CRITICAL ECOSYSTEM PARTNERSHIP FUND

Ecosystem Profile

Indo-Burma Biodiversity Hotspot

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U Saw Win	Renewable Energy Association Myanmar
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EXECUTIVE SUMMARY

The Critical Ecosystem Partnership Fund (CEPF) is designed to safeguard the world's biologically richest and most threatened regions, known as biodiversity hotspots. It is a joint initiative of l'Agence Française de Développement, Conservation International (CI), the Global Environment Facility, the Government of Japan, the John D. and Catherine T. MacArthur Foundation, and the World Bank.

A fundamental purpose of CEPF is to engage civil society, such as community groups, nongovernmental organizations (NGOs), academic institutions and private enterprises, in biodiversity conservation in the hotspots. To guarantee their success, these efforts must complement existing strategies and programs of national governments and other conservation funders. To this end, CEPF promotes working alliances among diverse groups, combining unique capacities and reducing duplication of efforts for a comprehensive, coordinated approach to conservation. One way in which CEPF does this is through preparation of "ecosystem profiles": shared strategies, developed in consultation with local stakeholders, that articulate a five-year investment strategy informed by a detailed situational analysis.

This document represents the ecosystem profile for the Indo-Burma Hotspot, which comprises all non-marine parts of Cambodia, Lao PDR, Myanmar, Thailand and Vietnam, plus parts of southern China. With its high levels of plant and animal endemism, and limited remaining natural habitat, Indo-Burma ranks among the top 10 biodiversity hotspots for irreplaceability and the top five for threat. Indo-Burma holds more people than any other hotspot, and its remaining natural ecosystems, already greatly reduced in extent, are subject to intense and growing pressure from habitat loss, degradation and fragmentation, and over-exploitation of natural resources.

Updating the Ecosystem Profile

CEPF has been making grants to civil society groups in the Indo-Burma Hotspot since July 2008, guided by an ecosystem profile developed through a consultative process conducted in 2003. Much has changed since the original profile was prepared. In particular, there have been major changes to the nature and relative importance of threats to biodiversity, and several new challenges have emerged, not the least of which are hydropower development, agro-industrial plantations, mining and climate change. In addition, there have been major shifts in patterns of conservation investment, with several traditional biodiversity conservation donors reorienting their programs to other priorities or leaving the region altogether. Moreover, the operational space available for civil society has expanded in most countries, creating new opportunities for national, local and grassroots groups to engage in conservation efforts. Finally, investments by CEPF and other donors have built a strong platform of conservation results, good practice, information and capacity that can be built upon.

In April 2011, CEPF came together with the MacArthur Foundation, the Margaret A. Cargill Foundation and the McKnight Foundation to discuss common interests with regard to coordinating their investments in civil society in the Greater Mekong Subregion, to which the Indo-Burma Hotspot broadly corresponds. Subsequently, the four donors agreed to fund an update of the ecosystem profile. The updating process was launched in June 2011, and concluded in January 2012.

The updating process was coordinated by the CEPF Secretariat, in collaboration with BirdLife International *in Indochina*, the CI-China Program, Kadoorie Farm & Botanic Garden, the Samdhana Institute and the Yunnan Green Environment Development Foundation. More than 470 stakeholders were consulted during the updating process, whether through consultation workshops, small group meetings or email correspondence, resulting in a final document that is truly a collaborative product of many sections of civil society, government and the donor community.

Investment Strategy and CEPF Niche

The ecosystem profile presents an overview of the Indo-Burma Hotspot in terms of its biodiversity conservation importance, and socioeconomic, policy and civil society contexts. It defines a suite of measurable conservation outcomes, at species, site and corridor (or landscape) scales, and assesses the major direct threats to biodiversity and their root causes. The situational analysis is completed by assessments of current conservation investment, and the implications of climate change for biodiversity conservation. The ecosystem profile then goes on to articulate an overarching investment strategy for funders interested in supporting conservation efforts led by civil society. The strategy includes a niche for CEPF' where its investment can provide the greatest incremental value.

The CEPF investment niche covers a five-year period, building on previous investments and complementing investments by the other funders. The niche comprises a series of strategic funding opportunities, termed strategic directions, broken down into a number of investment priorities outlining the types of activities that will be eligible for CEPF funding. Civil society organizations or individuals may propose projects that will help implement the strategy by addressing at least one strategic direction. The ecosystem profile does not include specific project concepts, as civil society groups will develop these as part of their applications for CEPF grant funding.

The biological basis for CEPF investment in the Indo-Burma Hotspot is provided by conservation outcomes: the quantifiable set of species, sites and corridors that must be conserved to curb biodiversity loss globally. The conservation outcomes for Indo-Burma were defined during the preparation of the original ecosystem profile. During the updating process, the conservation outcomes were revised to reflect changes in the status of species, sites and corridors and improved data availability, especially for Myanmar. In order to enable investment by CEPF and other funders to be directed effectively, the species, site and corridor outcomes were prioritized through the stakeholder consultation process by applying standard criteria, including urgency of conservation action and opportunity to enhance existing conservation efforts.

A total of 754 species outcomes, 509 site outcomes and 66 corridor outcomes were defined for the hotspot. Among these, 151 species, 74 sites and four corridors were prioritized for conservation investment. The priority species represent a significant increase over the 67 identified in the original ecosystem profile. This can be attributed largely to the inclusion, for the first time, of priority plant species, and the expansion of the analysis to include Myanmar, home to a suite of species not found elsewhere in the hotspot.

Priority Corridors for CEPF Investment in the Indo-Burma Hotspot

There was strong consensus during the stakeholder consultations that CEPF should retain its current geographic priorities (i.e. the Mekong River and Major Tributaries, and the Sino-Vietnamese Limestone (formerly, Northern Highlands Limestone) corridors, and the sites therein), adding additional priorities if resources allowed. There was also broad consensus to add the Tonle Sap Lake and Inundation Zone and the Hainan Mountains as additional priority corridors, reflecting the massive funding gap and rapidly intensifying development threats facing both corridors. Priority corridors were not identified in Myanmar, where the level of conservation investment is relatively low, many sites and corridors are facing severe threats, and there is a need for different strategies than elsewhere in the hotspot. Rather, Myanmar was recognized as a geographic priority for certain, specific investment priorities.

The thematic priorities for conservation investment in the hotspot were defined through the stakeholder consultation process, based upon an analysis of the main threats to biodiversity in the hotspot and their root causes. The highest ranked threat was hunting and trade of wildlife, which threatens individual species with extinction and impacts wider ecosystems. Conversion of natural habitats for agro-industrial plantations of rubber, oil palm, tea and other cash crops was identified as the next highest threat, followed by proliferation of hydropower dams, which is the major threat to riverine ecosystems in the hotspot. The broad consensus from the stakeholder consultations was that all three threats are getting more severe, and will continue to do so, at least in the short-term. In every case, these threats have major implications for national economies and the livelihoods of rural people, both of which depend upon the services provided by natural ecosystems.

To respond to these and other threats, and to begin to address some of their root causes, CEPF formulated an investment niche comprising 21 investment priorities grouped into six strategic directions. The niche is the result of an extensive process of consultation with civil society and government stakeholders, as well as CEPF's donor partners. The CEPF niche fits within an overarching investment strategy of 38 investment priorities grouped into 11 strategic directions. This strategy forms the basis for coordinated investment by CEPF and other donors interested in supporting conservation efforts led by civil society.

Strategic Directions and Investment Priorities for CEPF in the Indo-Burma Hotspot

Strategic Directions	Investment Priorities
1. Safeguard priority globally threatened species by mitigating major threats	1.1 Transform pilot interventions for core populations of priority species into long-term conservation programs
	1.2 Develop best-practice approaches for conservation of highly threatened and endemic freshwater species
	1.3 Conduct research on globally threatened species for which there is a need for greatly improved information on status and distribution
	1.4 Support existing funds to become effective tools for the conservation of priority species in the hotspot

Strategic Directions	Investment Priorities
2. Demonstrate innovative responses to illegal trafficking and consumption of wildlife	2.1 Support enforcement agencies to unravel high-level wildlife trade networks by introducing them to global best practice with investigations and informants
	2.2 Facilitate collaboration among enforcement agencies and non-traditional actors to reduce cross-border trafficking of wildlife
	2.3 Work with selected private sector companies to promote the adoption of voluntary restrictions on the international transportation, sale and consumption of wildlife
	2.4 Support campaigns, social marketing, hotlines and other long-term communication programs to reduce consumer demand for wildlife and build public support for wildlife law enforcement
4. Empower local communities to engage in conservation and management of priority key biodiversity areas	4.1 Raise awareness about biodiversity conservation legislation among target groups at priority sites
	4.2 Pilot and amplify community forests, community fisheries and community-managed protected areas
	4.3 Develop co-management mechanisms for formal protected areas that enable community participation in all levels of management
	4.4 Conduct a gap analysis of key biodiversity areas in Myanmar and support expansion of the protected area network using community-based models
6. Engage key actors in mainstreaming biodiversity, communities and livelihoods into development planning in the priority corridors	6.1 Support civil society efforts to analyze development policies, plans and programs, evaluate their impact on biodiversity, communities and livelihoods and propose alternative development scenarios and appropriate mitigating measures where needed
	6.2 Integrate the biodiversity and ecosystem service values of priority corridors into land-use and development planning at all levels
	6.3 Develop protocols and demonstration projects for ecological restoration that improve the biodiversity performance of national forestry programs
	6.4 Engage the media as a tool to increase awareness and inform public debate of environmental issues
8. Strengthen the capacity of civil society to work on biodiversity, communities and livelihoods at regional, national, local and grassroots levels	8.1 Support networking activities that enable collective civil society responses to priority and emerging threats
	8.2 Provide core support for the organizational development of domestic civil society organizations
	8.3 Establish clearing house mechanisms to match volunteers to civil society organizations' training needs

Strategic Directions	Investment Priorities
11. Provide strategic leadership and effective coordination of conservation investment through a regional implementation team	11.1 Operationalize and coordinate CEPF's grant-making processes and procedures to ensure effective implementation of the investment strategy throughout the hotspot
	11.2 Build a broad constituency of civil society groups working across institutional and political boundaries towards achieving the shared conservation goals described in the ecosystem profile

Note: to facilitate cross-referencing, numbering of strategic directions and investment priorities in the CEPF niche (six strategic directions) follows that in the overall strategy (11 strategic directions).

Conclusion

In terms of species diversity and endemism, the Indo-Burma Hotspot is one of the most biologically important regions of the planet. Due to high human population pressure, rapid economic development, and changing consumption patterns, the natural ecosystems of the hotspot are being placed under increasing pressure. Since the attention of the international conservation community was focused on the hotspot in the 1990s, and political developments enabled increased flows of overseas development assistance, most countries have benefited from significant conservation investment, particularly to governments and international NGOs. The impacts of this investment include expansion of the area of each country under (at least nominal) formal protection, and development of conservation strategies of demonstrated effectiveness, albeit at limited scales.

In recent years, however, there has been a gradual reduction in the amount of funding available for biodiversity conservation, as donors have shifted focus to other issues (most notably climate change) or retired from countries in the hotspot altogether. At the same time, changing political and economic conditions are facilitating greater private sector investment in hydropower, agro-industry, mining and other industries with potentially large environmental footprints. While these trends present ever-greater conservation challenges, one positive development has been the growth of domestic civil society groups engaged in biodiversity conservation and related issues of sustainable development, poverty alleviation and social equity.

The emergence of these groups presents opportunities for CEPF and other funders to support broad coalitions of civil society, ranging from international NGOs to community-based organizations, and to develop integrated grant portfolios that address the major conservation challenges from multiple angles. The shared investment strategy set out in this ecosystem profile provides a framework for this type of partnership development, which is required at local, national and regional levels. The investment strategy is both ambitious and indicative of the scale of the conservation challenges facing the Indo-Burma Hotspot. It is unrealistic to assume that these challenges can be resolved within the next five years. However, by making strategic investments in civil society, CEPF can put in place a strong foundation of capacity, knowledge and good practice to enable more effective responses by a strengthened, broadened and engaged conservation movement.

1. INTRODUCTION

The Critical Ecosystem Partnership Fund (CEPF) is designed to safeguard the world's biologically richest and most threatened regions known as biodiversity hotspots. It is a joint initiative of l'Agence Française de Développement (AFD), Conservation International (CI), the Global Environment Facility (GEF), the Government of Japan, the John D. and Catherine T. MacArthur Foundation, and the World Bank.

A fundamental purpose of CEPF is to engage civil society, such as community groups, nongovernmental organizations (NGOs), academic institutions and private enterprises, in biodiversity conservation in the hotspots. To guarantee their success, these efforts must complement existing strategies and programs of national governments and multilateral and bilateral donors. CEPF promotes working alliances among diverse groups, combining unique capacities and reducing duplication of efforts for a comprehensive, coordinated approach to conservation. CEPF focuses on biological areas rather than political boundaries and examines conservation threats on a hotspot-level basis. CEPF targets transboundary cooperation, in areas of high importance for biodiversity conservation that straddle national borders, or in areas where a regional approach will be more effective than a national approach. CEPF aims to provide civil society with an agile and flexible funding mechanism complementing funding available to government institutions.

Figure 1. Boundaries of the Indo-Burma Hotspot Defined by Mittermeier *et al.* (2004)

The Indo-Burma Hotspot is ranked in the top 10 hotspots for irreplaceability and in the top five for threat, with only 5 percent of its natural habitat remaining and with more people than any other hotspot (Mittermeier *et al.* 2004, CI 2011).

As defined by Mittermeier *et al.* (2004), the hotspot includes parts of northeastern India, Bangladesh and Malaysia (Figure 1). Northeastern India is included in a separate CEPF funding region (the Eastern Himalayas), while Bangladesh and Malaysia only extend marginally into the hotspot. For the purposes of the ecosystem profile, therefore, the Indo-Burma Hotspot is defined as all non-marine parts of Cambodia, Lao PDR, Myanmar, Thailand and Vietnam, plus those parts of southern China in Biounits 6 and 10 (i.e., Hainan Island, southern parts of Yunnan, Guangxi, and Guangdong provinces, and Hong Kong and Macau Special Administrative Regions) (Figure 2). As defined here, Indo-Burma covers a total land area of 2,308,815 square kilometers, more than any other hotspot (Mittermeier *et al.* 2004).

Figure 2. Boundaries of the Indo-Burma Hotspot Followed by the Ecosystem Profile

CEPF has been making grants to civil society groups in the Indo-Burma Hotspot since July 2008. CEPF grant making follows an investment strategy developed through an extensive stakeholder consultation process conducted in 2003, the results of which were documented in the original ecosystem profile, published in May 2007 (CEPF 2007).

Much has changed in the eight years since the original profile was prepared. While the biological priorities defined in the document have generally stood the test of time, there have been changes in the status of some species, sites and corridors, as well as in the level of knowledge about others. There have also been major changes to the nature and relative importance of threats to biodiversity, and several new challenges have emerged, including hydropower development, agro-industrial plantations, mining and climate change. In addition, there have been major shifts in patterns of conservation investment, with several traditional biodiversity conservation donors reorienting their programs to other priorities or leaving the region altogether. Moreover, the operational space available for civil society has expanded in most countries, creating new opportunities to engage civil society in biodiversity conservation. Finally, investments by international donors have built a strong platform of conservation results, good practice, information and capacity that can be built upon. For these reasons, a need was identified to update the ecosystem profile, through a participatory process, to create a platform on which donors interested in supporting conservation efforts led by civil society groups could build shared goals and strategies that address the highest priorities, take advantage of emerging opportunities, and align well with existing investments by governments and other donors.

In April 2011, CEPF came together with the MacArthur Foundation, the Margaret A. Cargill Foundation and the McKnight Foundation to discuss common interests with regard to coordinating their investments in civil society in the Greater Mekong Subregion, with which the Indo-Burma Hotspot broadly corresponds. Subsequently, the four donors agreed to fund an update of the ecosystem profile, and the updating process was launched in June 2011.

2. BACKGROUND

The ecosystem profile presents an overview of the Indo-Burma Hotspot in terms of its biodiversity conservation importance, major threats to and root causes of biodiversity loss, and the socioeconomic, policy and civil society context in which conservation takes place. The profile also presents assessments of the implications of climate change for biodiversity conservation in the hotspot, and of patterns of conservation investment over the last decade. It defines a comprehensive suite of measurable conservation outcomes at species, site and corridor scales, and identifies priorities for conservation investment within these.

The ecosystem profile concludes with a five-year investment strategy for donors interested in supporting civil-society-led conservation efforts in the hotspot. This investment strategy comprises a series of strategic funding opportunities, termed strategic directions, broken down into a number of investment priorities outlining the types of activities that will be eligible for funding. Civil society organizations (CSOs) or individuals may propose projects that will help implement the strategy by addressing at least one of the investment priorities. The ecosystem profile does not include specific project concepts, as civil society groups will develop these as part of their funding applications. Applicants are required to prepare detailed proposals identifying and describing the interventions and performance indicators that will be used to evaluate the success of their projects.

2.1 Original Ecosystem Profile

The original ecosystem profile was developed through a process of consultation and desk study coordinated by BirdLife International in collaboration with the Bird Conservation Society of Thailand (BCST), Kadoorie Farm & Botanic Garden (KFBG), and the World Wide Fund for Nature (WWF) Cambodia Program, with the technical support of the Center for Applied Biodiversity Science at CI. More than 170 stakeholders from civil society, government, and donor institutions were consulted during the preparation of the ecosystem profile (CEPF 2007). In parallel to this process, a stand-alone investment strategy was developed for Myanmar. This document was based upon the results of two stakeholder workshops held in Yangon in August 2003 and July 2004. More than 30 stakeholders from NGOs, academic institutions, government institutions and donor agencies attended each workshop. These workshops were the first attempt to reach multi-stakeholder consensus on geographic, taxonomic and thematic priorities for conservation in Myanmar (BirdLife International 2005).

2.2 First Investment Phase

The original ecosystem profile was approved by the CEPF Donor Council in April 2007, with a total budget allocation of $9.5 million. The Council subsequently approved the appointment of BirdLife International as the regional implementation team for the hotspot in November 2007, and grant making began in July 2008, following the investment strategy set out in the profile.

Given the significant investments already being made in biodiversity conservation by international donors and national governments, the CEPF investment strategy supported civil society initiatives that complemented and better targeted existing investments. In particular, resources were targeted at conservation efforts for freshwater biodiversity and trade-threatened species, two long-standing investment gaps, as well as efforts to mainstream biodiversity conservation goals into development policy and planning. The investment strategy had four strategic directions:

1. Safeguard priority globally threatened species by mitigating major threats.
2. Develop innovative, locally led approaches to site-based conservation at 28 key biodiversity areas.
3. Engage key actors in reconciling biodiversity conservation and development objectives.
4. Provide strategic leadership and effective coordination of CEPF investment through a regional implementation team.

To maximize impact and enable synergies among individual projects, the first phase of CEPF investment focused on 67 priority species and 28 priority sites in two conservation corridors: the Mekong River and Major Tributaries; and the Northern Highlands Limestone (now renamed Sino-Vietnamese Limestone). CEPF investment was restricted to four countries: Cambodia; Lao PDR; Thailand; and Vietnam.

2.2.1 Impacts

As of June 30, 2012, 97 grants had been awarded (54 small and 43 large), with a total value of $9,406,105. These comprised: 54 small grants (up to $20,000), with a mean of $16,926; 42 large grants (above $20,000), with a mean of $180,766; and the regional implementation team grant. The 97 grants raised a total of $7,009,001 in co-financing (including counterpart funding and in-kind contributions), equivalent to 75 percent of the total CEPF investment. Twenty-seven grants, totaling $1,508,405, were awarded to local civil society groups, with the remainder being awarded to international groups.

During July 2010, a participatory mid-term assessment was carried out, involving over 90 representatives of grantees, national governments, CEPF's donor partners and media; the purpose was to assess progress towards the goals set out in the original ecosystem profile (CEPF 2010). The results of this assessment were updated through regular monitoring of CEPF grants, including annual reporting on conservation impacts by grantees up to June 2012. Thus, the impacts of the first four years of CEPF investment in the Indo-Burma Hotspot (2008 to 2012) can be summarized as follows:

- Work initiated to identify and/or secure core populations of 47 of the 67 priority species identified in the ecosystem profile, with local conservation patrol teams in place for 11 species, and nest protection schemes in place for nine species.
- New information generated on four of the 12 globally threatened species identified as having an over-riding need for improved information on their status and distribution.
- Legal protection conferred on all globally threatened turtle species in Cambodia.
- Protection and management strengthened for more than 1.5 million hectares across 24 key biodiversity areas.
- New protected areas established covering more than 30,000 hectares.
- Conservation goals integrated into more than 160,000 hectares of production landscapes.
- Civil society efforts strengthened to raise concerns about the social, environmental and economic implications of hydropower dam construction in the Mekong and Major Tributaries corridor, and help affected communities voice their concerns.
- Profile of pressing conservation issues in the Northern Highlands Limestone corridor raised among key decision makers in Vietnam, with positive outcomes in several cases.
- Targeted outreach, training or awareness raising provided for at least 260 journalists, academics, civil society representatives and government staff.

- Improved regional collaboration to combat the wildlife trade through formation of a Cambodian Coordination Unit for the ASEAN-Wildlife Enforcement Network.
- National network of conservation volunteers in Vietnam expanded and engaged in efforts to combat the wildlife trade, with 3,200 new members and over 160 businesses monitored.
- Twenty local civil society organizations directly benefiting from CEPF investment as grantees, plus seven more benefiting via sub-grants, with most demonstrating improvements in organizational capacity.
- Direct benefits from sustainable use of natural resources received by more than 100 local communities.

It should be noted that the impacts summarized here are only the provisional results of the first phase of CEPF investment; they are expected to increase significantly during the final year of implementation, as 50 of the 97 grants were still active as of June 30, 2012.

2.2.2 Lessons Learned

The first phase of CEPF investment in the Indo-Burma Hotspot established a solid platform, in terms of results, capacity and experience, on which to build further success. It was vital, therefore, to capture lessons learned from the first phase in the update of the ecosystem profile, to amplify successful models, sustain improvements in the enabling conditions for conservation, and enhance the operations of CEPF grant making. This was done through the process of reflective practice and adaptive management by which the CEPF Secretariat continually evaluates its performance and refines its approach, complemented by consultations with grantees and other stakeholders during the updating process (see Section 2.3).

The key lessons learned from the first investment phase relevant to future investment in the hotspot by CEPF and other funders can be summarized as follows:

- The conservation needs of many of the most highly threatened species are not adequately addressed by current approaches to ecosystem conservation, and they require targeted conservation interventions. The demand for funding for such species-focused conservation greatly outstrips supply, and CEPF funding has been critical in bridging this gap for many species.
- Conservation of viable populations of the most highly threatened species requires a combination of on-the-ground interventions for core populations, to reduce levels of offtake or displace them elsewhere, and actions to reduce the illegal trade that is driving unsustainable exploitation. Effective approaches to on-the-ground conservation have been piloted in various contexts, and now need to be amplified and turned into long-term programs. With regard to combatting the wildlife trade, however, there has been little proven success, and there is a need for further innovation and testing to identify approaches that work.
- Local communities can be active partners in conservation, both within and outside of protected areas, but for their contributions to be effective and sustained they need to receive tangible, immediate benefits directly linked to their actions.

- Unless development planning and policy incorporates biodiversity conservation goals, site conservation efforts risk being rapidly undermined by incompatible developments, such as agro-industrial plantations or infrastructure projects. Civil society can play an important role in assessing the potential impacts of these developments on biodiversity and ecosystem services and proposing alternative development scenarios and appropriate mitigating measures.
- When responding to development-related threats, the agendas of conservation groups overlap with those of rural development and human-rights-based groups, as well as affected communities. Considerable potential exists to engage broad-based alliances of civil society in conservation of critical ecosystems, although this has yet to be fully realized.
- The political space available to civil society in most countries of the hotspot has increased over the last decade, and domestic organizations have had unprecedented influence on public debates of environmental issues. However, civil society continues to face a number of significant challenges, not least with regard to human and financial resources. As the need and potential to engage domestic organizations as grantees increase, CEPF needs to refine its strategies for doing this.
- Grants provide a context in which civil society capacity building can take place. However, facilitating the emergence of local conservation movements that can sustain the results of CEPF investment and respond to new conservation issues as they arise also requires direct investment in capacity building, at the individual, organizational and network levels.
- The scale of the conservation challenges facing the Indo-Burma Hotspot is far too great for any one organization to address alone. There is a need for coordinated action by government and civil society, towards common goals, and supported by well aligned donor funding. The CEPF ecosystem profile is a proven tool for facilitating such coordination, although it requires updating to reflect significant changes to the conservation context over the last decade.

2.3 Updating Process

The updated ecosystem profile was developed through a highly consultative process coordinated by the CEPF Secretariat, in collaboration with BirdLife International *in Indochina*, the CI-China Program, KFBG, the Samdhana Institute and the Yunnan Green Environment Development Foundation. More than 470 stakeholders were consulted during the updating process, whether through consultation workshops, small group meetings or email correspondence, resulting in a final document that is truly a collaborative product of many sections of civil society, government and the donor community.

2.3.1 Thematic Studies

The contextual sections of the profile were updated through a series of five thematic studies, covering: the socioeconomic and policy context for conservation; the civil society context for conservation; the implications of climate change for conservation;

patterns of conservation investment; and threats to biodiversity and their root causes. Each thematic study was led by one or more specialists, and involved some combination of desk study, small group meetings with stakeholders, one-to-one interviews and email correspondence. The output of each thematic study was a report, which was modified and integrated into the draft ecosystem profile.

2.3.2 National and Provincial Consultation Workshops

The main findings of the thematic studies were reviewed and verified at a series of consultation workshops, involving stakeholders from civil society, government and donor agencies. These workshops also provided an opportunity for stakeholders to: update the conservation outcomes and propose revisions to the lists of priority species, sites and corridors; identify and prioritize key threats to biodiversity; and propose investment priorities for inclusion in the investment strategy. For Thailand, the national consultation was held in Bangkok on July 20-21, 2011, and attended by 34 stakeholders. For Vietnam, the national consultation was held in Hanoi on August 22-23, 2011, and attended by 64 stakeholders. The national consultation for Lao PDR was held in Vientiane, on August 25-26, 2011, and attended by 39 stakeholders. For China, two national consultations were held: the first, covering Yunnan, was held in Kunming on July 25-26, 2011, and attended by 36 stakeholders; the second, covering Guangdong, Guangxi and Hainan, was held in Shenzhen on October 12-13, 2011, and attended by 19 stakeholders. For Cambodia, a national consultation was held in Phnom Penh on August 29-30, 2011, and attended by 51 stakeholders. This was complemented by three provincial consultations to engage a representative sample of the civil society groups working at local and grassroots levels, held in Kratie on September 1, 2011, Ban Lung (Ratanakiri) on September 6, 2011 and Siem Reap on September 9, 2011, and attended by 17, 18 and 34 stakeholders, respectively. A slightly delayed national consultation for Myanmar was held in Yangon on January 17-18, 2012, and attended by 85 stakeholders; this was after the regional consultation workshop, and the results were integrated into the profile retroactively.

2.3.3 Regional Consultation Workshop

A regional consultation meeting was held in Phnom Penh on October 10-11, 2011, and attended by 70 stakeholders. The purpose of the workshop was to develop more detailed strategies to respond to the highest priority conservation issues identified during the thematic studies and national and provincial consultations, specifically: agro-industrial plantations; hydropower dams; illegal wildlife trade; civil society capacity limitations; and lack of systematic monitoring of the impacts of conservation investments.

2.3.4 Drafting and Review of Ecosystem Profile

The results of the consultation process were integrated into a draft ecosystem profile, which was circulated for review by all stakeholders in December 2011. Comments received were integrated into a final draft, which was then reviewed internally by the CEPF Secretariat, prior to submission to the CEPF Working Group for additional review in July 2012.

3. BIOLOGICAL IMPORTANCE OF THE INDO-BURMA HOTSPOT

3.1 Geography, Climate, and History

Indo-Burma boasts an impressive geographic diversity. It spans nearly 6,000 meters in elevation, from the summit of Hkakaborazi in Myanmar, Southeast Asia's highest mountain, down to a coastline along the Bay of Bengal, Andaman Sea, Gulf of Thailand and South China Sea. The hotspot encompasses a number of complete mountain ranges, such as the Annamite Mountains, and includes parts of several others, including eastern extensions of the Himalayas. The hotspot features isolated massifs and plateaus, extensive areas of limestone karst and several of Asia's largest rivers: the Mekong, Chao Phraya, Ayeyarwady (Irrawaddy), Thanlwin (Salween), Chindwin, Sittaung, Red and Pearl (Zhu Jiang). The hotspot's sweeping expanses of lowlands embrace several fertile floodplains and deltas and include the Great Lake of Tonle Sap, Southeast Asia's largest and most productive freshwater lake.

Reflecting its high diversity of landforms and climatic zones, Indo-Burma supports a wide variety of habitats and thus high overall biodiversity. This diversity is enriched by the development of areas of endemism as a result of the hotspot's geological and evolutionary history. Fluctuating Pleistocene sea levels and the resulting repeated isolation and reconnection of ecosystems and plant and animal populations have helped to promote speciation (van Dijk *et al.* 1999), while fluctuations in the relative extent of lowland evergreen forest during glacial episodes have allowed species to evolve in isolation, and further contributed to the high levels of endemism in the hotspot (Baltzer *et al.* 2001, van Dijk *et al*. 2004). Centers of endemism are concentrated in the Annamite Mountains, the northern highlands of southern China and northern Vietnam and, although probably to a lesser extent because of their connection with the Himalaya, Myanmar's northern highlands. Others may remain to be documented, given the patchiness of survey and of taxonomic review.

Most parts of the hotspot experience a strongly seasonal climate, with the climate of the south and west of the hotspot dominated by a southwest monsoon season of variable duration and the climate of the northeast of the hotspot dominated by the northeast monsoon in the northern summer (Figures 3 and 4). During the northern winter months, drier conditions prevail throughout much of the hotspot under the influence of stable continental Asian high-pressure systems (Figures 5 and 6). Within the hotspot, however, a complex array of microclimates exists, with mean annual precipitation varying from under 800 mm in coastal areas of central Vietnam (Nguyen Khanh Van 2000) to almost 8,000 mm in some parts of the central Annamite Mountains (WWF/EC 1997).

Figure 3. Annual Mean Temperature across the Indo-Burma Hotspot

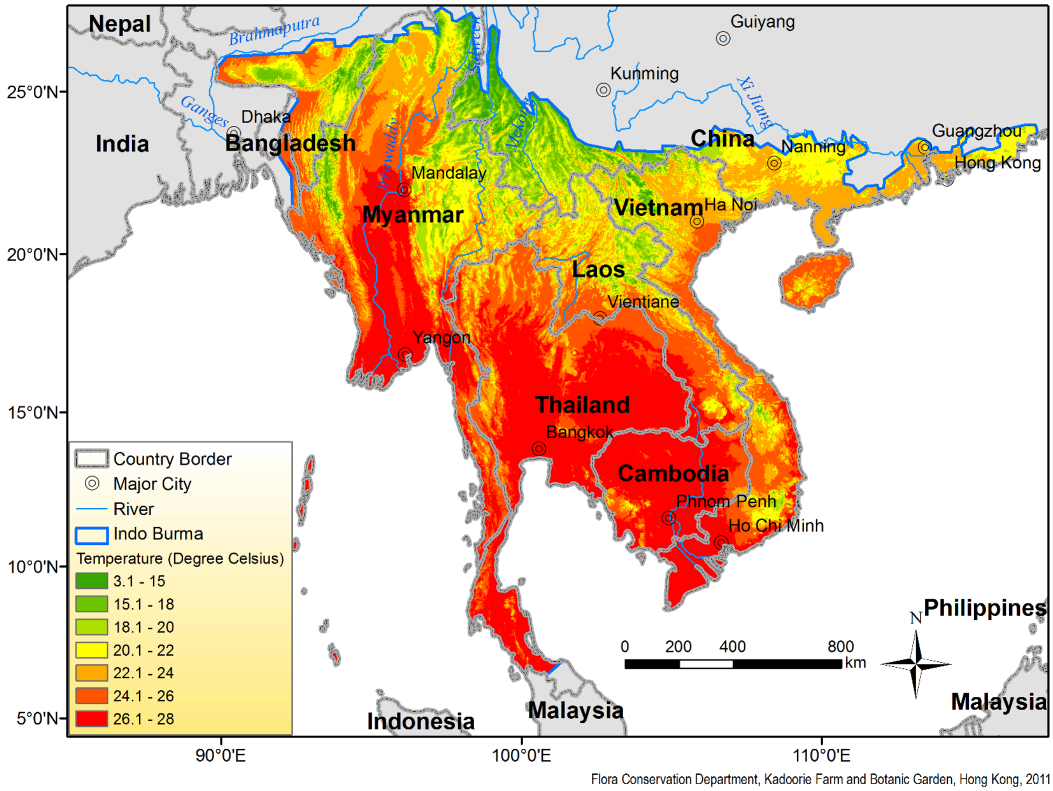


Figure 4. Annual Mean Precipitation across the Indo-Burma Hotspot

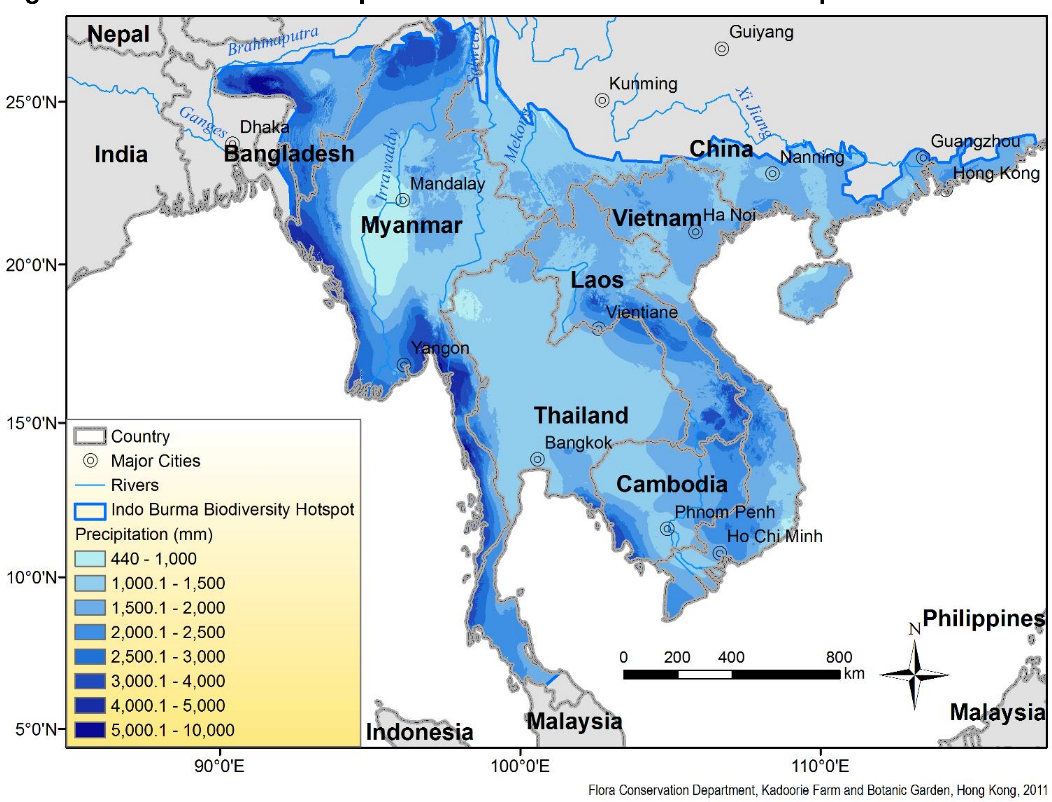


Figure 5. Monthly Mean Temperature across the Indo-Burma Hotspot

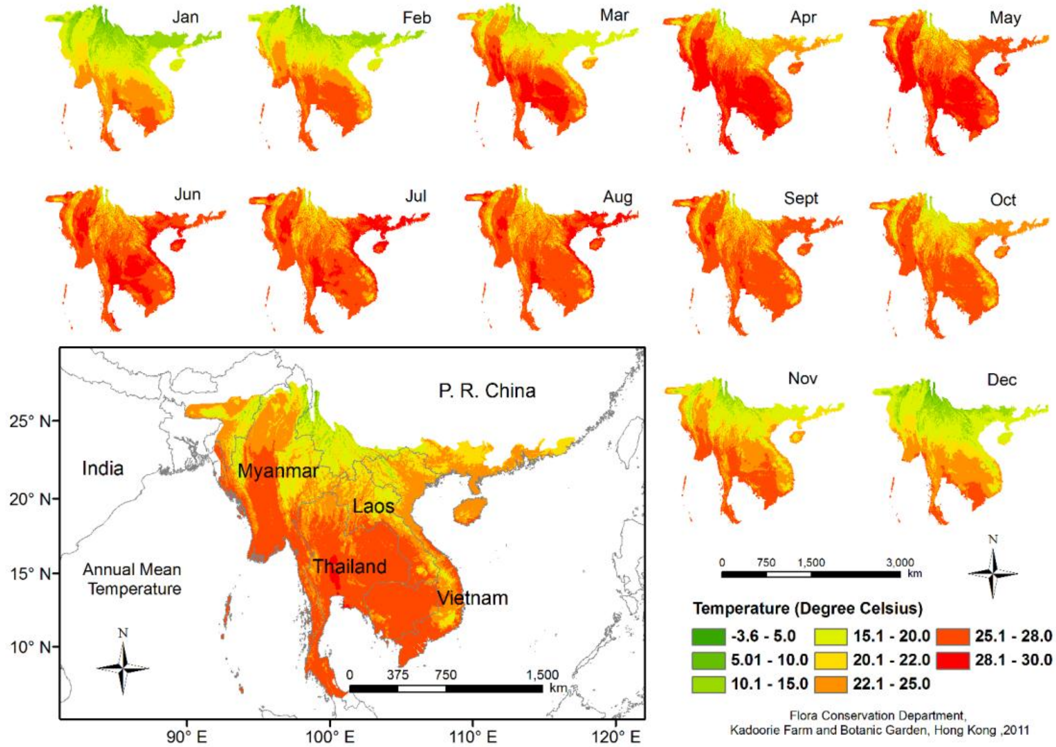
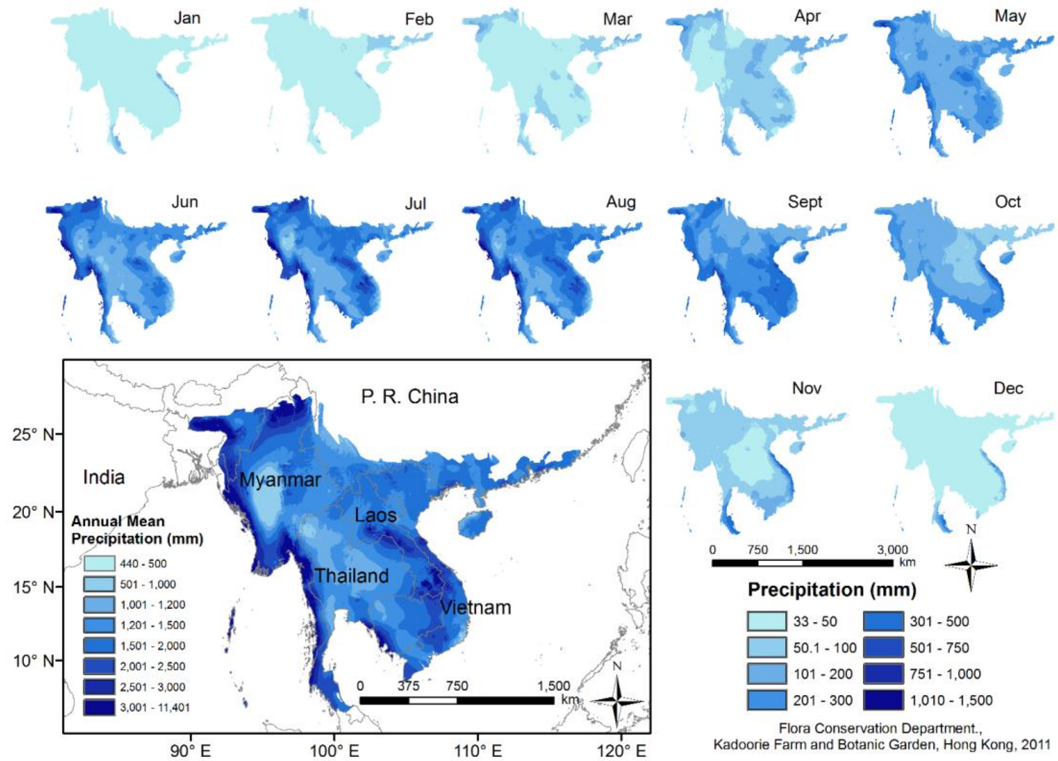


Figure 6. Monthly Mean Precipitation across the Indo-Burma Hotspot



3.2 Habitats and Ecosystems

Forests are among the most species-rich ecosystems in the hotspot, and before major anthropogenic change they covered the vast majority of its land. The variety of forest types is immense, from evergreen forests with a high diversity of canopy tree species, through semi-evergreen and mixed deciduous forests, to relatively (tree) species-poor deciduous dipterocarp forests. Limestone karst supports distinctive vegetation formations, with high levels of endemism to the habitat and, particularly among plants, reptiles and molluscs, to individual massifs. Mono-dominant and mixed formations of conifers are distributed mostly in montane areas, while open, fire-climax coniferous formations are distributed on drier hills and plateaus subject to regular burning. Lowland floodplain swamp or flooded forests are a feature of the permanently and seasonally inundated lowlands, especially in Cambodia, and mangrove forests are distributed in coastal areas.

Lowland evergreen forests are among the most species-rich in plants in the whole hotspot, and many plants and animals are restricted to them. Lowland evergreen forests formerly covered large areas of peninsular Thailand and peninsular Myanmar (surviving better in the latter country), as well as smaller areas elsewhere in the hotspot, including the Annamese lowlands of Vietnam. However, due to the (former) abundance of commercially valuable timber species in these forests and their suitability for agriculture (including tree plantations), they have been among the most heavily exploited of all habitats. Large areas have been cleared and much of the remaining forest is threatened with conversion to cash crops and subsistence agriculture.

Montane evergreen forests are distributed throughout the hotspot, including the Annamite Mountains of Lao PDR and Vietnam, the Cardamom Mountains of Cambodia, the Chin Hills, Bago Yoma, Rakhine Yoma and other ranges of Myanmar, and the vast and largely contiguous highland block across southern China, northern Vietnam, northern Lao PDR, northern Thailand and northern Myanmar. Altitudinal change in species distribution is marked in many taxonomic groups of plants and animals in the hotspot (e.g. Whitmore 1999), and many species undertake seasonal altitudinal movements and are dependent upon habitats at different altitudes. Relative to most other habitats in the hotspot, montane evergreen forests support many restricted-range amphibians, birds and plants, although fewer such mammals (at least among the larger-bodied species), which seem to show lower altitudinal stratification (Steinmetz *et al.* 2008). The hotspot's lower montane evergreen forests are believed to have plant species richness that is similar to nearby lowland evergreen forests, while upper montane evergreen forests are less species rich, and dominated by members of the Fagaceae, Lauraceae and Magnoliaceae families. At higher elevations, on summits and ridge crests, stunted, xerophytic formations dominated by *Rhododendron* spp. and other members of the Ericaceae family are found. Montane evergreen forests in Indo-Burma are generally less threatened by overexploitation than are the hotspot's lowland evergreen forests. However, conversion to cash crops and other land uses is leading to extensive clearance of lower montane evergreen forest in many areas.

Semi-evergreen and mixed deciduous forests are widely distributed in lowland and hill areas throughout the hotspot. These forests are less rich in plant species than are lowland evergreen forests and generally support lower levels of plant and animal endemism. These forests hold a number of commercially valuable timber species and are targeted for logging in many areas. The distinction between semi-evergreen and mixed deciduous forests is highly inconsistent depending on whether simple deciduousity is prioritized in definition (as would be implied by the habitats' names) or whether species and genus identity of the habitat-structuring species is considered of basic importance (Rundel 2009).

Deciduous dipterocarp forests are open forests mostly with grassy understory, which occur in areas with a prolonged dry season. These forests support relatively few tree species, although they support distinctive plant and animal communities, and there is a large variety of subtypes (Rundel 2009). Formerly these forests covered much of the center of the hotspot, notably in the Mekong Basin, but little-degraded tracts are now largely restricted to the plains of northern and northeastern Cambodia and adjacent areas of Lao PDR and Vietnam (Tordoff *et al*. 2005), and small tracts in western Thailand. In these areas, deciduous dipterocarp forests frequently occur in mosaics with patches of semi-evergreen forest, grassland and wetlands, many of which are subject to seasonal monsoon inundation, and the mosaic nature is itself probably vital to a large number of specialist deciduous dipterocarp animal species. As recently as the 1950s, these landscapes supported such impressive herds of large ungulates that they were considered one of the "great gamelands of the world" (Wharton 1957). The Ayeyarwady floodplain, sheltered from southwest and northeast monsoons by a horseshoe of mountain ranges, has an extremely dry and seasonal climate, which has given rise to specialized vegetation types, including deciduous dipterocarp forest similar to that of the Mekong Basin, as well as the only thorn scrub in the hotspot. Myanmar's dry scrub and forest landscapes have been isolated from similar landscapes in Southeast Asia and the Indian Subcontinent for significant periods of geological history. As a result, the area, termed the Central Dry Zone, supports a number of endemic species additional to many of the deciduous dipterocarp specialists of lands further east.

The limestone karst formations that are distributed throughout the hotspot (in some places as extensive belts and in other places as isolated outcrops) support highly distinctive ecosystems rich in endemic species (Clements *et al.* 2006). Although, to date, taxonomic groups such as primates, birds and orchids have received the greatest amount of conservation investment and scientific study, limestone ecosystems are of equal, if not greater, significance for other, generally less well known groups, including cave fish, land snails and deep-soil invertebrates. While the unsuitability of limestone karst for agriculture means that wholesale habitat conversion is generally less of a threat than it is to other forest types in the hotspot, tall forest on limestone is localized, often heavily harvested for firewood, and of unknown but possibly high importance to some, perhaps many, of the karst endemics. Animal and plant species of limestone ecosystems are often threatened by overharvest for the pet and horticulture trades. The karst formations themselves are, in places, heavily quarried, which has the potential to cause or contribute to the loss of plant and animal populations. Where quarrying takes place on a small scale within extensive, contiguous belts of karst, its overall effects may be predominantly local. However, destruction of isolated karst formations poses significant risks for many hyperendemic invertebrates and certain fish, plant and reptile species, and may already have resulted in global extinctions.

Seasonally inundated swamp forest ecosystems surround the Great Lake of Tonle Sap in Cambodia. Formerly, these ecosystems were also extensive in the deltas and lower floodplains of the Mekong and Chao Phraya rivers, but are now restricted to isolated fragments. Freshwater swamp forest in Myanmar is distributed in the Ayeyarwady Delta and in the floodplains of the Chindwin and other rivers. Because of its coincidence with areas of high human population and suitability for conversion to agricultural land, freshwater swamp forest has been extensively cleared throughout mainland Southeast Asia. These ecosystems are important for a number of globally threatened species, notably large waterbirds.

Mangrove forests were once distributed widely in coastal areas, particularly near estuaries, but are now greatly reduced, as a result of fuelwood extraction and conversion to aquaculture. Other important coastal habitats in the hotspot include intertidal mudflats and sandflats, which are the key habitat for many migratory shorebirds. The largest and ecologically most important intertidal ecosystems are found near large rivermouths, most importantly in the Red River and Mekong Deltas of Vietnam, the Inner Gulf of Thailand, the Ayeyarwady Delta in Myanmar, and the Pearl River Delta in southern China.

Grassland ecosystems range from small, seasonally wet meadows within dry forest landscapes to the extensive, seasonally inundated grasslands that characterize the inundation zone of Tonle Sap Lake. Seasonally inundated grasslands support distinctive assemblages of species, including several that are globally threatened. They are one of the most threatened ecosystems in the hotspot. Formerly well distributed in central Thailand and the Mekong Delta, and occurring as smaller expanses on all the floodplains of the major rivers and their tributaries, they have almost disappeared through conversion to agriculture, aquaculture and forestry.

Freshwater ecosystems range from fast-flowing rocky mountain streams to wide, slow-flowing lowland rivers braided by large, partly vegetated sand and rock bars. Prime examples of the latter are the Mekong and its major tributary complex the Sekong-Sesan-Srepok, and the Ayeyarwady. The Great Lake of Tonle Sap in Cambodia dwarfs all other lotic bodies in the hotspot, although Myanmar has several large open freshwater lakes. Freshwater ecosystems support many globally threatened species, including some of those most threatened in the hotspot, and provide the livelihoods of a substantial proportion of the hotspot's human population. However, these areas are often of high subsistence importance for some of the region's most economically marginalized people, and the frequently high levels of human use have many negative effects on biodiversity (e.g. Meusch *et al*. 2003, Mollot *et al*. 2006, Bezuijen *et al*. 2008). Specific threats to freshwater ecosystems include: unsustainable fishing; changes to river flow patterns, such as blasting of rapids for navigation channels; hydropower dam construction; and, increasingly, pollution.

3.3 Species Diversity and Endemism

Indo-Burma encompasses all or part of seven Endemic Bird Areas defined by BirdLife International (Stattersfield *et al*. 1998, as updated by http://www.birdlife.org/datazone/), 12 of the Global 200 Ecoregions defined by WWF (Olson *et al*. 2000) and 28 Centers of Plant Diversity defined by the International Union for Conservation of Nature (IUCN) (Davis *et al*. 1995). Endemism is generally associated with offshore islands (e.g., Hainan), montane isolates, limestone karst, and areas of lowland evergreen forest that were isolated during glacial episodes.

The Indo-Burma Hotspot has extraordinarily high plant species richness (Davis *et al*. 1995). Preliminary estimates suggest that the hotspot may support 15,000 to 25,000 species of vascular plant, and that as many as half the angiosperms and gymnosperms are endemic to the hotspot (Davis *et al*. 1986, Campbell and Hammond 1989, Davis *et al*. 1995, van Dijk *et al*. 1999, Kress *et al*. 2003). The complex merging of floras in the highlands of Southeast Asia (most of which is encompassed within the Indo-Burma Hotspot) has no parallel in any other part of the world (de Laubenfels 1975). It represents the convergence of several distinctive temperate, tropical and subtropical floristic regions: the Indian, Malesian (Sundaic), Sino-Himalayan and Indochinese (Schmid 1989). Forest ecosystems support the highest plant species richness, among which montane forests and lowland evergreen forests are apparently the most species-rich. Plant families particularly notable for their high species richness in the hotspot include the Orchidaceae and Dipterocarpaceae.

On the basis of current knowledge, the Indo-Burma Hotspot harbors more than 400 mammal species and 1,200 bird species. Most of the latter are resident within the hotspot but a significant number are highly migratory, most being species that spend the northern winter in the hotspot and breed further north. Reptiles number more than 500 species, of which more than a quarter are endemic. Of the more than 300 amphibian species known so far to occur in the hotspot, around half are endemic (Mittermeier *et al*. 2004), and new species are regularly discovered.

Freshwater biodiversity in Indo-Burma is still very poorly known: for example, Kottelat (2011a) estimated that 11 percent of fish species so far found in the Sekong catchment in Lao PDR were certainly or potentially unnamed. In 1989, more than 900 freshwater fish species were known from mainland Southeast Asia (a region with a large overlap with Indo-Burma) (Kottelat 1989, Kottelat and Whitten 1996), of which about half might be expected to be endemic (van Dijk *et al*. 1999). The Lower Mekong Basin supports at least 850 freshwater fish species, with a total estimate of 1,100 species if possible coastal or marine visitors are included (Hortle 2009) and may be exceeded in species richness only by the Amazon and Congo Basins (Dudgeon 2000a). Overall, knowledge of freshwater biodiversity is still at the exploratory stage, with numerous taxonomic uncertainties, large areas unsurveyed, and many species known only from a single locality (Kottelat and Whitten 1996, Baltzer *et al*. 2001). The high rate at which fish species were newly described during the 1990s and 2000s (often more than a dozen at a time, e.g. Freyhof and Serov 2001) shows no sign of abating, with, for example, Kottelat's (2011a) short (nine-day) survey of parts of the Lao Xe Kong (Sekong), finding five species new to science. Rapids are particularly notable as sites of high species richness, endemism and periodic congregations of fish, as are some headwaters areas (e.g. more than a quarter of fishes recorded from the Dakchung Plateau in Lao PDR are apparently endemic to it; Kottelat 2011a). In addition, Inle Lake in Myanmar has been isolated for significant periods of geological history, resulting in the evolution of endemic taxa. This indicates that many more fish species may await discovery and description. In general, other freshwater taxa remain even less studied than fish. One exception is the Pomatiopsidae, a family of aquatic gastropods, for which the Mekong Basin represents a remarkable center of radiation, with at least 121 species (Davis 1979); this suggests that similarly high diversities might be found in other aquatic invertebrate taxa.

While it is abundantly clear that Indo-Burma supports extraordinary vertebrate species richness, detailed comparable data for most plant, invertebrate and fish groups are lacking. Even among mammals, birds and turtles, new species for science are still being regularly discovered in the hotspot, including, in recent decades, saola (*Pseudoryx nghetinhensis*) (Vu Van Dung *et al*. 1993), large-antlered muntjac (*Muntiacus vuquangensis*) (Do Tuoc *et al*. 1994, Timmins *et al*. 1998), grey-shanked douc (*Pygathrix cinerea*) (Nadler 1997), leaf muntjac (*Muntiacus putaoensis*) (Amato *et al*. 1999), Annamite striped rabbit (*Nesolagus timminsi*) (Averianov *et al*. 2000), long-eared gymnure (*Hylomys megalotis*) (Jenkins and Robinson 2002), shield-nosed leaf-nosed bat (*Hipposideros scutinares*) (Robinson *et al*. 2003), Kachin woolly bat (*Kerivoula kachinensis*) (Bates *et al*. 2004), kha-nyou (*Laonastes aenigmamus*) (Jenkins *et al*. 2005), Paulina's limestone rat (*Saxatilomys paulinae*) (Musser *et al*. 2005), various *Crocidura* shrews (e.g. Jenkins *et al*. 2009), Myanmar snub-nosed monkey (*Rhinopithecus strykeri*) (Geissmann *et al*. 2010; an entirely unexpected discovery), black-crowned barwing (*Actinodura sodangorum*) (Eames *et al*. 1999b), chestnut-eared laughingthrush (*Garrulax konkakinhensis*) (Eames and Eames 2001), Mekong wagtail (*Motacilla samvaesnae*) (Duckworth *et al*. 2001), Nonggang babbler (*Stachyris nonggangensis*) (Zhou and Jiang 2008), bare-faced bulbul (*Pycnonotus hualon*) (Woxvold *et al*. 2009), limestone leaf warbler (*Phylloscopus calciatilis*) (Alström *et al*. 2009) and Zhou's box turtle (*Cuora zhoui*) (Zhao *et al*. 1990).

Although some of these new species are so similar to already-named species that they are known or likely to have been previously overlooked, a number are so startlingly distinctive as to help set this part of the world apart: saola and kha-nyou look unlike any other species, even coarsely, and have no close relatives (indeed kha-nyou is a startling survival from a rodent lineage thought long extinct; Dawson *et al*. 2006); bare-faced bulbul (a species of bird) is the world's only bulbul with a mainly bald head (Woxvold *et al*. 2009), and while Annamite striped rabbit looks extremely similar to its close relative Sumatran striped rabbit (*Nesolagus netscheri*), there was no previous suspicion that such a dramatic-looking animal inhabited mainland Southeast Asia (Surridge *et al*. 1999). There are also a number of newly proposed species in these groups that require taxonomic confirmation, such as Annamite muntjac (*Muntiacus truongsonensis)* (Nguyen An Quang Ha 1997, P[ham] M[ong] Giao *et al*. 1998), Puhoat muntjac (*M. puhoatensis*) (Binh Chau 1997), Cuc Phuong ferret badger (*Melogale cucphuongensis*) (Nadler *et al*.

2011), golden-winged laughingthrush (*Garrulax ngoclinhensis*) (Eames *et al*. 1999a) and Naung Maung scimitar babbler (*Jabouilleia naungmungensis*) (Rappole *et al*. 2005).

The continued naming of new species for the world in the hotspot, and discovery within it of species previously thought extralimital to it (e.g. beech marten (*Martes foina*); Rabinowitz and Saw Tun Khaing 1998), are combined with a recent upsurge of taxonomic revision that is resulting in many widespread "species" being segregated into several different species (e.g. Fritz *et al.* 1997, Alström 1998, Groves 2001, Meijaard and Groves 2004, Stuart and Parham 2004, Stuart *et al*. 2006a, Leader *et al*. 2010). These three factors are leading to continued increases in known species richness and endemism.

3.4 Globally Threatened Species

Species listed on *The IUCN Red List of Threatened Species* (hereafter, the Red List) as Critically Endangered, Endangered or Vulnerable (the three categories that constitute the "globally threatened" list), form the principal basis for the identification of conservation outcomes for Indo-Burma and, consequently, the determination of investment priorities for CEPF (Appendix 1). A significant proportion of the plant and vertebrate species in Indo-Burma has been assessed as globally threatened. For many groups of fish, reptiles and plants in the hotspot, global threat assessments are not comprehensive, while the hotspot's invertebrates and fungi have barely been assessed. These groups may include many species meeting the criteria for globally threatened, despite not yet being classified as such by the Red List.

3.4.1 Mammals

At least a quarter of mammal species are considered globally threatened, with South and Southeast Asia holding a concentration of such threatened species (Schipper *et al*. 2008). Most mammals inhabit forest ecosystems, and this is particularly true for threatened mammals of Southeast Asia (Schipper *et al*. 2008). Overexploitation and habitat loss, the two principal threats to mammal survival globally, are also the major threats in Southeast Asia, where 90 percent of large mammals are threatened by overhunting (Schipper *et al*. 2008).

Indo-Burma is noteworthy for its concentration of globally threatened primates, of which 20 are endemic to the hotspot: pygmy loris (*Nycticebus pygmaeus*); Delacour's leaf monkey (*Trachypithecus delacouri*); François's leaf monkey (*T. francoisi*); white-headed leaf monkey (*T. poliocephalus*); Lao leaf monkey (*T. laotum*); Hatinh leaf monkey (*T. hatinhensis*); Indochinese silvered leaf monkey (*T. germaini*); Shortridge's leaf monkey (*T. shortridgei*); red-shanked douc (*Pygathrix nemaeus*); black-shanked douc (*P. nigripes*); grey-shanked douc; Tonkin snub-nosed monkey (*Rhinopithecus avunculus*); Myanmar snub-nosed monkey; eastern hoolock (*Hoolock leuconedys*); Hainan gibbon (*Nomascus hainanus*); cao vit crested gibbon (*N. nasutus*); black crested gibbon (*N. concolor*); northern white-cheeked gibbon (*N. leucogenys*); southern white-cheeked gibbon (*N. siki*); and yellow-cheeked gibbon (*N. gabriellae*). Various other globally threatened primate species inhabit the hotspot but also occur elsewhere.. Unresolved taxonomy, especially in the genera *Nomascus* and *Trachypithecus*, makes the figures quoted here preliminary; additional species recognized are likely to qualify as globally threatened (e.g. Duckworth *et al*. 2010). For instance, the recently named yellow-cheeked gibbon (*N. annamensis*) (Van Ngoc Thinh *et al*. 2010; formerly included by the Red List within *N. gabriellae*) will surely meet criteria for globally threatened.

Other globally threatened mammals endemic to the hotspot include the recently described saola and large-antlered muntjac. Both are confined to evergreen forests of the Annamite Mountains of Lao PDR and Vietnam and, for the muntjac, a small part of Cambodia (Timmins *et al.* 1998, Saola Working Group 2009). Other globally threatened mammal species are endemic to the hotspot; as with primates, ongoing taxonomic review of bats and rodents is liable to increase the number, perhaps substantially.

Two Endangered deer have races endemic to the hotspot (Mattioli 2011). Eld's deer *(Rucervus eldii)* has three subspecies, of which two are endemic to Indo-Burma: *C. e. siamensis*; and *C. e. thamin*. The former underwent a massive decline in the second half of the 20th century and only tiny numbers remain outside Cambodia, where declines continue apace. Hog deer (*Axis porcinus*) is probably reduced in the hotspot to, at most, a few dozen individuals within each of two small populations in Cambodia, the last remnants of the race *A. p. annamiticus*, and an unknown number of animals in Myanmar of the nominate race, which also occurs in the Indian subcontinent but is also in steep decline (Biswas *et al*. 2002, Maxwell *et al*. 2007, Timmins and Sechrest in press).

Many globally threatened mammals with more widespread world distributions inhabit the hotspot, including tiger (*Panthera tigris*), Asian elephant (*Elephas maximus*), banteng (*Bos javanicus*), gaur (*B. gaurus*), two species of pangolin (*Manis pentadactyla* and *M. javanica*) and four species of otter. These are all severely threatened by overexploitation, and require species-focused conservation interventions (IUCN 2011). Several, notably tiger, wild cattle and Asian elephant, remain mostly as small, isolated groups or individuals, and only some of the larger, less encroached blocks of natural habitat support potentially viable populations (e.g. Walston *et al*. 2010).

High mountains in northern Myanmar support mammal species characteristic of the Eastern Himalayas, including red panda (*Ailurus fulgens*), takin (*Budorcas taxicolor*) and red goral (*Naemorhedus baileyi*), which occur nowhere else in the hotspot.

At least one mammal species endemic to the hotspot is already extinct globally, Schomburgk's deer (*Rucervus schomburgki*), which inhabited the lowland plains and swamps of central Thailand, dying out in 1938 (Lekagul and McNeely 1977). Also, there are no recent records of kouprey (*Bos sauveli*), although survey effort has been inadequate to be sure that the species is extinct (Timmins in prep.). Lesser one-horned rhinoceros (*Rhinoceros sondaicus*) recently disappeared from the hotspot (Brook *et al*. 2011), and survives globally only in one location in Java. Hairy rhinoceros (*Dicerorhinus sumatrensis*) may also have recently been poached to extirpation in the hotspot.

Recent taxonomic revisions have recognized several species too poorly known to be categorized on the Red List other than as Data Deficient. Several have very small known ranges and may well be globally threatened, such as the chevrotains ("mousedeer") *Tragulus versicolor* and *T. williamsoni* (Meijaard and Groves 2004) and the leaf monkey *Trachypithecus barbei* (Geissmann *et al*. 2004).

3.4.2 Birds

Each major ecosystem in Indo-Burma supports a suite of globally threatened bird species; except where stated, the following information about the species is drawn from the species accounts in BirdLife International (2001) and IUCN (2011). Of these ecosystems, montane forests are the best represented within protected area networks and, generally, under the lowest threat. However, montane forest ecosystems support many restricted-range species, some of which are threatened by habitat loss. Lowland forest, coastal, freshwater wetland, riverine and grassland ecosystems generally receive less conservation effort than hill and montane forest ecosystems, yet are under higher levels of threat. It is these ecosystems that support the greatest numbers of Endangered and Critically Endangered bird species.

The hotspot's most enigmatic bird, and probably its rarest, is white-eyed river-martin (*Eurychelidon sirintarae*) known from wetlands in central Thailand. There are no confirmed records since 1978; the species is categorized as Critically Endangered but may well already be extinct. Many floodplain species, particularly larger ones of open habitats, and including endemics to the hotspot like giant ibis (*Thaumatibis gigantea*) and the biggest breeding colony of large waterbirds in the whole of Asia, in the flooded forests of Prek Toal in the northwestern corner of the Great Lake of Tonle Sap (Goes 2005, Campbell *et al*. 2006), are severely threatened. This bird mega-fauna requires species-focused interventions at the landscape scale (not confined to pristine habitat) to conserve viable populations (e.g. He *et al*. 2007a,b, Gray *et al*. 2009, Pilgrim *et al*. 2009). Perhaps the most threatened large waterbird of the hotspot is white-bellied heron *Ardea insignis*. Now restricted in the hotspot to northern Myanmar (which probably supports the bulk of the global population), conservation of this species is impeded by the uncertainty as to the factors behind its decline (R. J. Tizard pers. comm. 2011).

White-winged duck (*Cairina scutulata*) and masked finfoot (*Heliopais personata*), of the forest/wetland interface, are extremely depleted and, without targeted action, face inevitable global extinction soon. Even rarer, is pink-headed duck (*Rhodonessa caryophyllacea*). Tied to large rivers, Indian skimmer (*Rynchops albicollis*) is probably extinct in the hotspot outside of Myanmar, leading the way for a suite of other river-channel breeders; the next casualty is likely to be black-bellied tern (*Sterna acuticauda*), which has recently disappeared from the Mekong system (Goes *et al*. 2010).

The hotspot's coastal ecosystems are particularly important for several globally threatened migratory waterbirds: black-faced spoonbill (*Platalea minor*), spotted greenshank (*Tringa guttifer*), great knot (*Calidris tenuirostris*), far-eastern curlew (*Numenius madagascarensis*) and the rapidly declining spoon-billed sandpiper (*Eurynorhynchus pygmeus*) (e.g. Round 2008, Zöckler *et al*. 2010a,b).

The recent population crash of various vultures in the Indian Subcontinent resulted in their global threat status being revised from Near-threatened to Critically Endangered. Three species' populations in the hotspot are now of high conservation significance, as the veterinary drugs causing the precipitous declines in the Indian Subcontinent are not used in Indo-Burma (e.g. Pain *et al*. 2003, 2008, Htin Hla *et al*. 2011).

Among threatened forest passerines, lowland forest specialists, typified by Gurney's pitta (*Pitta gurneyi*) are chiefly distributed in the evergreen forests of peninsular Thailand and Myanmar, where the Sundaic biogeographic influence in the hotspot is at its strongest (Hughes *et al*. 2003, Donald *et al*. 2009). Globally threatened montane passerines threatened by habitat loss and fragmentation include collared laughingthrush (*Garrulax yersini*) and grey-crowned crocias (*Crocias langbianis*), endemic to Vietnam's southern Annamite Mountains , and golden-winged laughingthrush, chestnut-eared laughingthrush and black-crowned barwing endemic to the central Annamite Mountains of Lao PDR and Vietnam. Their extremely restricted ranges compound these threats.

3.4.3 Reptiles

Many reptile species are still being discovered in the hotspot, making meaningful statistics evasive. For example, until 1997, only three species of *Cyrtodactylus* gecko had been recorded for Vietnam, whereas currently two dozen species are known from the country; the increase coming mostly from new discoveries rather than taxonomic reassessment (Luu Quang Vinh *et al*. 2011). Similarly, during 2009–2011, six new *Gekko* gecko species were discovered in Vietnam, whereas only eight had previously been found there (Phung My Trung and Ziegler 2011). Some newly described species were first found in trade, and detective-style investigation was required to find wild populations (e.g. the turtle *Cuora picturata*; Ly Tri *et al*. 2011). Southeast Asian reptiles have not yet been comprehensively assessed by the Red List. Some broad patterns, relevant to conservation, are already clear, however: montane forest, wet evergreen forest and limestone karst are all richer in restricted-range species than the more seasonal, mostly lower-lying habitats of the hotspot. Limestone karst is particularly prone to hold species with very small geographic ranges. Such species are susceptible to relatively localized habitat perturbation, from direct human activity or perhaps climate change. There are also a suite of large-bodied, mostly slowly reproducing species (i.e. turtles, crocodiles, *Varanus* lizards and various big snakes) that are in steep decline through overharvest. Some of these also have restricted ranges but others are widespread in tropical Asia. These large species tend to be better known but conservation efforts in their favor still lag behind those for many mammals and birds.

Siamese crocodile (*Crocodylus siamensis)*, formerly widespread in the Mekong, Chao Phraya and Mae Klong Basins, is now Critically Endangered and restricted to a few, widely scattered, localities. Although it is abundant in captivity, where it is farmed for its hide, it has been extensively hybridized with other crocodile species, severely limiting the potential of most captive populations for reintroduction programs. Escapes from captivity occur, and the few remnant wild populations require careful management to ensure genetic purity (van Dijk *et al*. 1999, FitzSimmons *et al*. 2002).

The hotspot supports the richest non-marine turtle fauna in the world. In 1999, a re-evaluation of the global threat status of Asia's turtles concluded that 75 percent were globally threatened, with more than 50 percent meeting the criteria for Endangered or Critically Endangered. The distributions and habitat requirements of most species in Indo-Burma remain imperfectly understood, in part because many recent records stem from wildlife markets (van Dijk *et al*. 2000, Stuart *et al*. 2001, Stuart and Platt 2004, Turtle Conservation Coalition 2011). Overexploitation to supply the wildlife trade is clearly the major factor driving the decline of most turtle species in the hotspot, with some species fetching thousands of U.S. dollars for a single animal. The naturally slow reproductive rates of many turtle species mean that wild populations cannot sustain exploitation on this scale. Conservation action is urgently needed to prevent a wave of extinctions among the hotspot's turtles (Turtle Conservation Coalition 2011).

Only six snake and lizard species in Indo-Burma are currently assessed as globally threatened, in part reflecting limited assessment of the hotspot's reptiles by the Red List. Reptiles make up a significant proportion of traded wildlife entering China from Southeast Asia, and a number of snake and lizard species with a high value in trade may qualify as globally threatened. Also of great concern are species with highly restricted ranges, such as Chinese crocodile lizard (*Shinisaurus crocodilurus*), a large lizard known only from a few sites in southern China and northern Vietnam, and which is threatened by over-collection for the pet trade. The conservation of most globally threatened reptile species requires strategic, coordinated regional and global initiatives to combat the over-riding threat to their populations: overexploitation for trade.

3.4.4 Amphibians

Many of the hotspot's amphibian taxa have been described only in the last 20 years: for example, 31 percent of amphibian species known from Vietnam, Lao PDR and Cambodia in 2005 had been described since 1997 (Bain *et al*. 2007). This indicates that many more remain to be described. Collecting has been uneven over the hotspot but, as with reptiles, and perhaps even more so, permanently humid areas (montane forest, wet evergreen forest and limestone karst) support concentrations of restricted-range species, whereas non-forest habitats and forests with a harsh dry season hold fewer such species. Many of the amphibians occurring in the hotspot occur nowhere else in the world (Stuart *et al*. 2008, IUCN 2011).

In *The 1996 IUCN Red List of Threatened Animals* (IUCN 1996), only a single amphibian species in Indo-Burma was assessed as globally threatened. Following the Global Amphibian Assessment (IUCN-SSC and CI-CABS 2003; final presentation in Stuart *et al*. 2008), however, this total increased greatly and now stands at 48. This means that almost one-fifth of Southeast Asian amphibians are listed as globally threatened and a further 36 percent are listed as Data Deficient, 11 percent higher than the global average (Rowley *et al*. 2010). Many amphibian species are considered highly threatened by habitat loss due to their highly restricted ranges, such as the Endangered Hoang Lien moustache toad (*Leptobrachium echinata*) known only from the Hoang Lien Mountains of Vietnam. Other species with highly restricted ranges include Hainan knobby newt (*Tylototriton hainanensis*), Hainan stream frog (*Buergaria oxycephala*), Hainan torrent frog (*Amolops hainanensis*) (all three of which are restricted to forested streams on Hainan Island), Yunnan Asian frog (*Nanorana unculuanus*), endemic to Yunnan, Vietnamese salamander (*Paramesotriton deloustali*), endemic to northern Vietnam, and Guangxi warty newt (*P. guangxiensis*), endemic to southern China and northern Vietnam, as well as a number of other species with comparably small ranges currently classified as Data Deficient, such as Laos warty newt (*P. laoensis*). Threat levels to all the hotspot's salamanders are of rapidly increasing concern (Rowley *et al*. 2010). Several large-bodied stream frogs, such as Yunnan spiny frog (*Nanorana yunnanensis*), are assessed as Endangered because they are harvested in vast quantities for food. As well as new discoveries, improved taxonomic knowledge reveals localized taxa hitherto included in widespread "species" that should be treated as full species (e.g. Stuart *et al*. 2006a, Weisrock *et al*. 2006); some are likely to qualify as being globally threatened.

While the need for conservation action for Southeast Asian amphibians is becoming increasingly apparent (Rowley *et al*. 2010), information is often insufficient to allow specific action to be taken. Even the most obvious action, habitat protection, is hampered by a lack of information on distribution of key sites for most species. The most pervasive threats affecting the hotspot's amphibians (including even some presently considered common) may comprise (in no order of priority) habitat loss for highly restricted-range species; localized declines of some common species due to over-collection (mostly for food); the disease chytridiomycosis (Woodhams *et al*. 2011; now confirmed to occur in the hotspot), possibly the inadvertent introduction of amphibian viruses through farmed frogs, and in the long term, climate change (M. Bezuijen *in litt.* 2011).

3.4.5 Freshwater Fish

Mekong giant catfish (*Pangasianodon gigas*) is perhaps the best-known globally threatened fish in Indo-Burma. Despite being abundant in the Mekong River a century ago, and being legally protected for several decades, the species is at risk of extinction due to overharvesting, habitat loss and pollution (Baltzer *et al*. 2001; WWF 2010). Mekong giant catfish is, however, just one of a suite of giant freshwater fish threatened by overexploitation and infrastructure developments that may disrupt their migratory patterns (WWF 2010). Other globally threatened giant freshwater fish in the hotspot include Mekong freshwater stingray (*Dasyatis laosensis*), several *Himantura* stingrays, giant carp (*Catlocarpio siamensis*) and Jullien's golden carp (*Probarbus jullieni*). Most of these large species are migratory, and require the maintenance of little-changed, large-scale aquatic systems. These long-distance migrations are also made by many smaller-bodied species; many such species are endemic to a single catchment.

Despite great progress in recent years, many of the hotspot's fish species had not been assessed by the Red List in time for comprehensive inclusion in this review. Emerging results of ongoing assessment suggest that when assessment is complete a high proportion of fish species will be listed as globally threatened. Many species, particularly those of lowland waterbodies and watercourses, have populations very depleted and fragmented from intensive agriculture, pollution and problems of urbanization, notably channelization (Dudgeon 2000a,b). Hill and mountain fishes, including the many species endemic to rapids in such streams, are threatened by dam construction and destructive fishing practices, such as electrofishing, poisoning and dynamiting (Roberts 1995, KFBG 2002, Chen 2003, Dugan *et al*. 2010a). Invasive non-native species threaten some fish species. Smaller-bodied, less commercially valuable species, especially those occurring outside the Mekong mainstream, also include many species at high risk of extinction. Many have very small ranges, which makes them vulnerable to the impacts of river engineering projects, such as hydropower dams.

3.4.6 Invertebrates

In the absence of comprehensive global threat assessments of invertebrates occurring in Indo-Burma, it is difficult to identify taxonomic priorities for global invertebrate conservation in the hotspot. Considerable progress is being made with some groups (notably, dragonflies and various aquatic mollusc groups) but some other groups likely to contain species under rapid decline have not been assessed. These include large specimen beetles, which attract high prices in the pet and specimen trades in countries such as Japan (New 2005, 2010). Nor has any assessment been made of dung beetles or other coprophagous invertebrates, which are dependent on large mammals for adult and larval food resources and could therefore be affected by population collapses of large herbivores (Nichols *et al*. 2009). For the majority of invertebrate groups, however, habitat degradation and loss is likely to represent the major threat. For instance, a recent study of carabid beetles in southern Yunnan province provides evidence of the negative impacts of expansion of rubber plantations on native forest assemblages, with the strongest effects on forest specialists and rare species (Meng *et al.* 2011).

Even broad patterns of richness, endemism and threat remain unclear among invertebrates. It has sometimes been assumed that the richest forest communities are in the evergreen lowlands. However, a recent study of crane flies at protected areas across Thailand found a correlation between diversity and landscape topology, with mountainous areas in the north supporting the highest species richness (Petersen and Courtney 2010). Regarding endemism, it is assumed that restricted-range species are particularly prevalent in montane habitats and, especially, limestone karst formations, and that species adapted to year-round humidity are more sensitive to habitat perturbation than those of areas with a harsh dry season. None of these patterns is well supported by basic data, however, with the exception of the high richness of endemic species in limestone karst (Clements *et al.* 2006). This is particularly the case for endemism in land snails, which peaks on karst because of their low dispersal capabilities and isolation effects, both of which facilitate speciation (Schilthuizen *et al.* 1999). There can be no quick solution to filling this enormous information gap; and in the inevitably very long interim, the best strategy for invertebrate conservation in the region is probably based around ensuring the conservation of little-degraded blocks of at least 100 square kilometers and preferably much more, of all identifiable habitat types, represented across the region. This needs to be supplemented with species-specific action where overharvest may be problematic. There is little solid information available even on this, either on trade volumes or on effects on source populations.

3.4.7 Plants

There are 309 globally threatened plant species in Indo-Burma (IUCN 2011), comprising two-fifths of the hotspot's globally threatened species (Appendix 1). However, this figure probably represents only a fraction of the plant species of global conservation concern in the hotspot, because comprehensive global threat assessments have only been conducted for certain groups. Gymnosperms are generally better assessed than angiosperms. Within angiosperms, tree species and particularly commercially valuable timber species are generally better assessed than other groups. The Orchidaceae, for example, which includes a large number of endemic species with very restricted ranges and high levels of threat from habitat loss and overexploitation, contains only 11 species assessed as globally threatened.

Many species of orchids are globally restricted to the hotspot, of which a significant proportion is narrowly endemic to small areas within it. Many species of slipper orchid *(Paphiopedilum* spp.*)* have very restricted known distributions, yet they continue to be targeted by collectors for the horticultural trade, while the destruction of primary forest (the habitat of the most vulnerable species) places some at imminent risk of extinction. The same is true of other iconic orchids within the hotspot, such as *Renanthera imschootiana* and *Vanda coerulea*. Meanwhile, the illegal collection of plants for the medicinal plants trade continues to place unsustainable pressure on wild populations of *Dendrobium* spp., especially in northern Myanmar, northern Laos and southern China. Although generally more widespread than *Paphiopedilum* species, the collection pressure is so extreme that local extirpations have already been witnessed. *D. monoliforme* and *D. catenatum*, for example, have disappeared from many parts of their former ranges in southern China. Species of *Nervilia* are also collected for use in herbal medicine within the hotspot. Comprehensive global threat assessments are a priority for these groups, and for pteridophytes and non-vascular plants (S. Gale *in litt*. 2012).

Of the plant species already assessed as globally threatened, many are high-value timber species threatened by overexploitation. The family with the highest number of globally threatened species is the Dipterocarpaceae, which includes three threatened species of *Anisoptera*, 12 species of *Dipterocarpus*, 20 species of *Hopea*, two species of *Parashorea*, 14 species of *Shorea*, and eight species of *Vatica*. Other globally threatened plant species in the hotspot include four species of *Aquilaria*, which are threatened by overexploitation of agarwood, an aromatic non-timber forest product.

4. CONSERVATION OUTCOMES DEFINED FOR THE HOTSPOT

Biological diversity cannot be saved by ad hoc actions (Pressey 1994). In order to support the delivery of coordinated conservation action, CEPF invests effort in defining conservation outcomes: the quantifiable set of species, sites, and corridors that must be conserved to maximize the long-term persistence of global biodiversity. By presenting quantitative and justifiable targets against which the success of investments can be measured, conservation outcomes allow the limited resources available for conservation to be targeted more effectively, and their impacts to be monitored at the global scale. Therefore, conservation outcomes form the basis for identifying biological priorities for CEPF investment in Indo-Burma.

Biodiversity cannot be measured in any single unit because it is distributed across an hierarchical continuum of ecological scales (Wilson 1992). This continuum can be condensed into three levels: species, sites and corridors (inter-connected landscapes of sites). These three levels interlock geographically, through the occurrence of species at sites and of species and sites in corridors, but are nonetheless identifiable. Given threats to biodiversity at each of the three levels, quantifiable targets for conservation can be set in terms of extinctions avoided (species outcomes), areas protected (site outcomes), and corridors created (corridor outcomes).

Conservation outcomes are defined sequentially, with species outcomes defined first, then site outcomes and, finally, corridor outcomes. Since species outcomes are extinctions avoided at the global level, they relate to globally threatened species (in the IUCN categories Critically Endangered, Endangered and Vulnerable). This definition excludes species categorized as Data Deficient, which are considered to be priorities for further research because any might be globally threatened, but not yet to be priorities for conservation action *per se*, because many will not be globally threatened. Also excluded are species threatened locally but not globally, which may be national or regional conservation priorities but are not high global priorities. Species outcomes are met when a species' global threat status improves, particularly when it is categorized on the Red List as Least Concern.

Because of the CEPF focus on global biodiversity hotspots, the process to derive conservation targets for CEPF should be based on a global standard. The principal basis for defining species outcomes for this document is the global threat assessments contained within the Red List as of 1 July 2011. This list was current at the time the expert roundtables were held in 2011, although it was superseded by version 2011.2 in November 2011. Experienced surveyors and biologists, grouped by country, reviewed draft country-specific lists of globally threatened species to confirm which species occur in each country.

Many species are best conserved through the protection of a network of sites at which they occur, so the next stage is to define a set of key biodiversity areas (KBAs), important for the conservation of threatened species, which form the basis for species outcomes. The most important criterion for defining KBAs is the regular occurrence of significant numbers of one or more globally threatened species. The major challenge here is to determine whether a given threatened species recorded at a given site is likely to occur both regularly and in numbers significant to its conservation prospects. In most cases, in the absence of detailed data on population size and minimum area requirements, it is necessary to make a provisional assessment, based on a necessarily somewhat speculative consideration of the ecological requirements, density and home-range size of the species in question (parameters that are often themselves poorly understood, or for some species, entirely unknown), the availability of suitable habitat at the site, and the number of records relative to the appropriate survey effort expended there.

In addition to the occurrence of globally threatened species, KBAs are also defined based on the occurrence of restricted-range species and congregatory species. Sites regularly supporting significant populations of restricted-range species are global conservation priorities, because there are few or no other sites in the world for which conservation action for these species can be taken. This criterion is used to define KBAs only for birds, the only group for which the concept of restricted-range species has been quantified: species with a global breeding range of less than 50,000 square kilometers (Stattersfield *et al.* 1998). Sites supporting a high proportion of the total population of one or more congregatory species at a particular time of year (e.g. breeding; wintering; post-breeding moulting; staging sites for migratory waterbirds) are conservation priorities because these species are particularly susceptible to threats at these sites. Again, this criterion is only used to define KBAs for birds, as these are the only group with comprehensive population estimates for congregatory species (Wetlands International 2002); a threshold of 1 percent of the Asian biogeographic population is used.

Site outcomes are met when a KBA is protected, through improved management or expansion of an existing conservation area, or creation of an effective new conservation area. Improved management of an existing conservation area will involve changing management practices for a KBA in order to improve the long-term conservation of species' populations and the ecosystem as a whole. Expansion of an existing conservation area will involve increasing the proportion of a KBA under conservation management to meet species' area requirements or include other previously excluded species or habitats. Creation of an effective new conservation area will involve designating all or part of a KBA as a conservation area, and initiating effective long-term management. Conservation areas are not limited to actual or potential governmental protected areas, but also include sites that could potentially be managed for conservation by local communities, private landowners, military units or other stakeholders.

The starting point for defining KBAs in Indo-Burma was the Important Bird Area (IBA) networks in each country, identified by BirdLife International and collaborating organizations (Tordoff 2002, Ounekham and Inthapatha 2003, Seng Kim Hout *et al.* 2003, BCST 2004, Chan *et al*. 2004, preparatory work for BirdLife International 2009). As the IBA networks included most key sites for the conservation of globally threatened, restricted-range and congregatory bird species, it was only necessary to supplement them through the definition of additional KBAs for other taxonomic groups. This was done through consultation with surveyors, biologists and others with information on recent wildlife status in each country, complemented by literature review.

While the protection of a network of sites would probably be sufficient to conserve most elements of biodiversity in the medium term, the long-term conservation of all elements of biodiversity requires the protection of inter-connected landscapes of sites, or conservation corridors. This is particularly important for the conservation of broad-scale ecological and evolutionary processes (Schwartz 1999), and also for the conservation of species with wide home ranges, low natural densities, migratory behavior or other characteristics that make them unlikely to be conserved by site-based interventions alone. Such species can be termed "landscape species" (Sanderson *et al*. 2001). In addition, conservation corridors can support the integration of habitat management consistent with conservation objectives (ranging from strict protection to sustainable use) into local, regional, and national land-use planning processes. Consequently, corridor outcomes are defined (based on conservation corridors), in addition to site and species outcomes.

Corridor outcomes are met when a conservation corridor maintains little-changed biotic assemblages and natural processes. Maintaining little-changed biotic assemblages requires the maintenance of little-changed ecological communities, a prerequisite for which is the conservation of landscape species. Maintaining natural processes involves achieving the long-term sustainability of little-changed ecological and evolutionary processes that are species-driven and essential for the long-term viability of natural ecosystems.

In order to allow the persistence of biodiversity, inter-connected landscapes of sites must be anchored on core areas, embedded in a matrix of natural and/or anthropogenic habitats (Soulé and Terborgh 1999). Therefore, conservation corridors are anchored on KBAs (core areas), with the rest of the conservation corridor comprising either areas that have the potential to become KBAs in their own right (through management or restoration) or areas that contribute to the ability of the conservation corridor to support all elements of biodiversity in the long term.

Therefore, KBAs are the starting point for defining conservation corridors. First, conservation corridors are defined wherever it is considered necessary that connectivity be maintained between two or more KBAs in order to meet the long-term conservation needs of landscape species. Then, additional conservation corridors are defined wherever it is considered necessary to increase the area of actual or potential natural habitat in order to maintain evolutionary and ecological processes. In the latter case, the definition of conservation corridors is largely subjective, due to limitations of time, paucity of relevant data, and absence of detailed criteria. Given these limitations, emphasis is placed on maintaining continuums of natural habitat across environmental gradients, particularly altitudinal gradients, in order to maintain such ecological processes as seasonal altitudinal migration and to provide a safeguard against the potential impacts of climate change.

Conservation corridors are defined through consultation with local experts, complemented by analysis of spatial data on land cover, elevation and human population distribution, and consideration of the results of previous landscape-scale conservation planning exercises. In Indo-Burma, the key sources of information for defining conservation corridors for the regions they covered were (1) the results of an ecoregion-based conservation assessment covering most of Cambodia, Lao PDR and Vietnam and convened by WWF (Baltzer *et al.* 2001), (2) an analysis of forest complexes in Thailand conducted by the Royal Forest Department (1999), and (3) an overview for southern China provided by J. Fellowes (pers. comm.) resulting from a series of discussions with relevant specialists. Corridors for the remainder of the area were proposed during CEPF's stakeholder workshops. Because natural habitats are more fragmented in Indo-Burma than in many other regions, the average conservation corridor size was relatively small. One consequence of this was that a relatively large number of conservation corridors were defined, with the benefit that CEPF funding could be more precisely targeted geographically.

In theory, within any given region, or, ultimately, for the whole world, conservation outcomes can and should be defined for all taxonomic groups. However, this requires data on the global threat status of each species, and on the distribution of globally threatened species at sites and across corridors. Many of these data are incomplete or lacking. The global threat status has been assessed comprehensively only for mammals, birds and amphibians; some groups of reptiles, fish, invertebrates and plants have been assessed, but many gaps remain, particularly among the latter two groups. In Indo-Burma, the distribution of many taxa remains poorly known, with birds and large mammals covered best. Thus, conservation outcomes have been defined mostly around birds and mammals, with information about plants, reptiles, amphibians and fish used as available. The invertebrates so far assessed as globally threatened are listed, but have not generated species targets.

The use of global threat assessments as the basis for defining species outcomes, and, consequently, site and corridor outcomes, has a number of limitations. However, taxonomic groups for which comprehensive global threat assessments have been completed, particularly birds, have been suggested to be effective indicators of biodiversity in general, especially when used to define networks of priority sites for conservation (Howard *et al.* 1998, Burgess *et al.* 2002). Furthermore, the definition of conservation outcomes is an adaptive process: as more species are assessed as globally threatened, additional conservation outcomes can be defined.

4.1 Species Outcomes

In total, 754 species assessed in the Red List as globally threatened occur in the Indo-Burma Hotspot (Table 1 and Appendix 1); this total excludes species that formerly occurred but are now believed to be regionally extinct but it does include a small number of species with only provisional records in the region. The incomplete Red List assessment of reptiles, invertebrates and, particularly, plants means that the relative numbers of species presently listed as globally threatened per taxonomic group is not a fair representation of relative priorities: in particular, the invertebrates are grossly under-represented. Certain invertebrate groups, for instance those containing many cave-dwelling taxa, are characterized by high levels of endemism and of threat; although huge gaps remain, there have been great increases in knowledge on such species during recent years (Deharveng 2002). In Indo-Burma, therefore, comprehensive global threat assessments are a priority for most invertebrate and plant groups, fishes in the Chinese part of the hotspot, and reptiles other than turtles. There are very real limitations to conducting these: for example, most of the invertebrates of the region are not yet named to science, let alone understood well enough to make a realistic assessment of their extinction risk.

Table 1. Summary of Globally Threatened Species in the Indo-Burma Hotspot

Taxonomic Group	Global Threat Status				Distribution by Country					
	Critically Endangered	Endangered	Vulnerable	Total	Cambodia	China	Lao PDR	Myanmar	Thailand	Vietnam
Mammals	12	37	39	**88**	31	35	40	43	47	46
Birds	12	19	54	**85**	28	37	24	41	46	42
Reptiles	13	20	14	**47**	14	20	16	23	19	25
Amphibians	0	16	32	**48**	4	33	5	0	4	15
Fish	25	28	58	**111**	31	17	44	16	58	34
Invertebrates	9	21	36	**66**	0	10	6	4	28	25
Plants	69	89	151	**309**	33	153	25	45	98	148
Total	**140**	**230**	**384**	**754**	**141**	**305**	**160**	**172**	**300**	**335**

The current total of 754 globally threatened species in Indo-Burma is a considerable increase over the 492 listed in the original profile. This reflects a mix of methodological factors but also, probably, a genuine increase in threat levels. In terms of methodology, firstly, various groups among the invertebrates and plants have been comprehensively assessed in the interim period, as have more reptiles and fish. Secondly, although mammals had been nominally assessed comprehensively during the 1990s, the Global Mammal Assessment of the 2000s (Schipper *et al*. 2008) reassessed all species and, moreover, used a process far better at capturing in-region information and opinion, resulting in assessments greatly improved over those from the 1990s. Exemplifying this, all six mammals listed as provisional priority species in the original profile but not then listed as globally threatened (which made already a highly conservative list) are now assigned to some category of global threat. And thirdly, Myanmar was excluded from the original analysis, and so species that occur in the hotspot only in Myanmar were not listed. The only like-for-like figures to allow inspection of genuine change in Red List categorization over this period are therefore those of the birds and the amphibians.

The original ecosystem profile listed 73 globally threatened bird species in the analyzed region (the present hotspot boundary minus Myanmar), whereas the update lists 77 (again excluding Myanmar-only species); for amphibians the figures are 46 in the original profile and 48 in the update. These figures suggest stasis in overall threat levels but this is probably misleading for both classes. The original profile was able to use the then-just-determined results of the Global Amphibian Assessment (Stuart *et al*. 2008), the first comprehensive assessment of extinction risk for the world's amphibians. Since then there has been little revision of the Southeast Asian amphibians on the Red List, and for example, Laos warty newt is still assessed as Data Deficient even though it has been clear for several years now it is highly threatened through collection for the medicinal and aquarium trades (Stuart *et al*. 2006b, Anon. 2009, Phimmachak 2010). Also relevant is that not a single amphibian in Myanmar is assessed as globally threatened, although extrapolating from patterns in other animal groups, the country must surely hold many endemics, some of which are threatened; this is reflected in the large number of Data Deficient amphibian species for the country.

Birds have, by contrast, been subject to rolling revision, and the similar totals in the two years are coincidental: the species comprising the two lists are rather different and while the species newly added have mostly shown a genuine deterioration in status, those species removed have changed Red List category mostly as a result of better information rather than through a real improvement in their conservation prospects. A prime example of this is among the game birds (Galliformes) which have for years been listed in inappropriately high threat categories due to a false inference that, since they are large, showy and (in western Europe) subject to tightly regulated hunting, they "must obviously" therefore be highly threatened in a region with widespread, almost unregulated hunting and a rapacious demand for exotic-looking species in the menagerie trade. Buttressing this myth is the birds' own behavior: most species are sufficiently evasive to be overlooked by inexperienced surveyors. Critical inspection of the available, albeit largely qualitative, information suggests that, with some important exceptions, the Indochinese forest galliforms are actually anomalously good survivors in this region of heavy hunting and habitat encroachment (Brickle *et al*. 2008) and as a result, of the 11 galliforms listed in the original profile, five are no longer considered globally threatened.

Corroborating the impression of generally deteriorating species conservation status in the hotspot, a Red List workshop for the tortoises and turtles of Asia, held in February 2011, concluded that 38 percent of the Asian species should be categorized as Critically Endangered—a huge increase since the findings of the last critical analysis, in 1999 (Shepherd and Shepherd 2011). These revised categories were not finalized by the time of the 1 July 2011 Red List snapshot used to guide this document, which therefore presents an unduly optimistic picture of this group's regional conservation status. However, Shepherd and Shepherd (2011) did point out that so far no species is yet extinct, and that this is probably due solely to the conservation interventions of the last couple of decades.

Of the 754 globally threatened species in Indo-Burma: 335 (44 percent) are confirmed to occur in Vietnam, including 106 that are not found elsewhere in the hotspot; 305 (40 percent) in China, including 157 not found elsewhere in the hotspot; 300 (40 percent) in Thailand, including 114 not found elsewhere in the hotspot; 172 (23 percent) in Myanmar, including 35 not found elsewhere in the hotspot; 160 (21 percent) in Lao PDR, including 17 not found elsewhere in the hotspot; and 141 (19 percent) in Cambodia, including two not found elsewhere in the hotspot. Thus, Cambodia and Lao PDR support few globally threatened species not found elsewhere in the hotspot. They are, nevertheless, high priorities for CEPF investment because they support some of the largest extant habitat tracts in the region, and, consequently, for many species, support the populations with most potential to be viable in the long term, and/or represent the greatest opportunity for conservation success.

In total, 140 of the globally threatened species in Indo-Burma are Critically Endangered, 230 are Endangered and 384 are Vulnerable. The Critically Endangered are by definition those most at risk of imminent extinction and, when other factors are accounted for, warrant greater per-species attention than the species in the lower threat categories of Endangered and Vulnerable.

The 12 Critically Endangered mammal species in the region comprise nine primate species (four gibbons *Nomascus* and five colobine leaf-eating monkeys: Delacour's leaf monkey, white-headed leaf monkey, grey-shanked douc, Tonkin snub-nosed monkey and Myanmar snub-nosed monkey) and three large ungulates. Seven of the nine primates have naturally small ranges: six in the densely settled regions of Vietnam and southeastern China; and one in the more sparsely populated highlands of northern Myanmar. The other two primates have wider ranges (again both in Vietnam and China, but also Lao PDR), but even so have suffered massive hunting-driven reductions. They include several of the most threatened primates of the world. The primate list is large partly as a result of recent research indicating the need for increasingly narrow species limits: 25 years ago all of these four gibbons were universally considered conspecific, forming one species (*Nomascus* [then considered a subgenus of *Hylobates*] *concolor*) also with other taxa still today a good deal less threatened; and two of the colobines were considered one species (*Trachypithecus francoisi*) again combined with other, less threatened, taxa.

The same cannot be said of the three ungulates, which include two species in monospecific genera, i.e. with no close living relatives anywhere in the world. The three comprise one species with a formerly huge range (northeast India through Southeast Asia to Sumatra; hairy rhinoceros), one that occurred rather widely in the deciduous landscapes of southern Indochina (kouprey) and one with a narrow range in the permanently humid evergreen forests of the Lao-Vietnamese Annamite Mountains (saola). There are only a handful of credible post-2000 records of saola, the rhinoceros's continued occurrence within the region is unconfirmed, and the situation is even worse with kouprey, which may be globally extinct not having been recorded reliably for several decades. Perhaps surprisingly, this list includes no carnivores, a group often considered to have heightened extinction risk. Carnivore numbers have been severely reduced in parts of the hotspot (Lau *et al.* 2010) and without effective action these declines are likely to be replicated over the remainder. Yet the pattern of extinctions to date in the hotspots demonstrates that it is the ungulates, not their predators, that are disappearing first (see Section 3.4.1). The original profile also included two bats, a mole and a dormouse as Critically Endangered, but in the interim all have been reassessed as Data Deficient (i.e. their paucity of records may simply reflect insufficient survey) or absorbed into other species through taxonomic reassessment.

The 12 Critically Endangered bird species in Indo-Burma include five large ground-dwelling birds associated with wetlands of various forms: giant ibis and white-shouldered ibis (*Pseudibis davisoni*), the former being endemic to the region and the latter being only otherwise known from a small population on Borneo; pink-headed duck and white-bellied heron, of northeastern India and adjacent countries, including Myanmar in the hotspot; and Bengal florican (*Houbaropsis bengalensis*) of seasonally inundated grassland, with its largest population in Cambodia, and the disjunct Himalayan foothills population now perhaps non-viable). Also Critically Endangered are: three species of vulture (the Indo-Burmese populations of which are of increasing significance as they are not affected by the drug-induced precipitous declines undergone by the Indian Subcontinent populations over the last 20 years; Pain *et al.* 2003, Oaks *et al.* 2004, Cuthbert *et al*. 2006); two seabirds breeding outside the hotspot, Christmas Island frigatebird (*Fregata andrewsi)*, which occurs in significant numbers as a non-breeding visitor to shallow seas in the region, chiefly off the west coast of peninsular Thailand, and Chinese crested tern (*Sterna bernsteini)*, for which there is only one confirmed record from the hotspot; the Arctic-breeding spoon-billed sandpiper, for which the hotspot's estuaries support the majority of its fast-decreasing population during the winter; and white-eyed river-martin, one of the most enigmatic bird species in the world, of which there have been no confirmed records since 1975 (BirdLife International 2001).

The 13 Critically Endangered reptile species comprise Siamese crocodile (the only inland crocodile extant in the hotspot, except for marginal occurrence of false gharial (*Tomistoma schlegelii*)), and 12 species of turtle. That so many species of turtle in the region are assessed as globally Critically Endangered is a strong indication of the extreme levels of threat faced by turtles as a group, particularly from overexploitation (Turtle Conservation Coalition 2011). Although between them these species occur almost throughout the hotspot (or did, before their recent major reductions) they are concentrated in Vietnam and adjacent southeastern China and Lao PDR. This probably reflects both that very heavy harvesting pressure has been going on longer here (as a result of the area's proximity to the main markets in southern China), and that this part of the hotspot has many species with small distribution ranges and so perhaps predisposed to extinction.

No amphibian species in Indo-Burma is currently listed as Critically Endangered.

Of all animal groups, the fish contain the most species in Indo-Burma currently listed as Critically Endangered, with 25. Some of these are large and/or slow-breeding long-distance migrant species, heavily depleted by overfishing, and for which the increasing specter of dams across large rivers are likely to prove the final factor; others are a varied mix of single-location species facing a several threats, restricted-range migrants threatened by specific dams, and species highly sought in the aquarium trade. The updated ecosystem profile has benefited by being able to use many new assessments of fish, but as of July 1, 2011, many fishes of the hotspot remained Not Evaluated on the Red List (D. Allen pers. comm.). Considerably more information concerning distribution and other facets of conservation status is necessary for many of the Indo-Burmese fish species before a more comprehensive global threat assessment can be made for the group in the hotspot. It is probable that the region supports more fish species of the highest global conservation concern than were listed by 1 July 2011.

Nine invertebrate species in Indo-Burma are currently listed as Critically Endangered, but, as indicated above, this is likely to be only a small proportion of the true total. They comprise three dragonflies, five unionid bivalve molluscs and one littorinimorph gastropod mollusc.

Finally, 69 Critically Endangered plant species are known to occur in Indo-Burma. Half of these are members of the family Dipterocarpaceae, including 13 species of *Hopea*, eight of *Dipterocarpus*, eight of *Shorea* and four of *Vatica*. These species are high-value timber trees, severely threatened by overexploitation, as are most of the hotspot's other Critically Endangered plant species. Also included among the Critically Endangered plant species are five cycads *Cycas*, slow-growing plants heavily poached for the horticulture trade, and a number of conifers, mostly of montane habitats across the region, suffering heavily from overharvest as the spiraling prices they can be sold for make logging commercially viable in increasing areas of hill terrain (IUCN 2011).

4.2 Site Outcomes

A total of 509 KBAs were defined in Indo-Burma, covering a combined area of approximately 380,000 square kilometerskm² or 16 percent of the total area of the hotspot (Appendix 2 and Figures 7 to 12). Of these, 274 sites (54 percent of the total) were defined for globally threatened mammal species, 312 (61 percent) were defined for globally threatened, restricted-range or congregatory bird species, 201 (39 percent) were defined for globally threatened reptile species, 39 (eight percent) were defined for globally threatened amphibian species, 29 (six percent) were defined for globally threatened fish species, and 201 (39 percent) were defined for globally threatened plant species (Table 2). The figures add to well over 100 percent because most KBAs are triggered by species from more than one taxonomic group.

The number of KBAs defined for globally threatened plant and fish species would undoubtedly be considerably higher if more detailed information was available on the distribution of plant and fish species at the site level, and if comprehensive Red List assessments reflecting true global conservation priorities within these groups had been conducted. And none was defined for invertebrates, reflecting limitations of information (see above).

This total of 509 KBAs compares with 438 identified in the 2000s (362 for the hotspot excepting Myanmar in the original profile, and 76 for Myanmar). This expansion in the number of KBAs is more a reflection of better knowledge (especially in Myanmar, where the number of KBAs increased to 122) than a consequence an increased number of globally threatened species. Indeed, that there has not been a much larger increase in KBAs proportionate to the increase in species listed as globally threatened may reflect the fact that globally threatened species tend to occur in concentrations and, thus, many sites for the newly added species are those already selected based on already-listed species. However, most of the species newly assessed as globally threatened in the interim period are poorly surveyed and the KBAs may seriously under-represent their distribution and fail to include the most important areas. This is particularly likely among plants and fishes.

Table 2. Summary of Key Biodiversity Areas in the Indo-Burma Hotspot

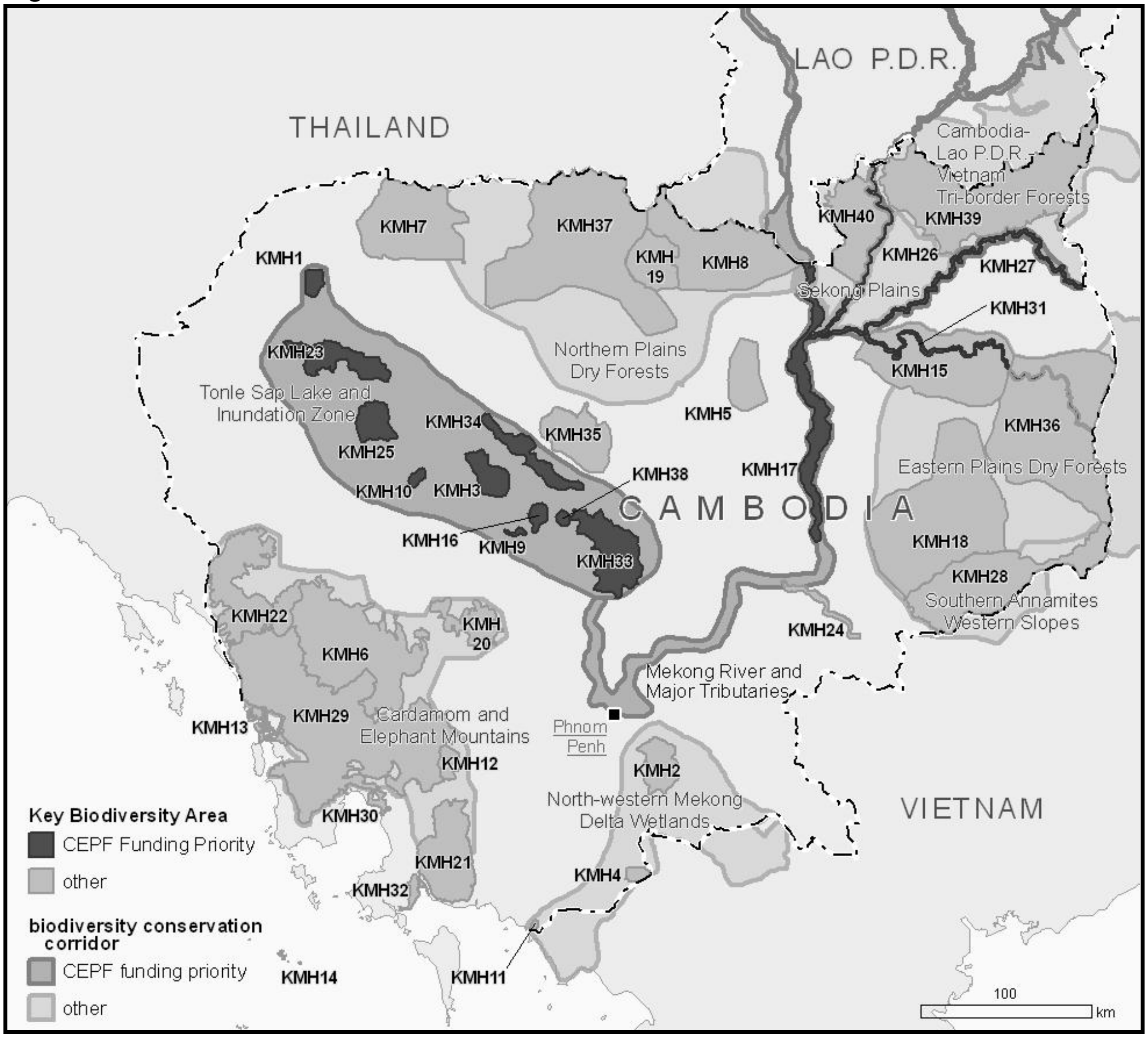
Taxonomic Group	**Cambodia**	**China**	**Lao PDR**	**Myanmar**	**Thailand**	**Vietnam**	**Total**
Mammals	21	25	32	59	59	78	**274**
Birds	38	46	24	82	63	59	**312**
Reptiles	24	18	20	86	32	21	**201**
Amphibians	1	20	1	0	5	12	**39**
Fish	5	2	10	1	9	2	**29**
Plants	8	47	8	28	75	35	**201**
All KBAs	**40**	**80**	**43**	**122**	**114**	**110**	**509**

Of the 509 KBAs in Indo-Burma, only 303 (60 percent) are wholly or partly included within gazetted protected areas. This indicates that, while protected area-based approaches could form an important component of any conservation strategy for the region, there also exists great potential (indeed, necessity) for conservation action at sites outside formal protected areas. The proportion of KBAs wholly or partly included within gazetted protected areas varies significantly among countries, from only 25 percent in Myanmar to 83 percent in Thailand; thus, the opportunity for conservation action outside formal protected areas may be greater in some countries than in others.

Several KBAs are known to support large numbers of globally threatened species. Areas known to support at least 30 globally threatened species include: Htamanthi in Myanmar; Hala-Bala, Huai Kha Khaeng and Khao Banthad in Thailand; and Phong Nha and Pu Mat in Vietnam. These sites are not necessarily the highest priorities for conservation action in the region, for two reasons: they may not be the most important for the conservation of any particular highly threatened species, and other sites less surveyed to date may support similar or even greater numbers of globally threatened species.

As the comprehensiveness of available data on the distribution of globally threatened species among KBAs varies significantly among taxonomic groups, KBAs identified as being important for the conservation of one taxonomic group may also be important for other groups for which data are not yet available. In addition, there are likely to be other important sites for the conservation of globally threatened species in the region that have not been identified during this process, especially for plants, fungi, fish and invertebrates.

Figure 7. Site and Corridor Outcomes for Cambodia



Code	Key Biodiversity Area	Code	Key Biodiversity Area
KMH1	Ang Tropeang Thmor	KMH21	Phnom Bokor
KMH2	Bassac Marsh	KMH22	Phnom Samkos
KMH3	Boeung Chhmar/Moat Khla	KMH23	Preah Net Preah/Kra Lanh/Pourk
KMH4	Boeung Prek Lapouv	KMH24	Prek Chhlong
KMH5	Central Cambodia Lowlands	KMH25	Prek Toal
KMH6	Central Cardamoms	KMH26	Sekong River
KMH7	Central Oddar Meanchey	KMH27	Sesan River
KMH8	Chhep	KMH28	Snoul/Keo Sema/O Reang
KMH9	Chhnuck Tru	KMH29	Southern Cardamoms
KMH10	Dei Roneat	KMH30	Sre Ambel
KMH11	Kampong Trach	KMH31	Srepok River
KMH12	Kirirom	KMH32	Stung Kampong Smach
KMH13	Koh Kapik	KMH33	Stung Sen/Santuk/Baray
KMH14	Koh Tang Archipelago	KMH34	Stung/Chi Kreng/Kampong Svay
KMH15	Lomphat	KMH35	Stung/Prasat Balang
KMH16	Lower Stung Sen	KMH36	Upper Srepok Catchment
KMH17	Mekong River from Kratie to Lao PDR	KMH37	Upper Stung Sen Catchment
KMH18	Mondulkiri-Kratie Lowlands	KMH38	Veal Srongae
KMH19	O Skach	KMH39	Virachey
KMH20	Phnom Aural	KMH40	Western Siem Pang

Figure 8a. Site and Corridor Outcomes for China (West)

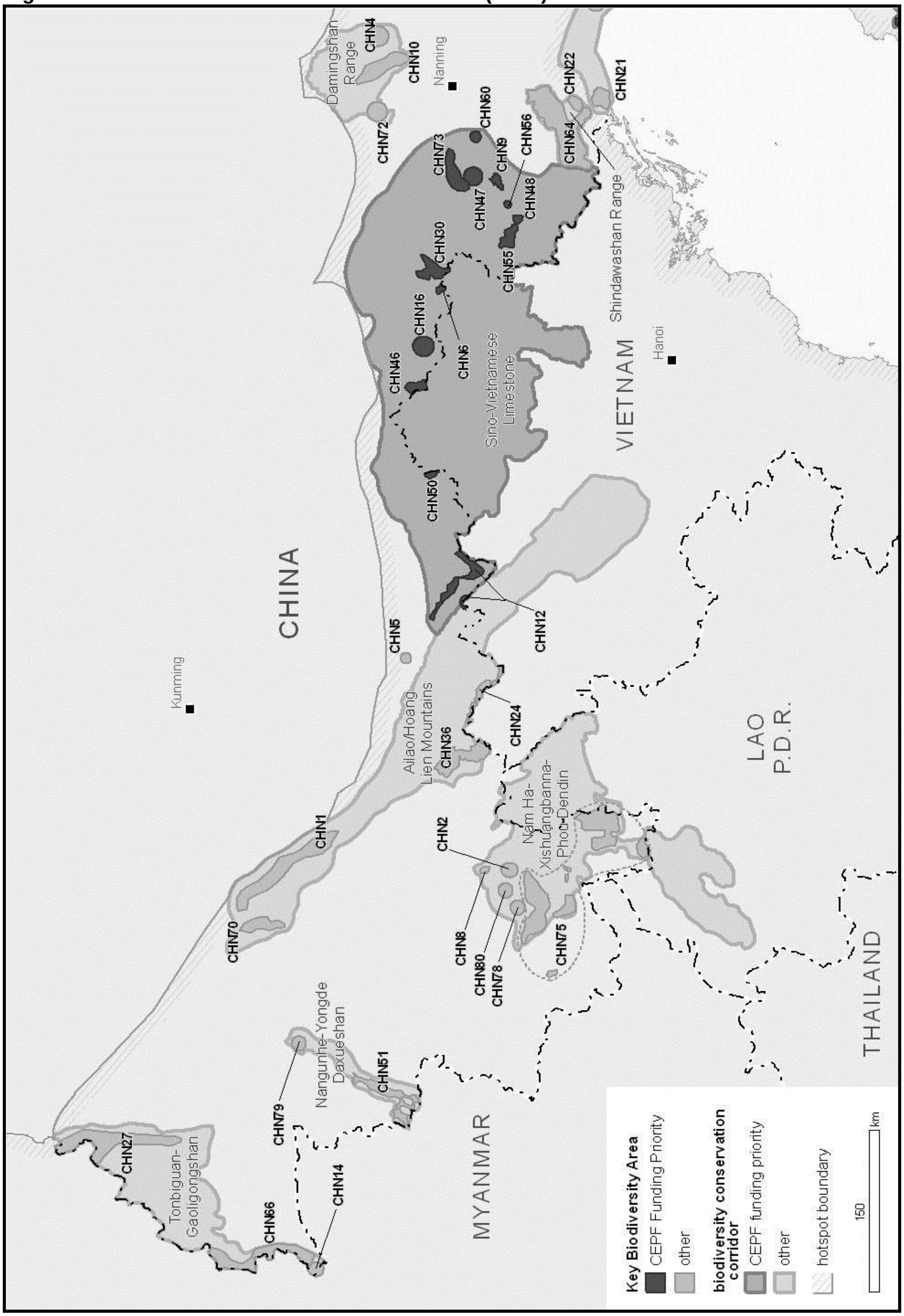
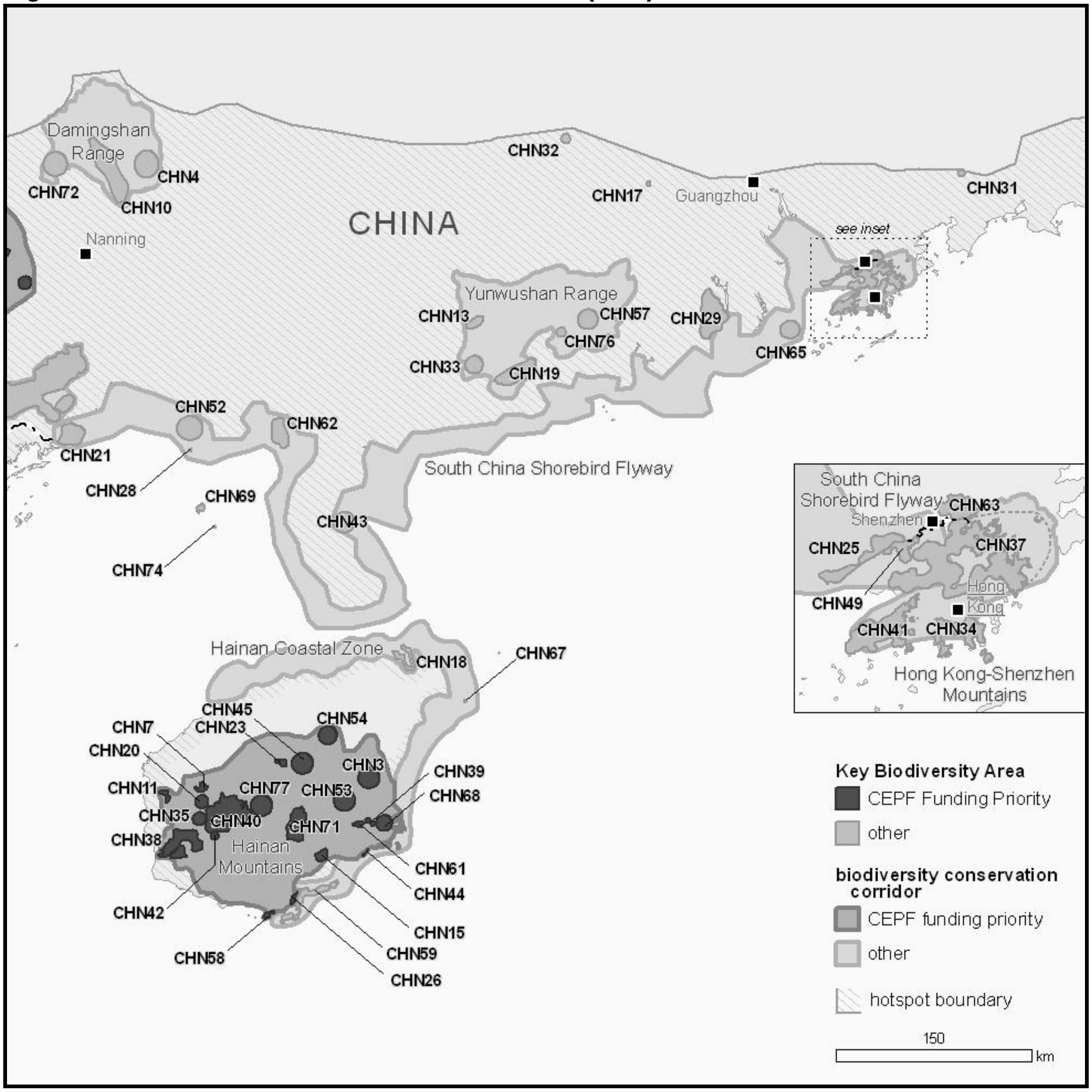


Figure 8b. Site and Corridor Outcomes for China (East)



Code	Key Biodiversity Area	Code	Key Biodiversity Area
CHN1	Ailaoshan	CHN41	Lantau Island and Associated Islands
CHN2	Babianjiang	CHN42	Ledong
CHN3	Baimaling-Huishan	CHN43	Leizhou Peninsula
CHN4	Baixu-Qinpai	CHN44	Liji
CHN5	Bajianjing	CHN45	Limushan
CHN6	Bangliang	CHN46	Longhua
CHN7	Bawangling	CHN47	Longhushan
CHN8	Caiyanghe	CHN48	Longshan section of Nonggang
CHN9	Chongzuo	CHN49	Mai Po and Inner Deep Bay
CHN10	Damingshan	CHN50	Malipo
CHN11	Datian	CHN51	Nangunhe
CHN12	Daweishan	CHN52	Nangliujiang Hekou
CHN13	Dawuling	CHN53	Nanmaoling
CHN14	Dehong Zizhizhou	CHN54	Nanweiling
CHN15	Diaoluoshan	CHN55	Nonggang
CHN16	Diding	CHN56	Paiyangshan

CHN17	Dinghushan	CHN57	Qixingkeng
CHN18	Dongzhaigang	CHN58	Sanya
CHN19	Ehuangzhang	CHN59	Sanya Seagrass Beds
CHN20	Exianling and Changhuajiang	CHN60	Shangsi-Biannian
CHN21	Fangcheng	CHN61	Shangxi
CHN22	Fangcheng Shangyue	CHN62	Shankou
CHN23	Fanjia	CHN63	Shenzhen Wutongshan
CHN24	Fenshuiling	CHN64	Shiwandashan
CHN25	Futian	CHN65	Taipa-Coloane
CHN26	Ganshiling	CHN66	Tongbiguan
CHN27	Gaoligongshan	CHN67	Tongguling
CHN28	Guangtouling	CHN68	Tongtieling
CHN29	Gudoushan	CHN69	Weizhou Dao
CHN30	Gulongshan	CHN70	Wuliangshan
CHN31	Gutian	CHN71	Wuzhishan
CHN32	Heishiding	CHN72	Xianhu Reservoir
CHN33	Heweishan	CHN73	Xidamingshan
CHN34	Hong Kong Island and Associated Islands	CHN74	Xieyang Dao
CHN35	Houmiling	CHN75	Xishuangbanna
CHN36	Huanglianshan	CHN76	Yangchun Baiyong
CHN37	Inland New Territories	CHN77	Yinggeling
CHN38	Jianfengling	CHN78	Yiwa
CHN39	Jianling	CHN79	Yongde Daxueshan
CHN40	Jiaxi	CHN80	Youluoshan

Code	**Key Biodiversity Area**	**Code**	**Key Biodiversity Area**
LAO1	Bolaven Northeast	LAO23	Nam Kan
LAO2	Chonabuly	LAO24	Nam Phoun
LAO3	Dakchung Plateau	LAO25	Nam Xam
LAO4	Dong Ampham	LAO26	Nong Khe Wetlands
LAO5	Dong Hua Sao	LAO27	Pakxan Wetlands
LAO6	Dong Khanthung	LAO28	Phou Ahyon
LAO7	Dong Phou Vieng	LAO29	Phou Dendin
LAO8	Eastern Bolikhamxay Mountains	LAO30	Phou Kathong
LAO9	Hin Namno	LAO31	Phou Khaokhoay
LAO10	Khammouan Limestone	LAO32	Phou Loeuy
LAO11	Laving-Laveun	LAO33	Phou Xang He
LAO12	Lower Nam Ou	LAO34	Phou Xiang Thong
LAO13	Mekong Confluence with Nam Kading	LAO35	Siphandon
LAO14	Mekong Confluence with Xe Bangfai	LAO36	Upper Lao Mekong
LAO15	Mekong River from Louangphabang to Vientiane	LAO37	Upper Xe Bangfai
LAO16	Mekong River from Phou Xiang Thong to Siphandon	LAO38	Upper Xe Kaman
LAO17	Nakai Plateau	LAO39	Xe Bang-Nouan
LAO18	Nakai-Nam Theun	LAO40	Xe Champhon
LAO19	Nam Et	LAO41	Xe Khampho-Xe Pian
LAO20	Nam Ghong	LAO42	Xe Pian
LAO21	Nam Ha	LAO43	Xe Sap
LAO22	Nam Kading		

Figure 9. Site and Corridor Outcomes for Lao PDR

Figure 10a. Site and Corridor Outcomes for Myanmar (North)

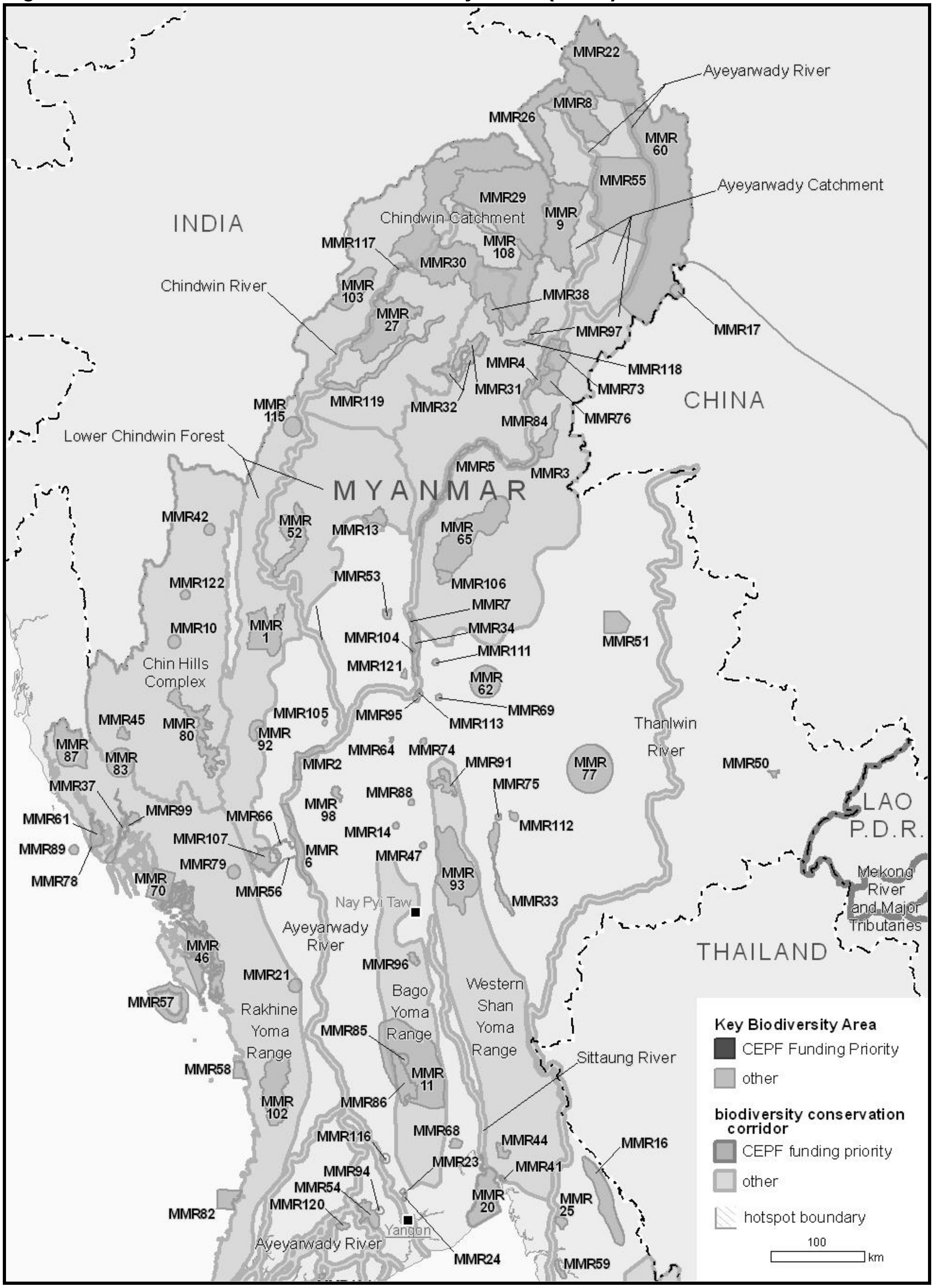


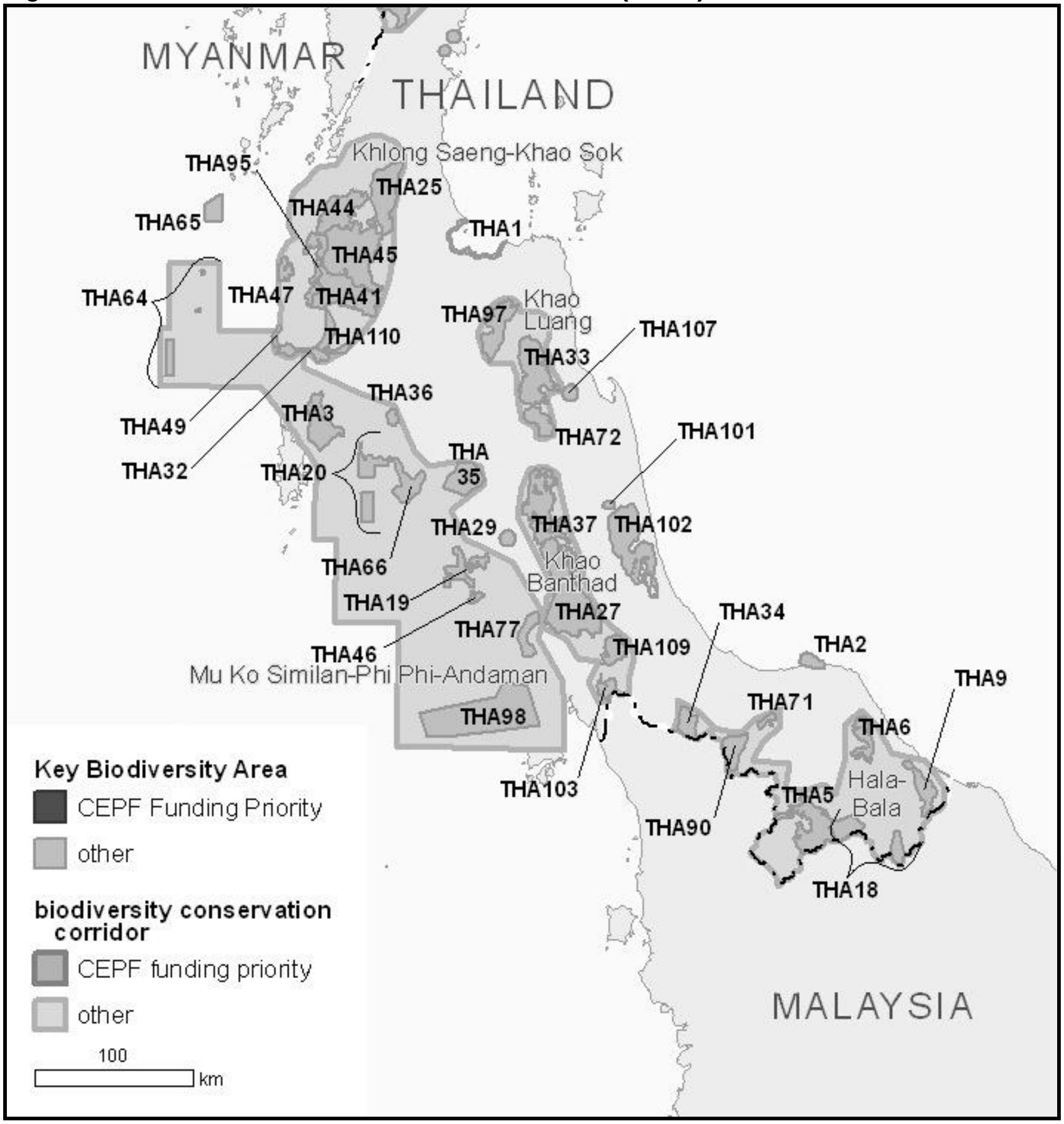
Figure 10b. Site and Corridor Outcomes for Myanmar (South)

Code	Key Biodiversity Area	Code	Key Biodiversity Area
MMR1	Alaungdaw Kathapa	MMR62	Mehon (Doke-hta Wady River)
MMR2	Ayeyarwady River: Bagan Section	MMR63	Meinmahla Kyun
MMR3	Ayeyarwady River: Bhamo Section	MMR64	Minzontaung
MMR4	Ayeyarwady River: Myitkyina to Sinbo Section	MMR65	Momeik-Mabein
MMR5	Ayeyarwady River: Shwegu Section	MMR66	Mone Chaung
MMR6	Ayeyarwady River: Sinbyugyun to Minbu Section	MMR67	Moscos Kyun
MMR7	Ayeyarwady River: Singu Section	MMR68	Moyingyi
MMR8	Babulon Htan	MMR69	Myaleik Taung
MMR9	Bumphabum	MMR70	Myebon
MMR10	Bwe Pa	MMR71	Myeik Archipelago
MMR11	Central Bago Yoma	MMR72	Myinmoletkhat
MMR12	Central Tanintharyi Coast	MMR73	Myitkyina-Nandebad-Talawgyi
MMR13	Chatthin	MMR74	Myittha Lakes

Code	Key Biodiversity Area	Code	Key Biodiversity Area
MMR14	Chaungmagyi Reservoir	MMR75	Nadi Kan
MMR15	Chaungmon-Wachaung	MMR76	Nam Sam Chaung
MMR16	Dawna Range	MMR77	Nam San Valley
MMR17	Fen-shui-ling Valley	MMR78	Nantha Island
MMR18	Gayetgyi Island	MMR79	Nat-yekan
MMR19	Great Coco Island	MMR80	Natmataung (Mount Victoria)
MMR20	Gulf of Mottama	MMR81	Ngawun (Lenya extension)
MMR21	Gyobin	MMR82	Ngwe Saung
MMR22	Hkakaborazi	MMR83	Ngwe Taung
MMR23	Hlawga Park	MMR84	Ninety-six Inns
MMR24	Hlawga Reservoir	MMR85	North Zarmayi
MMR25	Hpa-an	MMR86	North Zarmayi Elephant Range
MMR26	Hponkanrazi	MMR87	Northern Rakhine Yoma
MMR27	Htamanthi	MMR88	Nyaung Kan-Minhla Kan
MMR28	Htaung Pru	MMR89	Oyster Island
MMR29	Hukaung Valley	MMR90	Pachan
MMR30	Hukaung Valley extension	MMR91	Panlaung-Pyadalin Cave
MMR31	Indawgyi Grassland and Indaw Chaung Wetland	MMR92	Pauk Area
MMR32	Indawgyi Wildlife Sanctuary	MMR93	Paunglaung Catchment Area
MMR33	Inle Lake	MMR94	Payagyi
MMR34	Irrawaddy Dolphin	MMR95	Peleik Inn
MMR35	Kadongalay Island	MMR96	Phokyar Elephant Camp
MMR36	Kadonkani	MMR97	Pidaung
MMR37	Kaladan River	MMR98	Popa
MMR38	Kamaing	MMR99	Pyaungbya River
MMR39	Karathuri	MMR100	Pyin-ah-lan
MMR40	Kawthaung District Lowlands	MMR101	Pyindaye
MMR41	Kelatha	MMR102	Rakhine Yoma Elephant Range
MMR42	Kennedy Peak	MMR103	Saramati Taung
MMR43	Khaing Thaung Island	MMR104	Sheinmaga Tawyagyi
MMR44	Kyaikhtiyoe	MMR105	Shinmataung
MMR45	Kyauk Pan Taung	MMR106	Shwe U Daung
MMR46	Kyaukphyu (Wunbike)	MMR107	Shwesettaw
MMR47	Kyee-ni Inn	MMR108	Tanai River
MMR48	Lampi Island	MMR109	Tanintharyi National Park
MMR49	Lenya	MMR110	Tanintharyi Nature Reserve
MMR50	Loimwe	MMR111	Taung Kan at Sedawgyi
MMR51	Lwoilin/Ginga Mountain	MMR112	Taunggyi
MMR52	Mahamyaing	MMR113	Taungtaman Inn
MMR53	Mahanandar Kan	MMR114	Thamihla Kyun
MMR54	Maletto Inn	MMR115	Thaungdut
MMR55	Mali Hka Area	MMR116	U-do
MMR56	Man Chaung	MMR117	Upper Chindwin River: Kaunghein to Padumone Section
MMR57	Manaung Kyun	MMR118	Upper Mogaung Chaung Basin
MMR58	Maw She	MMR119	Uyu River
MMR59	Mawlamyine	MMR120	Yelegale
MMR60	May Hka Area	MMR121	Yemyet Inn
MMR61	May Yu	MMR122	Zeihmu Range

Figure 11a. Site and Corridor Outcomes for Thailand (North)

Figure 11b. Site and Corridor Outcomes for Thailand (South)



Code	Key Biodiversity Area	Code	Key Biodiversity Area
THA1	Ao Bandon	THA58	Mae Ping
THA2	Ao Pattani	THA59	Mae Tuen
THA3	Ao Phang-nga	THA60	Mae Wong
THA4	Ban Khlong Marakor Tai	THA61	Mae Yom
THA5	Bang Lang	THA62	Mekong Channel near Pakchom
THA6	Bu Do-Sungai Padi	THA63	Mu Ko Chang
THA7	Bung Boraphet	THA64	Mu Ko Similan
THA8	Bung Khong Lhong	THA65	Mu Ko Surin
THA9	Chaloem Pra Kiet (Pa Phru To Daeng)	THA66	Na Muang Krabi
THA10	Chao Phraya River from Nonthaburi to Nakon Sawan	THA67	Nam Nao
THA11	Doi Chiang Dao	THA68	Nam River
THA12	Doi Inthanon	THA69	Namtok Huai Yang
THA13	Doi Pha Chang	THA70	Namtok Khlong Kaew
THA14	Doi Phu Nang	THA71	Namtok Sai Khao
THA15	Doi Phukha	THA72	Namtok Yong
THA16	Doi Suthep-Pui	THA73	Nanthaburi
THA17	Erawan	THA74	Nong Bong Kai
THA18	Hala-Bala	THA75	Om Koi
THA19	Hat Chao Mai	THA76	Pak Nam Prasae
THA20	Hat Nopharat Thara-Mu Ko Phi Phi	THA77	Palian Lang-ngu
THA21	Huai Kha Khaeng	THA78	Pang Sida
THA22	Huai Nam Dang	THA79	Phu Jong Na Yoi
THA23	Inner Gulf of Thailand	THA80	Phu Khieo
THA24	Kaeng Krachan	THA81	Phu Kradung
THA25	Kaeng Krung	THA82	Phu Luang
THA26	Khao Ang Ru Nai	THA83	Phu Miang-Phu Thong
THA27	Khao Banthad	THA84	Phu Phan
THA28	Khao Chamao-Khao Wong	THA85	Prince Chumphon Park
THA29	Khao Chong	THA86	Sai Yok
THA30	Khao Khitchakut	THA87	Sakaerat
THA31	Khao Laem	THA88	Salak Phra
THA32	Khao Lak-Lam Ru	THA89	Salawin
THA33	Khao Luang	THA90	San Kala Khiri
THA34	Khao Nam Khang	THA91	Sanambin
THA35	Khao Nor Chuchi	THA92	Sri Lanna
THA36	Khao Phanom Bencha	THA93	Sri Nakarin
THA37	Khao Pu-Khao Ya	THA94	Sri Nan
THA38	Khao Sabab-Namtok Phlew	THA95	Sri Phang-nga
THA39	Khao Sam Roi Yot	THA96	Sub Langkha
THA40	Khao Soi Dao	THA97	Tai Rom Yen
THA41	Khao Sok	THA98	Tarutao
THA42	Khao Yai	THA99	Tha Yang
THA43	Khlong Lan	THA100	Thab Lan
THA44	Khlong Nakha	THA101	Thale Noi
THA45	Khlong Saeng	THA102	Thale Sap Songkhla
THA46	Ko Li Bong	THA103	Thaleban
THA47	Ko Phra Tong	THA104	Tham Ba Dan
THA48	Kuiburi	THA105	Thung Kha
THA49	Laem Pakarang	THA106	Thung Salaeng Luang
THA50	Lam Khlong Ngu	THA107	Thung Tha Laad
THA51	Lower Central Basin	THA108	Thung Yai-Naresuan
THA52	Lum Nam Pai	THA109	Ton Nga Chang
THA53	Mae Fang	THA110	Tonpariwat
THA54	Mae Jarim NP	THA111	Trat Wetlands
THA55	Mae Jarim WS	THA112	Umphang
THA56	Mae Klong Basin	THA113	Wiang Lo
THA57	Mae Lao-Mae Sae	THA114	Yot Dom

Figure 12a. Site and Corridor Outcomes for Vietnam (North)

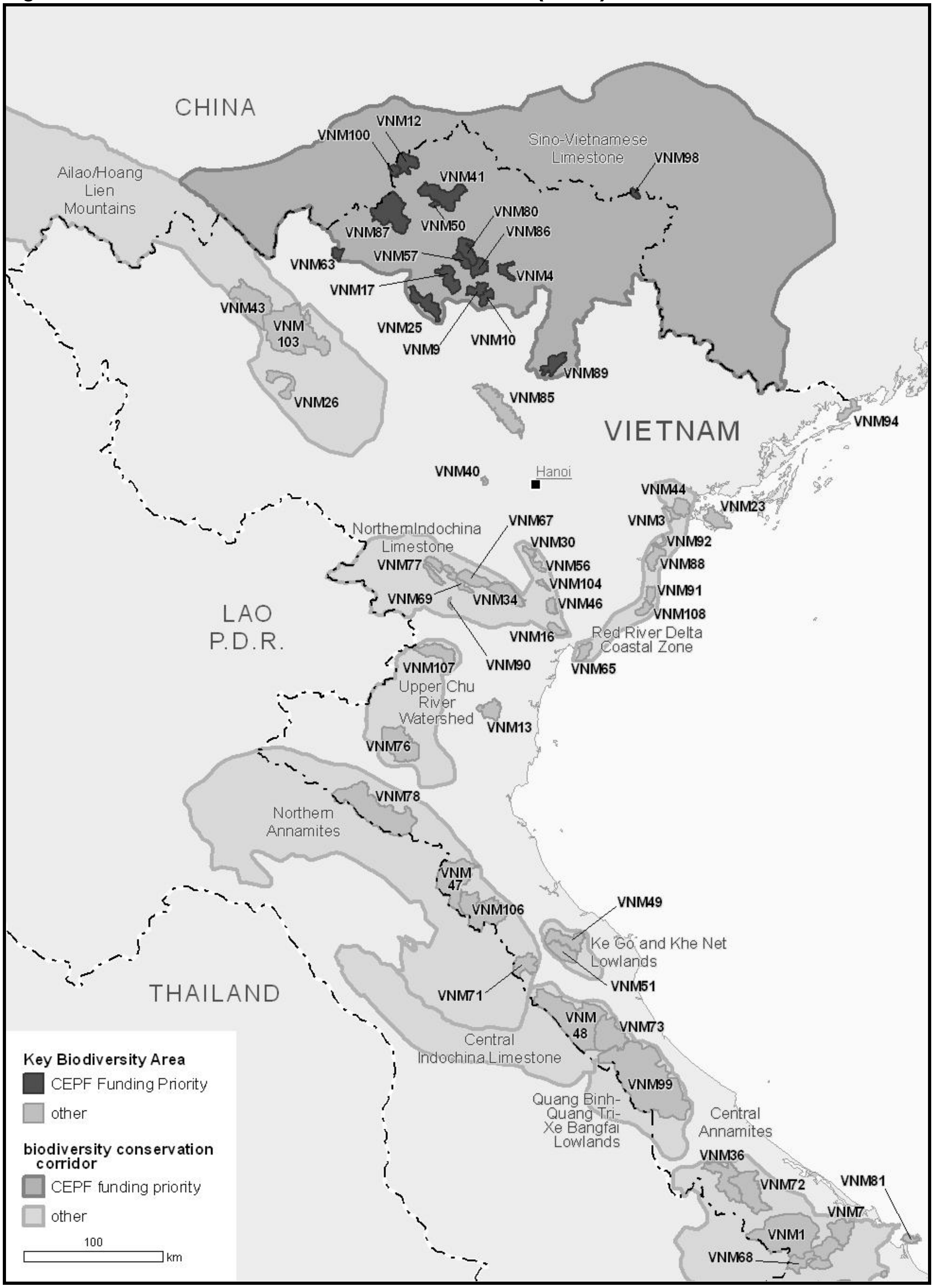


Figure 12b. Site and Corridor Outcomes for Vietnam (South)

Code	Key Biodiversity Area	Code	Key Biodiversity Area
VNM1	A Luoi-Nam Dong	VNM56	Lac Thuy-Kim Bang
VNM2	A Yun Pa	VNM57	Lam Binh
VNM3	An Hai	VNM58	Lang Sen
VNM4	Ba Be	VNM59	Lo Go-Xa Mat
VNM5	Ba Tri	VNM60	Lo Xo Pass
VNM6	Bac Lieu	VNM61	Macooih
VNM7	Bach Ma	VNM62	Mom Ray
VNM8	Bai Boi	VNM63	Na Chi
VNM9	Ban Bung	VNM64	Nam Cat Tien
VNM10	Ban Thi-Xuan Lac	VNM65	Nghia Hung
VNM11	Bao Loc-Loc Bac	VNM66	Ngoc Linh
VNM12	Bat Dai Son	VNM67	Ngoc Son
VNM13	Ben En	VNM68	Northern Hien
VNM14	Bi Dup-Nui Ba	VNM69	Nui Boi Yao
VNM15	Bien Lac-Nui Ong	VNM70	Nui Chua
VNM16	Bim Son	VNM71	Nui Giang Man
VNM17	Binh An	VNM72	Phong Dien
VNM18	Binh Dai	VNM73	Phong Nha
VNM19	Binh Khuong	VNM74	Phu Ninh
VNM20	Bu Gia Map	VNM75	Phuoc Binh
VNM21	Ca Mau	VNM76	Pu Huong
VNM22	Can Gio	VNM77	Pu Luong
VNM23	Cat Ba	VNM78	Pu Mat
VNM24	Cat Loc	VNM79	Que Son
VNM25	Cham Chu	VNM80	Sinh Long
VNM26	Che Tao	VNM81	Son Tra
VNM27	Chu Prong	VNM82	Song Hinh
VNM28	Chu Yang Sin	VNM83	Song Thanh
VNM29	Chua Hang	VNM84	Ta Dung
VNM30	Chua Huong	VNM85	Tam Dao
VNM31	Co Nhi River	VNM86	Tat Ke
VNM32	Cong Troi	VNM87	Tay Con Linh
VNM33	Cu Jut	VNM88	Thai Thuy
VNM34	Cuc Phuong	VNM89	Than Xa
VNM35	Dak Dam	VNM90	Thiet Ong
VNM36	Dakrong	VNM91	Tien Hai
VNM37	Dat Mui	VNM92	Tien Lang
VNM38	Deo Ca-Hon Nua	VNM93	Tien Phuoc
VNM39	Deo Nui San	VNM94	Tra Co
VNM40	Dong Mo Lake	VNM95	Tra Cu
VNM41	Du Gia	VNM96	Tram Chim
VNM42	Ea So	VNM97	Tram Lap-Dakrong
VNM43	Fan Si Pan	VNM98	Trung Khanh
VNM44	Ha Nam	VNM99	Truong Son
VNM45	Ha Tien	VNM100	Tung Vai
VNM46	Hoa Lu-Tam Coc-Bich Dong	VNM101	Tuyen Lam
VNM47	Huong Son	VNM102	U Minh Thuong
VNM48	Ke Bang	VNM103	Van Ban
VNM49	Ke Go	VNM104	Van Long
VNM50	Khau Ca	VNM105	Vinh Cuu
VNM51	Khe Net	VNM106	Vu Quang
VNM52	Kien Luong	VNM107	Xuan Lien
VNM53	Kon Cha Rang-An Toan	VNM108	Xuan Thuy
VNM54	Kon Ka Kinh	VNM109	Ya Lop
VNM55	Kon Plong	VNM110	Yok Don

4.3 Corridor Outcomes

Sixty-six conservation corridors were defined in Indo-Burma (Table 3 and Appendix 3). The corridors cover a total area of 1,064,019 square kilometers, equivalent to 46 percent of the total area of the hotspot. They range in size from around 1,000 square kilometers (Ke Go and Khe Net Lowlands) to a little over 100,000 square kilometers (Ayeyarwady Catchment). The full list of KBAs within each conservation corridor is presented in Appendix 3.

Many of the conservation corridors were defined for the conservation of landscape species. In Indo-Burma, these species were taken to comprise Asian elephant, takin, tiger, Irrawaddy dolphin (*Orcaella brevirostris*), rufous-necked hornbill (*Aceros nipalensis*), plain-pouched hornbill (*A. subruficollis*), great hornbill (*Buceros bicornis*), rhinoceros hornbill (*B. rhinoceros*), sandbar-nesting birds, vultures, large waterbirds (including the long-distance migrant black-faced spoonbill, and white-bellied heron, which is restricted to the northwest of the hotspot, as well as the clutch of species typical of lowland deciduous landscapes in the southern half of the hotspot) and migratory freshwater fish. For all these species, conservation of individual sites in isolation is unlikely to meet their long-term conservation needs. Other conservation corridors were defined on the basis of their importance for maintaining ecological and evolutionary processes, including shorebird migration, annual flooding cycles and altitudinal migration.

The 66 conservation corridors contain 400 KBAs (equivalent to 79 percent of the total). Moreover, the coverage of globally threatened species within the conservation corridors is very good: of the 424 globally threatened species for which reliable data on their distribution among sites were available, 415 (98 percent) occur in one or more conservation corridor.

Table 3. Summary of Conservation Corridors in the Indo-Burma Hotspot

Conservation Corridor	Countries	Area (km^2)	# of KBAs
Ailaoshan/Hoang Lien Mountains	China and Vietnam	28,076	7
Ayeyarwady Catchment	Myanmar	101,382	17
Ayeyarwady River	Myanmar	19,758	9
Bago Yoma Range	Myanmar	16,119	4
Bolaven Plateau	Lao PDR	4,411	2
Cambodia-Lao PDR-Vietnam Tri-border Forests	Cambodia, Lao PDR and Vietnam	10,617	4
Cardamom and Elephant Mountains	Cambodia	17,660	6
Central Annamites	Lao PDR and Vietnam	32,873	19
Central Indochina Limestone	Lao PDR and Vietnam	7,990	4
Chin Hills Complex	Myanmar	36,013	5
Chindwin Catchment	Myanmar	50,072	6
Chindwin River	Myanmar	5,281	1
Chumphon	Thailand	1,740	2
Damingshan Range	China	5,685	3

Conservation Corridor	Countries	Area (km^2)	# of KBAs
Di Linh	Vietnam	5,166	2
Doi Phuka-Mae Yom	Lao PDR and Thailand	17,053	10
Eastern Plains Dry Forests	Cambodia and Vietnam	21,160	8
Hainan Coastal Zone	China	8,311	3
Hainan Mountains	China	17,452	21
Hala-Bala	Thailand	7,423	7
Hong Kong-Shenzhen Mountains	China	1,337	3
Inner Gulf of Thailand	Thailand	1,408	2
Kaeng Krachan	Thailand	5,479	2
Ke Go and Khe Net Lowlands	Vietnam	1,011	2
Khao Banthad	Thailand	4,064	4
Khao Luang	Thailand	2,439	3
Khlong Saeng-Khao Sok	Thailand	8,132	8
Lower Chindwin Forest	Myanmar	39,926	6
Lower Eastern Forest Complex	Thailand	4,139	5
Lowland Dong Nai Watershed	Vietnam	8,293	5
Lum Nam Pai-Salawin	Thailand	24,333	7
Mae Ping-Om Koi	Thailand	8,666	3
Mekong Delta Coastal Zone	Vietnam	3,933	8
Mekong River and Major Tributaries	Cambodia, Lao PDR and Thailand	16,475	14
Mu Ko Similan-Phi Phi-Andaman	Thailand	26,317	11
Nam Et-Phou Louey	Lao PDR	4,391	2
Nam Ha-Xishuangbanna-Phou Dendin	China and Lao PDR	21,523	8
Nangunhe-Yongde Daxueshan	China	2,588	2
North-western Mekong Delta Wetlands	Cambodia and Vietnam	7,854	7
Northern Annamites	Lao PDR and Vietnam	21,112	7
Northern Indochina Limestone	Vietnam	6,793	10
Northern Plains Dry Forests	Cambodia and Lao PDR	19,322	4
Phanom Dongrak-Pha Tam	Thailand	3,510	2
Phu Khieo-Nam Nao	Thailand	13,395	5
Phu Miang-Phu Thong	Thailand	9,944	2
Quang Binh-Quang Tri-Xe Bangfai Lowlands	Lao PDR and Vietnam	3,819	3
Rakhine Yoma Range	Myanmar	47,614	12
Red River Delta Coastal Zone	Vietnam	2,255	7
Sekong Plains	Cambodia	3,845	1
Shiwandashan Range	China	2,458	2
Sino-Vietnamese Limestone	China and Vietnam	58,502	29
Sittaung River	Myanmar	47,614	1
South China Shorebird Flyway	China	22,665	8
Southern Annamites Main Montane Block	Vietnam	11,976	7
Southern Annamites Western Slopes	Cambodia and Vietnam	3,945	2
Sri Lanna-Khun Tan	Thailand	20,164	1

Conservation Corridor	Countries	Area (km^2)	# of KBAs
Tanintharyi Range	Myanmar	42,912	12
Thanlwin River	Myanmar	7,696	0
Tongbiguan-Gaoligongshan	China	11,216	3
Tonle Sap Lake and Inundation Zone	Cambodia	17,547	10
Upper Chu River Watershed	Vietnam	4,505	2
Upper Eastern Forest Complex	Thailand	9,685	4
Western Forest Complex	Thailand	24,112	12
Western Shan Yoma Range	Myanmar	27,732	4
Xe Khampho-Xe Pian	Lao PDR	4,723	3
Yunwushan Range	China	8,408	5

5. SOCIOECONOMIC CONTEXT OF THE INDO-BURMA HOTSPOT

This chapter provides a broad overview of the socioeconomic context for biodiversity conservation in the hotspot. The chapter reviews the main trends in socioeconomic development over recent decades, the principal economic sectors operating in the region and evaluates how they impact biodiversity and the enabling environment for conservation actions. In addition, this chapter assesses the broad changes in land cover that have occurred in the hotspot.

5.1 Historical Context

The hotspot has a long history of human occupation, forest clearance and cultivation. The region has been home to some of Asia's most successful civilizations and empires. These have included successive Vietnamese imperial dynasties, the Cham empire (7th to 10th centuries), and the Angkorian empire (9th to 15th centuries). At its height (12th Century) the latter extended over much of the hotspot. The power of the Angkorian empire was built on intensive irrigated rice cultivation and probably led to the clearance of large areas of forest. Recent analysis (Clements 2005) indicates that although much of the area has returned to forest, remains of this agricultural system now form grasslands and wetlands, which are of high importance for waterbirds and ungulates in the deciduous dipterocarp forests of northern Cambodia.

Significant European influences on the region began in the 16th century, through trade posts, such as that of the Portuguese in Macau. By the 19th and early 20th century, trading posts had evolved into colonial regimes: the British in Hong Kong and present-day Myanmar, and the French in present-day Cambodia, Lao PDR and Vietnam. During this period, Thailand and China remained independent states. Agricultural expansion and intensification increased during this time, notably with the introduction by the French of large-scale rubber plantations in eastern Cambodia and southern Vietnam. Expansion of commercial rice production for export in the Chao Phraya floodplain of central Thailand, in the late 19th century and 20th century, possibly contributed to the extinction of Schomburgk's deer (IUCN 2011).

Independence movements that emerged in each colonized country came to prominence following the end of Japanese occupation during World War Two. Myanmar gained independence from Britain in 1948, while Cambodia became independent in 1953, and Lao PDR and Vietnam in 1954, following several years of conflict with France. The conflicts sparked during the independence period continued in various forms across these countries for several decades, with profound effects on the socioeconomics, politics and biodiversity of the hotspot. To cite one example, widespread use of defoliants by U.S. forces impacted forests throughout southern Vietnam (Dudley *et al.* 2002). Deprivation following years of conflict in Lao PDR and Vietnam, and the extreme policies of the Khmer Rouge and the 15-year civil war that followed its downfall in Cambodia, drove a high demand for wildlife and forest products for food and basic needs. It is during this period that the once-huge herds of wild ungulates in Cambodia, famously described as 'the Serengeti of Asia' (Wharton 1957), were decimated, leading to the possible extinction of kouprey and the near-extirpation of wild water buffalo (*Bubalus arnee*).

Overall, the region has enjoyed greater political stability since the early 1990s. Communist governments in China, Lao PDR and Vietnam have liberalized their economies and experienced rapid growth. Post-civil-war Cambodia became a democratic constitutional monarchy in 1993. Thailand has remained a constitutional monarchy, and, despite decades of political instability with frequent periods of military rule, has experienced rapid economic and social development. Post-independence Myanmar has been marked by long periods of military rule, and prolonged conflict between the government and armed insurgent groups. Elections were held in November 2010, which were won comfortably by a party backed by the military. Pro-democracy groups hope that this will initiate a period of reform.

5.2 Key Social and Demographic Trends

5.2.1 Regional and National Demographics

Indo-Burma is the most populous of all the biodiversity hotspots. The total population is estimated as at least 331 million people (Table 4). This is almost certainly an underestimate, because the population calculation for the Mainland China part of the hotspot is based on data from 2000. Since 2000, for example, the total population of Guangdong province has grown from approximately 73 million (about 60 percent of them in the hotspot) to over 104 million people (National Bureau of Statistics 2011).

Population density averages 143 people per square kilometer across the hotspot but varies greatly by country (Table 4) and within each country. Lao PDR, for example, has one of the lowest population densities in the world at only 28 people per square kilometer (World Bank 2011c) while Macau and Hong Kong have the highest (18,500 and 6,300 respectively). Vietnam's population shows marked concentrations in the Red River (approximately 1,000 people per square kilometer) and Mekong deltas (approximately 800 people per square kilometer) (RRCAP undated), with mountainous parts of the country being much more sparsely populated; southern China shows even more extreme variations.

Table 4. Basic Population Statistics for the Indo-Burma Hotspot

Country	Population in the Hotspot (2010)	Population Density (pax per km^2)	% Annual Population Growth (2010)	% Population Increase 1990-2010	Rural population as % of Total (2009)
Cambodia	14,138,255	80	1.14	55	78
China	103,699,244**	268	0.51*	18*	55*
Lao PDR	6,436,093	28	1.81	53	68
Myanmar	50,405,672	77	0.94	23	67
Thailand	68,139,238	133	0.55	20	66
Vietnam	88,361,982	285	1.23	34	72
Total	**331,180,484**	**143**			

Sources: Census and Statistics Department (2011); Statistics and Census Service (2011); UNDP (2011); World Bank (2011c). Notes: * = figures for the whole country; ** = The population for the Chinese part of the hotspot was calculated from detailed population statistics for individual counties (HUCE 1999). The total population of a county was included if more than 50 percent of its area was in the hotspot. For Macau and Hong Kong, the most recent available data were for 2010; for Hainan, Guangxi, Guangdong and Yunnan, they were for 2000.

There is, similarly, great variation in population growth between the countries. The application of the one child policy in Mainland China has kept its national population growth at only around 0.5 percent per annum (World Bank 2011c). This policy does not apply to some minority groups that live in the hotspot, however, so it is likely that there is some local variation to the natural population growth rate in the Chinese part of the hotspot. This figure also hides patterns of migration, which have impacted on the hotspot.

In contrast with the slow growth rates in China, Lao PDR saw an estimated population growth of 1.8 percent in 2010 and Cambodia of 1.15 percent. Both countries have seen their populations grow by more than 50 percent since 1990 (UNDP 2011). It is important to note, however, that population growth rates have decreased notably in most countries. For the period 1990-1995, for example, Lao PDR experienced average annual population growth of 2.7 percent, Cambodia of 3.2 percent and Vietnam of 1.9 percent (UNDP 2011).

Although the hotspot contains some major urban population centers, such as Guangzhou (c.12.7 million people), Shenzhen (c.10.3 million), Bangkok (c.9.8 million), Ho Chi Minh City (c.7.8 million) and Hong Kong (c.7.1 million), the population is still predominately rural (Table 4). The large part of this rural population depends on agriculture for their livelihoods, which has direct impacts on biodiversity through use of agrichemicals and the expansion of the agricultural lands into forests and wetlands. In addition, a great many are also still dependent on wild resources for their basic needs and income. Foremost amongst these, for many communities, are freshwater fisheries. Other products widely harvested by rural communities include firewood, building materials (timber, rattans, bamboo, etc.), wild fruits and vegetables (Ashwell and Walston 2008), medicines and wild animals (for domestic use or sale).

Increasing rural populations are putting greater pressures on biodiversity and natural resources. In some countries, these pressures are being exacerbated by national policies promoting the expansion of agro-industrial plantations which not only clear large areas of natural habitats, but can also lead the displacement of human populations and new clearance for subsistence agriculture.

5.2.2 Migration and Urbanization

Since the 1990s there has been a notable trend for rural-to-urban migration in the hotspot (Guest 2003). This has been most notable in southern China, where the Pearl River Delta region has seen massive levels of in-migration from other parts of China to work in the industrial complexes of China's south coast. The pattern is repeated in other countries. For instance, in Cambodia, people have moved to Phnom Penh to find employment, chiefly in the garment factories (World Bank 2007), and in Vietnam there has been a movement from the northern highlands to the industrial heartland in the Red River Delta (AAG 2011). Another significant pattern has been rural-to-rural migration. In Cambodia, there has been significant movement of people from the more densely populated regions around Phnom Penh and the Tonle Sap great lake 'rice belt' to more sparsely populated regions including protected areas (Pollard and Evans 2008). In Vietnam, an estimated 6 million people resettled or migrated during the second half of the 20th century (UNDP 1998), and migration policies played an important role in government plans for agricultural expansion (particularly of tea, coffee and other commodities) in the south of the country and mountainous areas (World Bank 2009).

The increases in urban populations do not necessarily decrease pressures on natural resources and biodiversity, however. Booming urban centers need building supplies, including timber and charcoal for brick kilns, and fuel often from firewood, and may provide a large demand for wild meat and fish. Research in Cambodia (for example Blackett 2008) has revealed the huge demand for charcoal for bricks, and fuelwood for garment factories in the relatively small city of Phnom Penh. The NGO GERES (reported in Blackett 2008) report that a single brick and tile factory requires around 500 cubic meters of charcoal per month. There are dozens of such factories surrounding Phnom Penh.

5.2.3 Ethnicity, Language and Religion

Patterns of ethnicity are similar in each of the main hotspot countries. Broadly speaking, each country has a lowland, rice-farming, ethnic group that makes up the majority of the population and forms the cultural and political elite (in all countries, these groups make up the majority of the population). The hotspot is also, however, home to many minority ethnic groups, with unique culture, language and heritage (Table 5). Most of these groups live in the more remote, mountainous parts of the region, and are, on average, more economically and politically marginalized than the majority ethnic group.

Table 5. Ethnic Groups, Religions and Languages in the Indo-Burma Hotspot

Country	Majority Ethnic Group	Total No. of Ethnic Groups	Significant other Ethnicities	Majority Religion	Other Religions	Majority Language
Cambodia	Khmer	Approx. 25	Brao, Bunong, Cham, Chinese, Kuy, Jarai, Tai, Lao	Buddhism	Christianity, Islam, Animism	Khmer
China	Han	Hotspot figure unavailable	Cantonese, Zhuang, Dai, Yi, Li, Hmong	none	Buddhism, Confucianism, Christianity	Mandarin
Lao PDR	Lao	149	Hmong, Chinese, Vietnamese,	Buddhism	Christianity, Animism	Lao
Myanmar	Burmese	135	Kachin, Kayah, Karen (Kayin), Chin, Shan, Chinese, Rakhine	Buddhism	Christianity, Islam, Animism	Burmese
Thailand	Thai	Approx. 40	Akha, Hmong, Yao, Karen, Lahu, Lisu	Buddhism	Christianity, Islam, Animism	Thai
Vietnam	Kinh	54	Tay, Thai, Muong, Khmer, Chinese, Hmong	Buddhism	Christianity	Vietnamese

Many of the most important protected areas in the hotspot are located in remote and upland areas. Therefore, although they may be minority groups nationally, some ethnic groups form the majority in and around protected areas. The largest ethnic group around Mondulkiri Protected Forest in eastern Cambodia, for example, is Bunong (WWF 2008). Similarly in Thung Yai Wildlife Sanctuary in western Thailand, the population in and around the park is almost entirely Karen (Emphandhu 2003). Minority groups, therefore, have a disproportionate influence on protected areas and biodiversity. In addition, many minority groups follow animist belief systems with very close links to the forest. Traditional taboos exist that form complex resource management systems (Degan *et al.* 2004) and many groups have networks of spirit groves and pools that protect culturally important forest and river sites, leading to the maintenance of biodiversity values. Improving infrastructure and the extension of market economies into remote areas is impacting on minority cultures, however. Many of these traditional systems are being eroded and the values lost. Supporting the maintenance of minority cultures not only has important social benefits, but may also have secondary benefits for biodiversity conservation.

Each country in the hotspot has its own national language, in each case the language of the majority ethnic group. Among minority ethnic groups, the national language may at best be a second language for many people. Knowledge of English among the educated urban middle and upper classes is fairly widespread, especially in Myanmar and Thailand, but English language skills are generally lacking in rural populations, in lower levels of government institutions and in grassroots CSOs.

5.2.4 Poverty and Human Development

As with many other socioeconomic metrics, the hotspot exhibits great disparities in wealth and human well-being. Settlements in the hotspot range from the international financial center of Hong Kong to isolated subsistence farming communities in Lao PDR.

Fisher and Christopher (2007) assessed various measures of poverty among the 34 hotspots across the globe. Their study ranked the Indo-Burma Hotspot third for total area affected by poor socioeconomic conditions. In addition, countries in the hotspot appeared in four of the five lists of poverty indicators.

All countries in the hotspot rank in the bottom half of the UNDP (United Nations Development Program) Human Development Index (Table 6) but the economic growth since the 1990s (see below) has helped bring many people out of poverty in the region. All countries have moved up in rank in the HDI over the period 2005-2010 (China by 8 places, Cambodia 1, Lao 4, Myanmar 6, Thailand 1 and Vietnam 1) and have seen improvements in other key metrics. Each country has significant populations suffering from extreme poverty, with over a third of the population of Lao PDR earning less than $1.25 per day, and two-thirds earning less than $2 per day (2008 figures). While these figures still represent high levels of poverty, considerable progress has been made in poverty reduction across the hotspot. In 2002, more than 40 percent of the population of Vietnam earned less than $1.25 per day; it is now around 13 percent. By bringing nearly 30 percent of the population out of extreme poverty in less than 10 years Vietnam has one of the most significant development achievements in the region. Similarly, in 2004, more than 40 percent of the population of Cambodia earned less than $1.25 per day, compared to 28 percent in 2010. Lao and China have also seen gains, albeit less significant. No data are available for Myanmar.

Table 6. Poverty Indicators for the Indo-Burma Hotspot

Country	Human Development Index Rank (out of 169)	Life Expectancy (Years)	% Earning <$1.25 per Day	% Earning <$2 per Day	Adult Literacy Rate (%)	Gender Inequality Rank (out of 169)
Cambodia	124	62.2	28	56	77	95
China	89	73.5	16	36	94	38
Lao PDR	122	65.9	34	66	73	88
Myanmar	132	62.7	-	-	92	-
Thailand	92	69.3	11	26	94	69
Vietnam	113	74.9	13	38	93	58

Source: UNDP (2011).

Sub-national patterns are harder to determine, because few comparative data are available, but it is likely that rural populations, and particularly ethnic minorities, rate worse than national averages. Development indicators, such as income and literacy rates, are typically lower in remote rural areas, which are often also the site of concentrations of biodiversity and protected areas.

5.2.5 Gender Issues

At a national level, political and economic elites are dominated by men, as are senior levels of government and legislature (although Thailand elected a female Prime Minister in 2011, the first in the region), and the voice of women is generally under-represented. Although each of the hotspot countries has a Gender Inequality Rank (UNDP 2011) higher than its overall rank, indicating the countries perform better against this than against other conventional development indicators (Table 6), there remains gender disparity in poverty and livelihood indicators. Many of these disparities are exaggerated further in rural areas. Women's access to basic services, resources and infrastructure is more limited than men's, and their voice in decision making is limited (World Bank 2011b). Throughout the region there are general patterns of women carrying the burden of working on household farmlands, while men carry out wage labor (for example in plantations or construction). In rural communities, such as in Cambodia, women are typically responsible for collecting firewood and water and for cooking, whereas activities such as logging, hunting and collection of certain non-timber products (eg tree resins) are carried out by men. Where community-based natural resource management groups exist, these patterns of male dominance tend to be repeated. There is a need, therefore, for conservation initiatives to recognize that gender relations exercise an important influence on women and men's access to and control over environmental resources and the goods and services they provide, and to integrate gender considerations into the design and implementation of projects, where relevant.

National and international conservation NGOs tend to show a gender imbalance. The majority of management and field staff are male, with most female staff tending to be in administrative and support roles. There are notable exceptions to this pattern with several successful and influential female researchers and conservation practitioners working in the region. This pattern is not unique to Indo-Burma and perhaps reflects broader gender imbalances in the conservation sector. Nevertheless, capacity building and support for the development of female conservation practitioners in the hotspot needs greater investment.

5.3 Key Economic Context

5.3.1 Key Recent Economic Trends

Until very recently, all nations had predominantly rural, natural resource/agriculture-based economies. This is essentially still the case in Cambodia and Lao PDR, but large parts of Thailand, Vietnam and southern China too have yet to become industrialized. Thailand achieved double-digit economic growth in the late 1980s, marking its gradual shift to an export-driven, industrialized economy (ADB 2000). Since the early 1990s, Vietnam has gradually shed its centrally planned economic policies for market-oriented policies. China has been doing so for some time already and is now the world's second-largest economy. A large part of this growth has occurred in the industrialized area of the

Pearl River Delta within the hotspot. All countries in the region were affected by the Asian economic crisis and global economic slump in the late 1990s, Thailand most severely. The area recovered well during the 2000s, however, and has continued to see fast economic growth (Table 7). This economic growth is among the highest of any hotspot.

Table 7. Main Economic Statistics for Countries in the Indo-Burma Hotspot

Country	Income Group	GDP per Capita (2010)	GDP Growth (%) (2010)	Net ODA Received (2009; $ Million)	Net ODA Received as % of GNI (2009)
Cambodia	Low	$802	6.7	$722	7.3
China*	Upper Middle	$4,393	10.3	$1,132	0.0
Lao PDR	Lower Middle	$1,208	8.4	$420	7.1
Myanmar	Low	-	-	$357	-
Thailand	Upper Middle	$4,613	7.8	minus $77	0.0
Vietnam	Lower Middle	$1,191	6.8	$3,744	4.1

Source: World Bank (2011a). Note: * = figures for the whole country.

The global economic problems manifest since the 2008/2009 credit crunch have slowed this growth, principally through a decline in exports to Europe and North America, but the impact of these problems has been far less severe than in Europe or the USA (FAO 2011a). In terms of absolute gain, China and Thailand has seen the largest economic growth since 2000, however Cambodia and Lao PDR have seen the most rapid rate of growth. These trends look set to continue over the coming decade. Overseas development assistance (ODA) has formed a significant part of the gross national income (GNI) of Lao PDR and Cambodia since the 1990s; and, in 2009, stood at about 7 percent of GNI (World Bank 2011a). Although the absolute amount of aid has remained approximately constant over this period, growth in national economies has meant that the contribution of aid to GNI in Lao PDR and Cambodia has declined from 17 and 16 percent respectively in 1995. Aid budgets to the hotspot continue to shrink (see Chapter 10) and, as GNI increases (particularly with potential oil and gas revenues in Cambodia, see below), the contribution of ODA will continue to decline further, and the influence of international donors over national policy will continue to wane (Seiff 2011). The declining role of international donors in major development projects may have some significant impacts. Private sector investment, particularly from regional economies, may lack the transparency and safeguards that are now standard in many bilateral and multilateral donor investments. The lack of safeguards and conditions increases the risk of inappropriate and environmentally damaging developments.

This rapid economic growth has brought much of the population of the hotspot countries out of poverty, and seen many of the cities transformed into major metropolises. Development priorities have also influenced rural areas. Most countries have seen a rapid increase in the road network (often paid for with aid from neighboring economies). Thus previously remote areas have, in recent years, been opened up. Market economies have become more established and agricultural economies have tended towards cash crops (Pollard and Evans 2008), such as cashew, cassava, coffee and rubber smallholdings. Farmers still grow subsistence crops, however, and therefore require larger areas of land altogether. Increasing rural populations in Cambodia and Lao PDR, demanding more land per household, are leading to increased clearance of forest in remote areas (FAO 2011a).

Regional Patterns of Investment

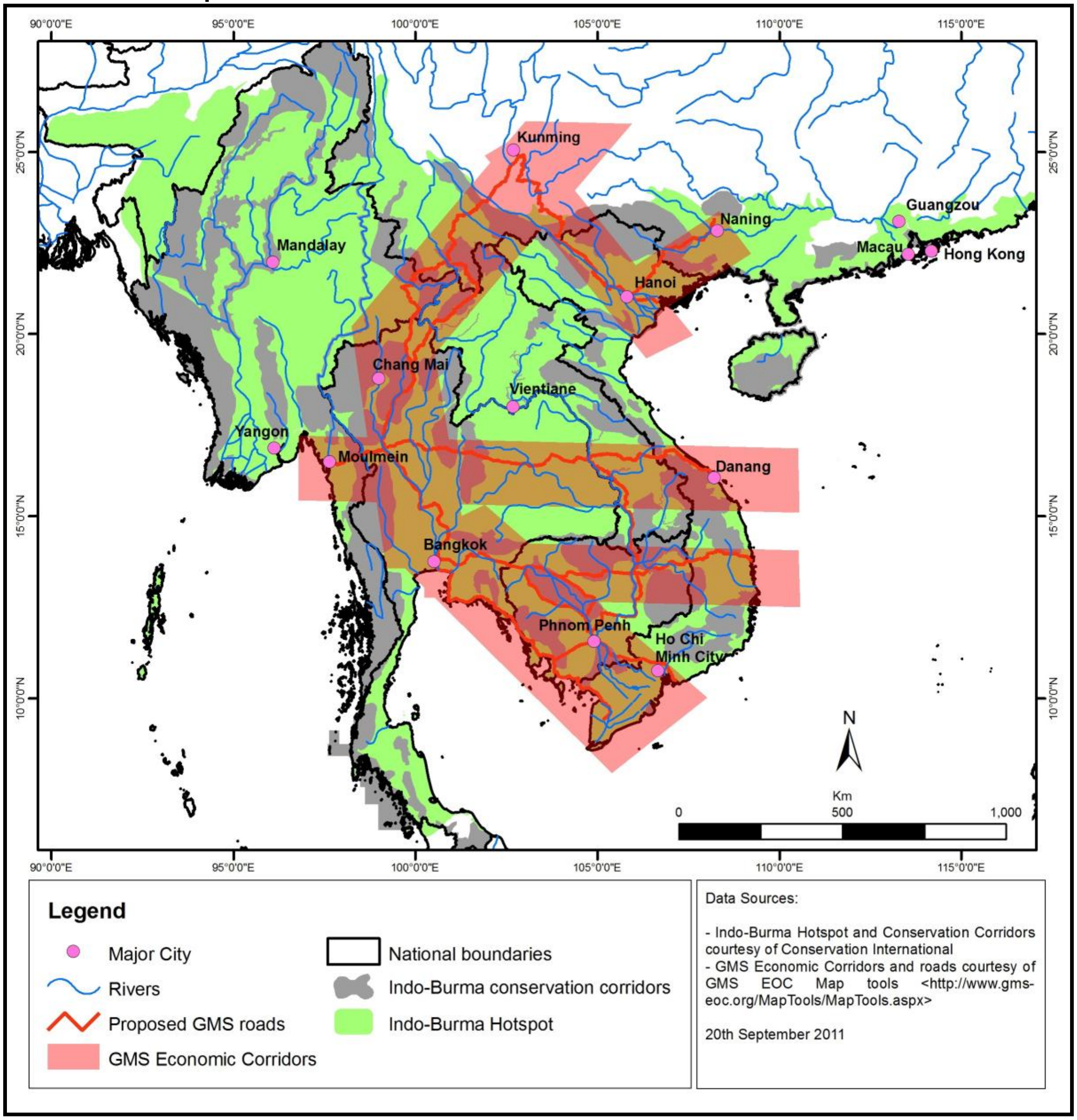
Local investment is a notable pattern in the Indo-Burma hotspot. The larger economies of Thailand, Vietnam and, particularly, China are investing in the smaller economies of Myanmar, Lao PDR and Cambodia. This investment is both from the private sector and in the form of ODA (principally loans). Vietnamese and Chinese firms are investing in agro-industrial plantations, timber extraction and the extractive industries to supply raw materials to manufacturers in their countries. As outlined below, these rapid, and generally poorly planned and regulated developments are having significant impacts on biodiversity in many parts of the hotspot, including several of the target corridors.

One bounding framework for regional economic integration is the Asian Development Bank (ADB) Greater Mekong Subregion (GMS) Regional Cooperation Strategy and Program. This "holistic strategy seeks to improve and enhance investments in transport, energy, and telecommunications in the subregion" (ADB 2011d). This program has identified three broad corridors based around improved road networks that will promote regional economic cooperation (ADB 2011c). The corridors are:

- North-South Corridor : Kunming to Hanoi/Hai Phong and Nanning; and Kunming to Bangkok
- East-West Corridor : Mawlamyine-Myawaddy across Thailand and Lao PDR to Hue in Vietnam
- Southern Corridor : Bangkok to Phnom Penh and Ho Chi Minh City; Bangkok across northern Cambodia to Quy Nhon in Vietnam; Bangkok along the coast to Nam Can in the Mekong Delta; and a corridor link from the Cambodian coast to the East West Corridor at Savannakhet.

The economic corridors program is accompanied by a biodiversity conservation corridors initiative which is hoped to mitigate some the impacts of development along the corridors (see Section 10.2.2). The economic corridors will influence several KBAs, and conservation corridors, however, including the Central Annamites in Vietnam and Lao PDR, the Shiwandashan Range in China, and parts of Thailand's Western Forest Complex (Figure 13). Improving access and promoting investment in previously remote areas has significant impacts on biodiversity. In addition to direct land conversion, new road networks can lead to the spread of frontier agricultural expansion, facilitate the illegal wildlife and timber trade, and enable the increased expansion of agro-industrial plantations, leading to further forest loss. The corridor program is part of the broader Core Environment Program of the ADB. This has broader aims, and is covered in more detail in Chapter 6.

Figure 13. Overlap between GMS Economic Corridors and Conservation Corridors in the Indo-Burma Hotspot



Source: ADB (2011b); unpublished data from CI.

Investment from other Asian and Middle Eastern economies is also increasing, notably from South Korea, India (mostly in Myanmar) and the United Arab Emirates, who have interests in agricultural commodities, principally rice, in Thailand, Cambodia and Lao PDR (McCarten 2008). As described below, there is also significant regional investment in the energy sector with Indian, Chinese, Vietnamese and Thai companies heavily involved in oil and gas, and hydropower development across the hotspot.

5.3.2 Main Economic Sectors

Key economic sectors that have an impact on or are dependent on natural ecosystems in the hotspot are agriculture, forestry, tourism, fisheries, mining and energy (particularly the hydro-power sub-sector). Historically, and continuing to the present day, agriculture has been the prime economic activity in the many of hotspot countries. Although, as their economies grow, the countries of the hotspot are becoming increasingly industrialized, the agriculture sector remains the largest employer.

Agriculture

Agriculture is a major part of the economy in all hotspot countries, making a significant contribution to gross domestic product (GDP), and being a major employer. It is still the most important economic sector in Cambodia, Lao PDR and Myanmar, where in 2008 it contributed more than a third of the GDP of each (World Bank 2011a). The contribution to GDP is smaller in Thailand and Vietnam (only 12 and 21 percent respectively) but it is still a major employer, providing jobs to over 40 percent of the workforce in each country. Far and away the most important crop is rice. The majority of the production is from permanent wet rice cultivation, which has a large land-use footprint, especially in floodplain and delta regions, and is a major source of pollution of freshwater systems, due to pesticide and fertilizer run-off. In addition, shifting cultivation of rice, maize and cassava is widespread in upland areas, and has contributed to significant forest loss and land-use change in some mountainous parts of the hotspot.

Data on land area dedicated to agriculture are available up until 2008 (World Bank 2011c). These show that agricultural lands stayed roughly stable throughout this period with slight increases in Cambodia, Myanmar and Lao PDR. The recent increase in large-scale agro-industrial plantations in Cambodia and Lao PDR, since 2008, may result in an increase in the agricultural area, which is not yet represented by these figures. Another trend that is not recognized in these data is moves towards increased productivity. For example, industrialized irrigated dry-season rice farming around the flood plain of Tonle Sap Lake in Cambodia , which has increased dramatically since 2007, has resulted in the loss of large areas of a unique grassland agro-ecosystem, which is home to several threatened species such as the Critically Endangered Bengal florican (Eames 2010, Sophakchakrya 2010).

One trend over the past 15 years has been the increase in large-scale agro-industrial plantations of several different crops. Such developments can have some socioeconomic benefits. They can potentially provide significant employment in rural areas, could (for some crops) improve food security, and may increase export earnings and provide important contributions to national budgets through tax contributions. Poorly planned and un-regulated developments, combined with low levels of transparency, mean that these potential benefits have not always been realized in the hotspot (Oxfam 2011). The expansion of these plantations is having significant impact on forest cover and biodiversity throughout the hotspot, and is currently a major driver of forest loss in the region.

During the 1990s and 2000s, large coffee plantations were established in the central highlands of Vietnam to such an extent that the country is now the world's number two producer of coffee beans (ICO 2010). Southern Vietnam and Cambodia have also seen the establishment of cashew and cassava crops, in plantations and by small-holders. Oil palm and rubber plantations have expanded in the lowlands of southern Thailand clearing much of the remnant lowland forest of the areas (Aratrakorn *et al.* 2006). The most high profile impact of this has been the decline in the population of the Endangered Gurney's pitta. Once believed extinct, it was re-discovered in 1986, when the population was estimated at 44-45 pairs (IUCN 2011). Since then however forest loss, principally conversion to oil palm, has led to a decline in the Thai population, which is now estimated at perhaps only five pairs (Sykes 2011). The majority of the global population is found in neighboring areas of Myanmar. No protected area exists in this part of the bird's range, however, and forests there are highly threatened with conversion to oil palm (Donald *et al.* 2009, Woods 2011). Lao PDR, Vietnam, Cambodia and Yunnan province's Xishuangbanna prefecture have seen a rapid growth in rubber plantations (Qiu 2009, FAO 2011a). This has been particularly dramatic in Cambodia where a large number of 'economic land concessions' (ELCs) for a range of commodities (including rubber, cassava, teak and acacia) have been granted across the country. Clear data on the number of ELCs and the area they now cover are hard to obtain, but these ELCs are leading to a major loss of forest cover throughout the country. One trend of particular concern is the placement of plantations in protected areas. Large areas of several protected areas, including Snuol and Boung Per Wildlife Sanctuaries and Virachey National Park, have been de-gazetted or zoned to allow plantation development (Reoun and Vrieze 2011). Between February 1 and April 1, 2011, 1,100 square kilometers of ELCs were granted in Cambodian protected areas. Plantation development is also expanding in Myanmar (FAO 2011a) where it is also impacting on protected areas, and hotspot corridors. Large-scale sugar plantations in northern Myanmar have severely fragmented the Huakang Valley (Woods 2011).

This rapid expansion of agro-industrial plantations is being driven by a range of macro-economic factors, and is facilitated by socio-political conditions in the hotspot nations (Oxfam 2011). Global commodity prices have risen dramatically in recent years. The price of natural rubber has tripled since 2000 (Qiu 2009). This rise is in response to the increase in the price of mineral oil, making artificial rubber more expensive, but also because of the use of natural rubber in vehicle tires. Booming economies in India and China have led to a large increase in demand for vehicles and therefore tires. Demands for bio-fuels driven by policies aimed at reducing the use of fossil fuels as an attempt to reduce greenhouse gas emissions, have increased demands for sugar, oil palm, cassava and jatropha, and may have impacted on food prices such as for rice. China and Thailand have limited areas of land available for agriculture but are experiencing increased demands and rising production costs. Production is shifting therefore to neighboring countries with greater land availability, and cheaper costs (particularly labor). China's opium substitution program provides incentives to Chinese companies to develop agriculture in poppy-producing regions of northern Lao PDR and Myanmar. Conditions in countries that are expanding their agro-industry encourage the trend further. For example Cambodia is promoting actively the development of agro-industry as a foreign currency earner (McCarten 2008, Chung 2011). Weak and unclear legal frameworks (see Chapter 6), which leave loopholes that developers can exploit to get access to cheap land (Oxfam 2011), combined with a lack of transparency, create conditions under which development agreements can be obtained extra-legally. Remote areas with uncertain land tenure, often populated by ethnic minorities, are also exploited by developers.

Industry and Manufacturing

As mentioned above, many of the hotspot's countries have undergone a period of rapid industrialization since the 1970s. The Pearl River Delta in the Chinese part of the hotspot is one of the great industrial centers of the world, with factories manufacturing goods for export around the world. Vietnam and Thailand are now both primarily industrial countries, with industry providing over 40 percent of the GDP of both countries in 2009 (World Bank 2011c).

The impacts of industry on the environment are diverse. There have been direct impacts in the development of industrial zones, often in coastal areas to ease logistics, leading to the widespread loss of wetlands, particularly along the Chinese coast, and around Bangkok. Heavy industry is poorly regulated in the region, and levels of air and water pollution are high. The most important indirect impacts of industry come from energy demands. Energy supply and hydropower are covered in greater detail below. However other energy demands are also made. For example garment factories around Phnom Penh use significant volumes of firewood (Blackett 2008), and for much of the 2000s this has been supplied by wood from senescent rubber plantations. This supply is ending, and the shortfall is believed to be coming from natural forest areas, including forests cleared for ELCs.

Tourism

Tourism is an important source of foreign income to many hotspot countries. Tourism income to Thailand totaled nearly $19.5 billion in 2009, 22 percent of all export receipts (World Bank 2011c). Although the absolute sum was much lower for Lao PDR ($271 million), this still accounted for 19 percent of its export receipts.

Most of this international tourism is focused on beach holidays in Thailand, and visits to the major cities of the region. Tourism in Cambodia and Lao PDR focuses on cultural tourism, principally to the temples of Angkor Wat, and the town of Louangphabang. There is, however, a small but significant market for nature-based tourism. Largest in this sub-sector is dive tourism in Thailand (and to a lesser extent in Cambodian and Vietnam), visiting the well established network of marine protected areas on both coasts. Specialist ecotourism operations currently contribute relatively little to national income but can have significant positive impacts on rural communities and wildlife. Examples of successful ventures include bird-based tourism packages provided by the Sam Veasna Center in northern Cambodia, and the Chi Phat community-based ecotourism project in the southwest of the country, supported by Wildlife Alliance, geared towards trekking and mountain biking.

Domestic tourism is an increasingly important sector, though data are harder to obtain. Affluent middle classes in Vietnam, China and Thailand are travelling more, including to protected areas. Heavily visited protected areas in the hotspot include Khao Yai National Park in Thailand, Phong Nha-Ke Bang National Park in Vietnam and Angkor Wat in Cambodia.

Fisheries

Marine and freshwater fisheries are an incredibly important component of the economy of the hotspot. Fisheries are a major employer, provide significant contributions to national income, and are a vitally important source of protein and fatty acids for millions of people. The hotspot includes productive coastal waters in the Bay of Bengal, Andaman Sea, Gulf of Thailand and South China Sea, as well as highly productive freshwater fisheries in the Mekong and Ayeyarwady basins. The Tonle Sap Great Lake is one of the most productive freshwater fisheries in the world, and it is estimated that 80 percent of Cambodia's population obtains its protein from its waters (Poole and Briggs 2005).

The hotspot has seen growth in fisheries since the mid-1980s, in large part through the expansion of aquaculture. This has provided significant economic gains but at a high environmental cost through the loss of mangroves (see below). Overall production levels are now high in the region (FAO 2010b). In 2009, Thailand's fisheries produced 3.1 million tonnes, Vietnam's 4.8 million tonnes and Cambodia's half a million tonnes (up from only 120,000 tonnes in 1988). Since 1984, aquaculture production in Thailand has grown from 112,000 tonnes (generating $108 million) to 1.3 million tonnes (generating $2.4 billion). Over the same period Vietnam saw growth from 120,000 tonnes ($257 million) to 2.5 million tonnes ($4.8 billion). Cambodian aquaculture is still relatively modest, but has grown from only 1,000 tonnes in 1984 to 50,000 tonnes in 2009.

Forestry

With the exception of Myanmar, exploitation of natural forests has declined in importance across the hotspot since the 1990s. This has happened as the resource base declined, and countries have become more industrialized. Natural-forest logging bans are now in place in Cambodia, Thailand and China. Production from State Forest Enterprises in Vietnam has declined but operations continue to be supported by state subsidies (FAO 2011a). Official production figures have declined slightly in Lao PDR (FAO 2011a) but this may be a consequence of under-reporting (EIA 2008, 2011) because it is believed that large volumes are exported to Vietnam extra-legally. Unsustainable forestry practices persist throughout the region, and the impacts on biodiversity of natural forest management are probably high. Production in Myanmar increased between 1997 and 2007, primarily as the area of forest available for timber production increased (FAO 2011a).

Reductions in production from natural forest management in Thailand, China and Vietnam have been compensated by increased production from plantations: chiefly teak (*Tectona grandis*) for timber, and Australasian exotics (*Acacia* spp. and *Eucalyptus* spp.) for pulp and timber. Roundwood production tripled in Thailand between 1997 and 2007 (FAO 2011a).

Although the contribution of forestry to national development may be decreasing, forests of the hotspot still have considerable value as a source of non-wood products. Forest communities throughout the hotspot are still reliant to some extent on products such as bamboos, rattans, and fuel woods. The value of this local use has not been comprehensively calculated, but across the hotspot is probably quite considerable. Forest products are increasingly important as an income source rather than for subsistence use. Large-scale trade has exhausted economically viable stocks of rattans across large parts Lao PDR, Cambodia and Vietnam (Evans 2002). Bamboo is heavily harvested for construction materials and for use in incense sticks (Mann 2009). Wildlife is heavily hunted for local subsistence and trade throughout the hotspot. This widespread and intense hunting is one of the main threats to wildlife in Southeast Asia.

Extractive Industries

Mining and the oil and gas industries are growing rapidly in the hotspot. Large-scale mining operations are now operating in Lao PDR and Vietnam (principally for copper, gold and bauxite), and unregulated 'artisanal' mining is taking place widely, sometimes on a large scale, including within conservation corridors and protected areas (e.g. Cambodia's Phnom Prich Wildlife Sanctuary, and Myanmar's Huakang Valley). Improving investment conditions, rising commodity prices and high demand for minerals from China and India have sparked something of a boom in exploration throughout the region. Australian, Chinese and Vietnamese companies are exploring for mineral deposits in many parts of Cambodia, Lao PDR and Vietnam. Data on these exploration activities are often hard to obtain but it is believed that exploration is taking place in several hotspot corridors. Commercial exploitation of mineral deposits remains relatively rare, and the presence of exploration does not necessarily mean that a commercially viable resource will be found. Nevertheless, where such resources are found, the impacts for biodiversity could be highly significant, not only from the direct impact of mining operations but also from the potential secondary impacts from opening up remote areas, infrastructure development, and influx of migrant labor.

Myanmar, Thailand, Vietnam and southern China all have active oil and gas fields, which, while relatively small, are important for domestic use and foreign exchange generation. For example crude oil is Vietnam's leading export earner, although production peaked in 2004 (IndexMundi 2011). The environmental impacts of many these operations are not known, but the impact of oil extraction on the environment globally is well known. Potentially significant oil reserves have been found off the Cambodian coast in the last decade. Exploration is still continuing but Cambodia hopes to start production soon. The impact of oil revenue could be enormous, potentially dwarfing all other sources of income (UNDP 2005). Since 2008, oil and gas exploration has begun onshore, focusing on the Tonle Sap Basin. No results are publically available yet and it is not known whether there are commercially viable deposits. Should production go ahead, this could have severe impacts on the ecologically sensitive flooded forests of Tonle Sap Lake, and their associated fisheries and wildlife populations.

Energy
As of August 2011 at least 40 large or medium capacity hydropower dams were complete or under-construction in the Indo-Burma hotspot (ADB-GMS EOC data, International Rivers 2008). Accurate data on the status and location of proposed dams are elusive and subject to change but it is highly likely that many more hydro-power dams will be constructed in the region in the coming decades. Up to 71 large and medium capacity dams could be operating in the Mekong basin alone by 2030 (ICEM 2010). This is likely to have profound impacts on riverine ecosystems and the people who depend on them. The lower Mekong River (downstream of the China / Lao PDR border) is one of the last great rivers on earth that has not yet been dammed. There are at present eight dams on the Chinese stretch of the river, but plans exist for at least 12 more in Lao PDR and Cambodia. This will have dramatic impacts on the hydrology of the river, sediment flow, and block the migration of several endemic fish species, including the iconic Mekong giant catfish. Two dams are currently operating in the Cardamom and Elephant Mountains of southwestern Cambodia, and six more are under construction (L. Perlman *in litt*. 2012).

One reason behind this surge in dam construction is an increased demand for electricity in China, Vietnam and Thailand. Between 1993 and 2005, electricity demand in the Mekong region increased by on average 8 percent per year (ICEM 2010) and is expected to continue to grow at around this rate until 2025. A Mekong River Commission (MRC) Strategic Environmental Assessment (SEA) estimated that 96 percent of the power demands for dam construction on the lower Mekong mainstream came from Thailand and Vietnam. If all planned lower mainstream dams were constructed, they would provide an increase in power generation, although they would only meet around 11 percent of predicted power demands (ICEM 2010). Power demand will continue to be met largely from fossil fuels, and the need for further dam construction is not inevitable. In particular, significant investments in demand-side management could reduce rates of growth in electricity consumption to below current projections, and are essential given decling oil and gas availability and the need to curb greenhouse gas emissions.

In economic terms, Lao PDR currently stands to receive the greatest short-term benefit from this expansion of dams. Existing dams currently provide significant income to the country, and, should all the mainstream dams go ahead, Lao PDR will receive an estimated 70 percent of the export revenues ($2.6 billion per year). The National Socioeconomic Development plan mandates that this money is used for national development (ICEM 2010).

However these dams are expected to have significant livelihood and environmental impacts. The SEA identified many of these more severe impacts:

- Long stretches of the middle Mekong will no longer experience important seasonal water level changes.
- Around 50 percent of sediment flow will be lost by construction of dams on the Chinese mainstream, and the Srepok, Sesan and Sekong tributaries. Lower mainstream dams will reduce this by another 50 percent, resulting in only 25

percent of historical sediment flows at Kratie. This will have significant impacts on the Mekong Delta and Tonle Sap floodplain in terms of agricultural and fisheries production and, in the case of the delta, coastal erosion.

- 17 percent of Mekong wetlands would be permanently inundated by the mainstream dams
- Loss of riverine habitats would have a severe impact on endemic fish, and benefit habitat generalists. Pangasiidae catfish are likely to be particularly impacted.
- Fisheries losses of $475 million per year.
- Agricultural losses of $25 million per year.
- Poor fishing and farming households are likely to be disproportionately impacted.

In summary, the SEA states "the loss in Lower Mekong Basin biodiversity would be a permanent and irreplaceable global loss which could not be compensated" and "risks and losses incurred by the Mekong terrestrial and aquatic ecosystems will result in increasing food insecurity for millions of people". It recommends that decisions on all mainstream dams be deferred for 10 years whilst comprehensive feasibility studies are carried out. However, it goes on to recommend that, during this time, tributary dams should be fast-tracked (ICEM 2010).

The SEA study did not examine the environmental and social impact of the tributary dams, which, while they may not be as far reaching as the mainstream dams, will have significant environmental impacts. Dams are proposed on the Srepok River, for example which would inundate large parts of Lomphat Wildlife Sanctuary and the Mondulkiri Protected Forest, both areas of international importance for large waterbirds and ungulates. Cambodia's need for foreign income and weak regulatory framework mean that prospects for stopping these dams, or minimizing their impacts, may be limited.

Major hydro-power developments exist or are planned in many other river systems in the hotspot. Six dams are currently under construction in the Cardamom and Elephant Mountains, which will inundate large areas of forest, including areas holding some of the last remaining wild populations of Siamese crocodile, create more access roads in previously inaccessible forest areas, and bring thousands of workers into the forest (L. Perlman *in litt.* 2012). Most major Vietnamese river systems draining from the Annamite Mountains to the South China Sea are now dammed, or have plans for dams, and many of these developments have impacted areas supporting high levels of localized endemism. The Salween remains the last major river in the hotspot yet to be dammed, even in its Chinese headwaters. Plans exist however for at least six dams in Myanmar and up to 13 in China (Salween Watch 2011). The advocacy group The Burma Rivers Network report that an additional 13 large dams are planned in Myanmar. These are reported to be backed by investment from India, China and Thailand (Burma Rivers Network 2010, UPI 2010). The 1,200 MW Htamanthi dam on the Chindwin River in northeastern Myanmar is being developed in cooperation with India's National Hydroelectric Power Corporation and it is estimated that 80 percent of the electricity will be sold to India. It is estimated the 6 percent of the Htamanthi Wildlife Sanctuary will be inundated upon completion. However, construction of many of the dams in Myanmar, including the Htamanthi dam, is impacted by civil unrest, and the future of these developments is unclear (Burma Rivers Network 2011).

Hydrocarbons (mainly imported) currently provide about 85 percent of power generation in the Lower Mekong Region (ICEM 2010). Even with the proposed expansion of hydro-power outlined above, increased demand will mean that fossil fuels will continue to be a critical component in energy supply in the region. Potential oil and gas reserves are being explored in the region, but hotspot countries are highly unlikely to be self-sufficient in oil and gas. Their economies will continue to be reliant on importing fuels, and the risks that entails. Some development programs are supporting the household level use of solar power in remote communities, but in general other low-carbon energy sources have not yet been developed at scale in the region. China has a burgeoning nuclear power industry, and, as economies develop further, other nations may develop alternatives, such as nuclear, wind, solar, tidal, wave or biomass energy. As these emerge, unforeseen environmental issues may arise.

Transportation

As described above, the rapid development of the region has been accompanied by an expanding road network. Roads have been improved and upgraded across the region with clear socioeconomic benefits from improved access to markets, healthcare and education. Many of the roads have been built in environmentally sensitive areas however, including KBAs and conservation corridors, with significant impacts. Cambodia's National Route 76 runs through the Seima Protection Forest. Until 2008, this was a dirt road, which was often impassible during the wet season. With assistance from a Chinese loan the road was upgraded to an all-season sealed highway. The improved access has led to increased land prices around the protected area, and increased threats from encroachment and land grabs. Improved access to markets has facilitated a shift away from small-scale shifting agriculture and towards larger-scale permanent agriculture (Pollard and Evans 2008). Timber and wildlife which is harvested illegally from the forest can now be moved quicker and easier to the nearby Vietnamese border, or to Phnom Penh in less than five hours. These have combined to greatly increase pressures on the protected area. Vietnam's Highway 14, the "Ho Chi Minh Highway" was constructed during the 2000s and runs most of the length of Vietnam through the Annamite Mountains greatly improving access to previously isolated forested areas. In turn this has led to the up-grading of numerous transboundary roads linking Vietnam with Cambodia and Lao PDR.

In addition there are plans to improve the regional rail network. Supported by the ADB, some of this began in 2010 with the renovation of the rail link from Phnom Penh to the port of Sihanoukville. The ultimate goal is the improvement of the line from Phnom Penh to the Thai border, and eventually building a link from Phnom Penh to Ho Chi Minh City. Filling this missing link will allow uninterrupted rail transport of goods (and passengers) throughout Asia, from Singapore to Vladivostok. Construction of a rail link from Lao PDR to Kunming province began in 2011 (DPA 2011). This will massively improve transport links for this landlocked country, facilitating further the movement of natural resources and agricultural products to Chinese markets.

5.4 Land Cover and Land Use

Changes in land cover and use vary across the hotspot. While Thailand, China and Vietnam have reduced the rate of loss of natural forest, and are increasing tree cover through the establishment of plantations, Myanmar, Cambodia and Lao PDR continue to see high rates of deforestation and degradation.

5.4.1 Deforestation

Table 8 shows the recent deforestation rates for hotspot countries. Deforestation, together with unsustainable levels of hunting, and dam construction, remain the greatest threats to biodiversity in the Indo-Burma hotspot. Cambodia, Lao PDR and Myanmar still retain large areas of natural forest, but since 1990 have lost a combined total of nearly 120,000 square kilometers of forest (FAO 2010b). Forest cover in Vietnam and Thailand is generally restricted to upland and hilly areas. Most of the forest area is fragmented and few large blocks remain in Vietnam and Thailand. The most significant exception to this is the Western Forest Complex along the Thai-Myanmar border. At 18,000 square kilometers, this remains one of the largest unfragmented forest blocks in Southeast Asia, retains an almost complete suite of species and is one of the most important sites for biodiversity in the hotspot. Other important relatively un-fragmented forest blocks in the hotspot include the Cardamom Mountains and the northern and eastern plains of Cambodia, the Annamite Mountains of Vietnam and Lao PDR, and the Sundaic forests of Myanmar's Tanintharyi Division.

Table 8. Deforestation Rates in Indo-Burma Hotspot Countries

Country	Total Forest Area 2010 (km^2)	% of County under Forest	Annual Change in Forest Cover 2000-2005 (%)	Annual Change in Forest Cover 2005-2010 (%)	Total Change in Forest Area 1990-2010 (km^2)
Cambodia	100,940	57	-1.45	-1.22	-28,500
China*	2,068,610	22	+1.75	+1.39	+497,200
Lao PDR	157,510	68	-0.48	-0.49	-15,630
Myanmar	317,730	48	-0.9	-0.95	-74,450
Thailand	189,720	37	-0.1	+0.08	-5,770
Vietnam	137,970	44	*+2.2*	+1.08	+44,340

Source: FAO (2010a). Note: * = figures for the whole country.

Thailand and Vietnam have recorded net increases in forest cover since 2005 (Table 8). Closer examination of the data reveals that is due to a large increase in planted forest. Over 20 percent of the forest cover of the two countries is now planted forest (Table 9), a large proportion of which is exotics such as *Acacia* spp., *Eucalyptus* spp. and *Pinus* spp. The biodiversity value of plantation forest is significantly lower than natural forest, even heavily disturbed natural forest (Aratrakorn *et al.* 2006, Fitzherbert *et al.* 2008), and so forest cover statistics for Thailand and Vietnam belie a trend of natural forest loss which has had significant impacts on biodiversity.

Table 9. Forest Cover in Indo-Burma Hotspot Countries

Country	Primary Forest		Naturally Regenerated Forest		Planted Forest	
	km^2	% of Forest Area	km^2	% of Forest Area	km^2	% of Forest Area
Cambodia	3,220	3	97,030	96	690	1
China*	116,320	6	1,180,710	57	771,570	14
Lao PDR	14,900	9	140,370	89	2,240	1
Myanmar	31,920	10	275,930	87	9,880	3
Thailand	67,260	35	82,610	44	39,860	21
Vietnam	800	1	102,050	74	35,120	25

Source: FAO (2010a). Note: * = figures for the whole country.

Lowland forests in Vietnam and Thailand, which typically are the most species rich, have been most heavily impacted. These are now among the most highly threatened ecosystems in the hotspot.

Generally, deforestation is taking place in two direct forms (both driven by a suite of socioeconomic drivers): large-scale clearance of forest for forest plantations and agro-industry; and small-scale clearance by households for farmland. Both of these are significant factors in Lao PDR, Cambodia and Myanmar (see above), and this trend is likely to continue. Further clearance of large areas of natural forest for plantations is now less likely in Thailand, Vietnam and China but encroachment of natural forest (often protected areas) by farming communities continues to be a problem (FAO 2011a).

5.4.2 Degradation

Even where forest cover is retained, increasing levels of illegal logging, hunting and high levels of non-timber forest product collection mean that large areas of forest are increasingly degraded. Forest structure is affected, and species composition is altered, favoring pioneer species and generalists. Disturbed forest is more prone to fire, which may become an increasing problem considering predicted climate models (FAO 2011a). Wildlife densities are well below natural levels throughout the hotspot, and many areas (including protected areas) exhibit the ‘empty forests syndrome’, with tree cover but virtually no wildlife aside from the most resilient species.

5.4.3 Wetlands

Wetlands and coastal ecosystems have been particularly heavily impacted by human activities. Wetlands throughout the hotspot have been converted to agriculture and now cover a tiny fragment of their historical extent. Much of this conversion took place in the last century but the trend continues. As mentioned above, wetlands are also threatened by pollution from industrial expansion, inundation following dam construction, and also from over-exploitation of resources, principally over-fishing.

Mangrove forests along the coasts of the hotspot are a critically important ecosystem providing vital spawning grounds for many fish species, as well as coastal protection. They have also however suffered from high levels of disturbance and clearance. Thailand and Vietnam lost one third of their mangrove area between 1960 and 2000. The trend has continued, and the region is estimated to be suffering from around 0.5 percent loss per year (FAO 2011a). The main driver of mangrove destruction has been the creation of ponds for shrimp aquaculture, mainly for export. Mangrove cover has remained more constant in Myanmar and Cambodia but continued global demand for shrimp means that these areas are under threat of development.

5.5 Conclusions

The Indo-Burma Hotspot has witnessed extraordinary economic growth since the 1990s but remains a region of contrasts. It includes global cities like Bangkok and Hong Kong, and one of the world's great centers of manufacturing in southern China. It also includes isolated forest communities, little changed for hundreds of years, and some of the poorest parts of Asia. This rapid growth and extremes of wealth and development present many challenges for biodiversity conservation. Poverty alleviation remains a key development strategy and national priorities focus on continuing the rapid growth, often at the expense of natural ecosystems and biodiversity, which remain undervalued and under-appreciated. During this period of growth and industrialization, biodiversity conservation could be seen as in a phase of triage. All efforts should be made to maintain as much of the most critically important areas as possible but in the knowledge that some areas will be lost. While national (and most donor) priorities focus on poverty alleviation, economic development and, increasingly, climate change (see Chapter 10), opportunities exists to focus investments on core biodiversity activities. However it is also important to understand more fully the socioeconomic context for conservation in the region. Key topics that need deeper understanding include:

- Impacts of hydro-power developments on Mekong tributaries and associated conservation corridors.
- The potential growth of extractive industries in the hotspot.
- The potential for payments for ecosystem services linked to extractive industries and hydro-power.
- Options for engaging owners of Economic Land Concessions in more sustainable development of these areas, which preserves their key biodiversity values and respects traditional rights of local human communities, such as commodity certification.
- Status of mangroves throughout the hotspot, and likely future trends.
- The potential for links between traditional belief systems and biodiversity conservation.

6. POLICY CONTEXT OF THE INDO-BURMA HOTSPOT

6.1 Introduction

This chapter presents a review of the main environment-related national, regional and global policies and agreements being applied in the Indo-Burma Hotspot. It illustrates how development strategies of hotspot countries can hinder or benefit biodiversity conservation. As shown in Chapter 5, the region has gone through a period of unprecedented economic growth in the past two decades. This has been facilitated by a shift towards more market-oriented policies by governments in the hotspot. This push for more liberalized economies and a concerted effort to reduce poverty has had short-term environmental costs. At the same time, however, some of the political and institutional changes that have taken place create opportunities for long-term improvements in environmental management.

6.2 Overview of the Regional and National Political Situation

6.2.1 General Overview

The current policy and institutional context has been greatly influenced by the recent history of the region, and individual nations. At the same time, older, deeper cultural aspects still influence policy and its implementation. The past two decades have been a period of relative political stability in the region. This era of stability follows a long period of political instability and armed conflict following the end of the Second World War and the withdrawal of the colonial powers. One notable exception to this is Thailand, which, despite frequent changes of government and periods of military rule, has remained a constitutional monarchy with most of the trappings of a liberal democracy. The other notable exception is Myanmar, where many of the ethnic conflicts that erupted following independence in 1948 continue to this day, and where the legitimacy of the military-backed regime remains contested.

The hotspot includes three of the world's five remaining communist states in the People's Republic of China, Lao People's Democratic Republic, and the Socialist Republic of Vietnam. All three of these states have been opening up and introducing reforms since the 1990s, particularly with regard to liberalization of the economy. Political changes have been slower and all three states still maintain strong, one-party control of government, limited political space for civil society, regulated media and limited democratic accountability. Hong Kong and Macau (both in the Indo-Burma Hotspot) have the status of 'Special Administrative Regions' in China. This affords them a degree of autonomy and they have control over all issues except diplomacy and national defense.

After nearly 30 years of internal conflict (see below) and the despotic Khmer Rouge regime Cambodia is now a constitutional monarchy and democracy. The current administration has ruled since the late 1990s and dominates the political scene. Myanmar has been ruled directly or indirectly by the military since 1962. Elections in 2010 were dominated by the military-backed Union Solidarity and Development Party; the military retains control over all aspects of public life, and most democratic institutions are lacking.

A general pattern exists across the hotspot where political power in each country is held by an elite that has dominated for several decades. Only in Thailand have there been major swings in political power. There have been some moves towards decentralization (see below) but political power tends to be centralized and top-down. The political elite also maintain great economic power, which fuels patronage networks and encourages cronyism. With the partial exception of Thailand, the media are under state control across the region, and efforts at wider citizen participation in the political process have been sporadic. This tight state-control has fostered rapid industrialization, massive state investment in infrastructure, and brought millions out of poverty. This rush for economic growth has, however, taken priority over other issues, such as the environment.

6.2.2 Conflicts and Insecurity

Past conflict and insecurity has had a significant impact on biodiversity in the Indo-Burma hotspot. Areas of insecurity still exist in parts of the hotspot, with localized consequences for conservation.

The Indochina Wars in the latter half of the 20th century had multiple impacts. Human populations were displaced, often to forest areas, where they relied more heavily on wild meat. Periods of famine followed the conflicts increasing further the reliance on wild foods. The Khmer Rouge regime in Cambodia had a policy of active hunting of wildlife as a source of foreign income and supplies (Loucks *et al.* 2009). The wars had another direct impact on forest and wildlife. The widespread use of defoliants by US forces over Lao PDR, Cambodia and Vietnam destroyed thousands of square kilometers of forest (Dudley *et al.* 2002). In addition, Asian elephants were directly targeted by the US military who believed they may be used for transporting supplies (Dudley *et al.* 2002). The effects of the Khmer Rouge regime and the decades of insecurity and civil war that followed are still felt in Cambodia.

Several notable areas of conflict exist as of 2011, including in southern Thailand, along the Thai-Cambodia border and in Myanmar. Each of these conflicts is occurring in remote, predominately forested locations, and is likely having an impact on the biodiversity of those areas. In many ethnic areas of Myanmar, there are tensions between the government and ethnic groups, which erupt into sporadic armed conflict. The political developments in the run up to and following the 2010 election do not appear to have eased these tensions (BEWG 2011a). Some indicators point to a likelihood of increased conflict in ethnic areas but there is also a possibility of decreased violence due to economic motivations (BEWG 2011a). This happened widely in the 1990s, when the military regime offered armed groups cooperative arrangements to exploit natural resources in return for agreeing to ceasefires (BEWG 2011a), with direct implications for biodiversity conservation through increased logging, etc. Another major implication of the ethnic conflicts in Myanmar is that development has become entwined with militarization, as securing resource rich lands for development projects increases military and police presence, with serious consequences for local populations (BEWG 2011a). There have even been accusations of conservation projects (for instance the declaration of a Tiger Reserve within the Hukaung Valley) having similar effects (BEWG 2011a), and this calls for high levels of vigilance on the part of conservation groups to ensure that their actions do not restrict local people's freedoms and well-being.

A low-level insurgency exists in southern Thailand which has resulted in a strong response from the Thai military. Insecurity in the region is no doubt impacting on management of the protected areas in the region south of the Isthmus of Kra (A. Lynam pers. comm. 2010). Along the Thai-Cambodia border, disagreement over sovereignty of the region around the Prasat Preah Vihear temples flared up in 2008 following its declaration as a World Heritage Site. Armed conflict took place periodically between 2008 and early 2011, leading to the border areas becoming extensively militarized. As a result, the Cambodian military has been granted areas to develop bases within Kulen Promtep Wildlife Sanctuary and Preah Vihear Protected Forest (Fox 2009), leading to clearance of forest in these areas for the bases, barracks and farm land. There are also reports of increased hunting in these protected area, and other neighboring forests.

6.3 Global and Regional Agreements

All nations in the Indo-Burma hotspot are signatories to a range of global and regional agreements designed to promote environmental protection and sustainable development. The impact of these agreements on national policy is variable as economic development generally has primacy over environmental concerns; they have, however, probably mediated some of the more severe possible impacts of rapid economic development.

6.3.1 Hotspot Parties to Global Agreements

Hotspot nations are signatories to various multilateral environmental agreements. Apart from those in Table 10, all nations are signatories to the Convention on International Trade in Endangered Species (CITES), the United Nations Convention to Combat Desertification, the United Nations Forum on Forests, the United Nations Framework Convention on Climate Change (UNFCCC), and the Cartagena Protocol on Biosafety.

Convention on Biological Diversity (CBD)
This convention, effective since 1993, has 193 member countries. Its objectives are the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources. It seeks to promote conservation of biological diversity in the wild, through requesting signatories to identify regions of biodiversity importance, establish a system of protected areas, restore degraded ecosystems, maintain viable populations of species in natural surroundings, and develop or maintain necessary legislation and/or other regulatory provisions for the protection of threatened species and populations. All hotspot nations except Myanmar now have an official National Biodiversity Strategy and Action Plan (NBSAP) which should act as over-arching guides to biodiversity conservation in each country. Myanmar is in the process of drafting its NBSAP. Unfortunately, overlapping

jurisdiction combined with the limited resources and political power of many of the implementing agencies has limited the impact of these action plans.

Table 10. Number of Sites in the Hotspot Designated under Multilateral Environmental Agreements (as of August 2011)

Country	Ramsar Sites	Natural World Heritage Sites	Man and Biosphere Reserves	ASEAN Heritage Parks
Cambodia	3	0	1	2
China*	7	0	3	0
Lao PDR	2	0	0	1
Myanmar	1	0	0	6
Thailand	11	2	4	4
Vietnam	3	2	8	4
Total	**27**	**4**	**16**	**15**

Note: * = figures for the Indo-Burma Hotspot only.

Ramsar Convention

Effective since 1975, the Ramsar Convention, also known as the Convention on Wetlands of International Importance especially as Waterfowl Habitat, has 160 member countries. It is an "intergovernmental treaty that embodies the commitments of its member countries to maintain the ecological character of their Wetlands of International Importance and to plan for the 'wise use', or sustainable use, of all of the wetlands in their territories" (Ramsar 2011). All hotspot nations are contracting parties, and they have designated a total of 27 'Ramsar sites', or wetlands of international importance. Generally, however, wetlands are under-represented in national protected areas networks, which is of great consequence because they include some of the most threatened ecosystems in the hotspot. Designation of Ramsar sites is probably not indicative of the actual number of wetlands of international importance in the hotspot. For example, Myanmar, which includes many of the least disturbed wetland ecosystems in the region, has declared only a single Ramsar site (Moyingyi Wetland Wildlife Sanctuary), whereas the United Kingdom for instance has 168. Many KBAs in the hotspot qualify as Ramsar sites based on multiple criteria; promoting their recognition as Ramsar sites would give them global recognition, and may lead to increased protection.

World Heritage Convention

Effective since 1975, this convention has 187 member countries. Its aim is to identify and conserve cultural and natural monuments and sites of outstanding universal value, through the nomination of World Heritage Sites by national governments and their recognition by the United Nations Educational, Scientific and Cultural Organization (UNESCO). As of August 2011, only four natural heritage sites had been declared in the hotspot (compared to 11 cultural sites). Given the global importance of many sites in the hotspot, it is highly likely that other areas would qualify. Some hotspot nations have stated that they will not nominate some areas as they fear that World Heritage status would restrict development opportunities.

UNESCO's Man and Biosphere Program

This program operates through national committees and focal points among UNESCO member states. It aims to develop a basis, within the natural and the social sciences, for the conservation and sustainable use of biological diversity and for the improvement of the relationship between people and their environment, encouraging interdisciplinary research, demonstration and training in natural resources management. An essential tool for the Man and Biosphere Program is the network of Biosphere Reserves, which are areas of terrestrial and coastal ecosystems where solutions are promoted to reconcile biodiversity conservation with its sustainable use. To date, 16 biosphere reserves have been declared in the hotspot, half of which are in Vietnam (and none in Lao PDR or Myanmar). Some of these sites have been very successful at combining biodiversity conservation and resource management. For example until August 2011 the Prek Toal Core Area of the Tonle Sap Biosphere Reserve was in an active commercial fishing lot. All fishing lots in the great lake have now been suspended for three years due to fears over mismanagement (Sokchea and Sherrel 2011). It is also the site of a waterbird colony of international importance, and great conservation success. Wise management of the area has seen the numbers of waterbirds breeding at the site increase significantly since 2000 (Sun Visal and Allebone-Webb 2009).

Convention on Migratory Species of Wild Animals (Bonn Convention)

The Bonn Convention has been implemented since 1983 and has 116 parties. Its objective is to protect migratory species that cross international borders. To date no hotspot nation is party to the convention. However, all except Lao PDR are signatories to an MoU that "aims to protect, conserve, replenish and recover marine turtles and their habitats of the Indian Ocean and Southeast Asian region" (IOSEA 2011). Thailand and Myanmar are signatories to a similar MoU protecting dugong (*Dugong dugon*).

6.3.2 Hotspot Parties to Regional Agreements

In addition to the global environmental agreements outlined above, the hotspot countries are also members or partners of three significant regional organizations (Table 11). Although no one organization covers the whole of the hotspot they all have influence on parts of it.

Table 11. Membership of Regional Organizations and Initiatives

Country	ASEAN	MRC	ADB-GMS
Cambodia	✓	✓	✓
China	a	a	b
Lao PDR	✓	✓	✓
Myanmar	✓	a	✓
Thailand	✓	✓	✓
Vietnam	✓	✓	✓

Notes: a = dialogue partner; b = Guangxi and Yunnan provinces only.

Association of Southeast Asian Nations (ASEAN)

ASEAN is a network of Southeast Asian Nations with the aim of promoting peace and stability, and accelerating economic growth and social progress in Southeast Asia. All hotspot nations are members, apart from China, which is a 'dialogue partner'. ASEAN includes countries outside of the hotspot and so influence on environmental issues in the hotspot is often diluted. It is also considered rather bureaucratic and may not have much power (Habito and Antonio 2007). It does however acknowledge the importance of the environment, the high biodiversity value of Southeast Asia, and the potential impacts of rapid economic growth (ASEAN 2010). It has identified 10 priority issues of regional importance as mentioned in the *ASEAN Socio-Cultural Community (ASCC Blueprint) 2009-2015* (ASEAN 2009). These include environmental education, harmonizing environmental policies, promoting the sustainable use of coastal and marine environment, of natural resources and biodiversity, and of freshwater resources. These are to be enhanced through greater regional cooperation and the setting of regional standards, for example for water quality.

In addition to these broad policy statements, ASEAN has established three focused programs related to biodiversity conservation. The ASEAN Wildlife Enforcement Network (ASEAN WEN) is "the world's largest wildlife law enforcement network that involves police, customs and environment agencies of all 10 ASEAN countries" (ASEAN WEN 2009). It is designed to provide training and capacity building to agencies across the region and improve collaboration and coordination between member states. To date, this program has been relatively successful in raising awareness of wildlife trade among member governments but the international trade in wildlife remains a huge problem in the ASEAN region, and increased efforts and support are needed. The ASEAN Centre for Biodiversity, based in the Philippines, aims to support national governments to meet their commitments to international agreements and commitments (such as the Millennium Development Goals) (ACB 2010). The center acts as a clearing house for regional biodiversity data, including online databases and policy briefs. In recognition of their importance, ASEAN states have also created a system of ASEAN Heritage Parks, 15 of which exist in the hotspot (Table 10). This status is not as well known as World Heritage status, and it is unclear whether this recognition provides any additional protection. For example, although Cambodia's Virachey National Park is an ASEAN Heritage Park, it is highly threatened by plantation development and mining (see Chapter 5).

Mekong River Commission (MRC)

The MRC was established in 1995 by the governments of Cambodia, Lao PDR, Thailand and Vietnam. It is a forum "to cooperate in all fields of sustainable development, utilization, management and conservation of the water and related resources of the Mekong River Basin" (MRC 2005a) . Although the source and headwaters of the river are in China, and part of its catchment is in Myanmar, the two countries are not full members of the organization but 'dialogue partners'. The main guiding documents of the MRC relating to the sustainable use of the river are the Basin Development Plans. These were designed to "promote the coordinated development and management of water and related resources, in order to maximize economic and social welfare in a balanced way without compromising the sustainability of vital ecosystems" (MRC 2005b). Phase 1 ran from

2001 to 2006, and Phase 2 from 2006 to 2010. A bridging period runs from May 2011 to April 2012 during which Phase 3 (2011-2015) is being developed. These plans aim to identify basin-wide development strategies, provide planning tools for member states, and improve knowledge of integrated water resource management.

The MRC has not proven to be an especially powerful institution. It acts only as an advisory body and forum for discussion and agreement. Within this remit its impact is further hampered by the inability to set binding agreements, and the absence of China, within whose territory lie the source and headwaters of the river. It has been effective within its mandate but is inherently limited (Lee and Scurrah 2008). For example the 2011 Strategic Environmental Assessment (ICEM 2010) provides valuable information on the impact of mainstream dams and clear recommendations (see Section 5.3.2). The MRC has no authority however to enforce implementation of any recommended actions. Fundamentally it is highly unlikely that any member states would surrender sovereignty over development decisions within their borders (even ones with regional implications) to a regional body.

Asian Development Bank Greater Mekong Sub-region (ADB-GMS) Program

The ADB-GMS program was set up in 1992 to enhance economic cooperation among the six member nations (Habito and Antonio 2007). It has a sectoral approach, which initially focused on infrastructure support. This remains the principal focus of some elements of the program, such as the economic corridors (see Chapter 5), although the program has also begun to take a more holistic approach to sustainable development. For instance, it has an environmental component which is run through an Environmental Operations Center in Bangkok (GMS EOC 2008). The initiative's main purpose, however, remains the economic development of the region and it is, therefore, helping promote development activities, increasingly through private sector development, which can have major negative impacts on biodiversity.

The program is currently being guided by the 2002-2012 strategic framework, which includes as one of its five development thrusts "protect the environment and promote sustainable use of the subregion's shared natural resources" (ADB 2002, ADB 2010b). Additionally, the ADB website reports that "A new long-term GMS Strategic Framework is being developed to succeed the first strategic framework that ends in 2012. Under the emerging new directions, it is expected that the GMS Program will continue its physical infrastructure investments, but will increasingly focus on softer aspects of subregional cooperation (including human resource development, trade and transport facilitation, protection of shared environmental resources, and communicable disease control and monitoring) and solicit greater involvement among the private sector and development partners to address the issues and requirements of the GMS Program" (ADB 2010b, 2011d).

6.4 Development Strategies and Policy Interactions with Natural Resources

National development strategies for all countries in the hotspot have many similarities. They are principally based on an aggressive drive for economic development and industrialization, aimed at reducing the proportion of the population living in poverty. As shown in Chapter 5, this approach has been broadly successful, at least in the short term. National development strategies mostly operate on five-year cycles. Although their goals may align with the Millennium Development Goals, they are primarily a response to national policy imperatives.

The national development strategy for Cambodia is based around the government's 'rectangular strategy' philosophy: to promote growth, employment, equity and efficiency. At the heart of this is economic development, through the enhancement of the agricultural sector, infrastructure improvement, private-sector investment and capacity building. A major component of the development strategy has been a process of decentralization and deconcentration, with increased planning powers being devolved to provincial governments (NCDD 2010). However, low levels of capacity and weak governance have led to many problems of overlapping business developments, and an almost total lack of consideration for environmental issues. Moreover, decentralization and deconcentration has also, ironically, weakened the voice of ethnic minorities over natural resource management, through, for example, literacy requirements for local official positions that few minority people can meet (J. Ironside *in litt.* 2012).

Development of part of the Chinese portion of the Indo-Burma hotspot is dominated by the 'China Western Development' strategy. This aims to improve the economic situation of western China, including Yunnan and Guangxi, through capital investment. It was first proposed in 1999, and began supporting activities in 2000. It has supported infrastructure development, including dams on the upper Mekong River (see Chapter 5). China's rapid development in the 1980s and 1990s came at a high environmental and social cost. In recognition of the potential impacts of infrastructure development, the China Western Development Strategy also includes environmental protection activities. To date, these have focused on reforestation, aimed primarily at water catchment protection. The biodiversity benefits of this reforestation program are yet to be evaluated but it is highly unlikely that either the biodiversity or environmental protection values of these plantations will be comparable to those of natural forests. Protection of remaining natural forest in this region remains a very high priority for biodiversity conservation. Acknowledgement of the importance of limiting the environmental damage of development is becoming increasingly widespread in China.

Lao PDR's sixth National Socioeconomic Development Plan (NSEDP) ran from 2006-2010. Unlike other development plans in the region, it pays almost no attention to environmental sustainability (Habito and Antonio 2007) and gives clear primacy to economic growth. Indeed, the plan assumes that there are few pressing environmental issues in the country, stating that "currently, the Lao PDR does not have many environmental problems like other countries, but in the future this will change as the country develops socioeconomically, natural resources will reduce (*sic*) and waste will increase" (NSEDP p86 quoted in Habito and Antonio 2007). The acknowledgement that there may be environmental risks in the future may provide an opportunity to influence future NSEDPs.

Ongoing armed conflicts across large areas of the country and low levels of ODA and foreign direct investment have slowed development in Myanmar compared to its neighbors. This has not hindered ambition, however, and its five-year plan (2007-2011) has targeted an annual growth of 12 percent. As with other nations in the hotspot, this is based on a strategy of improving agricultural productivity, enhancing power supply to support industrial expansion, and human capacity development.

Thailand is currently on its 10th National Economic and Social Development Plan, running from 2007 to 2011. Like other plans, it is anchored in increased industrialization and a move away from subsistence agriculture, but follows the King's philosophy of 'Sufficient Economy'. The vision of the 10th strategy is "Green and Happiness Society", implying an emphasis on environmental and human well-being goals.

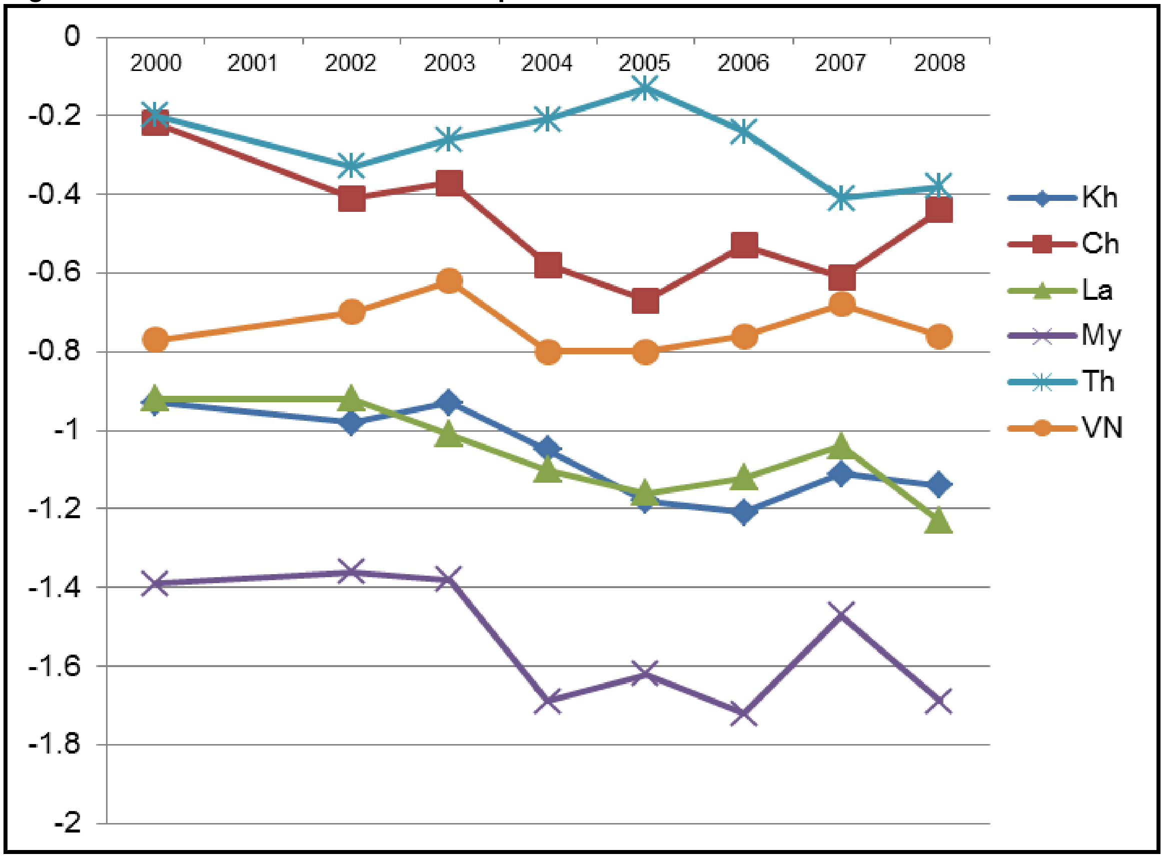
The guiding aim of Vietnam's development plans is for the country to attain the status of an industrialized nation by 2020. A review of development strategies carried out for the ADB (Habito and Antonio 2007), however, concluded that "Vietnam may be succeeding in pursuing this economic ambition, but having this come at significant expense to the environment remains a real risk".

The same report (Habito and Antonio 2007) noted several issues that were common to the implementation of sustainable development in the Greater Mekong Sub-region. Some of these have important implications when attempting to improve the conservation of biodiversity in the Indo-Burma Hotspot:

- Policy integration is generally weak (but improving) with development priorities stressing economic development over social and environmental dimensions.
- Although all countries have at least one long-term document, most planning cycles are short-term. This tends to underestimate environmental costs, which occur on a longer timescale.
- There is very poor institutional coordination within nations. Individual ministries and agencies develop their own plans, which often clash with those of others. This is an especially significant problem in the environment sector, where the relevant ministries are often politically weak and the priorities of other departments are given precedence.
- Although most countries maintain central control, there has been a trend for increased decentralization during the 2000s in several countries. However, the capacity of local institutions often remains low and this undermines the effectiveness of decentralization policies.
- Funding for the implementation of sustainable development plans is restricted (see Chapter 10 for more information on the state of conservation finance).

There are growing concerns about governance and transparency in all the hotspot nations. The World Bank Governance Indicators are aggregates of six dimensions of governance. They are scored by interviews with citizens and experts in each country. They all show negative scores, indicating a problem with governance. Of particular concern, all countries but Vietnam show a decrease in governance standards since 2000 (Figure 14).

Figure 14. Governance Scores for Hotspot Countries



Source: World Bank (2011d).
Notes: Kh = Cambodia; Ch = China; La = Lao PDR; My = Myanmar; Th = Thailand; VN = Vietnam.

Similarly, Transparency International's Corruption Perceptions Index (CPI), is an annual survey of perceived levels of corruption in the public sector. The results of the CPI for 2010 placed three of the hotspot countries among the bottom 25 in the world in terms of transparency and corruption (Table 12).

Table 12. CPI Scores for Hotspot Countries

Country	CPI Score (min 0, max 10)	Rank (out of 178)
Cambodia	2.1	154
China	3.5	78
Lao PDR	2.1	154
Myanmar	1.4	176
Thailand	3.5	78
Vietnam	2.7	116

Source: Transparency International (2010).

These problems with governance are having huge impacts on biodiversity conservation. Government staff mandated to protect biodiversity are often very poorly paid and operate in environments where corruption is normalized. As outlined below, hotspot nations generally have good legal basis for biodiversity conservation; limited budgets and poor governance, however, mean that these laws are often not implemented adequately.

6.5 Environmental Policies and Legislation

All hotspot nations have a set of laws and policies that support biodiversity conservation. Central to these is the legislation supporting the creation and management of protected areas, and wildlife protection laws. In addition, states have other legislation that impacts on biodiversity, including forestry and fisheries policies, environmental impact regulations, and pollution control regulations. This legislation is implemented by a diverse array of different ministries, agencies and institutions. While the legal framework for biodiversity conservation in the hotspot is robust, significant issues exist in terms of coordination between institutions, and effective implementation of laws.

Protected areas form the heart of biodiversity conservation strategies in the hotspot. A total of 756 terrestrial and 96 marine protected areas have been designated in the hotspot (WPDA data accessed Aug 2011) (Table 13). Overall, around 14 percent of the land area of the hotspot is covered by protected areas but the national coverage is very variable. Cambodia has the greatest coverage, with over 25 percent of the land area protected. Myanmar and Vietnam, however, have only placed around 6 percent of their land areas under protection. Distribution of protected areas by habitat is also not uniform. Across the hotspot, protected area coverage is more complete in upland and mountainous area (where agricultural productivity is lower and, hence, the opportunity costs of conservation are typically lower). Lowland forest areas are poorly represented in protected areas, especially in Thailand, Vietnam and China. With the exception of Thailand, there is also poor coverage of coastal ecosystems in protected area networks. Freshwater ecosystems are also severely under-represented in protected area networks. This is of particular concern given their importance for biodiversity, environmental services and social values.

Table 13. Protected Area Coverage in the Indo-Burma Hotspot

Country	Number of Terrestrial PAs	Total Area (km^2)	% of National Land Area	Number of Marine PAs	Area of Marine PAs (km^2)
Cambodia	45	47,034	25.7	1	84
China*	210	73,570	19.0	29	3,358
Lao PDR	32	38,433	16.6	0	0
Myanmar	53	42,639	6.3	9	476
Thailand	194	104,024	20.1	33	4,804
Vietnam	222	20,568	6.2	54	3,281
Total	**756**	**326,268**	**14.1**	**96**	**8,561**

Source: IUCN and UNEP (2009). Note: * = figures for the Indo-Burma Hotspot only.

Three large protected area complexes exist in the hotspot, all of international importance for the conservation of threatened wildlife. The Western Forest Complex in Thailand consists of 15 protected areas, with two more proposed, and covers over 18,000 square kilometers. In the Cardamom Mountains of southwestern Cambodia, there is a complex of six protected areas, covering 17,364 square kilometers. In the eastern plains and Annamite foothills of eastern Cambodia, there is a complex of seven protected areas, covering 13,700 square kilometers. Two contiguous protected areas in neighboring Vietnam bring the total area under protection to over 15,000 square kilometers.

6.5.1 Cambodia

The constitution of Cambodia was completely re-written in the early 1990s and all laws and policies had to be created from scratch. Most of these laws were written with international assistance, and include some progressive elements, such as recognition of indigenous communal tenure in the Land Law and community forestry in the Forest Law. Most of the laws are relatively new, however, and many of the decrees and documents needed to interpret them adequately are still lacking. These legal and policy gaps leave loopholes that make implementation of the laws confusing and complex.

The two ministries responsible for biodiversity conservation are the Ministry of Agriculture, Forestry and Fisheries (MAFF) and the Ministry of Environment (MoE). The General Department for Administration of Nature Conservation and Protection under MoE is responsible for management of the protected areas designated by Royal Decree in 1993, Ramsar sites, and Tonle Sap Biosphere Reserve, and for implementation of environmental impact regulations. Two agencies within MAFF are responsible for biodiversity resources throughout the rest of the country. The Fisheries Administration is responsible for fisheries, aquatic reptiles and freshwater mammals (including fisheries lots that overlap with Tonle Sap Biosphere Reserve). The Forestry Administration (FA) is responsible for forest resources and wildlife outside the MoE protected areas network. This includes the management of a parallel network of 11 additional conservation areas.

The two key legal documents are the Forestry Law of 2002, and the 1996 Law on Environmental Protection and Natural Resource Management (a.k.a. the ‘Environment Law’). In recent years, these laws have been supplemented by two important new documents. The 2008 Protected Areas Law strengthens the legal mandate for management of MoE protected areas. The 2010 National Forest Plan provides a 20-year guiding strategy for FA and includes a component dedicated to strengthening biodiversity conservation. As part of this, a Wildlife Law is currently being drafted. The two ministries divide between themselves responsibility for the various international conventions and treaties to which Cambodia is party. For example, MoE is responsible for the CBD, the Kyoto protocol and the Ramsar Convention, while FA is responsible for CITES and implementation of Reducing Emissions from Deforestation and Forest Degradation (REDD) activities. Unfortunately, collaboration and coordination between the ministries is not as strong as it might be.

6.5.2 China

China's State Council, appointed by the National People's Congress, has ultimate responsibility for the country's environment. The State Council authorizes the Ministry of Environmental Protection (MEP, formerly the State Environmental Protection Administration (SEPA)) to coordinate and monitor the management of biodiversity conservation. SEPA was formed in 1989, following a revision of the key Environmental Protection Law, and became a full ministry in 2008. Its responsibilities include formulating laws, regulations, economic, and technical policies, compiling national programs and technical specifications, formulating management regulations and evaluation standards for nature reserves, and supervising the conservation of rare and threatened species. In addition, MEP is responsible for the implementation and supervision of international environmental conventions, and represented the government in drafting and revising the CBD. However, responsibility for managing the majority of forests and other protected areas lies with the State Forestry Administration. Several other institutions also have biodiversity conservation responsibilities, including the Ministry of Agriculture, the Ministry of Construction, the Ministry of Water Resources and the Chinese Academy of Sciences. One source of independent expert advice to the State Council in policy development and planning is the China Council for International Cooperation on Environment and Development, a high-level, nongovernmental consultative forum created in 1992, consisting of senior Chinese officials and experts, together with high-profile international experts.

Key legal documents for China include laws on water pollution (1984), forests (1984), fisheries (1986), air pollution (1987), and water (1988). Subsequent to the passing of the Environmental Protection Law there have been laws passed on other environment protection issues, such as water and soil conservation (1991), energy utilization (1997), and land resource administration (1998). All these laws have been promulgated by the Standing Committee of the People's Congress. In addition, the State Council has passed a key resolution on environment protection (1996) and regulations on environment protection in construction (1988) (Habito and Antonio 2007).

Environmental issues in Hong Kong and Macau are governed by separate administrative and legal frameworks. Hong Kong's primary agency concerned with biodiversity conservation is the Nature Conservation and Country Parks Programme of the Agriculture, Fisheries and Conservation Department. Environmental protection (including impacts and pollution control) is administered by the Environmental Protection Department, which has the critical role of coordination with Mainland Chinese authorities on environmental concerns. Environmental protection in Macau is managed by the Environmental Protection Bureau, which was established in mid 2009.

6.5.3 Lao PDR

As of late 2011, the institutional arrangements for the management of Lao PDR's forests and protected areas were in a state of flux. In August 2011, the government of Lao PDR created the new Ministry of Natural Resources and Environment (MoNRE), responsible for managing all forest types except production forests. The Department of Forestry (DoF) of the Ministry of Agriculture and Forestry will continue to manage all production forest activities including forest concessions and industrial forest plantations. Previously, the key institution at the central level within DoF was the Division of Forest Resource Conservation, which was created in mid-1999 as part of a wide-ranging restructuring of central government, to improve efficiency and move central staff to assist provinces and districts. This division will be moved to MoNRE and upgraded to a department. Several other government institutions outside of DoF will be moved to the new ministry, including the Water Resources and Environment Agency (WREA) in the Office of the Prime Minister, which is mandated to provide broad inter-sectoral coordination and regulation. Other institutions, such as the Ministry of Defence, the Hydropower Office of the Ministry of Industry and Handicrafts, and the National Tourism Authority, are also integrally involved in or near protected areas (Robichaud *et al*. 2001).

Key legal documents include the Water Resources Law (1997), the Environmental Protection Law (1999), the Forestry Law (2007), the Wildlife Law (2008) and the Fishery Law (2010). These documents are the bases in formulating a Sustainable Forestry and Rural Development Program, the National Environment Strategy and the National Biodiversity Action Plan (2004). The forestry law was first developed in 1996 and revised in 2007. The revision included stronger measures to control illegal logging and resulted in the created of a division for forest protection. Lao has a Forest Strategy to 2020, which was developed in 2002 (MAF 2004). This helped refine forest policy and includes targets for species conservation and preserving environmental services.

6.5.4 Myanmar

The government institution with principal responsibility for the implementation of key policies relating to biodiversity conservation is the Department of Forestry. Established in 1856, it is one of the oldest forest departments in Asia (Das 2000). It is primarily responsible for management of forest lands, including logging and protected areas. Within the department, the Nature and Wildlife Conservation Division has overall responsibility for wildlife conservation and protected area management, while the University of Forestry and the Forestry Research Institute are responsible for applied forestry research.

The Department of Forestry is under the Ministry of Environmental Conservation and Forestry, which was formerly known as the Ministry or Forestry, until it was renamed in recognition of the increased role it will play in conservation of the environment in the future. A new Department of Environmental Conservation is expected to be established during 2012, with responsibility for environmental clearance of the growing number of large development projects in the country, including review of environmental impact assessment (EIA) reports. This new department is likely to include what was formally known as National Commission for Environmental Affairs (NCEA), the body responsible for the development and coordination of environmental policy in Myanmar. Next to its policy function, NCEA is the principal institution responsible for international cooperation on the environment.

Regarding the management of non-forest habitats, the Department of Fisheries has recently begun to explore a more active role in the conservation of aquatic resources. The department has created several protected areas, and works closely with local and international NGOs to manage these areas.

Key legal and policy documents include the Myanmar Forest Policy of 1995 which included protection of wildlife and biodiversity amongst its six priority areas, the National Forest Master Plan 2001 – 2030, the 1990 Marine Fisheries Law, Tourism Law (1990), Forests Law (1992), Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law (1994), and the National Environment Policy Law (1994, followed by a procedural framework in 2003) (Habito and Antonio 2007, U Mint Aung 2007)

6.5.5 Thailand

Since 2002, management of the national protected area system has been the responsibility of the Department of National Parks, Wildlife and Plant Conservation of the Ministry of Natural Resources and Environment. Other bodies with environment-related remits include the Department of Marine and Coastal Resources, the Royal Forestry Department (both within MoNRE), the Department of Fisheries, and the Department of Agriculture. The other main government institution involved in natural resources management is the Office of Natural Resources and Environmental Policy and Planning of the Ministry of Natural Resources and Environment, which is responsible for developing and coordinating national and international environmental plans and policies. It hosts the secretariat of the National Biodiversity Board, functions as a clearing house for the CBD, and supports research and programs relating to access to and sharing of benefits from biodiversity use.

Important legal documents include the 1960 Wild Animals Reservation and Protection Act which led to the establishment of the first protected areas, followed by the National Parks Act of 1961. These two Acts led to the creation of many of Thailand's protected areas. The National Forest Policy of 1985 emphasized environmental protection and committed 25 percent of the forest area to be set aside for protection, with 15 percent for economic use. Commercial logging of natural forest was banned in 1989. Other important laws included the Forest Act of 1941, the Fisheries Act of 1947, the Forest Reserve Act of 1964 and the 1992 Wild Animals Reservation and Protection (which updated and replaced the 1960 Wild Animals Act) and Enhancement and Conservation of National Environmental Quality Acts of 1992.

6.5.6 Vietnam

Responsibility for environmental management is divided among several central government institutions, including the Ministry of Agriculture and Rural Development (MARD), the Ministry of Natural Resources and Environment (MoNRE), the Ministry of Fisheries (MoFi), the Ministry of Education and Training, and the Ministry of Planning and Investment. Of these institutions MARD has the main responsibility for forest management, with the Forest Protection Department within MARD being responsible for developing the national protected area system and enforcing wildlife protection regulations. The Vietnam Environment Agency within MoNRE was formed in 2008. Its responsibilities include developing and promulgating environmental laws, environmental management and implementing nationwide biodiversity surveys. The agency is responsible for the development of a system of wetlands of national importance, and is the national contact for CBD and the Ramsar Convention. Conservation of marine biodiversity is principally the responsibility of MoFi, although a number of marine and wetland sites are included in the national protected area system managed by MARD. In addition, there are a number of government research institutes whose work supports biodiversity conservation and protected areas planning, including the Institute of Ecology and Biological Resources within the Vietnam Academy of Science and Technology, and the Forest Inventory and Planning Institute of MARD.

Significant new laws have been passed recently in Vietnam, chief among them being the 2008 Biodiversity Law. Prior to this, biodiversity conservation was covered only by the 1991 Law on Forest Protection and Development, the Fisheries Law and the 1994 Law on Environmental Protection (revised in 2005). The Law on Forest Protection and Development has been updated on several occasions most recently in 2004, and it is this current version that is generally referred to. One of the key provisions of the 2004 revised law is that it allows for non-state actors to lease natural forest outside of protected areas. This creates a basis for the establishment of 'conservation concessions', such as have been piloted in Indonesia and elsewhere (Rice 2002). To date, however, no conservation group has taken advantage of this provision. Important new provisions include protective measures which support local livelihoods, and establishment of a legal basis for payments for ecosystem services. A follow-up decree formalizing the system was put into effect on January 1, 2011. This is the first national legal framework supporting payments for ecosystem services in the hotspot. Another important recent decree provides a new legal framework for the Vietnamese protected area network (known as special-use forests). The decree was put in place in late 2010 to reform the management of special-use forests, which allowed for increased decentralization to local authorities (PanNature 2011).

6.6 Conclusions

6.6.1 Constraints to Policies and Legislation

It is clear from the data presented above that a framework of legislation and policy on biodiversity conservation exists throughout the Indo-Burma Hotspot. There are significant limitations, however, to the successful implementation of environmental legislation, specifically:

- **Overlaps and lack of institutional coordination.** In all hotspot nations, responsibility for biodiversity conservation is divided among multiple agencies. Fisheries, wetland and marine conservation is typically handled by a different department or ministry to the one that manages terrestrial biodiversity. In Cambodia, this division of responsibility is particularly marked, resulting in two parallel networks of terrestrial conservation areas managed by different ministries.

Coordination between institutions is poor in all hotspot nations (Habito and Antonio 2007). Development plans that impact on protected areas are often approved without consultation with the management authority. National development and economic growth takes priority over biodiversity conservation and the institutions tasked with it (e.g. ministries of finance, planning, industry) have more political power and influence than those mandated to ensure sustainable development.

- **Human capacity and institutional resource limitations.** Government institutions mandated to protect biodiversity are generally understaffed and operate with insufficient budget (see Chapter 10). Staff that are employed, particularly in remote areas (including protected areas), often lack the knowledge and skills necessary for effective conservation management and wildlife protection.
- **Weak governance.** As described above, most hotspot nations have problems with corruption and weak governance. This is an issue within government agencies tasked with biodiversity conservation. Poor pay and conditions, low motivation and training, and lack of appropriate incentive mechanisms, lead to underperformance of government staff. Lack of transparency in planning processes can also contribute to the approval of developments with significant social and environmental costs with little or no public disclosure or consultation.

The legal frameworks that exist provide a clear opportunity for improved biodiversity conservation in the region. The legislation is in place but it needs the right conditions to be implemented. Sustained improvements in implementation of environmental laws and policies are likely to be only achievable as part of comprehensive public administration reforms. These reform processes are typically gradual, and may be beyond the influence of CSOs. Local-level improvements can occur, however, particularly by taking advantage of opportunities arising from increased decentralization. Piloting improvements to legislation, enhancing inter-departmental cooperation, and delivering training for protected area staff are examples of the types of action that can be taken by civil society to enhance implementation of legislation on the ground. Efforts to improve capacity of national staff should not be restricted to civil society. Building the capacity of interested and motivated government staff should be encouraged.

6.6.2 Recommendations

The past two decades have been a period of dramatic economic and social development in the Indo-Burma hotspot. This has been facilitated by development policies that promote industrialization and economic growth. Unfortunately, these policies have often had insufficient social and environmental safeguards, and those measures that are provided for in legislation have frequently not been applied consistently and transparently. Lack of resources available to environmental agencies and governance problems have had further impacts on biodiversity. A legal and policy framework for conservation is in place in each hotspot country, however, which creates opportunities for effective and, in some cases, innovative conservation action on the ground. To maximize the benefits of the legal and policy context, conservation investments should focus on:

- Supporting the development of laws and decrees where gaps exist, for example the Cambodian Wildlife Law.
- Encouraging greater collaboration and coordination among different government agencies. Civil society groups, which often work with multiple agencies within a country, can act as a bridge between institutions which do not normally work together.
- Supporting pilot programs to help develop new modalities for conservation that can then feed back into national legal frameworks.
- Support piloting of programs in light of new legal provisions, particularly conservation concession models (e.g. in Cambodia and Vietnam), and of payments for ecosystem services mechanisms.
- Supporting best practice programs that demonstrate how the full application of the law can have multiple benefits. For example, providing protected areas staff with the training and resources to implement existing laws fully, and supporting the transparent reporting of successes and failures.
- Building the capacity and increasing the motivation of government staff so that they are better placed to implement laws and promote biodiversity conservation.

7. CIVIL SOCIETY CONTEXT OF THE INDO-BURMA HOTSPOT

7.1. Overview

CSOs actively engaged in biodiversity conservation in the Indo-Burma Hotspot or with the potential to support the conservation agenda comprise a mixture of domestic and international organizations. Domestic organizations include community-based organizations (CBOs), national and local NGOs, academic institutions, private companies, and faith-based organizations. Compared with many other parts of the world, domestic CSOs in Indo-Burma have only recently begun to register and engage on environmental issues. In most hotspot countries, there are relatively few national and local NGOs active in biodiversity conservation, and these typically face limitations in terms of human and financial resources and political leverage. Nevertheless, the last decade has witnessed the emergence of a number of active domestic NGOs in the hotspot, which are finding innovative ways to work, and bringing new perspectives to dialogues on conservation and sustainable development. CBOs take different forms across the region, and are typically interested in the well-being and rights (human, land, etc.) of the communities they represent. CBOs are present in many of the most important conservation landscapes in the hotspot, where a number of domestic and international NGOs are partnering with them to respond to development projects with major social and environmental impacts. The potential for such alliances is great and greatly under-utilized.

An important section of civil society throughout the hotspot is domestic academic institutions, which have the capacity to undertake applied biodiversity, social and economic research to inform key questions. In many countries, these academic institutions form the main reservoir of national scientific expertise, as well as playing a critical role in training new generations of conservationists and field biologists. With a few exceptions, the private sector in the hotspot is generally not actively engaged in conservation, although signs of active philanthropy by domestic companies are beginning to be seen, facilitated in part by the emergence of public and non-public foundations in China. Faith-based organizations can also play an important role in conservation in the region, through both promoting positive attitudes toward environmental protection and taking on-the-ground action. In the Mekong Delta of Vietnam, for instance, there are examples of Buddhist monks protecting bird and bat colonies within temple grounds, while, in Cambodia's Kratie province, a Buddhist temple is playing a leading role in conservation of the Endangered Asian giant softshell turtle (*Pelochelys cantorii*).

International CSOs active in the hotspot include international NGOs (INGOs) and networks. These organizations typically have larger programs and greater financial and human capacity than domestic NGOs, and are generally active in more than one country in the region. Moreover, INGOs have generally been considered to have greater leverage with governments and international donors but there are signs that this may be changing, as the overall influence of the international community on domestic policy decisions wanes and domestic NGOs grow in influence and stature. In addition to INGOs, several academic institutions based outside of the hotspot are active in conservation efforts there. These groups typically focus on research and capacity building, particularly in biodiversity survey and taxonomy.

With the exception of consulting companies, international private sector organizations have played a relatively limited role in biodiversity conservation in the hotspot to date. Again, there are signs that this may be changing, as a number of private sector companies, most notably in the extractives industry, enter into partnerships with conservation groups to conserve biodiversity in their areas of operation, for examples the Minerals and Metals Group, which operates the Sepon gold and copper mine in Lao PDR.

The above overview disguises significant variation among countries in the region, with respect to the level of development of local civil society and the extent and nature of its engagement in conservation. This chapter characterizes the regulatory environment and operational 'space' for CSOs in each of the hotspot countries, before reviewing patterns in capacity of CSOs, and identifying opportunities for and barriers to engaging them in biodiversity conservation. The chapter draws on the results of a thematic study, undertaken between July and October 2011, which comprised a mixture of desk study, interviews with key individuals, and small group meetings, with an emphasis on engaging with stakeholders from a diversity of sectors.

7.2 Classification of CSOs

Generally, there are two useful ways of classifying CSOs with potential roles in biodiversity conservation, environmental protection and sustainable development in the Indo-Burma Hotspot. The first is in terms of regulatory framework: how and where they are registered and regulated. The second is in terms of the operational 'space' they occupy or the mechanisms they use for engagement at regional, national, sub-national and/or local levels to influence local actions and decisions. These classifications are important to identify the different elements of civil society in the hotspot, and evaluate opportunities and strategies for further engaging them in biodiversity conservation.

Within the various regulatory frameworks described below can be found international NGOs (INGOs, which include regional groups) and domestic NGOs (which include national, local and community associations). INGOs largely comply with registration to operate in the countries where they work. Most have specialized portfolios that comply with what is legally allowable as environmental work, such as community forest management, wildlife conservation, sustainable development, etc. INGOs are also able to work with already registered domestic NGOs and associations. Over time, INGOs either maintain an independent identity, transform into domestic NGOs by establishing locally registered organizations with their own local boards, or establish independent organizations, which they keep within their own international network.

Among domestic CSOs, regulatory differences can be found between NGOs on one hand and CBOs on the other. While, in general, INGOs are registered with and regulated by foreign ministries or their respective counterparts in other ministries, domestic NGOs are registered with and report to local or national agencies. CBOs, on the other hand, have diverse regulatory arrangements. They may be regulated as cooperatives and associations, or localized within communes, or exist virtually only at village levels. In China and Lao PDR, most domestic CSOs are government affiliated and funded, and known as government-organized NGOs (GONGOs). In the other hotspot countries, the proportion of independently registered and funded CSOs is greater, particularly in Cambodia and Thailand.

With regard to operational 'space', there are various ways in which CSOs, having met the formal registration requirements, meet the practical operational challenges and opportunities that arise. Some CSOs, particularly INGOs and consulting companies, are funded mainly through large grants with environmental and/or sustainable development goals, which they implement with strict adherence to project logframes and budgets. The majority of CSOs, however, in implementing their work, innovate and go beyond pre-determined 'boundaries' to engage multiple sectors and penetrate various levels through partnerships with local groups.

The operational space for biodiversity conservation cuts across issues of poverty, social equity, land rights and indigenous people's rights, and intersects with debates on food versus fuel, hydropower versus other energy options, etc. Many of these issues involve local civil society institutions and ethnic minorities as major actors. In some parts of the hotspot, notably Cambodia and Thailand, there is a concentration of NGOs working at the grassroots level with 'interested community groups', especially ones directly affected by major infrastructure projects, land concessions and other projects that overlap with their homes and surrounding environments. Some of these NGOs manage to transform operational 'space' into opportunities for effecting change. Here, the key elements of success include 'collaboration'. Hence, there have been collaborative efforts linking conservation with: livelihoods, particularly forest-based livelihoods; climate change, especially through REDD initiatives; disaster management, especially flood prevention and mitigation; and indigenous people's rights, especially the conduct of free and prior informed consent. Examples of NGOs working in these and other areas are given in Appendix 5.

There are also a good number of international research and scientific organizations (some located at universities), that are active in the hotspot. If organized to generate and 'pool' evidence and 'link' traditional practices and tenure rights to conservation approaches, these organizations could have a strong voice in public discourse on conservation, and could be instrumental in sharing skills and knowledge with more NGOs and CBOs active on the ground.

Both by regulation, and by operational 'space', biodiversity conservation groups interviewed during the update of the ecosystem profile tend to avoid addressing development issues activities that are perceived as politically sensitive, such as development projects with major impacts on local people and human rights. In these instances, conservation NGOs are neither likely nor well positioned to espouse or defend the rights or political interests of the affected communities. However, there is significant overlap between areas of high biodiversity value and concentrations of rural poverty, and there are other, less politically sensitive, development issues where conservation NGOs may be better placed to respond, such as food and livelihoods, health, disaster relief, economic development, and basic grassroots institution building for planning and micro-finance. The big challenges are in matching community interests with CSO and government agendas (e.g. species conservation, landscape conservation, REDD, etc.) at all levels, and in finding entry points to promote good conservation practices that address community rights and sustainability.

Among conservation and development groups, a sub-classification may be made between those that are steadfast in biodiversity conservation (whether of species, sites and/or landscapes) and those that are community-oriented but engage in conserving biodiversity as an integral part of their work with communities. However, this distinction is not clear cut, and the majority of CSOs interviewed combine a portfolio of approaches, depending on site needs and donor. Looking forward, there is a trend towards merging approaches, with biodiversity conservation moving towards community participation, and community-oriented approaches placing a stronger emphasis on biodiversity conservation.

7.3 Regulatory Framework

There are established processes for registering and regulating CSOs in each hotspot country, which treat INGOs, domestic NGOs and CBOs differently.

7.3.1 Cambodia

There is no law, at present, governing the registration of civil society groups in Cambodia; registered CSOs are recognized as legal entities under the Civil Code of 2007. Registration is based on administrative regulations or *prakas*. At the moment, domestic

NGOs are required to register with the Ministry of Interior. Their financial and activity reports have to be submitted to the local government with jurisdiction over their office. INGOs are required to enter into a Memorandum of Understanding with the Ministry of Foreign Affairs. After registration, they are required to submit reports on their finances and activities every three months.

NGOs have their internal accountability mechanism, through their respective board of directors and internal accounting system. Externally, they are required to submit reports to the government. Their funders have also their own monitoring and reporting systems, which the NGOs follow on a project-by-project basis.

Cambodian CSOs are evolving a voluntary certification mechanism, with a Code of Ethical Principles, to ensure transparency and accountability. The Cooperation Committee for Cambodia is an on-going effort by the NGO community to self-regulate. It has a program for accrediting NGOs that demonstrate good practices. There is low participation by NGOs in this program, however, because of difficulty in complying with the requirements.

The regulatory framework for Cambodian CSOs has become a contested space. The government recently proposed a new Law on NGOs and Associations, which would have empowered it to close down CSOs at will. In December 2011, in the face of opposition from civil society, however, the government deprioritized the passing of this law. In a related and unprecedented move, the government included civil society groups in the coverage of the recently enacted Anti-Corruption Law (ICNL 2011).

7.3.2 China

In China, the legal framework governing CSOs is in need of an overhaul. The government has formulated one law and four sets of regulations on NGO establishment and related activities. The tendency of this legislation is to control and limit NGOs, and it has restricted their development (Liu 2002). As a step towards updating this legislation, the government is currently working on a new regulation governing international NGOs and how domestic NGOs cooperate with them.
The main pieces of legislation governing CSOs in China are the following:

- Interim Procedures on the Registration of Social Organizations, passed in 1950;
- Management Measures on Foundations, passed in 1988, which requires foundations to have at least 100,000 Yuan to be established;
- Regulations on the Registration and Administration of Social Organizations, and Interim Procedures on the Registration and Administration of Private Non-enterprise Organizations, both adopted in 1989, which regulate domestic CSOs;
- Interim Provisions on the Administration of Foreign Chambers of Commerce, adopted in 1989, which regulates international NGOs; and
- Law of Donation, adopted in 1999, which regulates donations to public welfare organizations and offers some tax incentives.

Official CSOs in China are registered with the Civil Affairs offices and fall into three categories: ‘social organizations’, which are membership-based associations; ‘non-enterprise units’, which are similar to service providers, such as training schools; and ‘foundations’, which are further divided into public foundations and non-public foundations. Among this universe of non-profits are found many GONGOs and some independent organizations. GONGOs are frequently large organizations, sponsored by government agencies or the Communist Party, and receive most of their funding, staff, and office space from the government. In general, most public foundations and social organizations are GONGOs, while independent organizations are more common among Private Foundations and Non-Enterprise Units.

In southern China, there are now a few independent non-profits that have succeeded in registering as public foundations, such as the Yunnan Green Environment Development Foundation in Kunming, Yunnan province, and the One Foundation in Shenzhen, Guangdong province. Most non-public foundations, in turn, are established by private individuals or companies.

Beyond the officially registered CSOs, there are many organizations that function like non-profit CSOs but either are registered as for-profit businesses (which is often easier to do), or simply operate without registering. Unregistered groups are typically locally based, informal clubs or associations but they are sometimes networked and work in coordination with national and international organizations.

7.3.3 Lao PDR

Lao PDR has few laws *per se* and its governing legislation principally comprises decrees. Legislation governing the operations of INGOs has been in place for some time but legislation regarding domestic CSOs has only recently begun to be introduced. To operate in Lao PDR, INGOs must seek approval from and register with the Ministry of Foreign Affairs (ADB 2011a). They are also required to register and provide financial reports to the appropriate government office under the Decree of the Prime Minister on the Regulation of NGOs, issued in 1998 (ADB 2011a). INGOs and their expatriate staff are accorded some privileges such as income tax exemption (ADB 2011a).

The constitution of Lao PDR permits the establishment of associations and organizations (ADB 2011a). Until 2009, however, there was no specific legislation to implement this constitutional provision. A limited number of development associations and other local CSOs were able to register in the absence of legislation but only through *de facto* means, such as personal connections to government (ADB 2011a). This situation changed with the issuance of Prime Ministerial Decree 115 on Association, which allows for the registration of local associations for the first time (and the re-registering of existing ones established through other channels) (ADB 2011a). The Public Administration and Civil Service Authority is responsible for registration and has recently been moved from the Prime Minister’s Office to the Ministry of the Interior. All associations are strictly forbidden from having political agendas, and can only provide development assistance and humanitarian aid. There is still nervousness in government about associations especially those at the provincial and district levels where they are not well known.

From the government's perspective, civil society is represented by party-affiliated mass organizations, including the Lao Women's Union, the Lao People's Revolutionary Youth Union, the Lao Patriotic Front for Reconstruction, and the Lao Federation of Trade Unions. In addition to supporting formal government activities, these mass organizations carry out participatory planning activities using their extensive networks throughout the country (ADB 2011a). They can also be a very effective channel for disseminating conservation messages, as they have representatives in all villages in the country.

7.3.4 Myanmar

In Myanmar, both INGOs and domestic NGOs working inside the country are allowed to register as non-profit associations. These are treated as a type of business association, a class that includes such entities as partnerships, companies limited by shares, branch offices of foreign companies. Myanmar registers associations on a sectoral basis, such as medicine, youth, immigrant workers associations, etc. INGOs can register as long as they fall within these government-approved sectoral niches.

Thailand hosts many INGOs and NGOs working on the Thai-Myanmar border (so called cross-border NGOs). They usually register under Thai laws but work closely with the communities on both side of the border. The more political ones have links with resistance movements inside Myanmar. With specific regard to environmental issues, a group of international and domestic NGOs, including some based within and outside of Myanmar, have come together to form the umbrella Burma Environmental Working Group, which "provides a forum for member organizations to combine the successes, knowledge, expertise and voices of ethnic peoples in pursuit of not just local livelihoods but sustainable and peaceful national, regional and international development policy" (BEWG 2011b).

The ongoing ethnic conflicts in different parts of the country, combined with a lack of human rights and land security, have made it very difficult for local communities to manage and protect their own natural resources. In spite of this, there are CBOs with a range of programs aimed towards increasing livelihood security and environmental security in Myanmar.

7.3.5 Thailand

In Thailand, CSOs can be established under the Civil and Commercial Code and the Social Welfare Act of 2003. Under Section 115 of the Civil and Commercial Code, Thai nationals can set up foundations and associations for nongovernmental, nonprofit, public benefit purposes, while the Social Welfare Act of 2003 allows for the establishment of public benefit organizations. Both laws confer legal personality to the CSO established. INGOs, on the other hand, must get a permit from the Committee on Consideration of the Entry of Foreign Private Organizations. Registered NGOs may publicly solicit for funds provided they have the necessary permit from the Ministry of Interior, and there are some ministerial regulations governing private fundraising activity (NGO Regulation Network 2011).

For many CSOs operating in Thailand, however, the process of registration is difficult and time consuming. For this reason, many remain unregistered and do not have legal standing. While internally they may have their own set of officers and directors and carry on their business as independent organizations, for external funding and regulatory reporting purposes, they operate as projects, working groups or units of registered organizations.

7.3.6 Vietnam

Most groups identified as CSOs in Vietnam are unregistered. In contrast to the trend in other countries, CSOs in Vietnam have to be "approved" and not simply "registered" (Booth 2011). The government retains the discretion to approve or reject an application, especially for groups seeking "to work in a more sensitive field" (ADB 2011e). Legal recognition is essential for organizations that are applying for foreign funds or seeking to engage in policy dialogue (ADB 2011e). Once organizations are legally registered, they may also run into difficulties securing project approval, especially if foreign funds are involved, which may take months to resolve. Local CSOs are debating what should be done to improve the regulatory environment, and whether it is wise to push for policy reform at present.

Domestic NGOs exist as voluntary organizations, associations, or funds. Domestic NGOs are required to follow Government Decree No. 88, dated 30 July 2003, on Regulations on the Organization, Operations and Management of Associations, as well as Government Decree No. 177, dated 22 December 1999, on Regulations on the Organization, Operations and Management of Social and Charity Funds. There are two ways that domestic NGOs can register. The fastest and easiest route is by affiliating with various semi-public organizations, such as the Vietnam Union of Science and Technology Associations. A more difficult and expensive route is to register directly with the Ministry of Science and Technology. Organizations that are able to register by the latter route have more autonomy and independence. All the same, regardless of the route followed, the government closely regulates the goals that domestic (and international) NGOs can pursue, and prohibits activities related to social justice, human rights and democratization, among others. All NGOs operating in Vietnam must be non-political, non-religious, and non-profit. Perhaps because of this inability to express independent views on political issues, there is an on-going trend in Vietnam towards transforming advocacy organizations into entrepreneurial entities, such as community-based cooperatives.

INGOs are regulated under a separate legal framework, specifically, the Regulations on the Operation of Foreign Nongovernmental Organizations in Vietnam, pursuant to Prime Ministerial Decree 340, dated 24 May 1996. INGOs are required to register with the

People's Aid Coordinating Committee of the Vietnam Union of Friendship Organizations, and to submit narrative and financial reports to it annually.

INGOs, due to the funding and expertise they bring, frequently partner with and are listened to by government agencies. The expertise of domestic NGOs is, on the whole, less respected by government. Particularly on controversial issues, their views are often brushed aside by decision makers as mere opinions of activists. Nevertheless, Vietnam does have a tradition of evidence-based policy making, and the opinions of scientists and academics are respected, or at least listened to, by policy makers. This makes Vietnamese universities and research institutes an influential actor, and an important component of local civil society.

At the grassroots level, CBOs were recognized as legal entities (associations) under Prime Ministerial Decree 88 in 2003, meaning that they can open bank accounts and mobilize external financial support. In 2005, the Revised Civil Code opened up more operation space for CBOs by recognizing informal cooperative groups outside of the state structure. Under this code, groups of people with a common interest (such as water user groups or forest protection groups) can register directly with the relevant commune people's committee. These new rights were elaborated further by the 2007 Decree on Cooperative Groups, which allowed them to open bank accounts and collaborate with national and international CSOs.

Like Lao PDR, Vietnam also has party-affiliated mass organizations, through which public participation in the implementation of government policies is routinely channeled. Mass organizations have representatives down to the level of commune and, usually, village, and provide effective channels for disseminating information and mobilizing people at the grassroots level. For these reasons, CSOs frequently partner with mass organizations to implement activities at local levels.

7.4 Operating Environment

In general, countries in the hotspot are creating more 'space' for CSOs to operate in. Nevertheless, this is fragile, and hangs in the balance in the face of change. The conservation corridors identified in the Indo-Burma Hotspot (Appendix 3 and Figures 7 to 12) overlap with some of the most ethnically diverse and economically marginalized populations in the region, many of whom are heavily dependent on natural ecosystems for their livelihoods. Policy change to conserve biodiversity and accommodate community interests necessitates pressure, contestation, and negotiation. Despite recorded repressive actions, this policy change can be established in 'open space', or a public place using state procedures with discussions mediated by authorized representatives of government. That civil society can now be seen as a 'participant' in policy change in the Indo-Burma Hotspot is a big improvement over the situation a decade or so ago, yet it remains a sensitive issue with governments and ruling parties.

Among the factors helping to create space for civil society participation in policy change is the requirement of most regional and international processes for civil society participation and consent of local and indigenous people, for instance in United Nations and ASEAN processes, and the application of World Bank and ADB social and environmental safeguards. These factors are, however, offset to some degree by the trend for high-impact developments (i.e. mines, dams, economic land concessions, etc.) to be financed by private funding, as opposed to public or bilateral/multilateral funding. This trend limits entry points for civil society to exert influence, while raising transparency issues.

Despite the overall trend towards greater operational space for civil society, repressive practices, such as harassment of civil society activists, especially those working on human rights and social justice issues, continue. In the most extreme cases, the personal safety of activists speaking out on these issues can be put at risk. Human Rights Watch (2011) reports that more than 20 environmentalists and human rights activists have been killed in Thailand since 2001, and that few of those responsible have been held to account.

7.4.1 Cambodia

The development of civil society in Cambodia was interrupted by decades of armed conflict and political instability, which only subsided at the end of the 1990s with the establishment of United Nations Transitional Authority in Cambodia. Over the following decade, there was a dramatic growth in the number of domestic and international CSOs, facilitated by a major expansion of international donor investment in the country and an open regulatory environment compared with other countries in the hotspot. A large number of national and local NGOs were established over this period. A few of these groups, such as Mlup Baitong, the Sam Veasna Center for Wildlife Conservation and Save Cambodia’s Wildlife, have an explicit focus on biodiversity conservation, while a wider selection of groups have the potential to address biodiversity issues within missions that focus on rights, livelihoods and other aspects of human well-being.

The large sums that have been invested in Cambodia by international donors have also facilitated the development of country programs by various international conservation organizations, including BirdLife International, CI, Fauna & Flora International (FFI), Wildlife Conservation Society (WCS), Wildlife Alliance, WorldFish Center and WWF. These organizations are typically better resourced, with higher capacity and larger programs, than national NGOs. To date, a large proportion of conservation projects in Cambodia have been implemented by international conservation organizations in collaboration with government counterparts, although there is a growing trend of direct donor assistance to government institutions.

Over the last 12 months, there have been signs that the Cambodian government’s *laissez faire* attitude to the activities of CSOs may be beginning to change. Some existing regulations already restrict the activities and movements of Cambodian CSOs. For example, local CSOs are required to notify the relevant local authorities if they are conducting activities outside the province where they are registered, while INGOs are required to get government approval for their projects and must work in close collaboration with government counterparts (ICNL 2011). CSOs are also required to refrain from political activities, and groups involved in advocacy, legal rights and human rights are viewed negatively and their activities are restricted. In a landmark case in August 2011, the Cambodian authorities suspended the operations of Sahmakum Teang Tnaut, a local NGO that raised concerns about the impacts of a rail development project on the urban poor (Khmerization 2011).

CSOs in Cambodia fear that there will be more restrictions on their work, following a government proposal to enact a new Law on Associations and Nongovernmental Organizations. Under the draft legislation, all NGOs are required to register, and their registration can be revoked at will. These concerns led the U.N. Special Rapporteur on the Situation of Human Rights in Cambodia to issue a statement urging the Cambodian government to review the draft legislation especially in light of the “onerous” requirements for registration and the lack of clear criteria on which registration applications will be considered (UN News Centre 2011).

The recent actions by the government have resulted in a chilling effect among activists and CSOs. For example, people from the Prey Long forest fear that their actions to protect the forest from agro-industrial plantations and dams will be affected by the proposed law.

7.4.2 China

Several INGOs are engaged in biodiversity conservation in southern China. WWF began work on giant panda (*Ailuropoda melanoleuca*) conservation in southwestern China and wetland management in Hong Kong in the early 1980s, and opened a China Programme Office in 1996. WCS established a China program in 1996, and subsequently opened an office in Guangzhou, Guangdong province, from where it undertakes work to combat the illegal wildlife trade. The Nature Conservancy (TNC) has been active in Yunnan province since 1998, working on conservation of Yunnan snub-nosed monkey (*Rhinopithecus bieti*), among other targets. The FFI China Programme has been working in Guangxi, Hainan and Yunnan provinces since the early 2000s, with a focus on threatened primates and trees. Hong-Kong-based institutions have also contributed significantly to biodiversity conservation in southern China, through provision of technical and financial assistance, most notably KFBG, which launched a China biodiversity program in 1998, Hong Kong Bird Watching Society, which operates a joint China program with BirdLife International, and the Ocean Park Conservation Foundation.

To complement the work of these groups, numerous independent local Chinese environmental NGOs have sprung up during the past few years, given the increased political space, rising environmental challenges and demand for public participation. One example is EcoWomen in Yunnan province, which seeks to empower women to protect their environment and to pursue sustainable socioeconomic development. Specifically, women are encouraged to participate in political processes and campaigns aimed at combating the use of pesticides. The group worked with Pesticide Action Network to document pesticide use, poisoning cases and the behavior of agrochemical companies, and use the findings for international advocacy. Other groups, such as Green Watershed, Green Society Environmental Action Network and GreenSOS, are working with the advocacy group, International Rivers, to monitor rampant hydropower dam construction projects in China and neighboring countries of mainland Southeast Asia. The work of these groups draws attention to the severe social and ecological impacts of these schemes.

Local academic institutions, including research institutions and universities, represent another important section of civil society in China. Institutions such as the Kunming Institutes of Zoology and Botany, South China Botanical Garden, Guangxi Institute of Botany, and Xishuangbanna Tropical Botanical Garden (all under the Chinese Academy of Sciences), Center for Biodiversity and Indigenous Knowledge, and various universities have made significant contributions to biodiversity conservation in southern China, primarily through research and monitoring, and through informing protected area management and public policy.

7.4.3 Lao PDR

Of all the countries in the hotspot, Lao PDR has the most restricted operational space for civil society. Until the issuance of the Prime Ministerial Decree on Associations in 2009, there was no legal basis for the establishment of domestic NGOs. However, there was clearly a latent interest in forming CSOs, because, by the end of 2010, 80 organizations had applied for registration under the new decree (ADB 2011a). These include a few organizations with an explicit focus on biodiversity conservation, such as the Lao Biodiversity Association, and the Lao Wildlife Conservation Association. A larger number of groups are working on wider set of rural development issues, sometimes with an environmental focus, such as the Community Development and Environment Association, the Poverty Reduction and Development Association, and the Sustainable Agriculture and Environment Development Association. Although there remain a number of challenges, domestic NGOs are slowly finding operational space. They have, of necessity, been creative in the various ways in which they manage to organize mutual assistance activities, and obtain technical and funding support. One common means of doing this is by working in partnership with small, officially sanctioned, INGOs, such as Global Association for People and the Environment (GAPE) and Village Focus International, which provide them with ‘cover’ as well as more tangible support.

Because local NGOs have only recently begun to emerge, civil-society-led conservation efforts in Lao PDR remain dominated by INGOs. However, operational space for international CSOs is also limited, compared with other countries in the hotspot, and Lao PDR has relatively few international conservation organizations active within its borders, with only IUCN, WCS and WWF maintaining a permanent presence in the country. In addition to the conservation groups, a number of international development NGOs active in the natural resources sector are implementing projects that include biodiversity conservation among their objectives.

A number of academic institutions in Lao PDR are also actively involved in the implementation of biodiversity conservation projects, for example the National University of Lao PDR. As in China and Vietnam, academic institutions in Lao PDR are government institutions and their activities tend to be restricted to areas such as research and environmental awareness.

7.4.4 Myanmar

Regarding Myanmar, stakeholders interviewed during the thematic study make a distinction between the ‘cross-border’ NGOs based in Thailand, especially those in Chiang Mai, and the recently increasing community of NGOs based in Yangon. The former have a proven track record in community organizing, resource mobilization, and natural resource management at the grassroots level. There is fear among the cross-border NGOs that the ongoing rapprochement between the Myanmar government and the international community will draw funding and attention away from their work and towards Yangon-based NGOs. They fear that the Yangon-based NGOs, while appearing to have operating space, will basically be limited to collaborating with the ruling regime. While agreeing that the newly opened social space inside the country should be explored and that the number of new CSOs established in Yangon will continue to grow, they warn that the cross-border NGOs should not be forgotten, not least because of the vital role they play in generating and transmitting crucial information in and out of Myanmar.

While many cross-border NGOs are active in the resistance movement, there are cross-border NGOs that are focused on capacity building, education and development assistance for various ethnic groups along the Thai-Myanmar border. KESAN for instance, while engaging in anti-dam campaigns in Myanmar, is also heavily invested in livelihood, rural development and biodiversity conservation projects with its partner communities on both sides of the border. Considering the limited capacity of CBOs to source and manage financial resources, such NGOs can perform a role of conduit for funds as well as technical advisor.

Within Myanmar, there are a growing number of local and national NGOs, including a small number engaged in biodiversity conservation. Most national conservation NGOs have been established by retired officials from the Ministry of Forestry, whose political connections enable them to operate with some degree of independence from government (BirdLife International 2005). In addition to limited operational space, the ability of these NGOs to contribute to biodiversity conservation is severely constrained by limited funding opportunities. The national NGO with the largest program of conservation activities in Myanmar is the Forest Resources, Environment, Development and Conservation Association (FREDA), which was established by retired staff from the Ministry of Forestry and Myanmar Timber Enterprise. FREDA is currently implementing a number of pilot projects on sustainable forest management, and mangrove protection and rehabilitation, in collaboration with several Japanese NGOs. Another national NGO engaged in biodiversity conservation is the Biodiversity and Nature Conservation Association (BANCA), which is involved in a number of collaborative projects with BirdLife International, FFI and other INGOs. A third national NGO engaged in biodiversity conservation is Myanmar Bird and Nature Society, whose program is focused on protection, research and public education related to birds and nature (BirdLife International 2005).

Many of the other domestic NGOs in Myanmar have a principal focus on rural development or health, and several are active in the natural resources sector, such as: Friends of Rainforests in Myanmar, which is working on environmental protection, poverty reduction, education and health promotion, and promotion of renewable energy; and the Renewable Energy Association Myanmar, which is working on promoting renewable energy sources, including fuelwood substitution and biogas use (BirdLife International 2005). As in other countries, these organizations could make important contributions to biodiversity conservation goals, in areas such as sustainable livelihoods, land rights and grassroots institution building.

Due to the restricted operating space, and the very challenging funding environment arising from the present economic sanctions, few international CSOs are engaged on biodiversity conservation in Myanmar. Several groups that had active programs in the first half of the 2000s, such as BirdLife International, CI and the Smithsonian Institution, have now largely or entirely ceased work in the country. The main player among the international conservation organizations is WCS, which established a program in the country in 1993, and has been conducting wildlife surveys and conservation projects throughout the country, in collaboration with the Ministry of Forestry. Other large international NGOs are present in Myanmar, with programs focused on health, rural development and humanitarian assistance, including CARE, Oxfam, Save the Children and World Concern.

7.4.5 Thailand

Thailand has a long history of civil society involvement in conservation, dating back to the work of the Natural History Society of Siam to secure legal protection for rhinoceroses in the 1920s and including the efforts of the Association for the Conservation of Wildlife to promote the establishment and expansion of the national protected area system from the 1950s onward (P. P. van Dijk *in litt.* 2003). A defining moment in the development of the local conservation movement in Thailand was the dispute over the proposed construction of the Nam Choan hydropower dam within Thung Yai Naresuan Wildlife Sanctuary in the early 1980s. This proposal met with opposition from a broad-based coalition of civil society, including local communities, students and academics, environmental NGOs and representatives of the private sector. These events are now considered to have given birth to Thailand's "green movement," which has continued to develop and gain momentum since then (Carew-Reid 2002), particularly following the re-establishment of civilian rule in 1992.

Today, Thailand has a reputation of relative openness to the activities of CSOs, so much so that many regional NGOs are registered in Thailand. One example is Asia Indigenous People Pact (AIPP), a network of indigenous people's organizations and movements from Asia, which established its Secretariat in Chiang Mai in 1992. AIPP is a focal point for programs involving indigenous people, including for environment, biodiversity, climate change adaptation and awareness and REDD, and forms linkages between CBOs, local and national NGOs, INGOs and global networks. Another important regional NGO based in Thailand is the Center for People and Forests (RECOFTC), which was established in Bangkok in 1987 under the name Regional Community Forestry Training Center for Asia and the Pacific. Over the past two decades, RECOFTC has provided training for over 10,000 people in community forestry, from national policy makers to practitioners. In 2010, RECOFTC opened country programs in Cambodia, Thailand and Vietnam, in order to help these countries deliver on commitments to scale up community forestry (RECOFTC 2011).

Thailand also hosts a large number of local and national NGOs, with more than any other country in the hotspot, with the possible exception of Cambodia. A number of these NGOs have a specific focus on biodiversity conservation, including the Asian Elephant Foundation of Thailand, BCST, the Hornbill Research Foundation and the Seub Nakhasthein Foundation. Other Thai NGOs are addressing broader environmental agendas, such as air and water quality, for instance the Green World Foundation, which has a program to promote water-quality testing by local communities. Yet other NGOs are working with local communities on natural resources management and other initiatives with objectives that potentially overlap with those of biodiversity conservation. Thailand also hosts a number of INGOs, such as Freeland Foundation, International Rivers, WCS and WWF. These organizations are active in various areas including combating the illegal wildlife trade, building capacity of protected area managers and enforcement staff, raising environmental awareness, and advocating for sustainable development.

While some academic institutions in Thailand face limitations in terms of financial resources, staffing and technical capacity, others have high potential to engage in biodiversity conservation. Students and staff from various academic institutions conduct a significant amount of biodiversity research every year, including King Mongkut's University of Technology and Mahidol University. Some institutions directly inform conservation management, for example the Forestry Faculty of Kasetsart University, which has developed management plans for a number of protected areas in Thailand.

7.4.6 Vietnam

In Vietnam, while there is increasing openness to the role of CSOs, there remain certain restrictions on their operations. For example, the government of Vietnam has enacted a regulation establishing thematic priority areas where NGOs can work. Furthermore, INGOs are required to work in collaboration with government counterparts on all projects. Although

Although government policy in Vietnam is not strongly supportive of domestic CSO development, a number of high-capacity domestic NGOs are beginning to emerge, including Center for People and Nature Reconciliation (PanNature), Center for Water Resources Conservation and Development (WARECOD) and Education for Nature-

Vietnam (ENV). What is notable about these groups is that they are able to find space to operate that was not previously occupied by INGOs, for instance with developing networks of environmental journalist, piloting community co-management of inland fisheries and actively involving the general public in conservation actions. Nevertheless, most domestic NGOs to have emerged over the last decade are still relatively small, and find themselves in a very competitive field in terms of raising funding for their programs and recruiting and retaining suitably qualified staff.

The CSOs with the largest programs on biodiversity conservation in Vietnam remain the INGOs, which hosts country programs of BirdLife International, FFI, IUCN, TRAFFIC, WCS and WWF, among others. In 2006, the Vietnamese government issued a regulation identifying thematic issues that can be subject of INGO assistance. According to this regulation, the general thrust of INGO assistance, "should be in line with the country's orientations for socioeconomic development and strategy for hunger eradication and poverty reduction, along the lines of sectoral and local priorities and development planning, supporting the poverty reduction and development efforts of the Government of Vietnam". Human rights, social justice and democratization are not included, and some groups have interpreted this to mean that these areas cannot be supported by INGOs.

There also exist in Vietnam a large number of quasi-NGOs (or QUANGOs), staffed by serving or retired government officers and operating semi-independently from government. Several of these organizations are involved in biodiversity conservation, such as the Center of Environment and Rural Development, which is affiliated to Vinh University, and the Centre for Natural Resources and Environmental Studies, which is affiliated to Hanoi National University. As in most other countries in the region, several Vietnamese academic institutions are active in biodiversity conservation, particularly through applied research, and these are an important source of trained graduates to join environmental NGOs.

In the past, the government attempted to enact legislation recognizing and regulating CSOs. This became controversial after a domestic NGO drafted a more liberal version of the law. This was the first time that an alternative bill was submitted to the legislature alongside the government draft, and resulted in the shelving of the draft legislation.

7.5 Funding Environment

The donor context in each hotspot country is very different, and the funding modalities used by each donor are also different. The funding environment is also quite dynamic, with new donors arriving in the region and existing donors leaving or changing their priorities. This makes generalizations about the funding environment for CSOs difficult.

Stakeholders consulted during the thematic study reported that larger grants (above $50,000) are mostly provided by bilateral and multilateral agencies or certain private foundations, and tend to be awarded to INGOs and the larger national NGOs. The main source of funding for domestic CSOs are small grants (below $50,000), either awarded directly by the funding agency or channeled through an INGO or civil society network.

This pattern of segregation of CSOs by grant size is not absolute (especially as many INGOs also compete for small grants where they are eligible to apply), nor is it surprising, given that the larger INGOs typically have greater human and financial capacity and longer established programs than their domestic counterparts. Nonetheless, domestic CSOs report difficulty in ‘graduating’ from small grants to larger grants, where they often have to compete for funds with INGOs that are significantly better equipped for proposal writing, and have higher profiles and more established contacts with funders.

This pattern can also be partly explained by an understandable aversion, on the part of funders, to take risks with less well known organizations, particularly where larger sums are involved. Some representatives of INGOs draw attention to a perceived lack of accountability on the part of domestic CSOs. While some domestic organizations may lack ‘upward’ accountability to their donors, relative to international ones, they may nevertheless perform more strongly in terms of ‘downward’ accountability to their local constituencies (see Agyemang *et al.* 2009), and are generally less bound by strategies and approaches formulated elsewhere.

Some interviewees suggested that conservation donors should allocate a minimum percentage of their investment to domestic NGOs, in order to create a more level playing field with INGOs, and give them opportunities to build capacity, confidence and track records in managing larger projects. It was also proposed that application processes should be simplified, in order to enable more local NGOs and CBOs to access funding, either through re-granting mechanisms or by establishing funding windows for very small grants (under $10,000).

The importance of China as a donor is increasing, both in terms of bilateral assistance to other countries in the hotspot and philanthropic giving and among the themes supported is community development. The recent growth in philanthropy in China, particularly through the spread of corporate social responsibility, has increased the amount of funding available for local community assistance and simple environmental actions, such as tree planting. The Law on Donation, adopted in 1999, is the first legal document regulating donation activities in China. It encourages donations to public welfare organizations, and protects the legal rights of donors and recipients.

Many stakeholders consulted were concerned that dedicated funds for biodiversity conservation are diminishing, while forest carbon and climate adaptation related investments are increasing. In response, there is growing trend among CSOs to collaborate when developing and submitting funding proposals. Some formal alliances exist among NGOs in the hotspot but collaboration is more usually on an *ad hoc* basis. Complementary skill sets, good coordination and commonality of interest, are key success factors in project collaboration, which can be between NGOs or between NGOs and CBOs. Some domestic NGOs in Thailand and Cambodia have established internal disbursement and accountability systems for channeling small grants to grassroots CBOs. Thailand has a mechanism for channeling public funds to domestic NGOs and CBOs, spurring their growth at the grassroots level. No such mechanism yet exists in any of the other hotspot countries.

7.5.1 Small Granting Mechanisms

Small ($5,000 to $50,000) and micro (under $5,000) grant mechanisms are available in the Indo-Burma Hotspot but not common. There are several small grant mechanisms supported by private foundations, such as the Global GreenGrants Fund, and others supported by multilateral and bilateral agencies, such as the UNDP/GEF Small Grants Program. There are also a number of re-granting programs, such as the CEPF small grants mechanism managed by BirdLife International.

The collective realization and learning by many CSOs, reiterated in the interviews conducted during the thematic study, is that micro grants enable communities to work on a range of issues that directly affect them based on their own strategies and priorities, such as land rights, local empowerment, livelihoods and marketing. Small grants, accompanied by active facilitation and technical support, are a key tool in promoting community-based natural resource management and constituency building for conservation. It is also widely recognized that, for small and micro grant mechanisms to be an effective tool for engaging local and grassroots civil society, they need to include a capacity building component to train local NGOs and CBOs in the basics of project planning, monitoring, and technical and financial reporting. Furthermore, several interviewees identified a need for CBOs to be able to apply for and manage conservation grants themselves, in order to strengthen their capacity in fund management and negotiate their own strategies and priorities. It was suggested that community-centered domestic NGOs may be well placed to channel funding to CBOs through re-granting mechanisms.

7.6 Civil Society Capacity

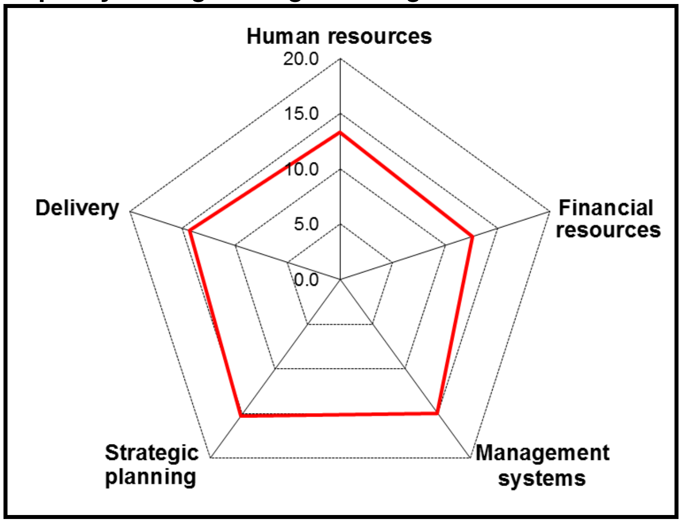
During the first phase of investment in Indo-Burma Hotspot, CEPF awarded grants to domestic CSOs in Cambodia, Lao PDR, Thailand and Vietnam. Each of these grantees was requested to conduct a self-assessment using CEPF's bespoke Civil Society Capacity Strengthening Tracking Tool. The purpose of this tool is to track changes over time of individual CSOs along five dimensions of capacity, and not necessarily to enable comparisons among CSOs. Another limitation is that the criteria used by the tool emphasize upward accountability to donors as opposed to downward accountability to local constituencies. Nonetheless, the aggregated results from the tool do provide some useful insights into patterns in capacity among domestic CSOs in the hotspot.

Overall, the aggregated results for the first 17 domestic CSOs to receive CEPF grants in the hotspot indicate that these organizations face the greatest capacity constraints with regard to human and, especially, financial resources (Figure 15).

With regard to human resources, 87 percent of the sampled CSOs reported that staff numbers are sufficient for the effective delivery of their mission. However, most of these organizations reported that at least 60 percent of their staff are on short-term contracts. This is also an issue for most international CSOs, where one or two years is the standard contract length, due to most positions relying on project-based funding. Short-term contracts are reportedly a major contributory factor to high staff turnover in domestic and international CSOs alike.

More than 80 percent of the CSOs reported being able to conduct participatory appraisals with local stakeholders and communicate conservation messages, while 33 percent reported being able to conduct biodiversity surveys or research with conservation applications. This indicates that the technical strengths of domestic NGOs lie more towards community engagement, and suggests good opportunities for partnership with INGOs, which typically have strong capacity in conservation biology.

Figure 15. Aggregated results of Civil Society Capacity Strengthening Tracking Tool



In terms of financial resources, 73 percent of the sampled CSOs reported having secured sufficient financial resources for the effective delivery of their mission. However, only 13 percent reported having sufficient secured resources for more than the next two years. This presumably presents a challenge for long-term planning and program development, as well as for staff retention, and is likely a reflection of many domestic CSOs' reliance on short-term, small grants. In terms of diversity of funding sources, however, the results were more positive, with all CSOs reporting that they had at least three sources of funding, with no one source providing more than 60 percent of the total.

With regard to management systems, all sampled CSOs reported systematically monitoring and evaluating the impacts of their projects and using the results to guide management and design of future projects. However, only one organization reported widely disseminating the results of this monitoring to stakeholders inside and outside the organization. This shortfall in public accountability regarding the results of conservation projects is certainly not limited to domestic CSOs; it is also something that the largest INGOs have been grappling with for some time (Christensen 2002, Jepson 2005).

In terms of strategic planning, most of the sampled CSOs reported having clear governance arrangements and strategic plans. Eighty percent have a board that clearly differentiates between its oversight role and the role of management, while 73 percent have a strategic plan, with measurable indicators, covering a period of at least three years.

Finally, in terms of delivery, although none of the sampled CSOs are implementing projects with an annual budget over $1 million, 60 percent are implementing at least one project with an annual budget over $100,000. This suggests that significant capacity exists among domestic CSOs to manage large grants. The sampled CSOs also reported a strong commitment towards networking, with 87 percent participating in or supporting one or more civil society coalition or network, and 53 percent playing a leadership role in at least one coalition or network.

With regard to capacity building, some INGOs working in the hotspot actively support domestic CSOs through grants or mentoring but there is considerable potential to do more. Interviewees recommended that INGOs and donors should invest in building the technical skills of domestic CSOs, as well as individuals who can contribute to their development. They also recommended that donors make use of existing NGO disbursement and accountability system to channel funds to CBOs, and encourage networking among domestic NGOs at national and regional levels.

7.7 Civil Society Networks

In order to respond to challenges greater beyond the skills and resources of any single organization, there is an increasing trend of CSOs in the hotspot to form networks. The two main types of network that can be identified are project-based networks and issue-based networks. Within both types of network, there is high usage of information technology for networking; face-to-face meetings are kept to a minimum.

Project-based networks are established as required by specific projects, and require coordination. This may be weak or strong, depending on the investment made to support them. The structure of coordination among participating organizations can be vertical (i.e. from INGOs down to domestic NGOs and CBOs), horizontal (i.e. among the same type of organization) or a combination of the two. Project-based networks are typically strong, because they are focused and output oriented. There is also clarity in the definition of the roles of each participating organization. The network members usually hold regular meetings to discuss project core objectives and progress towards them. The main weakness of project-based networks is with regard to sustainability, because they are highly dependent upon project funding.

Issue-based networks, on the other hand, are networks formed around a common issue, such as dams on the Mekong River or women's rights. Funding is sourced from the resources of member organizations, coupled with grants specifically secured from funders for use by the network. The main challenges faced by issue-based networks include the participation of global campaigners who may not be sensitive to local issues, the scrutiny that local groups may receive from their respective governments if they are associated with global campaigns, and the dangers that local groups may face when the global campaigners leave.

Neither type of network can be successful, however, without good facilitators who are provided with sufficient funding to hire good local staff to manage the network. Facilitators assist in building trust and communicating among network members, and transferring and monitoring the use of funds to and by local partners, especially local community organizations who do not have bank accounts.

Wider networking among groups engaged in biodiversity conservation does take place but is mostly *ad hoc* and limited to informal exchange of information and anecdotal experience. There have been several attempts to organize more regular, formal exchanges of experience among conservation groups, with a view to enabling more coordinated action on issues of common concern. For the most part, however, these efforts have not been sustained. Time constraints and competition among CSOs for limited funding were both cited as barriers to wider networking among conservation groups.

7.8 Emerging Trends

In terms of special-interest politics (Grossman and Helpman 2001), CSOs may be classified into those espousing the interest of affected communities and those espousing environmental interests. Environmental interest groups can, in turn, be sub-divided into species/landscape -conservation-oriented CSOs, and community-oriented CSOs that have conservation as an integral part of their culture and advocacy. Conflicts between these two groups revolve around contextualization and prioritization. Looking forwards, however, there is an emerging trend towards common ground between the two types of group, especially as new threats emerge that directly affect the interests of communities and biodiversity conservation priorities.

Among most of the CSOs interviewed, there is consensus on the importance of working with local communities who are the ‘stewards’ of the landscape. This requires specialized skills in community organizing, as well as conservation science. This, in turn, provides a motivation for CSOs to work together and combine their skills in different fields, such as social development, enterprise development and marketing, and conservation biology.

Building long-term commitment to conservation of biodiversity on the part of local communities also requires a focus on incentives for community members, such as land tenure, alternative livelihoods or payments in cash or in kind. In various projects reviewed as part of the thematic study, the link between conservation objectives and benefits for local people is still tenuous. There is an increasing tendency, therefore, for conservation groups to establish more explicit links, such as through the negotiated ‘Conservation Agreements’ currently being piloted in parts of Cambodia by CI and its partners.

Another emerging trend is recognition that successful conservation initiatives need to address local livelihoods and that, to be sustainable, appropriate market linkages must be forged. The prevailing socioeconomic conditions determine the success or failure of conservation initiatives. In Cambodia, for example, WWF is working with the Non Timber Forest Product (NTFP)-Exchange Program to develop good quality NTFPs and provide training to local people in their production. At almost all sites that are the focus of conservation interventions, issues related to economic incentives for local people are central, and, in most cases, the conservation organizations working there try to address them. However, the big gap visible in current strategies is the ability to link sustainable livelihoods to markets, and thereby enable pilot activities to be sustained and taken to scale.

A third emerging trend is the growing influence of private investment in sectors such as forestry, mining and plantation agriculture. This investment creates challenges, including reduced civil society influence on natural resource management decision making. However, it also creates new opportunities for innovative partnerships and funding arrangements. While some CSOs are cautious to engage with the private sector, others are exploring ways of partnering with companies demonstrating a commitment to social and environmental responsibility, to raise the bar for good practice in key industries.

A fourth emerging trend is a growing recognition that, if suitably organized, civil society can have a strong voice in public discourse on conservation. Where this has been done most effectively, for example in the case of the Save the Mekong Coalition, conservation, development and rights-based groups have been united around a common issue, economic and livelihoods arguments (which tend to carry more weight with decision makers than purely biological ones) have been employed, and vertical networking has been used to link experience from CBOs and indigenous people into national and regional policy dialogues.

Emerging trends are characterized by one common thread: there are local community groups and indigenous peoples who are well positioned to help biodiversity conservation succeed on the ground but there is a need for effective tools and facilitators to secure gains. This means linking conservation actions to targets established by scientists, linking pilot activities to markets for sustainability, and linking their experience to national policy debates. Among the networks interviewed, the key characteristics include: a combination of global to local coalition; joint agendas with access to funding that can be regranted all the way down to the grassroots level; strategies that combine conservation goals with human rights, livelihoods, market development, etc.; and access to campaigns and organizational linkages within and outside of the hotspot.

8. CLIMATE CHANGE ASSESSMENT

Regional awareness of the potential impacts of climate change to human society and the environment has increased considerably since the original ecosystem profile was prepared. Climate change is anticipated to cause severe socioeconomic impacts to the Indo-Burma Hotspot, partly due to the dependence of much of its population on freshwater fisheries and wetlands, thought to be among the most sensitive of natural resources to climate change, and the vulnerability of its coastal populations to sea-level rise. This chapter briefly describes climate change issues relevant to biodiversity conservation in the Indo-Burma Hotspot.

8.1 Palaeoclimate and Development of the Hotspot's Biota

Climate is a dominant factor controlling the global patterns of vegetation structure, productivity, and plant and animal species composition. The Earth has experienced changes in climate throughout its geological history, and has been warmer and cooler, wetter and drier, and with higher or lower carbon dioxide (CO_2) concentrations, than at present (Overpeck *et al.* 2005). Climate change in the Pleistocene Epoch (the last 2.5

million years) has resulted in major shifts in species ranges and the reorganization of biological communities, landscapes, and biomes (Gitay *et al*. 2002). In Southeast Asia, ~50 glacial cycles have occurred in the Pleistocene (Woodruff 2010), which has caused repeated fluctuations in sea level and changes in coastlines and rivers (Voris 2000; Hanebuth *et al*. 2011). For most of this time the land area was up to two times larger than present, mean sea levels were 62 m lower, it was cooler and drier, and there was almost continuous land access between the mainland and Sumatra, Java and Borneo (Woodruff 2010). For the past 11,000 years the Earth has been in an interglacial period, with warmer, wetter and more stable climate conditions, and higher sea levels and less land, than much of the previous two million years (Overpeck *et al*. 2005).

These conditions, together with tectonic movements and human activity, have determined the present biogeography of the Indo-Burma Hotspot. During glacial periods, parts of the Gulf of Thailand and South China Sea disappeared, montane forests expanded to lower elevations, and grasslands proliferated, pushing out lowland forests (Sterling *et al.* 2003). When the climate warmed, lowland forests expanded to higher elevations and latitudes, and cool-adapted species became restricted to mountains (cf. Williams *et al.* 2003). The savanna forests of central Indochina evolved to occupy dry, seasonal habitats, and may have been more extensive in the past (Stott 1990), while the rise of seas to present levels enabled the expansion of inter-tidal mudflats, seagrass beds and mangroves (Woodruff 2010). The high levels of floral and faunal endemism distinctive of the Cardamoms in Cambodia (e.g. Stuart and Emmett 2006), Annamites of Lao PDR/Vietnam (e.g. Surridge *et al.* 1999; Sterling *et al*. 2003) and Chin Hills of Myanmar (e.g. BirdLife International 2005) reflect the role of these mountains in providing refugia for high-rainfall-dependent and/or cool-adapted species. Northern Vietnam shares over 20 species of amphibians and reptiles with Hainan and Guangxi, that are not found in Yunnan, because low sea levels enabled movement to Hainan Island, while the drier, cooler climate of Yunnan limited westward dispersal of some species (Sterling *et al.* 2003). The hotspot was part of a regional corridor for the movement of flora and fauna between mainland and insular Southeast Asia (e.g. MacKinnon and MacKinnon 1986; Tougard 2001) and due to past land bridges, mainland Southeast Asia and the Greater Sundas share a fifth of their herpetofauna (Sterling *et al.* 2003).

8.2 Anthropogenic Climate Change

8.2.1 Greenhouse Gas Emissions

Atmospheric concentrations of greenhouse gases (GHGs) have risen since the pre-industrial era due to human activity, and this is considered to be the principal cause of current changes in the Earth's climate (Gitay *et al.* 2002). Excluding China, the other five Hotspot nations contribute only 1.8 percent of global GHG emissions (Table 14). China is the world's largest emitter of GHGs and contributes 19.1 percent of global GHG emissions (Table 14). Within the Chinese provinces of the hotspot, carbon dioxide emissions in 2007 were <120 million metric tons for Guangdong (the fourth-highest of 28 provinces in China), ~50 million metric tons in Yunnan (the tenth lowest) and <25 million metric tons in Guangxi (the fifth lowest) (derived from Lieu *et al.* 2010: 164; no data given for Hainan Island. Provincial data for other GHGs was not located). Emissions of CO_2 alone from a single province, Guangdong, are higher than for all GHG emissions of Cambodia, Lao PDR or Myanmar.

Table 14. Greenhouse Gas Emissions in the Indo-Burma Hotspot

Country	Mt CO_2e	% of World Total	Global Rank	Mt CO_2e per Capita	Mt CO_2 (1990)	Mt CO_2 (2000)	Mt CO_2 (2007)	Global Rank
Cambodia	22.8	0.06	102	1.2	0.5	2.3	4.4	121
China	7,232.8	19.13	1	5.5	2,460.7	3,405.2	6,791.8	1
Lao PDR	17.4	0.05	116	3.0	0.2	1.1	1.5	151
Myanmar	107.0	0.28	49	2.2	4.3	8.9	13.0	89
Thailand	351.1	0.93	24	5.3	95.8	201.6	282.1	23
Vietnam	179.0	0.47	35	2.2	21.4	53.6	112.3	35

Sources: UNSD (2011); WRI (2011). Notes: Figures in million tonnes (Mt) of carbon dioxide equivalent (CO_2e) are for the year 2005, and include emissions of CO_2 and other GHGs but exclude contributions from land-use change. Figures in million tonnes (Mt) of carbon dioxide (CO_2) emissions only are from 1990, 2000 and 2007. Figures for China are for the whole country.

Lao PDR has the lowest GHG emissions of the hotspot country, but per person has higher emission intensity than Cambodia, Myanmar or Vietnam, presumably due to a predominance of energy-intensive logging industry and high levels of deforestation. Between 1990 and 2007, CO_2 emissions more than doubled in all nations (Table 14).

8.2.2 Observed and Projected Changes in the Climate

The Indo-Burma Hotspot has a seasonal, tropical monsoonal climate, with a cool dry season (~November-April) and warm wet season (~May-October), with mean annual rainfall from <500 mm to 6,000 mm, and mean monthly temperatures from 18-30ºC (BirdLife International 2005; MRC 2010). The extent to which climate has already changed in the hotspot is unclear. In the Lower Mekong Basin (most of Cambodia and Lao PDR and parts of Thailand and Vietnam), rainfall trends suggest there is no evidence that the regional timing and duration of the southwest monsoon has changed (MRC 2010: 16). Conversely, along the Mekong River in Yunnan province, 41 years (1960-2000) of temperature and rainfall data indicate that air temperature and the Drought Index has increased, and precipitation has decreased, with greater changes in the south (near Lao PDR and Myanmar) than in the upper reaches near Tibet (He and Zhang 2005). Close to the hotspot, studies in northwest Yunnan have documented rising temperatures and falling precipitation, glacier retreat, and the upward advance of alpine vegetation (Baker and Moseley 2007).

Globally, climate change is forecast to include increasing temperatures and sea levels, rising CO_2 concentrations, and altered patterns of precipitation (Gitay *et al.* 2002). For Southeast Asia, the Intergovernmental Panel on Climate Change (IPCC) forecasts a 2.4-2.7ºC rise in mean annual temperature, 7 percent increase in wet season rainfall, and a drier dry season, by the end of this century (Christensen *et al.* 2007). Sea levels in

Southeast Asia may rise 1-2 m by 2050 and 2.5-5 m by 2300 (Woodruff 2010). Within the hotspot, more specific predictions have been developed for some parts of Cambodia, Lao PDR, Thailand and Vietnam, based on down-scaling of IPCC 'Global Circulation Models' (see MRC and ICEM 2009). These studies suggest major changes in climate may occur in the hotspot over the next several decades; while there is some uncertainty about the details, the major projected trends are outlined below.

Temperature

By 2050, mean annual temperatures in the Lower Mekong Basin may increase by 0.4-1.2ºC and the number of days over 33ºC may increase by 19-65 days/year, with central and southern regions experiencing greater increases than northern regions (TKK and SEA START 2009; Hoanh *et al.* 2010). Elsewhere, by 2100 temperatures may rise 1.4-4.3ºC along Cambodia's coast (Suppakorn 2011), by 1.5 to 2ºC in Thailand (Boonpragob and Santisirisomboon 1996) and by 2.5ºC by 2070 in the northern highlands of Vietnam (MRC 2009a,b).

Rainfall and Altered River Flows

By 2050, mean annual rainfall may increase by 80 mm in the Lower Mekong Basin, but with large local differences, with some regions receiving up to 133 mm more, or 35 mm less, rainfall in the wet season and/or +54 to -29 mm in the dry season (TKK and SEA START 2009; Hoanh *et al.* 2010). Rainfall is forecast to increase in northern Lao PDR, Thailand and Vietnam but decrease by 4-7 percent (-50 to -100 mm) in the south; despite this, the Mekong Delta may experience higher river flows, due to increased upstream flows (TKK and SEA START 2009; Hoanh *et al.* 2010). Along Cambodia's coast, rainfall may decrease by 0.5 to 4.5 percent by 2050 (Suppakorn 2011); in Peninsular Thailand, rainfall may increase by 40 percent by 2100 (Boonpragob and Santisirisomboon 1996).

Sea-level Rise

Sea levels are forecast to rise by at least one meter by 2100 in the Mekong Delta (Carew-Reid 2007), up to 0.4 m by 2050 along the Cambodian coast (Suppakorn 2011) and up to 0.21 m over the next century at Bangkok in the Gulf of Thailand (Niemnil *et al.* 2008).

Extreme Weather Events

The frequency, severity and duration of storms, drought and coastal wave surges is predicted to increase over the next several decades (TKK and SEA START 2009; Hoanh *et al.* 2010; Suppakorn 2011). Severe flooding and storm damage in Myanmar, Thailand, Vietnam, Guangxi and Hainan Island in the past several years, caused by record levels of rainfall and storm severity, have highlighted the vulnerability of the hotspot's coastal regions to climate change.

Carbon Dioxide Levels

Global CO_2 concentrations are rising and predicted impacts include vegetation change, higher mean runoff, and ocean acidification (Malcolm *et al.* 2006; Bates *et al.* 2008). Modeling undertaken for some parts of the hotspot suggests that small increases in CO_2 levels may contribute to cooler temperatures and lower flows, but larger increases may cause warmer temperatures and higher flows (MRC and ICEM 2009 and references therein).

Climate change is likely to impact virtually all regions of the hotspot, but the nature and extent of these changes is unclear. In the hotspot's rivers, climate change is anticipated to alter seasonal flow regimes and the timing, extent and duration of flooding, but predictions are confounded by modeling limitations and natural hydrological variability (Kingston *et al.* 2010) and the potential impacts of hydropower dams (Li and He 2008; TKK and SEA START 2009). New hydrological models for the Lower Mekong Basin addressing climate change and dams are under development (T. Cochrane *in litt*. 2011; and see http://mekongriver.info/home).

8.3 Potential Impacts of Climate Change on Biodiversity

8.3.1 Current Research in the Hotspot

Few field studies on the potential impacts of climate change on biodiversity have been conducted in the Indo-Burma Hotspot. A global analysis estimated that, depending on different modeling scenarios, between 1.9 and 40.5 percent of endemic plant and vertebrate species in the Indo-Burma Hotspot may become extinct due to climate change over the next century (Malcolm *et al.* 2006). In Thailand, bioclimatic modeling indicates that climate change may cause significant changes in the distribution of some tree species (Trisurat *et al*. 2009, 2011), while other research in Thailand has demonstrated climate-influenced changes in a plant *Nephelium melliferum* (W. Brockelman *in litt*.) and the apparent expansion in range/abundance of a forest bird (Round and Gale 2008). At least 94 bird species in Southeast Asia have increased their lower and/or upper elevational ranges, possibly due to climate warming (Peh 2007). Reviews of climate change which include biodiversity in the hotspot are available for amphibians and reptiles (Bickford *et al.* 2010) and some fish; for the latter, most studies focus on a small number of economically important species in the context of fisheries and livelihoods (e.g. Allan *et al.* 2005; Brander 2007; Halls 2009; Dugan *et al*. 2010b).

Preliminary assessments of vulnerability to climate change have been undertaken for some forest and wetland habitats and species in Cambodia, Lao PDR, Thailand and Vietnam (Blate 2009, 2010; MRC 2010; Bezuijen 2011a,b). In Vietnam, some sites of conservation importance vulnerable to sea-level rise have been identified (Carew-Reid 2007; Pilgrim 2008). No studies have been conducted on the potential impacts of climate change on the integrity of protected area networks for any of the hotspot nations, although in Thailand, an evaluation of the protected area system is underway which partly considers climate change (R. Mather in litt.). In Myanmar, a national report on the effects of climate change is apparently near completion but is not yet publicly available (Lwin 2011). No studies on climate change and biodiversity were located for the Chinese portion of the hotspot, although publications in national journals may have been overlooked. A rapid methodology to assess species vulnerability to climate change is being developed in 2011 by the Mekong River Commission and ICEM - International Centre for Environmental Management, with a focus on the region's wetlands, and will complement the array of vulnerability assessment methods for human populations (Morgan 2011). Studies on recent climate history based on tree ring chronology have been undertaken in Lao PDR, Thailand and Vietnam (Buckley *et al.* 2007a,b; Sano *et al.* 2009).

8.3.2 Impacts on Ecosystems and Habitats

Climate change is anticipated to cause significant impacts to a diverse range of coastal, lowland and upland ecosystems in the Indo-Burma Hotspot. Some of the hotspot's ecosystems which may be particularly vulnerable to climate change include the following.

Inland Freshwater Wetlands
Freshwater ecosystems are globally among the most sensitive to climate change, due to predicted impacts on hydrology (Bates *et al.* 2008). Large rivers and floodplains are a dominant feature of the hotspot and their productivity is regulated by distinctive seasonal flow regimes. In the Lower Mekong Basin, higher flood levels and higher dry season flows could cause the loss of distinctive riverine vegetation zones (cf. Maxwell 2009), but might also benefit the expansion of some floodplain flora. Conversely, hotter and drier conditions, especially toward the end of the dry season, could result in the drying out of small floodplain waterbodies and the contraction of shallow-water zones in lakes such as the Tonle Sap or Inle (Myanmar); these habitats support some of the most threatened fauna in the hotspot. For seasonally-flooded grasslands, a critically endangered habitat, hotter dry seasons and rising CO_2 concentrations could facilitate fire and the invasion of woody plants. Climate change in the hotspot's wetlands is of particular concern given the critical ecosystem services these ecosystems provide for human populations and biodiversity.

Coastal Wetlands and Deltas
The Mekong Delta is one of the top five "megadeltas" in the world predicted to be most vulnerable to the impacts of climate change, due to inundation and erosion from sea level rise, saltwater intrusion and increased storm and flood events (Cruz *et al.* 2007). A one-meter rise in sea level would inundate 12,376 square kilometers of the Delta (30 percent of the Delta's area and 3.76 percent of Vietnam's total land area), resulting in the loss of most swamp forest in the Lower Mekong Basin (Carew-Reid 2007), and probably most remaining grasslands, seagrass beds, mudflats and beaches (Bezuijen 2011b). For Vietnam in general, a one-meter rise in sea level would inundate at least 14,528 square kilometers (4.42 percent of its total land area), and in addition to the Mekong Delta, would inundate at least 340 square kilometers (0.10 percent of total land area) of the Red River Delta (Carew-Reid 2007). Elsewhere in the hotspot, the low-lying aspect of much of the Gulf of Thailand, Ayeyarwady Delta, and Andaman and Arakan coasts, suggests these areas may also experience widespread inundation and the permanent loss of freshwater wetlands and agricultural lands. Large areas of mangroves could be inundated, and although some may retreat inland, this will depend on the availability of space to do so. Because colonization ability differs between species, it is unlikely that entire communities would be able to retreat and species composition would probably change.

Lowland Forest Ecosystems

The impacts of rising temperatures on tropical lowland forests are reviewed by Corlett (2011), who identifies a striking range of views on the vulnerability of these ecosystems to climate change. Hotter and drier dry seasons could facilitate forest fires and increase drought stress, and might result in the expansion of dry, open forests (Stott 1990) but probably at the expense of moist, dense forests. Rising CO_2 concentrations could offset water stress under drier conditions but could facilitate the invasion of woody weeds. Wetter wet seasons and drier dry seasons could change the structure and composition of vegetation communities (Blate 2010), possibly causing declines in food and breeding resources for some species or benefiting others, including the invasion of pest species, and causing a cascade of ecological effects.

Montane Forest Ecosystems

Steep topography and high altitudinal gradients characterize many of the hotspot’s mountain ranges, and small increases in temperature could impact a disproportionately large range of habitats and species. Rising temperatures may exceed the physiological limits of cool-adapted endemic species, and drier conditions would alter moisture gradients, which could reduce water availability for flora and fauna. Large changes in the extent, structure and composition of biological communities may occur as the limits of more sensitive species are exceeded and new species, including invasive weeds, become established. The faculty for assemblages to shift to cooler conditions at higher elevations will be limited by their dispersal ability, whether there is space to do so, and ultimately, the physical upper limits of mountains. Eventually, many species extinctions may occur across the hotspot’s mountain ranges.

8.3.3 Impacts on Species and Assemblages

There is now evidence that relatively modest climatic changes over the past century have already had significant impacts on a wide range of species, including altered global ranges and population sizes, changes in the timing of breeding and migration, length of growing season, and pest and disease outbreaks (Hughes 2003; SCBD 2003). Future changes may include the movement of individuals to higher latitudes or elevations, changes in the structure, composition and primary productivity of ecosystems, expanded ranges of some species, and the extinction of others (Gitay *et al.* 2002). Of particular concern is the potential for large, non-linear threshold responses, in which cascades of changes occur across ecosystems. Some of the hotspot’s species and assemblages which may be particularly vulnerable to climate change include the following.

Montane Flora

In northern Thailand, some evergreen tree species are already shifting northward due to climate change and are anticipated to be replaced by deciduous species (Trisurat *et al.* 2009). Similar transitions may be expected elsewhere in the hotspot’s uplands, and may eventually reduce the extent of upland forests as they are replaced by lowland forests. Restricted-range limestone karst flora may be adapted to specific air and soil moisture gradients, and the naturally limited range of such species suggests they could become extinct due to rising temperatures and drier conditions.

Lowland Wetland and Terrestrial Flora

In lowland rivers and floodplains, higher water levels could cause excessive flooding or the permanent inundation of riparian trees and shrubs dependent on seasonal cycles of submergence and exposure. In the Mekong mainstream, low-lying islands support restricted-range terrestrial flora, including a recently discovered plant species known from a single island (Maxwell 2009): higher flood levels and/or altered soil and air moisture levels could render these small populations extinct. Because most of the hotspot's lowland habitats are located in the south, at lower latitudes, efforts by floodplain vegetation communities to shift to higher latitudes or elevations could involve movements of hundreds of kilometers before cooler conditions could be reached. These distances alone may be insurmountable for many species, but such movements would also be impeded by the cleared and fragmented nature of most of the hotspot's lowlands, such that dispersal would require crossing cultivated landscapes and degraded riverine corridors. Under these circumstances, populations of many species may be extirpated.

Freshwater Invertebrates

The Mekong mainstream supports the largest living endemic freshwater gastropod fauna in the world (>120 endemic species), many of which require complex microhabitats and cycles of inundation and exposure to survive (Davis 1982). Higher dry season flows could cause the extinction of species unable to cope with continual inundation. Endemic lowland clams of the Order Unionoida are especially sensitive to disturbance, because they possess a unique life history trait, an obligate parasitic stage on fish, and are threatened by impacts to their host fish populations (Bogan 1993). The hotspot's montane regions also support endemic stream invertebrates (e.g. Phu *et al.* 2006; Kottelat 2009), which may have little physiological capacity to adjust to warming waters or lower levels of dissolved oxygen caused by rising temperatures. Such changes may also facilitate the invasion of exotic species, which may displace native species (Rahel and Olden 2008). Impacts to invertebrates are of particular concern due to their critical role in nutrient recycling and as the basis of food chains for many other species.

Migratory Fish

The hotspot's lowland rivers support unique assemblages of migratory fish, and their survival and productivity is strongly dependent on the extent, duration and timing of seasonal flooding (Baird 2007). Higher wet season flows may benefit some species through extended breeding and access to new feeding areas (Halls 2009), but may also scour riverbeds and wash away fish larvae. Higher dry season flows may disrupt migration triggers for dry season migratory species. In the hotspot's deltas, increasing salinity may force stenohaline (narrow salinity tolerance) species further upstream and expand the upstream range and biomass of euryhaline (wide salinity tolerance) species (Halls 2009). Strong inherent dispersal ability of many migratory species, and the natural north-south orientation of rivers in the hotspot, suggest such species could cope with warming waters by shifting to higher latitudes. In reality this would be limited by the naturally restricted extent of floodplain habitats further north (which provide critical breeding or feeding habitats for many fish species), and the current or impending construction of dams along the hotspot's rivers, which will almost certainly block fish passage (e.g. Roberts 2001).

Montane and Lowland Amphibians

The dual lifecycle of most amphibian species, involving water (for eggs and tadpoles) and air (for adults), suggests both common and rare species in the hotspot will be impacted by climate change. Rising temperatures may desiccate eggs, while warming waters would hold less oxygen, which may increase tadpole mortality and impact species which require cool water (Bickford *et al.* 2010). Conversely, rising temperatures could result in the decline of chytrid fungus (*Batrachochytrium dendrobatidis*), which is implicated in the decline of many amphibian species globally (e.g. Pounds 2001). This fungus has not yet been detected in lowland amphibian populations in the hotspot (McLeod *et al.* 2008). However, it has been detected in the uplands of Lao PDR (Swei *et al.* 2011) and may occur elsewhere. Higher wet season flows and rainfall could wash away eggs and tadpoles, flood nests or increase the risk of fungal growth (Bickford *et al.* 2010). Montane species will have few options to shift to new climate spaces and once their thermal limits are exceeded, face extinction. Lowland species may be unable to travel the distances required to reach cooler conditions, while reduced rainfall in some parts of the hotspot may cause breeding failure among species dependent on extended hydroperiods.

Non-marine Turtles and Siamese Crocodile

The hotspot supports the highest number of non-marine turtle species in the world (~20; Stuart and Thorbjarnarson 2003) and the largest global populations of Siamese crocodile; all of these species are globally threatened. Crocodilians and many turtle species exhibit temperature-dependent sex determination, which renders them highly vulnerable to climate change. Rising temperatures in the hotspot could result in hotter nests and eggs, which could increase embryo mortality, and for surviving embryos, skew the sex ratios of males and females. Warmer temperatures could also impact daily patterns of thermoregulation and increase food demands. Because the populations of most of these species are already at critically low levels in the hotspot, these additional impacts could cause the complete loss of populations.

Migratory Shorebirds

The Ayeyarwady, Mekong and Red River Deltas support globally important populations of migratory shorebirds (Tordoff 2002; Buckton and Safford 2004; BirdLife International 2005) and Myanmar’s Arakan coast was recently found to support globally important populations of an endangered shorebird, spoon-billed sandpiper (SSRT 2008). Sea-level rise threatens all of these populations by aggravating more direct anthropogenic threats (such as coastal development) that are leading to loss of inter-tidal mudflats. Fewer feeding areas could increase crowding and competition for food and space, which could also facilitate disease spread. Individuals might be forced to travel longer distances to find feeding sites, placing them under greater physical stress. Dates of arrival and departure to the hotspot may also be changing, as suggested elsewhere (Beaumont *et al.* 2006), which could cause individuals to miss times of peak food availability. These impacts could weaken the integrity of the entire East Asian-Australasian Flyway for migratory shorebirds.

Sandbar-nesting Riverine Birds and Turtles
The hotspot's lowland rivers support a unique assemblage of sandbar-nesting birds and some turtles (e.g. Asian giant softshell turtle), which nest on seasonally-exposed sandbars (Thewlis *et al.* 1998; BirdLife International 2005). Higher dry season flows could cause the loss of nesting sites and the extirpation of this entire assemblage.

Wetland Mammals
Wetter wet seasons and the potential expansion of some riparian habitats may benefit some species, including otters, Indochinese silvered leaf monkey and long-tailed macaque (*Macaca fascicularis*), although this seems unlikely given the severe existing pressures on these habitats and species. Altered seasonal flow levels could impact habitat quality for freshwater populations of Irrawaddy dolphin and their prey in the Mekong and Ayeyarwady Rivers. Floodplain grasslands in northeastern Cambodia support the only documented population of hog deer in Indochina (Maxwell *et al.* 2006); drier dry seasons and elevated CO_2 levels could dry out these grasslands and facilitate fires and invasion of woody weeds, causing the extirpation of this population.

8.3.4 Impacts on Protected Areas and Other Sites of Conservation Significance

Climate change has profound implications for the integrity and effectiveness of protected area networks in the hotspot, for at least two reasons: as with most regions globally, neither protected areas nor the approaches used to identify sites of conservation importance (e.g. 'KBAs', Eken *et al.* 2004; 'Ecoregions', Olson and Dinerstein 2002) were designed to account for climate change; and, traditional protected area networks are static, while climate space is shifting (Williams *et al.* 2008). Climate change may alter the quality and extent of habitats within sites of conservation importance, and also cause species to shift elsewhere, such that protected areas may no longer encompass populations of the key species they were intended to protect.

The hotspot supports 509 KBAs and 66 Conservation Corridors (see Chapter 4). It also contains all or part of 12 'Global 200 Ecoregions' (Olson and Dinerstein 2002). Initial reviews suggest many of these will be impacted by climate change. In Vietnam, a one-meter rise in sea level could result in the inundation of 78 (27 percent) of the country's 286 'Critical Natural Habitats' (comprising existing and proposed protected areas and KBAs; Pilgrim 2008) and in the Mekong Delta, at least two sites, U Minh Thuong National Park and Bac Lieu Nature Reserve, would be entirely inundated (Carew-Reid 2007). In Thailand, some existing protected areas and plant hotspots are predicted to become less effective in protecting the populations of some tree species, as these species shift to higher latitudes, and the integrity of some hotspots may deteriorate (Trisurat *et al.* 2009, 2011). Large, non-linear protected area networks encompassing latitudinal and elevational gradients may have the highest resilience to climate change, such as transboundary areas extending north-south along the Annamite Ranges (Lao PDR/Vietnam), the Western Forest Complex of Thailand, and the protected area complex of southwestern Cambodia. These sites will provide organisms some opportunity to adjust to rising temperatures or sea levels by shifting northward, to higher elevations or to different microhabitats. Sites which are small, narrow, located in low-lying areas and/or isolated by development, such as protected areas in the Mekong Delta, provide few such opportunities (e.g. Bezuijen 2011b).

8.3.5 Synergistic Impacts

Climate change is anticipated to act in synergy with existing pressures on biodiversity, causing net impacts that are greater than climate change alone (Opdam and Wascher 2004). This is particularly relevant for the Indo-Burma Hotspot, where a large proportion of biodiversity is already under severe threat from existing pressures such as deforestation, hunting, trade, over-fishing and unsustainable hydropower development. For most threatened species and sites, climate change is probably less of an immediate threat compared with existing pressures. Most protected areas in the hotspot are already under threat from habitat degradation and development, and levels of management effectiveness and resources are low. Climate change in conjunction with these existing threats may cause the loss of many threatened species, while placing new pressures on common and widespread species and intact habitats (e.g. Malcolm *et al.* 2006).

8.4 People, Biodiversity and Climate Change

Climate change is anticipated to impact a large proportion of the hotspot's human populations, including loss of agricultural lands (e.g. Johnston *et al.* 2010a,b, MRC and ICEM 2009), aquaculture (e.g. Kam *et al.* 2010), shortages of food and fresh water, reduced income, damage to property and infrastructure, health issues, and the need for resettlement away from lands affected by sea-level rise or floods (e.g. Wassmann *et al.* 2004; MWBP 2005a-c). In Vietnam, a one-meter rise in sea level would impact almost six million people in the Mekong Delta (7.3 percent of the national population), submerge 9,200 kilometers (4.3 percent) of roads and in both the Mekong and Red River Deltas, inundate large areas of agricultural land and leave other areas unusable due to saltwater intrusion (Carew-Reid 2007). A large proportion of those most affected would be poor households and rural communities (ICEM 2009). Cambodia, northern and eastern Lao PDR, Bangkok (Thailand) and the Mekong Delta are considered to be among the most vulnerable regions of Southeast Asia to climate change (Yusuf and Francisco 2009).

Climate change impacts to the hotspot's human populations are closely linked to biodiversity. Most human populations in the hotspot are directly dependent on the products and services provided by its terrestrial, coastal and marine ecosystems, and most protected areas are populated. Poverty-affected populations in the hotspot are among the most vulnerable to climate change, due to their reliance on natural resources and limited technical or financial resources for adaptation (e.g. Oxfam 2008); globally, poverty is recognized as the largest barrier to addressing climate change in developing countries (Cruz et al. 2007). In the Lower Mekong Basin, migratory fish assemblages (see Section 8.3.3) form the basis of the largest inland fisheries in the world and one-quarter of global freshwater fish catches (Baran *et al.* 2007 and references therein). Declines in fish productivity due to climate change and hydropower development could result in food shortages for millions of people across the hotspot (e.g. Baran *et al.* 2008; Welcomme *et* *al*. 2010). The hotspot's freshwater ecosystems form an integral part of agricultural production systems, and agricultural planning under climate change will need to include environmental flows, fish migration routes, wetland condition and landscape connectivity (Johnston *et al*. 2010a,b).

Unless ecosystem-based adaptation is strategically integrated into development, the response of human populations to climate change will almost certainly place greater pressures on the hotspot's biodiversity. In upland areas, crop failure due to warming conditions and breakdown of predictable seasonal patterns may force communities to clear forests and establish crops at higher elevations; slash/burn practices under drier conditions might also increase the incidence of forest fires. In coastal areas, sea-level rise would force communities to seek new lands. In the lowlands generally, declining fish catches would force communities to seek alternative protein sources, and hunting of wildlife would probably increase. In all regions, increased conflict with protected areas is virtually certain, as displaced communities seek new lands to settle in. In coastal regions, the need to shift some infrastructure inland (such as coastal roads) to avoid sea-level rise may require the clearance, or further fragmentation, of remnant habitats. The scale of these impacts is potentially huge, involving tens of millions of people, and taking them into account will be critical to conservation planning under climate change (Woodruff 2010).

8.5 Climate Change Initiatives Relevant to Biodiversity Conservation

8.5.1 International Agreements and National Frameworks

Over the past decade there has been a large shift in the status of climate change initiatives in the hotspot, from little activity, to the start of many climate change projects and donor inputs of hundreds of millions of dollars. This has probably been driven by a combination of increasing national awareness of climate issues and a global swing by many donors toward climate initiatives. All nations in the hotspot are signatories of the Kyoto Protocol and United Nations Framework Convention on Climate Change, which obligates member countries to develop and implement strategies to address climate change. International agreements for biodiversity conservation to which the nations in the hotspot are members now also obligate members to address climate change. Each nation has a primary policy document which outlines its strategy and responses to climate change and a nominated national agency and/or committee (Table 15). National climate change policies are largely focused on human issues and place little direct emphasis on biodiversity.

Table 15. International and National Climate Change Frameworks in the Indo-Burma Hotspot

Country	UNFCCC	Kyoto Protocol	National policy	National committee	Focal agency	NBSAP climate themes
Cambodia	1995	2002	NAPA	NCCC	MOE	Theme 13–CC and biodiversity
China	1993	2002	NCCP	NCCC	NDRC	Theme 12–CC and biofuel
Lao PDR	1995	2003	NAPA	NSC	WREA	none
Myanmar	1994	2003	NAPA	NDMC	NCEA	NBSAP to be released in 2011
Thailand	1994	2002	APNC	NBCCP	MNRE	Strategy 3–mitigation
Vietnam	1994	2002	NTP	NCCC	MNRE	none

Sources: Cambodia = MoE (2002, 2006), Bradley (2011); China = NDRC (2007), Xue and Cai (2008); Lao PDR = STEA (2004), WREA (2009); Myanmar = Than Myint and San Hla Thaw (2009); Thailand = OEPP (2009); Vietnam = GoV (2007).
Notes: dates for Kyoto Protocol and UNFCCC are year of ratification; APNC = Action Plan on National Climate Change as the Five Year Strategy on Climate Change 2008 to 2012; MNRE = Ministry of Natural Resources and Environment; MOE = Ministry of Environment; NAPA = National Adaptation Programme of Action to Climate Change; NBCCP = National Board on Climate Change Policy; NCCC = National Climate Change Committee; NCCP = National Climate Change Programme; NCEA = National Commission on Environmental Affairs; NDMC = Natural Disaster Mitigation Committee; NDRC = National Development and Reform Commission; NSC = National Steering Committee on Climate Change; NTP = National Target Program to Respond to Climate Change; WREA = Water Resources and Environment Administration.

All nations in the hotspot are in the early stages of implementing climate change policies, and which are not yet well integrated into broader national policy frameworks (e.g. MoE 2005, 2006, 2007; MRC 2009a,b). Their current NBSAPs make little (Cambodia, China, Thailand) or no (Lao PDR, Vietnam) mention of climate change; the NBSAP for Myanmar is under preparation. Despite these limitations, a massive input of foreign aid over the past several years has resulted in the start of over 300 climate change projects in the Lower Mekong Basin alone (MRC and ICEM 2009). Within the hotspot, Cambodia, Lao PDR, Thailand and Vietnam appear to have made the most progress toward developing national frameworks for climate change, while Myanmar has made the least progress; China appears to lie between these extremes. For Cambodia, Lao PDR and Vietnam, this is at least partly due to the fact that the Lower Mekong Basin has received more international assistance for climate change than any other part of the hotspot (see Sections 8.5.2 to 8.5.3).

8.5.2 Mitigation Projects

In the context of climate change, ‘mitigation’ refers to measures which aim to reduce net GHG emissions. In the hotspot, mitigation projects are underway across most sectors of urban and rural society and include national GHG inventory and abatement strategies, ‘clean development mechanisms’ for improving the efficiency of existing technology (e.g. vehicles, lighting, cooking stoves) and renewable energy projects. Most of these activities do not involve biodiversity conservation and are not considered further here. The principal mitigation approach of relevance to biodiversity conservation in the hotspot is REDD, which aims to create monetary incentives for developing countries to reduce forest destruction, by creating a financial value for the carbon stored in trees which can be sold as carbon offsets to developed countries. ‘REDD+’ are activities which build on REDD to deliver additional benefits, including the enhancement of forest carbon stocks and biodiversity conservation (SCBD 2011b). Biodiversity conservation is not a primary objective of REDD, but if successful, REDD could benefit some of the hotspot’s forest ecosystems and biodiversity. Conversely, if REDD investments encourage plantations of non-native tree species or conversion of natural non-forest habitats to forest, they could have negative biodiversity implications.

Cambodia, Lao PDR and Vietnam are considered to have a high REDD potential due to their large forest coverage and high rates of forest loss and degradation (Poffenberger 2009; Mather 2010; UN-REDD at www.un-redd.org); Myanmar and some parts of the Chinese portion of the hotspot (e.g. Yunnan) probably have high REDD potential for similar reasons. A preliminary compilation of REDD projects in the hotspot (Appendix 6) provides a snapshot, which suggests the following trends.

- At least 37 REDD projects have been initiated in the hotspot: 14 in Cambodia, four in the Chinese portion of the hotspot (one in Guangxi, one in Guangdong, two in Yunnan), nine in Lao PDR, three in Myanmar, three in Thailand and 12 in Vietnam (numbers sum to more than 37 because some are regional projects involving more than one country). Cambodia and Vietnam are pilot nations for the United Nations REDD program and scoping activities are being undertaken in Lao PDR and China (see UN-REDD at www.un-redd.org).
- This preliminary compilation almost certainly under-represents the total number of projects involving REDD in the hotspot, because many existing forest initiatives are beginning to incorporate REDD approaches in their activities.
- At least 12 projects are focused on strengthening national capacity to implement REDD, and largely aim at government agencies rather than civil society. At least 22 projects involve pilot sites and communities, and include some of the lowland and upland forests of Cambodia, Lao PDR, Thailand, Vietnam and Yunnan, mangrove forests in the Mekong and Ayeyarwady Deltas, and at least nine protected areas in Cambodia, Lao PDR and Vietnam. Some of these projects specifically incorporate biodiversity conservation into their activities. At least one of these projects is specifically for biodiversity conservation: a project in Vietnam led by SNV, which aims to identify mechanism for biodiversity conservation through REDD+, and includes mapping of forest carbon/biodiversity in Vietnam (Appendix 6).
- Cambodia, Lao PDR and Vietnam have been the main recipients of REDD investment in the hotspot. Myanmar is receiving the least assistance for REDD.
- Although funding amounts were not compiled, project sources (Appendix 6) clearly indicate the hotspot is receiving tens of millions of dollars in REDD funding, mostly to Cambodia, Lao PDR and Vietnam. Donors and implementing agencies comprise a diverse range of multilateral and bilateral agencies, foundations and NGOs.
- REDD is at an early stage of implementation in the hotspot, with most projects having started within the past three years and within various stages of preparation and development.

At least one REDD project in the hotspot has successfully sold carbon credits, the 'Forest Restoration for Climate, Community, and Biodiversity' project in Yunnan (TransLinks 2009). Project challenges included the need to maintain community support in the gap between the start of the project to receiving financial benefits, closer alignment between national and international forest management systems, and low provincial capacity for measuring carbon stocks (L. Zhang pers. comm.). Other projects are nearing the stage of selling carbon credits, particularly in Cambodia: preliminary findings indicate that key challenges are building up stakeholder capacity to implement REDD, controlling the drivers of deforestation, demarcation of the forest estate, the security of forest tenure and the development of benefit distribution systems which ensure that communities receive financial benefits (Poffenberger 2009; Mather 2010; Bradley 2011).

8.5.3 Adaptation Projects

In the context of climate change, 'adaptation' refers to human activities aimed at coping with the impacts of a changing climate. In the hotspot, adaptation projects are underway across most sectors of urban and rural society, most of which do not involve biodiversity conservation and are not considered further here. A preliminary compilation of adaptation projects for, or relevant to, biodiversity conservation (Appendix 7) provides a 'snapshot' which suggests the following trends. This compilation is of projects which specifically describe themselves as 'climate change adaptation projects'; in a broad sense, most conservation activities in the hotspot may be termed 'adaptation' activities, because in aiming to reduce existing pressures to biodiversity they contribute to building the resilience of species to climate change.

- At least 55 adaptation projects which partly involve biodiversity conservation have been initiated in the hotspot: 23 in Cambodia, 14 in Lao PDR, four in Myanmar, 17 in Thailand and 29 in Vietnam (numbers sum to more than 55 because of 11 regional projects which involve more than one country). No projects were located in the Chinese portion of the hotspot.
- These projects include at least 22 in coastal regions, another 14 for wetlands generally, and at least four in forested regions. Coastal projects largely focus on disaster management for sea-level rise and storm damage, integrated coastal zone management, and mangrove restoration. Coastal projects are in the Mekong Delta (11), northern Vietnam (2), Cambodia (3), Thailand (5) and Myanmar (2) (numbers sum to more than 22 due to one regional project which involves more than one country). The majority of high-biodiversity sites within the hotspot, such as Tonle Sap Lake (Cambodia), Inle Lake (Myanmar), central Mekong River (northern Cambodia and southern Lao PDR) and protected areas in the Annamite Mountains (Lao PDR/Vietnam) have received little, or no, project effort.
- Only nine of 55 projects are largely focused on biodiversity: one regional project (adaptation planning for some sites/habitats in the Lower Mekong Basin), two in Cambodia (a climate change/biodiversity study; and a biodiversity survey in a REDD site), one in Lao PDR (a vulnerability assessment in a protected area), two in Thailand (studies of the protected area system) and three in Vietnam (climate change/biodiversity projects in the Mekong Delta, including within two protected

areas/biosphere reserves, Kien Giang and Can Gio). None of these projects include empirical studies of the potential impacts of climate change on biodiversity. Some involve inventories of some habitats (e.g. mangroves) and/or vulnerability assessments for selected habitats, species and sites.

- The other 46 projects are multi-sectoral, or principally for government or civil society, but which involve elements of natural resource management.
- Although funding amounts were not compiled, project sources (Appendix 7) clearly indicate that the scale of funding for adaptation projects is considerably smaller than for REDD projects. Donors and implementing agencies comprise a diverse range of multilateral and bilateral agencies, foundations and NGOs (Appendix 7).
- Virtually all international NGOs working in the hotspot have incorporated climate change as a thematic element of their programs. Many NGOs are participants in global climate change initiatives, such as the Climate, Community and Biodiversity Alliance.
- The adaptation projects being implemented in the hotspot are inadequate to address the potential impacts of climate change on biodiversity. There has been no systematic assessment of conservation priorities for the hotspot in the context of climate change, and existing projects are skewed toward mangroves and wetlands generally in the Lower Mekong Basin.

Within the hotspot, ecosystem-based approaches are increasingly advocated for adaptation projects, in which the vulnerability of people to climate change is reduced through the conservation, restoration, and management of ecosystems. Examples include mangrove restoration instead of seawalls for shoreline protection (the former also enhance fish stocks and sequester carbon), and forest restoration instead of agroforestry for catchment protection (the former also builds on local knowledge and benefits biodiversity) (Woodruff 2010).

Most adaptation projects in the hotspot involving biodiversity conservation are in the early phases of planning or implementation, and it is too early to assess the success of most projects. In general, the extent to which adaptation approaches will ultimately be able to offset the impacts of climate change to biodiversity is unclear. The IPCC notes that 'while adaptation is increasingly regarded as an inevitable part of the response to climate change, the evidence…suggests that climate change adaptation processes and actions face significant limitations, especially in vulnerable nations and communities' (Adger *et al.* 2007: 720). A further challenge is that monitoring to assess the results of adaptation projects will require longer timeframes than most projects.

8.5.4 Current Role of Civil Society

Civil society groups in the hotspot are playing an increasing role in climate change initiatives. Some of the key climate modeling work being undertaken in the region is by national agencies, including the Southeast Asia START Regional Center (Chulalongkorn University, Thailand; e.g. TKK and SEA START 2009) and, in Vietnam, the Southern Institute for Water Resources Planning (assessments in the Mekong Delta; e.g.

Wassmann et al. 2004; SIWRP 2008) and Can Tho University (host of the Delta Research and Global Observation Network).

Civil society groups are partners in many of the REDD and adaptation projects underway in the hotspot, including the national universities of all Hotspot nations, and local NGOs e.g. the 3S (Sekong, Sesan, Srepok) Rivers Protection Network, NGO forum on Cambodia, and Rivers Coalition of Cambodia. In Lao PDR, the Lao Biodiversity Association has hosted REDD+ workshops and is involved in developing REDD projects. In Myanmar, the Biodiversity and Nature Conservation Association is involved in mangrove restoration projects and is beginning to integrate climate change issues into its planning. Most international NGOs in the hotspot working on biodiversity or livelihoods have national staff who are leading climate change activities; these staff represent a growing resource of skills and experience for their nations. Some NGOs, such as RECOFTC, have a specific emphasis on developing climate change grassroots networks, and integrate their work into REDD or adaptation projects by other agencies in the hotspot (Appendices 6 and 7).

The extent to which civil society is empowered to take a leading role in climate change initiatives will be critical to determining the success of such efforts. The massive scale of potential climate change impacts in the hotspot, involving many millions of people, is clearly beyond the power of government agencies and international efforts alone. Mobilizing the support and active involvement of communities throughout the hotspot will be necessary to limiting impacts to people and biodiversity. It will also help ensure that community concerns and priorities are addressed within climate change initiatives, including equitable benefit sharing (e.g. from REDD schemes) and the management of natural ecosystems that local communities depend upon.

8.6 Factors Influencing Conservation Efforts

Efforts to address the potential impacts of climate change on biodiversity in the hotspot are currently influenced by several factors. The following issues were identified from information in preceding sections and discussions with regional project managers.

8.6.1 Information Gaps

The following information gaps hinder conservation planning for climate change in the hotspot:

- Lack of clear conservation priorities. Climate change efforts in the hotspot are proceeding in the absence of clearly defined priorities of which species and ecosystems are most at risk. Such planning is necessary because climate change impacts may be highly variable between species, and even considering threatened species alone, the large number of these requires a ranking of priorities to focus on those needing immediate attention.
- Limited biological research to guide planning and develop adaptation approaches. Little ‘bioclimatic modeling’ (Pearson and Dawson 2003) has been undertaken in

the hotspot (see Section 8.3.1) but such studies would help identify the nature of potential climate change impacts on biodiversity.
- Lack of a standardized rapid assessment methodology to identify species priorities. Bioclimatic modeling for most threatened or other species in the hotspot is unlikely to be conducted in the near future, and a short-term alternative is needed. Plans to develop and trial a rapid methodology to assess species vulnerability to climate change are underway (see Section 8.3.1).
- Low understanding of potential climate change impacts on protected areas and other sites of conservation importance. Assessment of potential climate change impacts on protected area systems is required in all Hotspot nations, as well as a regional assessment looking at the hotspot's protected area networks as a whole. This is particularly important because well-managed protected area networks will be a key tool in reducing the impacts of climate change on biodiversity (e.g. Hole *et al.* 2009).

Conservation planning is also hindered by a lack of climate change projections for much of the hotspot (most modeling has focused on the Lower Mekong Basin) and the inherent uncertainty of modeling results (see Section 8.2.2).

8.6.2 Capacity Needs

Raising local capacity to address climate change is a central objective of most of the reviewed initiatives in the hotspot (Appendices 6 and 7). Local capacity is currently limited by the following issues:

- Although some national agencies have been the focus of considerable project support (especially for REDD implementation), most agencies, especially at provincial and district levels, have limited understanding or awareness of climate change issues. They consequently lack the ability to provide enabling support to communities.
- Most communities have limited understanding of climate change issues and the links with resource degradation, although many people are aware of, and have been impacted by, changing weather patterns (e.g. Oxfam 2009; MoE 2011).
- Most communities lack the technical capacity or resources to plan for, and implement, climate change initiatives. In the context of biodiversity conservation, this is particularly relevant for poverty-affected communities dependent on natural resources.
- Most civil society groups have a limited capacity to address climate change issues, while some regional modeling agencies have a high technical capacity.

Addressing climate change issues is also hindered by the relatively small number of civil society groups in the hotspot for natural resource management, although this is changing.

8.6.3 Integration of Climate Change Policies

National climate change policies are not yet well integrated into broader policy frameworks in the hotspot (see Section 8.5.1); this is well recognized and in some Hotspot nations, especially Cambodia, Lao PDR and Vietnam, is being addressed by many efforts (e.g. some of the projects listed in Appendices 6 and 7). These policies, as well as National Biodiversity Strategies and Action Plans, currently place little emphasis on biodiversity conservation under climate change. Two other issues, noted by regional project managers, are (a) the challenge of integrating climate change into provincial government planning, which will be critical to achieving real changes to natural resource management; and (b) the lack of clarity among some government agencies over their individual roles and responsibilities for climate change.

8.6.4 Current Project Coverage

Most projects identified in this review (Appendices 6 and 7) are largely focused on (a) three of the six Hotspot nations, Cambodia, Lao PDR and Vietnam, and particularly sites within the Lower Mekong Basin; (b) mangroves, wetlands generally, and lowland and upland forests. Myanmar and the Chinese portion of the hotspot are receiving the least project effort. For Myanmar, this may largely be due to international sanctions which restrict many donors. For China, this is partly due to the early stage of climate initiatives within the nation and relatively limited funding opportunities thus far. For habitats, most projects appear to focus on habitats of importance to human livelihoods. The result may be mangrove projects which do not include nearby grasslands or peat swamp forest, or upland forest projects which do not include restricted montane vegetation communities; in both cases, the latter are of equally or higher priority for biodiversity conservation. In the context of CEPF Priority Corridors, the ‘Mekong River and Major Tributaries’ is receiving considerable project assistance, while the ‘Northern Highlands Limestone’ is receiving almost none.

These issues may not reflect design flaws in existing projects because for most, biodiversity conservation per se is not the principal objective; REDD projects for example need to target vegetation communities with large carbon stocks to be successful. Instead, they illustrate that: (a) current initiatives are insufficient to conserve biodiversity under climate change; (b) donor priorities are largely focused on human rather than biodiversity issues, with project elements for natural resources usually oriented toward human needs; (c) despite large sums of donor funding in some parts of the hotspot for climate change projects, little of this is available for biodiversity conservation; (d) donor priorities have an important influence on the scope and geographic spread of climate change initiatives in the hotspot. Donor priorities are heavily influenced by those of national governments in the hotspot, and these observations emphasize the need to provide both groups with timely and objective information on species and sites of highest conservation priority.

8.6.5 Existing Drivers of Biodiversity Loss

Factors influencing conservation efforts under climate change (see Sections 8.6.1 to 8.6.4) are compounded by other drivers of biodiversity loss in the hotspot. These include: population growth and urbanization; economic growth and increasing consumption; inappropriate land distribution, land tenure and land-use policies; weak regulatory and governance frameworks; and institutional capacity limitations (see Section 9.8). Parts of the hotspot have been the focus of conservation efforts for over a decade, but despite this, many issues, such as wildlife trade, illegal logging and unsustainable economic development, have appeared intractable. The impending construction of the first hydropower dams along the lower Mekong River (Grumbine and Xu 2011), despite scientific evidence of the impacts on people and biodiversity, is a case in point. Yet to be successful, climate change initiatives will require a far greater level of planning and coordination, in managing the well-being of millions of people potentially displaced by sea-level rise or those suffering food shortages due to declines in agricultural productivity or wild fisheries. This will be a vast undertaking, even if such changes occur gradually over several decades. Measured against the reality of existing threats to biodiversity and limitations to conservation action, these issues are daunting.

8.7 Conclusion

The key conclusion of this chapter is that conservation donors should continue to focus their investment on addressing the principal causes of biodiversity loss in the hotspot, in order to increase resilience of ecosystems and species populations, and enable them to adapt to a changing climate. Whether or not they are labeled as ‘climate change adaptation’, the most important activities to increase the resilience of biodiversity to climate change will be those that: maintain and enhance habitat connectivity; adopt ecosystem-based approaches; strengthen protected area management; provide refugia for core populations of threatened species where they are protected from over-exploitation; and alleviate pressure from illegal wildlife trade. These should be considered high priorities for funding in the context of climate change in the hotspot.

9. THREAT ASSESSMENT

9.1 Overview

The Indo-Burma Hotspot is the most threatened hotspot, based on the proportion of original habitat remaining (CI 2011). Threats to many species, sites and even landscapes are immediate and severe (e.g. Duckworth *et al.* 1999, Baltzer *et al.* 2001, Nooren and Claridge 2001, Tordoff 2002, IUCN 2011). The combination of economic development and an increasing human population is exerting enormous pressure on the region’s natural resources, and overexploitation has extirpated species from many areas. Existing planning and management systems are inadequate to control these pressures. The government institutions responsible for the management of natural resources and biodiversity often lack the financial resources, technical expertise and incentives to fulfill their mandates effectively.

This chapter draws on the results on the stakeholder consultations conducted in the hotspot between July 2011 and January 2012 (Figure 16 and Table 16), an analysis of threat data maintained on the IUCN Red List (IUCN 2011) for globally threatened species found in the Indo-Burma Hotspot (Table 17), and a review of relevant literature. Unless otherwise stated, most species-specific threat information in this chapter is drawn from the relevant page of the IUCN Red List: IUCN 2011.

Overall, there was broad agreement about the most urgent threats to biodiversity in the region across the stakeholder consultations, although there were differences among groups, workshops and countries with regard to the relative severity of different threats (Table 16). Some of these differences can be attributed to different perspectives among diverse groups of stakeholders but they also reflect genuine variation across the hotspot with regard to the severity and immediacy of different threats. For example, hydropower dams were viewed to be a greater threat in Cambodia and Lao PDR, where important lowland riverine ecosystems largely unaffected by dams remain, than in China or Thailand, where many of the major river systems have already been compromised by dam construction. It should also be noted that the conclusions of the participants reflect a very broad range in level of understanding of the identified threats among the individual participants within each country and across the hotspot as a whole.

Figure 16. Prioritized Threats to Biodiversity in the Indo-Burma Hotspot, Based on Stakeholder Consultations in Each Country

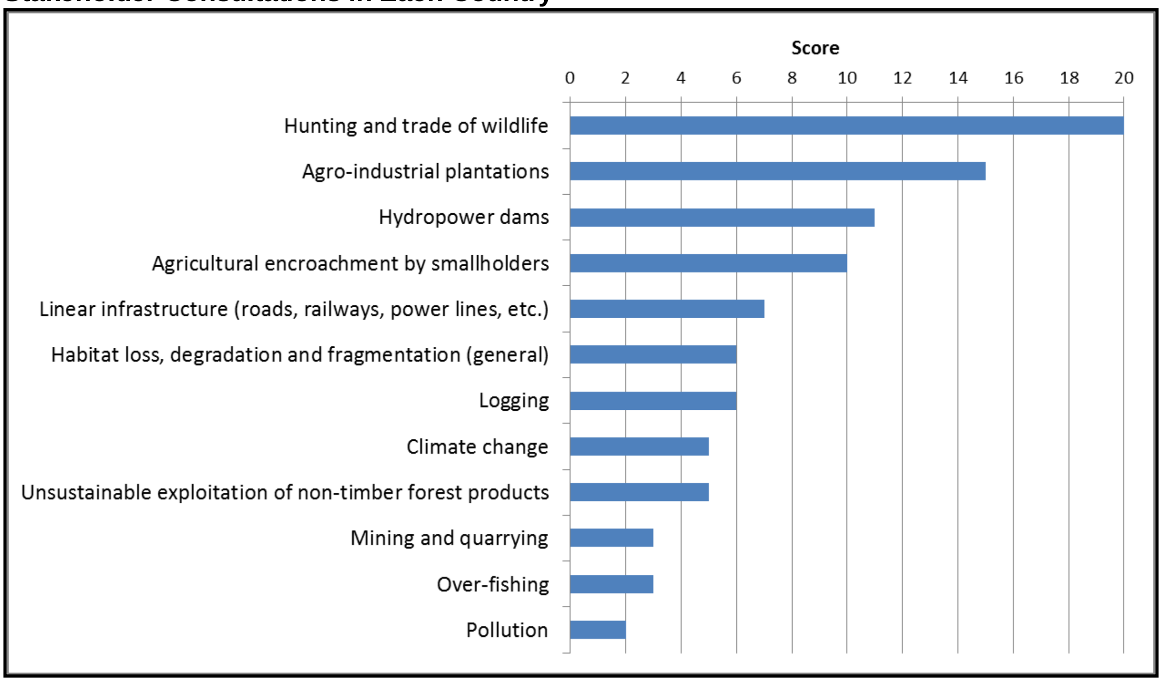


Table 16. Top Ranked Threats at Stakeholder Consultations in Each Hotspot Country

Threat	Cambodia	China	Lao PDR	Myanmar	Thailand	Vietnam	Overall Score	Overall Rank
Hunting and trade of wildlife	4	2	2=	1		1	20	**1**
Agro-industrial plantations	1	1	2=	5			15	**2**
Hydropower dams	2	4	1				11	**3**
Agricultural encroachment by smallholders			5	2	1		10	**4**
Linear infrastructure (roads, railways, etc.)		3			2=		7	**5**
Habitat loss, degradation and fragmentation (general)	5=				5	2	6	**6=**
Logging			4	4		4	6	**6=**
Climate change					4	3	5	**8=**
Unsustainable exploitation of NTFPs					2=	5	5	**8=**
Over-fishing				3			3	**10=**
Mining and quarrying	3						3	**10=**
Pollution	5=	5					2	**12**

Notes: Overall score equals the sum of the scores for each country, based on 5 for the top ranked threat, 4 for the second ranked, 3 for the third ranked, 2 for the fourth ranked and 1 for the fifth ranked. A standard set of threat categories was not used across the workshops but, rather, the suggestions of participants were grouped together under similar themes.

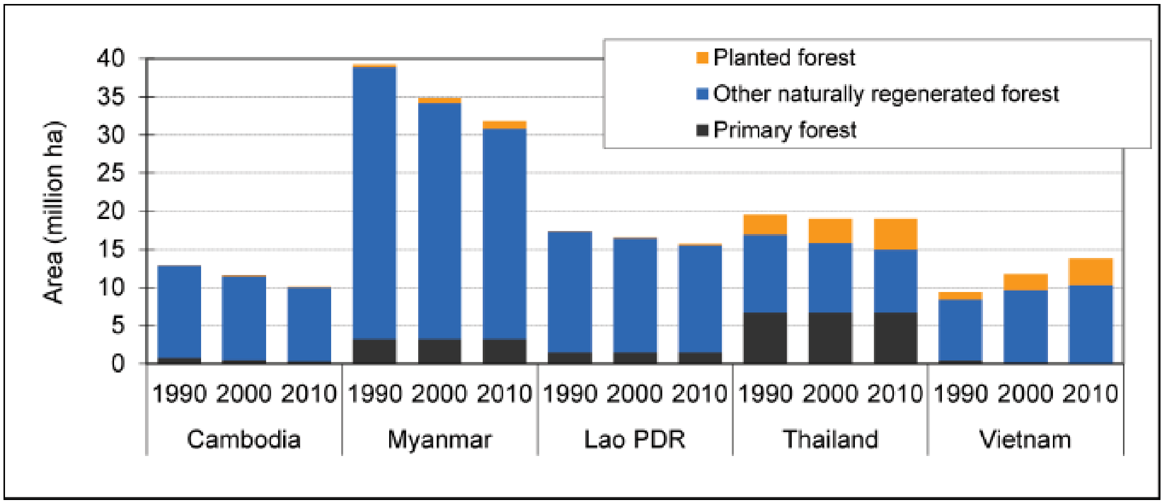
Table 17. Number of Globally Threatened Species Affected by Each Category of Threat on the IUCN Red List, with Projected Trend in Severity

IUCN Threat Category	No. of Threatened Species	Projected Trend in Severity of Threat
Biological resource use	123	Broadly constant
Agriculture and aquaculture	115	Increase
Residential and commercial development	68	Increase
Pollution	37	Broadly constant
Transportation and service corridors	24	Increase
Energy production and mining	13	Increase
Human intrusions and disturbance	13	Broadly constant
Climate change and severe weather	9	Increase
Invasive and other problematic species and genes	7	Increase
Natural system modifications (e.g. dams, fires)	6	Increase
Geological events	0	Broadly constant

Notes: Data on no. of threatened species from IUCN (2011); project trend in severity of threat based on subjective assessment.

Forest landscapes continue to face many pressures across the hotspot (Figure 17). A recent review of protected areas for tiger across Asia found that 71 percent were undergoing deforestation and fragmentation (Mondal and Nagendra 2011). Although commercial timber extraction accounts for much of the past deforestation in Indo-Burma, the greatest cause at present is the expansion of plantations and agriculture, usually accompanied by other threats, such as logging and infrastructure expansion (Geist and Lambin 2001). Meanwhile, freshwater floodplain swamps and wetlands have been converted to paddy rice cultivation and other uses, many rivers have been dammed and modified, and large areas of mangrove have been enclosed within aquacultural ponds.

Figure 17. Forest Area by Category in Hotspot Countries, 1990-2010



Source: FAO (2010a).

A threat ranked even higher than habitat loss, based both on the stakeholder consultations (Figure 16) and on the IUCN Red List threat categories (Table 17), is the unsustainable extraction of species from ecosystems, including selective logging, hunting, fishing and collection of nontimber forest products. Many species face extinction through this means, with knock-on effects on wider ecosystems. For instance, status assessments of many freshwater fish in recent years highlight the gravity of their plight.

Ecosystem integrity is also deteriorating due to a variety of other threats, notably the proliferation of dams and linear infrastructure, pollution, mining, invasive species and climate change. The broad consensus from the consultation workshops was that most of these threats are set to get more rather than less severe, at least in the short-term.

9.2 Overexploitation of Natural Resources

Direct use of biological resources is one of the greatest threats to conservation outcomes in Indo-Burma, and it is the threat affecting the largest number of globally threatened species in the hotspot (IUCN 2011). One or other form of over-exploitation was ranked in the top two threats during the stakeholder consultations in all countries except Cambodia. Over-exploitation takes many forms, which the stakeholders classified in various ways. This section distinguishes hunting and trade of wildlife from unsustainable exploitation of NTFPs, because the two threats require different, albeit overlapping, sets of strategies. Logging is treated separately, again because of the need for a different set of strategies.

9.2.1 Logging

Current Red List assessments list logging as a threat to more species than any other form of biological resource use in Indo-Burma. This was ranked among the top five threats in Lao PDR, Myanmar and Vietnam, and as the sixth-ranked threat overall. The clearfelling of natural forests and other destructive forestry practices that blighted past decades have now generally diminished, as countries look to plantations and to forests beyond their borders for their timber and pulp needs. Nevertheless, selective logging has massively impacted the condition and composition of forests over many centuries, especially in the past century with improved technology and transport, and continues today. The direct impacts of logging on ecosystem health can be significant, through the selective removal of large trees that provide food, roosting and nesting habitat for other species, such as hornbills, and changes to forest structure that affect arboreal species, such as gibbons. However, the indirect impacts can be equally, if not more, significant, if the construction of logging roads opens up forest areas to subsequent settlement, conversion to other land uses, and hunting.

Commercial logging in lowland evergreen and semi-evergreen forests has been devastating. On Hainan Island, natural forest cover fell from 26 percent in 1956 to 7 percent in 1983 (NEPA 1994), while in Thailand, less than 5 percent of the level lowlands retained forest cover by 1995 (Stewart-Cox and Cubitt 1995). Net annual forest loss between 1990 and 2000 was 0.2 to 0.3 percent in Myanmar (Leimgruber *et al.* 2004), and even higher in neighboring Thailand (Lynam 2003). Loss of natural forest cover in China, Thailand and Vietnam since the 1950s put their forestry industries into substantial decline. Floods, including those in Nakhon Si Thammarat province in Thailand and the Yangtze Basin in China, prompted national logging bans in Thailand, Vietnam and China in 1989, 1997 and 1998, respectively (Carew-Reid 2002, BirdLife International 2003). In Thailand, the annual rate of deforestation fell from 0.77 percent in 1990-2000 to 0.11 percent in 2000-2005, and to 0.08 percent in 2005-2010, although these figures conceal an increase in the area of plantation (Blaser *et al.* 2011). Some of the timber shortfall from rapid economic growth in these countries was then met by exploitation of forests in Myanmar and Lao PDR (Carew-Reid 2002, BirdLife International 2003). Western and northwestern Lao PDR lost over 5 percent of its humid tropical forest between 2000 and 2005 (Hansen *et al.* 2008), while Myanmar lost an estimated 74,400 square kilometers (19 percent) of forest between 1990 and 2010, including 15,500 square kilometers (4.7 percent) between 2005 and 2010 (Blaser *et al.* 2011).

Because demand for wood products in each country continues to increase, and is not fully met by commercial timber plantations, national logging bans in China, Thailand and Vietnam have heightened logging pressure on natural forests in Cambodia, Lao PDR and Myanmar (Sadoff 1992; Durst *et al.* 2001). Although a nationwide logging ban was introduced in Cambodia in 2002, commercial logging has been replaced by illegal logging (Global Witness 2007).

Often, implementation of forest-protection law falls down when it requires coordinated action between departments, notably the agency responsible for forest protection, the police and the public prosecutor's office. Timber species with high economic value are at greatest risk, such as *Erythrophleum fordii*, *Dalbergia* spp., various dipterocarps, such as *Dipterocarpus* spp., *Shorea* spp. and *Hopea* spp., and various conifers, including *Fokienia hodginsii*. Stocks of most of these species have declined significantly over recent decades.

Research from the National Resource Protection Group in Cambodia indicates that enforcement of protection for valuable timber trees has been lax there, leading to drastic declines (Weinland and Sokheng 2011). The group reported that, in 2008, the Kingdom retained more than 30 percent of its pre-Khmer-Rouge-era luxury-wood resources but that this number had fallen to a staggering 3 percent in Mondulkiri, Ratanakiri and five other heavily forested provinces by 2011. Criminal networks that traffic timber are increasingly sophisticated and the demand for *Afzelia xylocarpa* and rosewood (*Dalbergia* spp.) has increased, to supply Cambodia's proliferating hotels, mansions and boardrooms.

Myanmar's forests, which support a great diversity of commercially valuable timber species, including teak and various dipterocarps and rosewoods, have also been heavily impacted by commercial logging (e.g. Brunner *et al*. 1998, Blaser *et al.* 2011). Here, where the area harvested annually has averaged about 4,110 square kilometers over the last five years, 52 percent of logging areas are under some form of management plan or harvesting scheme but less than 2 percent of the total meets International Tropical Timber Organization (ITTO) criteria for sustainable forest management (Blaser *et al*. 2011). In neighboring Thailand, an estimated 110 square kilometers (4 percent) of semi-natural teak plantation and 4,020 square kilometers (4 percent) of the protected forest estate are under sustainable forest management (Blaser *et al*. 2011).

9.2.2 Unsustainable Exploitation of Non-timber Forest Products

Trees are not the only plants affected by unsustainable harvesting. Thousands of plant species in the region have documented uses in human societies, from decoration to construction, and from food to traditional medicine. Some two-thirds of plant species in the forests on Hainan Island, for instance, are used locally for timber, medicines, fiber and fruit (Davis *et al*. 1995). Thus, overexploitation of plants has implications not only for biodiversity but also for rural livelihoods. For instance, surveys in Cambodia found that NTFPs provide 0 to 20 percent of the livelihood value for better-off households, and 10 to 40 percent for poor households (Hansen 2006), while, in parts of the northeast, they provide up to 90 percent of farmers' income (Lund 2006). Lack of data constrains evaluation of the severity of threat, as does the fact that many of the species most affected by it have not been assessed by IUCN. Nonetheless, its effects on many groups of plants, for instance orchids, as well as on certain medicinal plants, ornamental plants and rattans, are potentially devastating, and local extirpations are already evident. Demand from the traditional medicine trade is known to be a significant factor contributing to the depletion of Himalayan yew (*Taxus wallichiana*) in Yunnan, and to the bulk removal of *Dendrobium* spp. and other wild orchids from Lao PDR and Myanmar to China (S. Gale *in litt*. 2012). Horticultural uses place huge pressure on cycads, a group that includes many threatened species in the hotspot, while *Paphiopedilum* slipper orchids continue to be removed *en masse* for the horticulture trade from forests in northern Myanmar, southern China and northern Vietnam (S. Gale *in litt.* 2012). Very little information is available on the status of fungi in the hotspot (Boa 2004) but it is likely that many species are over-collected.

9.2.3 Hunting and Trade of Wildlife

Unregulated, unsustainable and unreported hunting and trade has driven many animal species in the hotspot to (and, in some cases, over) the verge of extinction, and severely suppressed populations of others (e.g. Nash 1997, Nooren and Claridge 2001, Oldfield 2003, Lau *et al.* 2010). This was ranked as the top threat during the consultations in Myanmar and Vietnam and the number one threat overall. There are several causes that arise locally, among the people responsible, including subsistence needs, recreation, and incidental, opportunistic exploitation. For instance, in rural Lao PDR, wild foods contribute 61 to 79 percent of non-rice food consumption by weight (TRAFFIC 2008). However, trade demand, from both domestic and international markets, is often a key factor driving overexploitation (Corlett 2007, Nijman 2010). Pangolins and turtles used for meat and in traditional Chinese medicine are the most frequently encountered vertebrates seized from illegal traders in Southeast Asia (TRAFFIC 2008), leaving most species Endangered or Critically Endangered. Also affected are tiger, bears, rhinos, snakes, geckos, monitor lizards and primates.

Prior to the 1990s, the greatest declines were in China, which is the major market for wildlife products in the region. During the 1990s, the focus of pressure shifted to populations in Vietnam, then Lao PDR, Myanmar and Cambodia, as the economies of these countries opened to international trade, infrastructure developments linked previously remote areas to outside markets, supplies of wildlife products in China became depleted, and domestic demand for wildlife products increased. In Myanmar, hunting occurs in around 70 percent of protected areas (Rao *et al.* 2002), with large volumes of wildlife and wildlife products transported to China's Yunnan province and to Thailand, and some consumed domestically (Clarke 1999).

The values of some species have risen to the point that even formerly secure populations in more affluent areas are heavily trapped, as with the population of Chinese three-striped box turtle (*Cuora trifasciata*) in Hong Kong (Lau 2003). Many target species have been reduced to such low levels that traders now acquire wildlife and wildlife products from outside the region. Most pangolins found in trade in Vietnam are now in shipments from Malaysia and Indonesia (Shepherd 2009). In the last few years, wildlife trade webs have spread even further afield, to the point that Vietnamese traders have been implicated in a surge in rhinoceros hunting sweeping South Africa and Zimbabwe (Milliken *et al.* 2009).

Limited resources, manpower, capacity, and motivation among enforcement agencies mean that hunting and trapping of animal species continues largely unabated. Trade networks are pervasive, and financial incentives to hunt these species are often high for rural people, particularly where there are few alternative sources of income. A recent study in northern Myanmar found hunting to be the highest source of income among 24 percent of respondents, after NTFP collection (31 percent) and farming (45 percent) (Rao *et al*. 2010).

The combination of wide traditional uses, accelerating and poorly-regulated trade, and a growing consumer demand, has devastated many species. Hunting recently extirpated lesser one-horned rhinoceros from mainland Asia (Brook *et al*. 2011), and threatens to drive many other species to local or global extinction. High value species, such as pangolins and turtles, are hunted in a targeted manner, using trained dogs or other special techniques. However, species with little or no value in trade are not spared, as they may become victim to opportunistic exploitation by hunting parties or fall prey to snare lines set to capture other species. Indiscriminate snaring has been identified as a major threat to Indo-Burma's terrestrial flagship species, saola, which, ironically, has little value in the trade, perhaps because it was unknown in Chinese traditional medicine (Hance 2011).

Another way in which species are affected indirectly by trade-driven hunting is through declines in species to which they are ecologically linked. For instance, overharvesting of prey animals threatens the survival of carnivores, including all the otter species. Tiger, in particular, requires a large ungulate prey base, now rarely to be found, and this is considered the second-greatest barrier to tiger conservation after the lack of law enforcement (Sanderson *et al.* 2006, in IUCN 2011). In birds, declines in wild ungulate populations have contributed to those of scavengers, such as three Critically Endangered vulture species.

Many of the animal species being traded at highest volumes in the wildlife trade are reptiles. Many turtle species command high values in the trade, as pets and, especially, for food and traditional medicine, including Vietnamese pond turtle (*Mauremys annamensis*), impressed tortoise (*Manouria impressa*) and box turtles (*Cuora* spp.). Monitor lizards (*Varanus* spp.), tokay gecko (*Gekko gecko*) and various species of snake are particularly targeted by trade, because of their perceived medicinal benefits. The Critically Endangered Siamese crocodile is collected to supply crocodile farms in Cambodia and Vietnam, which, in turn, supply meat and skins for foreign markets.

A large number of mammal species are threatened by hunting and trade, as either direct targets or incidental by-catch, and this section does not attempt to present a comprehensive list. Primates are targeted throughout the hotspot, for food, traditional medicine (such as bone 'glue') and pets. Many of the primates endemic to Indo-Burma, such as cao vit crested gibbon, Delacour's leaf monkey and Tonkin snub-nosed monkey persist only as one or a handful of relict populations, and the hotspot is home to six of the 25 most endangered primates in the world (Mittermeier *et al.* 2009). Other species, previously thought to be relatively little threatened, such as macaques, are now coming under increasing hunting pressure to supply demand from the biomedical industry. Other mammal species highly impacted by hunting include: cats, such as tiger, Indochinese clouded leopard (*Neofelis nebulosa*) and marbled cat (*Pardofelis marmorata*), targeted for their skins, teeth and claws and bones used in traditional medicine; bears, targeted for their skins, bears and bile (extracted from captive animals held in 'farms'); otters, targeted for their meat, pelts and body parts for traditional medicine; and pangolins, targeted for their skin, meat and scales.

In comparison with mammals and reptiles, very few birds are of sufficiently high commercial value to be specifically targeted by hunters. Nevertheless, incidental hunting, indiscriminate snaring and egg collection have been major factors in the declines of many of the hotspot's most threatened bird species, including white-shouldered ibis, giant ibis, white-winged duck, Edwards's pheasant (*Lophura edwardsi*), green peafowl (*Pavo muticus*) and white-eared night-heron (*Gorsachius magnificus*).

As human populations and levels of consumption increase, overfishing presents a growing threat to the region's freshwater fish diversity, with potentially significant indirect impacts on other species through, for example, depletion of prey species. The hotspot's most productive freshwater fishery, Tonle Sap Lake, has witnessed the recent disappearance from catches of some of the larger, more valuable species, an overall decrease in average fish size, and lower catches per unit effort (Baran *et al.* 2001). Overfishing is not restricted to industrial-scale fisheries. The increasing incidence of poison, electric and even bomb fishing on a local scale (e.g. Chen 2003) can, in conjunction with other threats, cause drastic reduction in whole fish communities (Baltzer *et al.* 2001). At Myanmar's Alaungdaw Kathapa National Park and Htamanthi Wildlife Sanctuary, for example, liquid pesticides are poured into pools in seasonal streams; as well as affecting aquatic fauna, such practices can result in the poisoning of wild animals that drink from the pools, and harm humans and livestock (CARE Myanmar 2003). Use of poison and explosives for fishing is frequently associated with intensified infrastructure development, particularly as road workers often have access to dynamite (S. Kullander, C. Ferraris, Jr. and Fang Fang *in litt.* 2004).

The list of fish species threatened with extinction by overfishing is a long one. The most threatened species include Mekong giant salmon carp (*Aaptosyax grypus*), giant carp, Jullien's golden carp, and the hotspot's freshwater flagship, Mekong giant catfish. For these and other large-bodied species, over-exploitation typically takes the form of commercial fishing to meet domestic market demand. Other species are not captured for consumption but to supply the (mainly international) aquarium trade. Collection for the aquarium trade has been identified as a major factor in the declines of several globally threatened fish species, including red fin shark (*Epalzeorhynchos munense*), Siamese fighting fish (*Betta splendens*) and Asian arowana (*Scleropages formosus*), which has been traded since at least the 1970s and has disappeared from many locations where it formerly occurred.

9.3 Habitat Loss, Degradation and Fragmentation

The recent stakeholder consultations point to the overriding threat posed by habitat loss, degradation and fragmentation. Besides the better-known vertebrate species that constitute the targets of much conservation action, habitat loss threatens a vast array of lesser-known and undescribed species especially of plants, invertebrates and fungi. The scale of loss is immense: less than 5 percent of the Indo-Burma Hotspot remains covered by primary vegetation (CI 2011), while mildly damaged yet ecologically functional forest probably covers only 10 to 25 percent (van Dijk *et al.* 2004).

According to Cambodian government figures, 8,990 square kilometers of forest were converted legally, and 2,240 square kilometers illegally, from 2003 to 2007; the most significant losses were in the northwest, notably Banteay Meanchey, Battambong, Siem Reap, Oddar Meanchey and Pailin provinces (Blaser *et al.* 2011). Since 2006, one of the biggest threats to Myanmar's northern frontier forests has been deforestation to make way for sugarcane, tapioca, castor oil and rubber plantations (Global Witness 2009). Habitat conversion to agriculture takes two main forms: conversion of forest to agro-industrial plantations; and agricultural encroachment by small holders. Although both have similar impacts, the two forms are considered separately below because their socioeconomic and political drivers are distinct, and hence they require different responses. Other causes of habitat loss, degradation and fragmentation include development of hydropower dams, linear infrastructure, and mines and quarries.

9.3.1 Agro-industrial Plantations

Conversion to plantations, often through the granting of economic land concessions, is one of the most significant causes of forest loss in the region: a fact repeatedly and explicitly highlighted during the stakeholder consultations. This was considered the top-ranked threat during the consultations in Cambodia and China, and the second-ranked threat overall. While natural forests are mostly now confined to lands less suited to arable farming, they continue to be replaced by perennial cash crops, including: eucalypts, acacias, rubber, pines, and fruit trees across the region; tea in China, Myanmar and Vietnam; coffee in China, Lao PDR and Vietnam; oil palm in southern Myanmar and peninsular Thailand; teak in Myanmar; and cashew in Vietnam (Eames 1995, MacKinnon *et al.* 1996, Duckworth *et al.* 1999, Wells 1999, Das 2000, BirdLife International 2003, Clay 2004, Leimgruber *et al.* 2004, Eames *et al.* 2005, Manivong and Cramb 2008). In Myanmar, about 300 square kilometers of plantation are established each year (Blaser *et al.* 2011). The increasing threat to biodiversity from expansion of rubber was highlighted at the stakeholder workshops in Cambodia, Lao PDR, Thailand, and China, along with that from oil palm in Thailand and tea in Yunnan. Rubber plantations, originally planted for latex but increasingly harvested for timber (Blaser *et al.* 2011), are rapidly encroaching into protected areas in southern Thailand (The Nation 2011), Cambodia (Forest Carbon Asia 2011b) and China (Liu *et al.* 2006). Besides the growth of market economies and investment from firms in China and Vietnam, this is driven by increasing rural populations in some areas (see Section 5.2.2).

In general, conversion of forest to plantations implies wholesale loss of forest-adapted species (e.g. Aratrakorn *et al.* 2006). Globally threatened species affected by conversion include Eld's deer and white-shouldered ibis in Cambodia, which are threatened by expansion of rubber, cassava and teak, and Gurney's pitta in southern Myanmar, which is threatened by expansion of oil palm. In Vietnam the post-war human demographic explosion and extensive clearing for coffee, rubber, and cashew across the south of the country have reduced the available habitat for yellow-cheeked gibbon, black-shanked douc and other globally threatened species.

One documented case of the effect of plantations on a globally threatened species is that of Hainan gibbon. The area of forest on Hainan Island considered able to support the species fell by 58 percent between 1991 and 2008, with plantations the main factor below 760 m (Zhang *et al.* 2010). At the gibbon's Bawangling refuge, KFBG worked with the nature reserve authorities to freeze plantation expansion and implement active restoration between remaining habitat fragments. By contrast most "reforestation" programs underway in southern China and Vietnam adopt monocultures of eucalypts or pines, which are fire-prone, nutrient-depleting and ecologically sterile (MacKinnon *et al*. 1996, 2001). Some widely-introduced economic plants, such as eucalypts, actually have allelopathic impacts on native biota (Fang *et al.* 2009). At best, plantations of non-native trees provide some habitat structure and ground cover, as well as an alternative source of timber to natural forest. However, the biodiversity and ecosystem service values of such plantations are significantly lower than those of natural forests, and often even of the 'degraded', non-forest habitats they replace.

9.3.2 Agricultural Encroachment by Smallholders

Throughout Indo-Burma, rural communities in upland areas have long practiced various forms of shifting cultivation, typically involving rotational systems of swidden fields and regenerating fallows. This can have negative effects on forest integrity and continuity (MOPE 2002, Leimgruber *et al.* 2004), as in the case of Myanmar's Natmataung National Park (J. C. Eames verbally 2004). The replacement of forest by permanent arable agriculture has a long history in the hotspot, of which vast areas now lie under rice, maize, tobacco, cassava and sugarcane, along with the patchier occurrence of other crops, such as cotton, soybean, sorghum, cassava, wheat and peanuts (Clay 2004, Pollard and Evans 2008). Globally, tropical forests were the main source of new agricultural land in the 1980s and 1990s (Gibbs *et al.* 2010). Besides the expansion of cash crops, farmers still need new land for subsistence agriculture, especially the increasing rural populations in Cambodia and Lao PDR (see Chapter 5). Agricultural expansion is taking place along the edges of large forested regions, such as the northern edge of the Central Dry Zone and in the Ayeyarwady and Myitha River valleys in Myanmar (Leimgruber *et al.* 2004). During the stakeholder consultations, this was considered to be the top-ranked threat in Thailand and the number two threat in Myanmar.

Not all forms of shifting cultivation are detrimental to forest biodiversity (Pye-Smith 1997). For example, a landscape maintaining traditional swidden practices in Yunnan's Xishuangbanna prefecture retained high bird richness and diversity relative to a nearby landscape undergoing rapid agricultural change (Wang and Young 2003). Some forms of low-intensity agroforestry (e.g. in Lao PDR) have existed for millennia without major deleterious impacts; here a rich tapestry of landscape, tradition and culture supporting biodiversity of global importance is being fragmented as a result of agricultural intensification (P.D. Round *in litt*. 2002). There is a need to review the compatibility of such systems with forest conservation and safeguard sustainable practices. Cardamom is one crop that may be compatible with conserving semi-natural forest, if the economic context (Ducourtieux *et al.* 2006) and ecological impacts (Feng and Li 2007) are conducive. However, experience from the Hoang Lien mountains of northern Vietnam demonstrates the potential of this crop to destroy habitat for montane birds through changes to understory structure (Eames and Mahood 2011).

While there are limits on the amount of new land suitable for arable farming, there will continue to be escalating demand for land to meet the food, fiber and fuel demands of the burgeoning human population, exacerbated by depletion of soil nutrients and fossil-fuel-derived fertilizers, and increasingly unpredictable climates (van Vuuren *et al.* 2008, Smith *et al.* 2010). Natural forest continues to retreat in the face of this demand (e.g. Forest Carbon Asia 2011a), and loss of species richness, abundance and population size inevitably follows across taxa (Sodhi *et al.* 2009). Expansion of smallholder agriculture threatens a range of globally threatened species, such as cao vit crested gibbon, Tonkin snub-nosed monkey, François's leaf monkey and the cycad *Cycas debaoensis* in the Sino-Vietnamese Limestone Corridor, where this threat is particularly pervasive. In many cases, fire, over-grazing and over-harvest of firewood are additional threats, inhibiting the recovery of fallow or abandoned fields.

Floodplain swamps and wetlands, notably seasonally-inundated grasslands, have suffered immense historical losses to agricultural and aquacultural expansion. This has impacted many species, such as Bengal florican. In the Mekong Delta of Vietnam, almost all natural grasslands have been converted for intensive rice cultivation (Buckton *et al*. 1999), as have the formerly extensive wetlands in the Chao Phraya Basin of central Thailand (P. D. Round *in litt*. 2002).

9.3.3 Conversion of Coastal Habitats

Throughout the coastal zones of the hotspot, mangroves, lagoons, marshes and other wetlands, including some Ramsar sites, are undergoing widespread and rapid conversion to shrimp- and fish-farms (Ong 2003), or being cleared for charcoal and fuelwood. In Myanmar, where rates of loss have been quantified, mangroves are one of the ecosystems most severely threatened by habitat loss (Leimgruber *et al.* 2004). Impacts include not only habitat loss but interference with ecosystem hydrology, loss of storm barriers, and the demand for associated roads and other infrastructure (Clay 2004). Individual species threatened by aquacultural expansion into mangrove include the Critically Endangered mangrove tree *Sonneratia griffithii*, found along the Andaman Sea coast; over the period 1980 to 2000 there was a 26 percent loss of mangrove within this species' range (Duke *et al*. 2008).

Aquaculture is not necessarily incompatible with the conservation of coastal biodiversity. Traditionally managed, extensive aquaculture, as practiced at Mai Po Marshes Nature Reserve in Hong Kong (WWF Hong Kong 2006), can provide valuable habitat for many waterbirds including a number of globally threatened species (BirdLife International 2003). However, various forces, including the need for aquacultural pond owners to generate rapid financial returns in order to repay loans for the construction and lease of ponds, are driving a shift to unsustainable forms of intensive aquaculture, leading to die-back of mangrove and loss of habitat for many waterbirds.

Intertidal mudflats in the Indo-Burma Hotspot are the feeding areas of hundreds of thousands of migratory and resident shorebirds. At least 20 shorebird species, including the Critically Endangered spoon-billed sandpiper, occur in internationally-significant numbers, and several areas qualify for Ramsar designation (Round 2000, Wetlands International 2002). Piecemeal afforestation of intertidal areas with mangrove is a threat to the most important areas for migratory shorebirds, including the Inner Gulf of Thailand and the Red River Delta of Vietnam (Pedersen and Nguyen Huy Thang 1996, Erftermeijer and Lewis 1999). Mangrove afforestation changes the nature of the substrate, making intertidal mudflats unsuitable for dependent bird species such as the Endangered black-faced spoonbill (Yu and Swennen 2001). The forces driving afforestation of mudflats include the coastal protection, land reclamation, and aquaculture development agendas of national and local governments, and financial incentives from national forestry programs.

9.3.4 Hydropower Dams

Though not always separated by stakeholders from other forms of infrastructure, dams clearly emerged from the consultations as one of the most severe threats, indeed the top-ranked threat in Lao PDR and the second-ranked threat in Cambodia. Increasing regional demand for flood control, irrigation, and, especially, electricity generation is fuelling a wave of dam construction on large rivers. The reservoirs created often flood important terrestrial habitats, while artificially managed discharges cause major alterations to seasonal flow regimes and natural sedimentation processes. The dams directly impact fish migration routes and access to spawning grounds. Most lack fish passes or strategies to maintain aquatic communities downstream (Dudgeon 2000b), the first such experiments have been ineffectual (Roberts 2001), and the sheer volume of fish and diversity of species involved invalidate comparisons with temperate areas, where these techniques have been effective. Water regimes influence aquatic biodiversity via several inter-related mechanisms (Dudgeon *et al.* 2006), while displaced human communities are often relocated in areas where they convert or place additional pressure on natural habitats.

The hotspot's freshwater flagship, Mekong giant catfish is threatened by many proposed dams along the Mekong mainstream, such as Pak Lay, Pak Beng, Sayaboury, Louangphabang, Latsua and Don Sahong in Lao PDR, and Stung Treng and Sambor in Cambodia. Other highly threatened fish species potentially affected by dams in the Mekong and its Major Tributaries Corridor include Mekong giant salmon carp, giant carp, Siamese tiger perch (*Datnioides pulcher*), Mekong freshwater stingray, flying minnow (*Laubuca caeruleostigmata*) and Laotian shad (*Tenualosa thibaudeaui*). Long-distance migrants, such as Krempf's catfish (*Pangasius krempfi*), which migrates upstream from the Mekong Delta at least as far as the Khone falls (Hogan *et al.* 2007), are particularly vulnerable, because their migration routes cross the sites of multiple proposed dams. Eight-seven percent of mainstream Mekong fish species for which data are available are migratory (Baran 2006), and around 70 percent of the Mekong's commercial fish catch is composed of long-distance migrants (Dugan 2008). In terms of volume, between 700,000 and 1.6 million tonnes of the annual Mekong fish catch (up to 62 percent of the total) is at risk from the proposed Mekong mainstream dams (Baran 2010 cited in Peterson and Middleton 2010). The potential implications of this for fisheries and food security are clear when one considers that the Mekong supports the world's largest inland fishery, with approximately 2.6 million tonnes harvested annually from the Lower Mekong Basin (Dugan 2008).

While potential dam developments on the mainstream of the lower Mekong River, which remains free-flowing south of the Chinese border, have justifiably attracted a huge amount of attention from civil society, media and policy makers within and outside the region, the potential impacts of dam development on the Mekong tributaries and rivers outside the Mekong Basin are hardly less significant for freshwater biodiversity. The Yali Falls dam on the Sesan River in Vietnam has had serious deleterious effects on the river's fish and sandbar-nesting bird communities downstream in Cambodia (Baird *et al.* 2002, Seng Kim Hout *et al.* 2003). In Lao PDR, the population of Nam Theun barb (*Scaphognathops theunensis*) has declined dramatically over the last decade following the construction of the Nam Theun II and other dams in the Nam Kading Basin (Kottelat 2011b), while Nam Leuk loach (*Schistura leukensis*) and slender-tailed loach (*S. tenura*) are now considered Critically Endangered following completion of the Nam Leuk dam at their only known locality (Kottelat 2011c,d).

Impacts of dam construction on species other than fish are less known. The Critically Endangered damselfly *Cryptophaea saukra* is known only from streams in Doi Suthep-Pui National Park in northern Thailand, which have been adversely affected by the building of a small dam (Hämäläinen 2003, IUCN 2011). The bivalve mollusc *Cuneopsis demangei*, known only from the Da River near Viet Tri city, Vietnam, may already be extinct following construction of a large hydropower dam upstream. Hydropower dam projects can also have serious indirect impacts on terrestrial biodiversity, including forest destruction and increased hunting pressure, as has affected Tonkin snub-nosed monkey along the Gam River in Na Hang, Vietnam (Le Xuan Canh *et al.* 2008).

9.3.5 Linear Infrastructure (Roads, Railways, Power Lines, etc.)

The Greater Mekong Sub-region's rapid economic growth and associated urban, industrial and infrastructure developments are having severe direct and indirect impacts on natural habitats. Extension of national transport networks has had negative impacts on biodiversity throughout the hotspot, and such linear infrastructure was highlighted in the consultations, emerging as the second-ranked threat in Thailand and the third in China. At the regional level, major road networks are being created that link capital cities and major ports, such as the ADB's North-South Corridor Project, which now links all the hotspot countries with two-lane highways, and the East-West Corridor, linking the port of Da Nang in Vietnam with Bangkok, via southern Lao PDR. In Vietnam, a second major north-south highway linking Hanoi with Ho Chi Minh City through the Annamite Mountains has bisected several protected areas and compounded the threats to endemic and threatened species, such as saola, southern white-cheeked gibbon and red-shanked douc, fragmenting subpopulations and increasing human access for hunting and forest clearance. In Myanmar the impacts of roads, powerlines and other infrastructure was relatively localized as recently as a decade ago (Lynam 2003), for instance, only around 25 percent of protected areas contained roads in 2002 (Rao *et al*. 2002), but this is changing. Power and telephone lines have been implicated in habitat fragmentation for saola, Tonkin snub-nosed monkey and Hainan gibbon.

Road building has damaged aquatic ecosystems, diverting water courses, reducing canopy cover and depositing large volumes of sediment. In addition to its direct impacts, construction of roads facilitates human settlement, and makes agro-industrial plantations more economically viable. Another major indirect impact of new roads is that they strengthen economic links between remote rural areas and urban centers, facilitating the expansion of wildlife trade networks and placing increased pressure on plant and animal populations.

9.3.6 Urbanization

The world's total urban area quadrupled in size between 1970 and 2000: an increase of about 58,000 square kilometers. Urban expansion was especially rapid in the hotspot: in parts of coastal China the rate reached 13 percent per year (Seto *et al.* 2011). Urban expansion has impacted Critically Endangered plants, such as *Cycas fugax* in Vietnam and *Diospyros vaccinioides* in southern China. The loss of aquatic vegetation to urbanization threatens fish species, such as the Critically Endangered Somphongs's rasbora (*Trigonostigma somphongsi*) in the lowland Mae Khlong basin near Ratchaburi, central Thailand (Vidthayanon 2011). Urbanization is also a major contributor to pollution in the hotspot, which is treated in a later section, as well as to the growth in demand for wildlife, timber and energy. In this sense, it is both a threat and a driver.

9.3.7 Mining and Quarrying

Mining and quarrying for ores, gems and construction materials are causing localized but significant habitat loss in the hotspot. Mining was ranked as the number-three threat to biodiversity by stakeholders in Cambodia. There are currently 67 mining companies with licenses to explore for minerals in the northeast of that country, the majority of which are foreign owned. These exploration licenses cover a total of 12,000 square kilometers, including large areas in Phnom Prich Wildlife Sanctuary, Virachey National Park and other protected areas (MIME 2010). Not all exploration projects will lead to mining operations, however. There are currently only two active mining projects in northeastern Cambodia, both in Ratanakiri province: Seoul Digem Cambodia; and Ultra-marine Kiri Cambodia.

Quarrying of limestone for cement manufacture is a particular threat to limestone karst, and the severity is greatest in smaller, more isolated karst formations, such as those in the Kien Luong area in southern Vietnam, Tham Phulu and Tham Kubio in eastern Thailand, and Exianling in Hainan, which tend to be among the richest in terms of invertebrate endemism (Vermeulen and Whitten 1999). Limestone quarrying threatens a number of globally threatened species, including the cycad *Cycas tansachana* in Sariburi province, Thailand, Delacour’s leaf monkey at Van Long Nature Reserve, northern Vietnam, and François’s leaf monkey in the limestone karst of northern Vietnam and Guangxi province, China.

Mine access roads and temporary settlement by mine workers can also have serious indirect impacts, including increased levels of hunting by mine workers living in temporary camps in remote forest areas. Moreover, several mining techniques can lead to pollution of aquatic systems by sediment or toxic chemicals, with negative impacts on freshwater biodiversity. Gold panning releases mercury into the upper reaches of the Ayeyarwady and Chindwin Rivers in Myanmar (Eberhardt 2003), although there have been government efforts to control this. Mining is implicated in the collapse in populations of several Critically Endangered bivalves in the Sino-Vietnamese Limestone Corridor, including *Cuneopsis demangei*, *Lamprotula crassa*, *L. liedtkei*, *L. nodulosa* and *Lanceolaria bilirata*. Gold, sand and gravel mining are causing major changes to the geomorphologic and hydraulic features of rivers and marine-appended lakes that support important aquatic biodiversity.

9.4 Pollution

Urbanization, industrialization and agricultural intensification are leading to increased levels of pollution throughout the hotspot. Discharge of industrial waste into major waterways is a widespread problem, as is run-off of agrochemicals from agricultural land and agro-industrial plantations. Pollutants entering aquatic systems may have direct effects on sensitive animal and plant species, through toxicity, or indirect effects, particularly through eutrophication. According to the Division of Agricultural Toxic Substances of the Department of Agriculture, imports of herbicides into Thailand trebled in quantity between 1987 and 1994 (P. D. Round *in litt.* 2002). Sewage treatment is still scarce in the region, and mass dumping of raw sewage is frequent (BirdLife International 2003). Microplastic and nanosilver pollution are rising fast with consumption (Sutherland *et al.* 2009), while pollution by mining is a particular concern (see Section 9.3.7).

There has been little research on the impacts of pollution on biodiversity in the region, and as a threat to lesser-known ecosystems and organisms it may be under-appreciated. This is reflected in the results of the consultations, where pollution was consistently identified as a threat but never ranked above fifth. With the intensification of agriculture as a major socioeconomic strategy, the extensive use of agrochemicals will pose many problems for species and ecosystems in the immediate future: algal blooms in lakes are one consequence, to which vehicle emissions also contribute (Stone 2011). As well as the direct impacts on species through toxicity, the severe decline in invertebrate abundance associated with high levels of pesticide use is one of the major factors contributing to the collapse of open-country and peri-urban bird populations in agricultural landscapes throughout the region.

Impacts on coastal and marine ecosystems are significant. Nitrogen levels in waters off China have risen sharply over the last 30 years due to industrial (e.g. coal power plants) and agricultural (e.g. nitrogen oxide) pollution (Kim *et al.* 2011), increasing the threat of algal blooms and dead zones with low oxygen levels. Indeed nitrogen balance (along with biodiversity loss and climate change) has been characterized as one of the safe planetary boundaries that has already been crossed (Rockstrom *et al.* 2009).

According to IUCN (2011), pollution is a threat to many globally threatened fish species, including *Ceratoglanis pachynema* and *Schistura spiloptera*. Also believed to be threatened by pollution are various molluscs, such as *Gabbia alticola*, *Lanceolaria bilirata* and *Margarya monodi*, and the plant *Terniopsis ubonensis*.

9.5 Invasive Species, Disease and Genetic Contamination

Deliberate and accidental introduction of alien invasive species has occurred at many sites in Indo-Burma (e.g. Dudgeon and Corlett 1994, Fellowes 1999, Li and Xie 2002), although the impacts on biodiversity have been little studied to date and are, thus, poorly understood. It is often unclear whether the spread of alien species has driven or followed the depletion of native species; the latter is generally suspected, at least in terrestrial systems. Aquatic ecosystems may be more at risk. Two large introduced species, grass carp (*Ctenopharyngodon idellus*) and rohu (*Labeo rohita*), are found in Myanmar's Inle Lake, and the former poses a clear threat to the lake's ecosystem (Kullander *et al.* 2004). Water hyacinth (*Eichhornia crassipes*) and giant minosa (*Mimosa pigra*) are threats to Tonle Sap Lake and its inundation zone (MacDonald *et al*. 1997). Prickly pear (*Opuntia* sp.) is a threat to Khao Sam Roi Yot National Park in Thailand (J. Parr verbally 2003), as is mile-a-minute (*Mikania micrantha*) to the New Territories of Hong Kong (Liu *et al.* 1997). Vegetation in some areas of Myanmar's Central Dry Zone is dominated by introduced species such as *Prosopis juliflora* and *Euphorbia* spp. Globally threatened fish species threatened by invasive species include *Danio erythromicron*, *Devario auropurpureus* and Burmese rammy nose (*Sawbwa resplendens*).

Given the ongoing modification of most ecosystems, the expansion of tropical taxa into higher latitudes and altitudes, and climate variability favoring adaptable generalists over specialists, the economic and ecological impacts of invasive species look set to soar unless there is proactive and adaptive management with emphasis on prevention and early detection rather than on control, as advocated by the CBD. Of particular concern are ecologically dominant plants and ants, which have the potential to restrict the persistence of forest taxa (Corlett 2010). One potentially huge threat to ecosystems comes from aggressive invasive insects, such as the red imported fire ant (*Solenopsis invicta*), now expanding in many parts of South China (Zhang *et al.* 2007) including the Mai Po Marshes and Inner Deep Bay Ramsar site in Hong Kong (WWF Hong Kong 2006). A threat to invertebrates, plants and even medium-sized vertebrates (Taber 2000), this ant looks set to invade other countries of the region unless there are rapid improvements in biosecurity, guided by more systematic assessment of risk and probability of success: as practiced in New Zealand, the one country that has eliminated *S. invicta*. A strong biosecurity system requires coordination and information portals.

Disease may be another underappreciated threat to biodiversity. Coral disease has emerged as a serious threat to coral reefs worldwide and is a major cause of reef deterioration (IUCN 2011). Diseases and parasites from domestic and/or free-ranging livestock could also have disastrous impacts on wild ungulate species, particularly banteng, which appear to be particularly susceptible to a number of cattle diseases (Timmins *et al.* 2008a). The impact on Indo-Burma of chytridiomycosis, a fungal disease caused by the pathogen *Batrachochytrium dendrobatidis (Bd),* which has been implicated in the decline and extinction of many amphibian species in other regions of the world (Skerratt *et al.* 2007), has yet to be revealed. However, it may be that the climatic conditions currently prevalent across much of the hotspot are not conducive to the spread of the disease (see Piotrowski *et al.* 2004), and recent research has questioned the hypothesis that chytridiomycosis is causing widespread amphibian declines (Heard *et al.* 2011). Another disease that poses a potential threat to biodiversity in the region is avian malaria, which could become a greater problem with climate change (Garamszegi 2011).

The misdirected release of animals (for example, following confiscation of illegally trafficked wildlife or to earn spiritual merit) risks introducing diseases, as well as alien genotypes, to native populations (Karesh *et al.* 2007). Released captive animals can interbreed with wild populations of the same or related species, leading to genetic contamination. For example, release of confiscated long-tailed macaques is at least a localized threat to rhesus macaque (*Macaca mulatta*) in parts of the species's range in Hong Kong (Southwick and Southwick 1983) and Vietnam (Timmins *et al.* 2008b).

9.6 Climate Change

The potential impacts of climate change on the species populations and ecosystems of the Indo-Burma Hotspot are reviewed in Chapter 8. These impacts are anticipated to be severe, particularly for freshwater and coastal ecosystems, which are considered to be among the most sensitive to climate change and sea-level rise. Global effects of climate change are predicted to include temperature increases, sea level rise, increase in CO_2 concentrations, and altered patterns of precipitation (Gitay *et al.* 2002). Although temperature increases are forecast to be greatest towards the poles, climate sensitivity is highest in the tropics, since species there are not adapted to high variability and are close to their upper limits of temperature tolerance, hence many tropical species are at risk of extinction from temperature change (Deutsch *et al.* 2008). Species that persist within isolated or fragmented habitat patches are at elevated risk, because they are less able to undergo altitudinal or latitudinal range shifts in response to movement in climate 'envelopes' of suitable conditions. One of the few studies that has looked specifically at the impacts of climate change on biodiversity in the Indo-Burma Hotspot estimated that between 1.9 and 40.5 percent of endemic plant and vertebrate species may become extinct due to the climate change over the next century, depending on different modeling scenarios (Malcolm *et al.* 2006).

The specific effects of climate change on biodiversity are difficult to predict. However, Chapter 8 goes some way towards identifying the most sensitive ecosystems and species. Ecosystems that are particularly vulnerable to climate change include: inland freshwater wetlands, due to predicted impacts on hydrology (Bates *et al.* 2008); coastal wetlands and deltas, due to sea level rise, saltwater intrusion and increased severe weather events (Cruz *et al.* 2007); lowland forests, due to changes in temperature and rainfall patterns (Stott 1990, Blate 2010); and montane forests, due to changes in temperature and rainfall, compounded by limited dispersal ability of species assemblages (see Section 8.3.2). Species and groups of species that are particularly sensitive to climate change include: montane, lowland and wetland plants; freshwater invertebrates; migratory fish; montane and lowland amphibians; non-marine turtles; Siamese crocodile; migratory shorebirds; and mammals adapted to riparian and floodplain habitats (see Section 8.3.3).

Indirect impacts of climate change on biodiversity could be no less important than direct ones. In particular, the response of human populations to climate change will almost certainly place greater pressures on the hotspot's biodiversity (see Section 8.4), for instance, by due to changing agricultural patterns, realignment of infrastructure, resettlement of people and civil engineering responses to water-availability problems (Dudgeon 2007, Palmer *et al.* 2008).

9.7 Other Threats

9.7.1 Harmful Human Behavior

Besides infrastructure and agricultural expansion, human activity can itself be harmful to threatened species. This threat is sometimes referred to as 'disturbance' but it also encompasses deliberate persecution of living things. Tourist and recreational activity can disturb or kill coastal species, such as corals, sea turtles and dolphins; vessel strikes can kill or injure aquatic species, such as Irrawaddy dolphin, which are also accidentally entangled in gillnets, killed by electrofishing or restricted by fixed sitting-traps or barrier-traps, as in Songkhla Lake, Thailand. Tourist disturbance is considered a threat to the endemic white-headed langur subspecies at Cat Ba National Park, for instance night-time spotlighting from speed boats (Bleisch *et al.* 2008). Cave visiting is a threat to bats and other species, such as the Critically Endangered loach *Nemacheilus troglocataractus*, known only from a cave in the Mae Khlong Basin of Thailand. Direct human-animal conflict is a major conservation issue for certain globally threatened species, such as Asian elephant, which can destroy crops and even kill or injure people, and tiger, which is seen as a threat to humans and livestock.

9.7.2 Extinction Cascades through Degradation

Many of the threats to particular species or groups of species are having knock-on effects on ecosystems. In general, these are little studied but examples include the effects of ungulate depletion on predator and scavenger populations, the effects of disappearing seed-dispersing mammals and large birds on large-seeded trees, and the effects of declining pollinator insects on flowering plants. The decline of large ungulates across the hotspot may underlie those of threatened vulture species. The loss of large apex predators from ecosystems, exemplified by the depletion of mammals in the order Carnivora from southern China (Lau *et al.* 2010) and elsewhere in the hotspot, could be among humankind's most pervasive influences on nature due to extensive cascading effects of their disappearance on a range of processes, including the dynamics of disease, wildfire, carbon sequestration, invasive species and biogeochemical cycles (Estes *et al.* 2011). Climate change will certainly compound these disruptions.

9.7.3 Small Population Effects

The survival of many of Indo-Burma's Critically Endangered species is in doubt even if active threats can be mitigated, due to their small remaining populations, such that breeding is uncommon and inbreeding is likely. Populations of Hainan gibbon, white-headed langur, Irrawaddy dolphin and white-winged duck are threatened by inbreeding effects, limited mate-choice, and risk of human or natural disaster. The smallest populations of Delacour's leaf monkey are extremely unlikely to survive without population management, because the number of reproductively active males is often reduced to a single individual. Low population size is considered the third most significant threat to tiger, after active threats to the species and its prey (IUCN 2011). The Hainan population of Eld's deer has low genetic diversity following a population bottleneck, and this may inhibit recovery efforts. The hotspot's most threatened plant species are reduced to under a hundred mature individuals, and it seems likely that many will require active population management to recover.

9.8 Root Causes

The underlying causes of the threats outlined above are often deep-rooted and complex. Causes can be characterized as current factors that may be societal, socioeconomic or technological, or institutional (Smith *et al.* 2010). These factors can be combined with physical 'legacy' factors resulting from past ecological overshoot (or planetary boundaries already crossed), such as unavoidable climate change, soil depletion and nitrogen imbalance.

9.8.1 Population Growth, Urbanization and Migration Patterns

Humans (*Homo sapiens*) are one of the few large mammal species in Indo-Burma whose population is increasing not decreasing. Population density in the hotspot increased by about 1.4 percent per year from 2000 to 2010 (Williams 2011) and is now almost 150 per square kilometer (Mittermeier *et al.* 2011). Between 2010 and 2020, the population of the Greater Mekong Subregion is projected to increase by a further 10 percent, to 249 million (Asia Pacific Forestry Commission 2011a). Within this trend, there has been considerable migration since the 1990s, especially from rural to economically vibrant urban areas, although sometimes the converse, as in the movement of people from the Cambodian rice belt to more sparsely populated regions, including protected areas (see Chapter 5). Migration in rural areas can have huge impacts on the ability of upland populations to live sustainably (Eberhardt 2003); drivers include armed conflict, which has left an estimated 800,000 to 1 million people internally displaced within Myanmar (Mason 2000), and, increasingly, climate change (FAO 2011b). Migration towards urban centers, in the region or overseas, can reduce local pressure on land (Asia Pacific Forestry

Commission 2011b), but this may be outweighed by urban expansion into fertile regions. Furthermore, urban lifestyles are typically more resource-intensive, particularly where markets are highly liberal. The dramatic worldwide increases in urban population (from 732 million in 1950 to 3.15 billion in 2005 worldwide) and consumption have been enabled in turn by the energy subsidy of fossil fuels (i.e. the products of past photosynthesis), whose contribution to the human energy economy currently exceeds global net primary production. As we pass the peak in global oil supply, the development of alternatives to support humankind's huge population is itself a major threat to biodiversity in the hotspot, in the shape of hydropower and biofuel expansion (Lee *et al.* 2011), and the dependence of the current global food system on declining fossil fuels is bringing food-security concerns center stage.

9.8.2 Economic Growth and Regional Economic Integration

Economic growth and regional economic integration are major underlying causes of habitat loss and degradation and the overexploitation of plant and animal species. While the pace of economic development varies greatly within the hotspot, being higher in Thailand and southern China and lower in Myanmar and Lao PDR (Williams 2011), all countries are pursuing market-oriented economic policies and export-led development strategies, on the promise of strong economic growth and with the encouragement and support of external donors. This is especially notable in three critical sectors for biodiversity conservation (forestry, fisheries and agriculture), where natural ecosystems are often sacrificed for hard currency (Eberhardt 2003), generated through production of timber, pulp, palm oil and other commodities. Regional economic integration and the associated increases in cross-border trade and transnational infrastructure pose significant new challenges to biodiversity conservation, as the increased volumes of goods crossing borders make it hard to detect both illegally traded and invasive species, and the developing road networks expose previously remote areas to outside market pressures.

While increased economic growth can result in more resources being made available for biodiversity conservation, it does not necessarily translate into increased overall wealth. Measures like GNP, GDP and HDI fail to represent a country's productive base (i.e., its stock of capital assets, including institutions and natural capital) or the well-being of future generations (Dasgupta 2010). At the same time global carbon dioxide emissions continue to rise (by 45 percent globally between 1990 and 2010 and by 257 percent in China; Olivier *et al.* 2011) as a result of this mode of development, which is arguably now diminishing overall global wealth by any comprehensive definition.

Many analysts question whether economic growth can be sustained for long after the peak in global oil supply, calling for an alternative economic pathway that meets qualitative goals within energy constraints (Daly 2007, Jackson 2009, Aleklett *et al.* 2010). While economic projections become unreliable from this point onwards, there is a strong need for sustainable development policies backed up by studies that evaluate, document and promote the economic case for investing in natural capital (see Section 9.8.6). This will require interdisciplinary collaboration and dialogue between policymakers and researchers.

9.8.3 Changes in Consumption Patterns

Changes in consumption patterns for food and non-food goods are exacerbating pressure on land, particularly an increase in consumption of livestock proteins, which are less efficient foods than plants (Smith *et al.* 2010). From the mid-late 1960s to the late 1990s per-capita dietary fat supply in East and Southeast Asia rose by 86 percent; in East Asia annual consumption of meat rose by 333 percent and milk by 177 percent (WHO 2011). Global meat consumption in 2008 was projected to increase 66 percent by 2050 (Halweil 2008), and meat and dairy increases have dramatic implications for land use (e.g. Sutherland *et al.* 2010). There is cultural variation within this trend, and scope for influencing habits through environmental education. Consumption in developed countries is also contributing to loss of natural habitats in the region. For example, the major export markets for shrimp farmed in the region's coastal zones are the European Union, Japan and the United States.

Intensification is expected to be the main means of increasing agricultural production in Asia (Gregory *et al.* 2002; Bruinsma 2003) to meet the gathering food security challenge (Godfray *et al.* 2010). Some 24 percent of children in the hotspot are malnourished (Mittermeier *et al.* 2011), and this figure could rise if the challenge is not met. There is a clear need to develop approaches to natural resource management that deliver significant benefits to local communities while meeting biodiversity conservation objectives. In many cases, such approaches will need to simultaneously address issues of institutional capacity and land-use policy and planning. Both governments and producers have an interest in siting agriculture in optimal locations, and strengthening the ability of zoning to optimize ecosystem services and minimize societal costs (Clay 2004). Intact faunal communities can persist in an agricultural landscape provided that there is sufficient ecological integrity, including natural forest (Ranganathan *et al.* 2010). Productivity can rise, and environmental costs decrease, when agriculture is abandoned on marginal lands (Clay 2004). In Thailand, for instance, forests are regrowing on former agricultural land, allowing forest recovery (FAO 2011b). The global land area dedicated to fiber crops actually declined from 1961 to 2007, due to increased productivity (Smith *et al.* 2010). Improved research and practice are needed on rehabilitating degraded lands for agriculture (Clay 2004), on more innovative ecological farming methods that nurture soil biodiversity, and on the overall resource efficiency of farm management practices. These can be incorporated into efforts by protected areas to improve synergy between conservation and community development, as demonstrated by the joint work of KFBG and Yinggeling Nature Reserve on Hainan Island (Padilla and Fellowes 2010).

Environmental education, improved recycling and restoration of degraded lands may influence the pressure on forest land for pulp. Continued progress in curbing biomass demand cannot be assumed given rising fuel costs. In some cases, e.g. in west Guangxi, the fuelwood-saving benefits of biogas have been compromised by the collection of fuelwood to cook pig feed (J. R. Fellowes, pers. obs.), calling for the use of alternative feeds. While a relatively low proportion of forested land in Indo-Burma is considered suitable for conversion to biofuels, such as sugarcane (5.6 percent), soybean (2.7 percent) or oil palm (0.8 percent), the absolute area involved amounts to over 70,000 square kilometers (Lee *et al.* 2011), making this a serious threat to biodiversity.

9.8.4 Relationships between Humans and Nature

Culture influences all aspects of threats to biodiversity. Cultural drivers include increasing disconnection from nature and preference for consuming rare wildlife. Conversely, there are trends in some more educated populations to appreciate the non-utilitarian values of nature and pursue associated pastimes, such as birdwatching or nature photography. Indeed, some common presumptions, such as that most people in China are unwilling to sacrifice economic gains for nature conservation (McBeath and Leng 2006), need to be tested, as attitudes and values are dynamic. The growing separation of people from nature, with symptoms such as "biophobia" and the denial of biodiversity loss (Sutherland *et al.* 2010), threaten engagement with conservation. Several initiatives, including those of the Gaia School, KFBG, WWF and others in Hong Kong, Partnerships for Community Development in Mainland China, the Traidhos Three Generation Barge Program in Thailand, and FFI's EcoBoat Program on Vietnam's Halong Bay, are actively trying to reconnect urban people with nature. Experiential nature-education activities can be effective, and there is scope for synergy with governments' health and well-being agendas, as well as traditional Asian practices of mindfulness and spiritual enquiry.

Rural people living in close proximity to protected areas may not necessarily be supportive of conservation management (Clarke 1999), and this challenge can be compounded by poor communication about conservation aims, lack of mechanisms for local communities to benefit from protected areas, and lack of opportunities for grassroots participation in conservation. NGOs and academic institutions can build grassroots support by addressing these issues.

Unless responsible authorities have the political will to implement conservation, there is little potential to succeed. The extinction of the Vietnamese population of lesser one-horned rhinoceros, like other less heralded losses, ultimately reflects a lack of political support to secure adequate habitat, prevent encroachment, and control hunting (Brook *et al.* 2011). For protected areas, the possibility of excisions (partial or total), the lack of long-term funding security, and the lack of constant political support underlie institutional limitations (Blaser *et al.* 2011; see below). Changing the culture of indifference among decision-makers is a top priority, therefore.

9.8.5 Technological Innovation

Powerful new technologies can speed up rates of biodiversity loss, as has been noted for fishing, farming, logging, trade and pollution in the hotspot. Many industries have developed technologies that have failed to complete resource-flow cycles and, hence, to internalize costs, leading to pollution and climate change. Such technologies may be aggressively advertised by industry, with no comparable agency able to adequately present or even investigate the costs to ecosystems and society until the damage is done.

An emerging example is the genetic modification of crops, which is often held up by industry as a solution to food insecurity, despite the fact that it raises threats to food sovereignty, inherent risks to native biodiversity, and diversion of investment from ecologically resilient and sustainable agriculture (Altieri and Rosset 1999).

Arguably, though, technology is not a root cause of biodiversity loss but a neutral tool, which could equally be applied to more sustainable resource use. For example, while the internet can open up new pathways for illegal wildlife trade and invasive species, it can also empower civil society responses and cohesion. Field survey methods are improving due to use of Global Positioning System, camera traps, weather recorders, automated recognition of animal calls and images, and DNA barcoding (Sutherland *et al.* 2009). Surveillance can take advantage of the ubiquity of mobile phones with cameras and internet access, as used by members of the public in New Zealand to report suspected invasive species to a government response unit (New Zealand Government 2009). The challenge, then, is to improve the application of technology in support of biodiversity, while curbing its negative impacts.

9.8.6 Narrow Measures of Economic Development

Although biodiversity has important cultural, spiritual, recreational and personal values, government policies frequently recognize natural resources only for their market value. Throughout the world, market prices tend to reflect only the direct-use values of natural resources, ignoring indirect use, option use and existence values (e.g. SCBD 2001). Dispersed services, such as carbon sequestration, are undervalued by national governments, which tend to focus on the immediate gains from exploiting a natural resource rather than long-term, theoretical benefits from its maintenance; the devastating delayed impacts of climate change are one consequence of this market failure (Stern 2006). Yet, quality of life depends on a complex range of ecological functions that provide clean air, pure water, fertile soils and other ecosystem services. Forests and wetlands are particularly undervalued, and taking their full environmental and social value (for example, nutrient cycling, climate regulation, erosion control, and recreation) into account requires many diverse perspectives (Dudgeon *et al.* 2006).

More thorough attention to natural capital would help reinforce such policies as moratoria on the further expansion of plantations into natural forests, as was applied in 2010 to the six largest foreign plantation projects in Vietnam's Lang Son province (Forest Carbon Asia 2011c). Correcting the many market failures behind the biodiversity crisis will involve the costs of conservation being met by society as a whole, notably its wealthier sections (Whitten and Balmford 2006). Payments for ecosystem services can be effective tools for this (Goldman *et al.* 2008; Wunder *et al.* 2008). There has also been pioneering work under China's Natural Forest Conservation and Grain to Green Programs, as well as under national reforestation programs in Lao PDR and Vietnam (McNeely 2007). In future, such schemes need to address loopholes, such as the lack of additionality (Corlett 2009) and perverse incentives.

Governments responsible for long-term well-being clearly need to rise above "economism" (i.e. the reduction of progress to narrow economic measures) but also to refine these measures. Among the many improvements needed for a sustainable economics are the improved definition of 'shadow prices' (i.e. the values to be imputed to assets without current market value), and better representation of economies' comprehensive wealth, including all capital assets (Dasgupta 2010). Improving the ecological literacy of finance officials and economics students is an obvious and pressing need. Another is the improved valuation of ecosystem services. The combined value of 17 different ecosystem services, including climate regulation, water supply, and food production, has been estimated at between $16 and $54 trillion per year (Costanza *et al.* 1997), or twice the global GNP. A number of projects, including a review of the roles of natural vegetation in China (MacKinnon *et al.* 2001) and an economic review of protected areas undertaken for the lower Mekong countries (ICEM 2003), have aimed at demonstrating the economic values of biodiversity. Such studies may help ensure that investors compensate more fully for the full economic costs of their investments, for instance through a natural-resources tax or appropriate mitigation measures. Financial mechanisms could be developed that enable the beneficiaries of dispersed ecosystem services to contribute to their conservation, such as carbon offset payments and debt-for-nature swaps. However, the declining role of international donors, with standardized practices of transparency and safeguards (see Chapter 5), may make developing these more difficult.

Possible economic policy instruments to promote sustainability include: agricultural prices and subsidies; trade policies; user fees; payments for ecosystem services; tax exemptions for sustainable behavior; high levels of taxes on unsustainable practices; fines; and environmental performance bonds and deposits. To date, subsidies within the forestry and agriculture sectors have promoted increased production of a number of commodities linked to forest loss, including timber, other forest products and cash crops, as well as promoting agricultural intensification and the large-scale use of agrochemicals. Subsidies for tree planting have led to the afforestation of intertidal mudflats, grasslands and other natural non-forest habitats. Such perverse incentives may be direct, for example tax write-offs, grants or low-interests loans, or indirect, for example low land rents, low labor costs, construction of access roads and other infrastructure, or weak environmental protection regulations. Realigning subsidies and compensation schemes in support of environmental services is a key priority (Clay 2004) and signatories to the CBD must eliminate or reform incentives harmful to biodiversity by 2020 (Aichi Biodiversity Target 3; SCBD 2010).

Biodiversity offset and compensation schemes are at an early stage of development in Asia. China has various 'eco-compensation' schemes, mainly government-mediated payments for water quality and flood mitigation (Madsen *et al.* 2010). One national regulatory program, based in the Forest Law (1998), requires developers impacting forestry lands to avoid, minimize, and then pay a Forest Vegetation Restoration Fee, used for reforestation. This program collected RMB 8 billion (about $393 million) in 2003-2005. Constraints on payment for ecosystem services projects in Asia include high population density (escalating the transaction costs of contracting potential service suppliers) and state control over most forest land (Huang *et al.* 2009).

The private sector is seen as increasingly important in resolving problems of biodiversity conservation, which are often core to industry viability (TEEB 2009). Cross-sector partnerships, such as the Roundtable for Sustainable Palm Oil, have potential for integrating biodiversity concerns into business practices. Certification is another way of promoting environmentally benign practices, such as sustainable forest management. Tropical plywood exports have declined dramatically since the 1990s, in part due to consumer concern about environmental and social impacts, and legislation in the United States (the 2008 Lacey Act) and European Union, plus public purchasing policy in Japan, which are driving moves towards the production of certified, higher-value products to secure a viable future for the natural-forest-based tropical timber sector (Blaser *et al.* 2011). To assist such moves, the European Union provides technical assistance through its Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan, sometimes through legally binding 'voluntary partnership agreements' (VPAs) with timber-exporting countries. ITTO assists its member countries through several national-level projects and through its Tropical Forest Law Enforcement and Trade thematic program. To date, the Forest Stewardship Council has certified 25,915 square kilometers of forest in China as a whole (hotspot-specific figures are unavailable), 828 square kilometers in Lao PDR, 186 square kilometers in Thailand, 156 square kilometers in Vietnam, and none in Cambodia or Myanmar (FSC 2011). Myanmar is developing its own timber certification scheme in consultation with Malaysia and Indonesia (Blaser *et al.* 2011). While forest certification needs to pay attention to ecological quality-control, such trade measures could help strengthen forest law enforcement, governance and management. By value, 75 percent of the Greater Mekong Subregion's wooden furniture exports went to markets in the United States in 2007, and Vietnam exported wooden furniture worth over $2 billion to the European Union and United States (Asia Pacific Forestry Commission 2011a). At present, there is little positive pressure from consumer countries within Asia. Indeed, China and Vietnam have invested in a number of poorly planned and regulated agro-industrial plantation, logging and extractive ventures to supply raw materials to manufacturers in their countries (see Chapter 5).

As discussed in greater detail in Chapter 8, the carbon market is poised to be a major influence on forest conservation in Indo-Burma. Under the UNFCCC, policy approaches and positive incentives known as "REDD+" aim at reducing emissions from deforestation and forest degradation, and promoting conservation, sustainable forest management and enhancement of forest carbon stocks, in developing countries. REDD+ could provide substantial new funding for the sustainable management of tropical forests. An important, albeit overdue, development is that most (68 percent) of the world's largest public corporations now include steps to combat climate change as part of their business strategies, and 45 percent of respondents report actual reductions in greenhouse gas emissions (Carbon Disclosure Project 2011).

Tourism is another sector of key importance. National parks are of growing importance to Thailand's economically important tourism industry (Blaser *et al.* 2011), and areas such as Hainan in China have been targeted for rapid tourism development. This raises major risks to biodiversity (as highlighted in the Shenzhen workshop) but also opportunities, if the industry can learn from practices elsewhere of investing in biodiversity conservation (TEEB 2009) and pursue true ecotourism (Fellowes *et al.* 2008).

9.8.7 Inappropriate Land Distribution, Land Tenure and Land-use Policies

Inappropriate systems of land ownership, particularly lack of land tenure and opportunities to become involved in management for local communities, are a key underlying cause of biodiversity loss. Large tracts of natural habitat under the nominal ownership of the state have frequently failed to retain their biological and ecological values. Indeed the excision or downgrading of protected-area status is predictable where its value to society has not been demonstrated (Mascia and Pailler 2010; Sutherland *et al.* 2010). Land tenure is an important consideration in people's attitudes toward land use, and significant in terms of habitat loss, especially deforestation. Unresolved land tenure arrangements can facilitate spontaneous settlement and conversion of forested areas. Loss of land can force local communities to shorten fallow cycles, or cultivate steeper, less productive slopes, which are more susceptible to environmental degradation (Eberhardt 2003).

Over the last two decades, most countries in the region have undertaken major reforms to their land policies, including allocation of land to private owners. Unclear policies and lack of technical capacity within the government institutions involved have often meant that the land reform and allocation processes have further marginalized the poorer sections of rural communities, and exacerbated threats to biodiversity. Land-tenure systems in most upland areas of Myanmar, for example, are based on customary rights under local institutions (Eberhardt 2003), which are not upheld under national law. As a result, rural communities are vulnerable to losing access to land through such processes as establishment of commercial plantations by agribusinesses. This is further compounded by a lack of a specific land-use policy to settle disputes over land tenure (Eberhardt 2003).

In Thailand, local communities have no formal use rights in protected areas but can collect some basic forest products, such as dry fuelwood and NTFPs, for household use, with permission from the relevant authorities (Blaser *et al.* 2011). The establishment of community forests is currently permitted in national forest reserves under formal management by the Royal Forest Department and in other forests that are not yet occupied or developed for use. However, less than 1 percent of the forest estate has been brought under community management. Barriers include a lack of confidence in local communities as forest custodians, fear of exploitation by a rising number of illegal immigrants especially in border areas, transfer of land to households (rather than communities) through individual land-grant programs, and a lack of perceived benefits to villagers of formal registration (Blaser *et al*. 2011). Worldwide, tropical deforestation rates in official protected areas are higher than in community-managed areas but the evidence is more equivocal in Asia (Porter-Bolland *et al.* 2011).

9.8.8 Weak Regulatory and Governance Frameworks

Most countries are making progress with regard to stronger legislation in support of conservation (see Chapter 6; Blaser *et al.* 2011), and strengthened forest-management policy. All the same, the stakeholder consultations repeatedly highlighted the need for better enforcement. Protected areas are generally quite effective in protecting vegetation and fauna but problems of agricultural encroachment, illegal logging and hunting are at their worst in some tropical Asian countries, including Cambodia (Corlett 2009). Protected area status has also demonstrably failed to safeguard areas from hydropower projects, road construction, economic land concessions and mineral exploration. For example, saola conservation efforts have, in some cases, been actively blocked, apparently due to conflicting logging and hydropower interests (Timmins *et al.* 2008c). Some argue that standards of forest governance have actually fallen across much of the subregion (Asia Pacific Forestry Commission 2011a), mirroring overall trends in these countries (see Section 6.4). Certainly, despite increased attention to forest law enforcement and governance, significant improvements on the ground have been slow to emerge due to conflicting priorities, lack of resources and the reluctance of vested interests to stem the flow of forest products.

Taking Cambodia as an example, various guidelines and codes serve to regulate forest management. In 2001, for example, the government mandated long-term strategic forest management plans consistent with international standards, and cancelled or suspended concessions covering some 70,000 square kilometers of forest. There was no legal logging in the period 2004 to 2007, though allegedly a lot of illegal logging to place, involving various arms of the state (Global Witness 2007). From 2007, MAFF created the Cambodian Forestry Stamp to mark legal and illegal logs. Despite this tightening of forest policy, consumers still cannot determine the legality of luxury furniture produced in Cambodia, because no certification system is in place (CI cited in Weinland and Sokheng 2011). In 2010, a government decree allowed the cutting of plants in floodplains produced by newly built dams, giving rise to renewed illicit felling.

Armed conflict has had detrimental effects on wildlife in several hotspot countries, such as Cambodia, due to the proliferation of guns, the emergence of wildlife trade for external markets, and government policies mandating hunting by local villagers (Loucks *et al.* 2009). On-going ethnic conflicts are one factor behind the weak controls over illegal activity in Myanmar, where deforestation may have increased recently in the north (Blaser *et al.* 2011). Official imports of logs from Myanmar to China fell from 1 million m^3 in 2005 to 270,000 m^3 in 2008, due mainly to measures put in place by the Chinese authorities; however a suspected 90 percent of that trade was still illegal (Global Witness 2009). It has been claimed that areas with ethnic insurgencies in Myanmar, along the borders with China, India and Thailand, play a major role in facilitating regional trade in big cats and other endangered species (Oswell 2010).

All countries in the hotspot have introduced legislation aimed at mitigating biodiversity loss. Each country has developed EIA regulations laws or policies that require mitigation of adverse environmental impacts, and some, but not all, countries have specific biodiversity laws. Overall, however, there is a need for better integration of biodiversity considerations into government decision making at all levels, particularly in the agriculture, forestry, fisheries, mining and energy sectors. There are systemic weaknesses to the environmental planning process in all countries, including poor or faulty EIAs, lack of effective public participation, little or no opportunity to challenge planning decisions in court on environmental grounds, and little or no use of Strategic Environmental Assessment (SEA) to consider cumulative impacts of development projects and inform up-stream decision making.

The biosecurity outlook suffers from a lack of relevant international and national legislation, with heavy reliance on plant protection legislation to keep out invasives. Authorities find it difficult to take a precautionary approach, as befits biodiversity conservation, when urged to take a proportionate response by commerce.

9.8.9 Institutional Capacity Limitations

Many threats to biodiversity arise from situations where government agencies mandated to manage natural resources face limitations of personnel, resources, training, and motivation. Capacity limitations are especially pronounced in sub-national and local institutions (see Chapter 6), and are one of the major reasons why protected area systems in the region function so inefficiently. Specifically, protected areas are plagued by a suite of management problems, ranging from low staff morale, lack of accountability and incentives for good performance, limited technical capacity and legal knowledge to inappropriate budget allocations, and overemphasis on infrastructure development. Inadequate regulation of private businesses, illegal land clearance and encroachment of protected areas are other symptoms of capacity limitations.

In some respects, national technical capacity is increasing. For example, the GIS and Remote Sensing Unit of Cambodia's Forest Administration now produces national forest-cover maps and local maps supporting forest demarcation, the evaluation of forest function and forest management plans (Blaser *et al.* 2011). On the whole, however, the lack of firm political support for conservation makes it difficult to maintain a motivated and well-trained staff.

From the perspective of stakeholders consulted during the profiling exercise, improving protected area effectiveness remains a top priority in the region. However, many stakeholders reported that a sustained effort over many years is needed from a civil society organization to build and maintain capacity and motivation among protected area staff, and that this can be difficult to secure funding for. For example, a support program for Chatthin Wildlife Sanctuary, the main site in Myanmar for the conservation of Eld's deer, had an encouraging start. However, deer numbers dropped when external funding stopped (IUCN 2011). Similarly, the WWF-implemented Cat Tien National Park Conservation Project, funded by the Netherlands government, improved standards of patrolling and enforcement but these fell following the end of the project in 2004, and the last lesser one-horned rhino there was killed in 2010 (Brook *et al.* 2011).

Within each country, there is a need for improved coordination among policies and institutions (see Chapter 6). The EU-China Biodiversity Programme-funded project to mainstream biodiversity responsibilities in the Southwest Guangxi Limestone Area was one attempt to improve this. Some broad threats, which are growing in significance, such as biosecurity and climate change, need inter-institutional horizon-scanning, strategizing and coordination mechanisms. However, even basic cooperation and information on day-to-day issues is a challenge for institutions within the environment sector, let alone between the environment and other sectors. This weak coordination plays out in various ways, including failure to convert arrests for wildlife crimes into prosecutions due to poor coordination among wildlife protection, police, prosecution and court officials, and conflicting land-use objectives for the same areas due to poor coordination in planning processes for protected areas, mineral exploration licenses, economic land concessions, etc.

Building local civil society constituencies for conservation is a particularly high priority in Indo-Burma. Student organizations have some potential, for example the Green Students Organizations Society in China, which aims to develop the capability of university students to analyze and deal with environmental problems, especially in western China. There may be a lot of scope for building the understanding and long-term perspective of community forest organizations through regional networks, such as the Indigenous Knowledge and Peoples Network throughout mainland Southeast Asia and the Northern Farmers' Network in northern Thailand (Blaser *et al.* 2011).

The base of specialist knowledge for conservation requires capacity-building in a great many areas, including taxonomy, survey and monitoring techniques, ecological restoration, river hydrology and ecology, and biosecurity. Ecology and conservation science (natural and social) also need to be integrated into a wide range of other educational disciplines, including agriculture and agricultural extension, forestry and planning.

There is a recognized need to improve networking between experts and practitioners in all aspects of conservation. New opportunities to use and inform the rising numbers of amateur naturalists should be creatively pursued. Invariably, a feature of successful conservation efforts is the dedicated involvement of individuals who care about the work and can innovate when problems arise. Creative means are needed to encourage and sustain such dedication and innovation in the face of great challenges.

9.8.10 Global Climate Change

Global climate change is a rapidly emerging threat, which will compound the other pressures on biodiversity described here. Climate change scenarios for the Indo-Burma Hotspot and their implications for biodiversity conservation are reviewed in detail in Chapter 8. As that chapter recommends, the priority actions to help species and ecosystems adapt to climate change are to mitigate other pressures on them, particularly from over-exploitation and habitat loss, and thereby enhance their resilience to new pressures.

9.8.11 Agricultural Productivity Limits and Nitrogen Imbalance

Decades of agriculture focused on short-term yield at the expense of wider and longer-term ecosystem services have created further challenges, in depleting soils, wild fisheries and other resources, and polluting aquatic ecosystems. These call for a great investment in sustainable agriculture. Conservation projects at the interface between farming communities and nature conservation, and initiatives to reduce the pressure on land, need to help integrate ecological sustainability into production activity. Only with investment in forward-looking measures, such as restoring degraded agricultural land, promoting sustainable intensification and incorporating the true environmental costs into different production systems (see Foresight 2011), can the ecological deficit be reversed and natural capital rebuilt.

Refined ecological techniques are needed to improve the efficiency, biodiversity and ecosystem-service value of existing production lands, building on and strengthening evidence for high productivity in intercropping systems (e.g. tea and rubber: Guo *et al.* 2006). To improve the nitrogen efficiency of farming, systems research is needed at various scales, from single crops to diverse cropping and farming systems (Spiertz 2010). There is a strong need for quantitative systems research, including interdisciplinary research, along with the development of best practices and legislation.

10. ASSESSMENT OF CURRENT CONSERVATION INVESTMENT

10.1 Introduction

This chapter describes the most important recent investments in biodiversity conservation in the Indo-Burma Hotspot. Investments are assessed that have direct or significant indirect benefits for biodiversity conservation, including those related to livelihoods, natural resource management and climate change. The purpose of this assessment is to assist in identifying funding gaps and opportunities for conservation investment in the Indo-Burma Hotspot, and thereby help define the niche for CEPF investment. This is achieved through an analysis of current investment by source, country and thematic area.

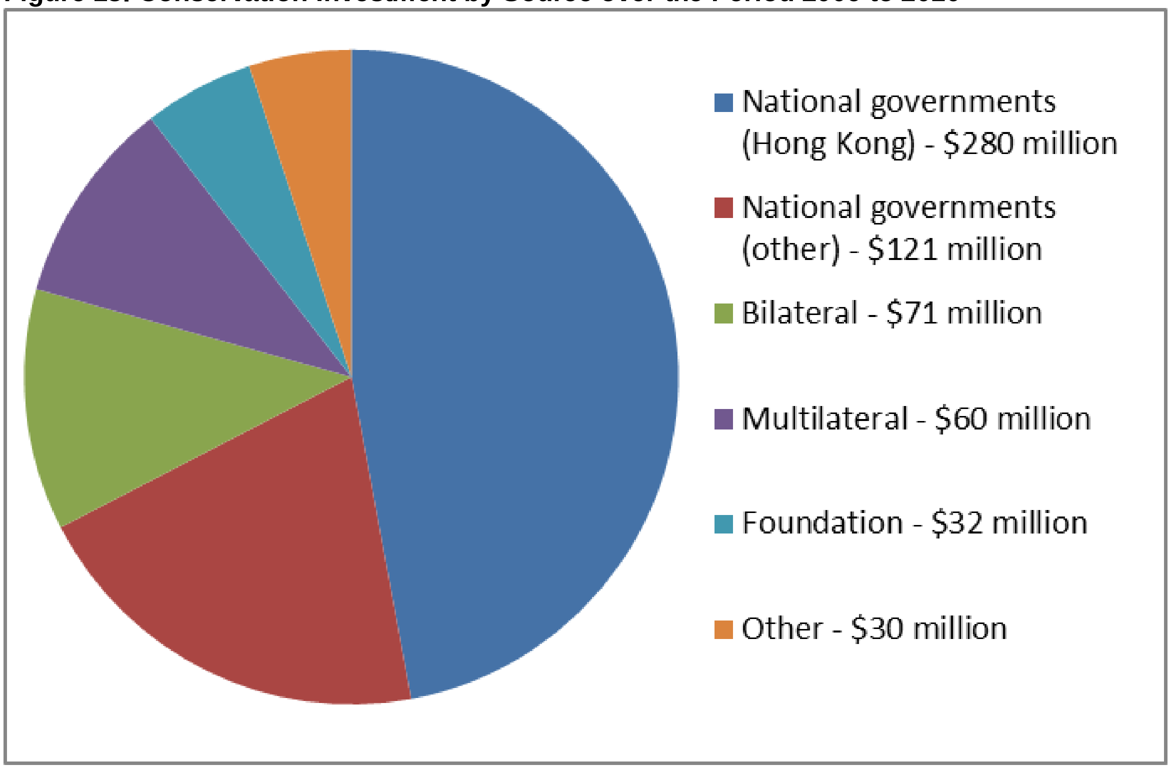
During the thematic study on patterns of conservation investment in the Indo-Burma Hotspot, conducted during June 2011, data on more than 700 grants and awards that were active in the period 1 January 2006 to 31 December 2010 were collated and analyzed. These quantitative data were compiled from web searches, direct enquiries to donors and recipients, and through consultations with key donors and implementers. For each grant, data on the period of implementation, country of implementation, donor, total award, duration of implementation and project title were obtained. Wherever possible, additional information was collected about the recipient and main objectives of each grant. Several of the assessed projects started or finish outside of the study period. If detailed information on the annual expenditure was not available, the proportion of the award used in the study period was calculated based on the proportion of the grant period during 2006-2010. The project title, objectives and discussions with recipients were used to assign each grant to a conservation theme. Descriptions of these themes are provided in

Section 10.4. To avoid double counting, only direct donor contributions to each project were included, not co-financing from other donors or in-kind contributions by governments and CSOs.

Quantitative data for the period before 2006 were not readily available for many donors. Hence, it was decided to focus the quantitative analysis on a period for which relatively complete data were available, and to analyze trends prior to 2006 qualitatively. Even for the period 2006-2010, the quantitative data collated during the thematic study are not totally comprehensive. Nevertheless, they are useful insofar as they illustrate key patterns of conservation investment in the hotspot.

These quantitative data are supported by a qualitative analysis of trends in funding over the last decade (2001-2010). This analysis is based upon information obtained through email discussions, telephone interviews and direct interviews with donors and implementers from all countries in the hotspot. In addition, two focus group discussions were held: in Hanoi, Vietnam, on 7 June 2011; and in Phnom Penh, Cambodia, on 10 June 2011. This analysis focused on identifying the main trends in investment as perceived by local stakeholders, as well as the main areas thought to be under-supported and any possible barriers to fundraising.

Figure 18. Conservation Investment by Source over the Period 2006 to 2010



10.2 Major Sources of Investment in the Hotspot

The results of the thematic study provide a picture of the conservation investment in the hotspot between 2006 and 2010. At least $594 million was invested in biodiversity conservation by national governments and various international donors during this period (Figure 18). Almost half of this investment was made by the Hong Kong Agriculture, Fisheries and Conservation Department, and focused on a tiny fraction of the hotspot by area. Excluding Hong Kong, the combined investment in the hotspot over the period 2006 to 2010 was at least $314 million, of which around two-fifths was contributed by national governments and three-fifths by international donors. On an annual basis, this represents only $63 million per year spread across the six hotspot countries: a very meager amount considering the scale of threats to biodiversity (see Chapter 9).

Of the at least $194 million invested by international donors between 2006 and 2010, multilateral and bilateral agencies provided the largest share, accounting for two-thirds of the total. Interviewees, however, considered that in many situations the relatively smaller, but more targeted, amounts from foundations (and two bilateral funding streams) were more effective and had greater impacts on biodiversity conservation.

10.2.1 National Government Investment

Biodiversity conservation is usually a low budgetary priority for national governments in hotspot countries, and is frequently viewed as the responsibility of international donors. Consequently, a significant proportion of government support for biodiversity conservation is in the form 'in-kind' contributions to international donor funded projects. Many government departments receive significant budget support from external donors (see Section 10.2.2), for example support to the Forest Protection Department from the Vietnam Conservation Fund, and support to the Cambodia's Forestry Administration from Danish International Development Assistance (Danida). Accurate information on national budgets for biodiversity conservation in the hotspot is very hard to come by, and there was not sufficient time during the thematic study to collate this information systematically. Published financial data on conservation investment were only available for Hong Kong; the other data presented in this section are estimates based on consultations with government staff and other experts.

National protected area networks are major recipients of government funding, although the bulk of this funding is typically dedicated to infrastructure and staff costs, with very modest sums available for operational costs, such as patrolling, community outreach or monitoring. With the exception of Hong Kong, interviewees consistently reported that current levels of government funding for most protected areas in the hotspot are significantly below levels needed for effective conservation management.

The bulk of the government conservation investment in the hotspot is the Nature

Table 18. Estimated Total Government Budget Contributions for Biodiversity Conservation during 2006-2010

Country	Investment ($)
Cambodia	2,500,000
China (Hong Kong)	280,000,000
China (Mainland)*	53,850,000
Lao	1,250,000
Myanmar	5,000,000
Thailand	13,000,000
Vietnam	45,000,000
Total	**400,600,000**

Note: * = figures for Indo-Burma Hotspot only

Conservation and Country Parks Program of the Hong Kong Agriculture, Fisheries and Conservation Department, which has an annual budget of around $56 million. Within Mainland China, comparatively little support is made available to conservation actions within the hotspot, although the amount invested is significantly higher than for other hotspot countries apart from Vietnam (Table 18). In Thailand the most significant support comes from the National Park, Wildlife and Plant Conservation Department, within the Ministry of Natural Resources and Environment. The department's budget was stable, at around $2.6 million per year, for the period 2006-2010, and is used to support all department activities, including staff, vehicles and basic running costs of protected areas.

National government support for conservation in Cambodia, Lao PDR and Myanmar is very limited. Conservation activities in Cambodia are managed by agencies under two ministries, particularly the General Department for Administration of Nature Conservation and Protection of the Ministry of Environment, and the Department of Wildlife and Biodiversity of the Ministry of Agriculture, Forestry and Fisheries. The General Department for Administration of Nature Conservation and Protection manages national parks and wildlife sanctuaries, and is provided with a small budget to cover protected area staff salaries and infrastructure costs. The Department of Wildlife and Biodiversity manages protected forests. There are no staff officially assigned to these areas, and they have no operating costs; the department's budget is estimated at $100,000 per year and supports staff and office costs in Phnom Penh only. The annual budget for Lao PDR's system of National Protected Areas is only around $250,000, and, as with other countries covers mainly staff salaries and some infrastructure costs. Data for Myanmar are patchy and out of date. A general impression is provided by a recent study by Myint Aung (2007), which concluded that "budgetary support... is insufficient to address park needs, particularly in remote parks that are understaffed."

There is a need to conduct more detailed research into patterns and effectiveness of national government investment in biodiversity conservation. For the purposes of the ecosystem profile (which defines an investment strategy for CSOs), however, national government investment is excluded from the remaining analyses in this chapter.

10.2.2 Multilateral and Bilateral Donors

Multilateral Agencies

The total amount of conservation investment in the Indo-Burma Hotspot made by multilateral funding agencies between 2006 and 2010 was at least $60 million (Table 20). The main source of multilateral donor investment over the period was the GEF, with at least 18 medium- and full-sized projects implemented, totaling more than $34 million. UNDP and the World Bank are the GEF implementing agencies for the majority of these projects (eight each), with the United Nations Environment Program (UNEP) and AFD each implementing one project. Most of the GEF projects were large, landscape-level initiatives covering a wide range of themes, including support for national government programs and policy development, community development in and around protected areas, and a small amount of support for law enforcement and biodiversity monitoring. The GEF-supported UNDP small grants program, which has provided more than $4 million to local civil society groups in the region, is another significant investment.

Relatively few of the small grants earmarked for biodiversity have been used for direct conservation management actions. Instead, they have typically funded livelihood and outreach activities in and around protected areas, which may indirectly assist conservation initiatives.

A typical GEF-funded project is Establishing Conservation Areas Landscape Management in the Northern Plains of Cambodia, a project implemented by UNDP and executed by WCS, the Forestry Administration and Ministry of Environment, which has a total investment of $2.15 million. This project is being implemented across 550,000 hectares of northern Cambodia, including two globally important conservation areas. In addition to some support of patrolling and biodiversity monitoring costs, the project has helped support the development of community-based ecotourism, improved NTFP management and village-level land-use planning, all of which was designed to indirectly ease threats to biodiversity in the core conservation areas. The Green Corridor project in Central Vietnam (a World Bank/GEF-supported project with an investment of nearly $1 million, implemented by WWF and the government of Vietnam) supported mapping, land-use planning, policy development, and capacity building as well as providing some support of law enforcement and monitoring. All agencies implement a small number of non-GEF projects as well.

The indicative allocations for the biodiversity focal area in the upcoming GEF Phase 5 for the six countries in the Indo-Burma Hotspot are provided in Table 19. These allocations are not guaranteed to be invested but the actual figures are likely to be close to the indicative allocations in the table.

Table 19. GEF-5 Allocations for Countries in the Indo-Burma Hotspot

Country	Biodiversity Focal Area ($)	Total Allocation ($)
Cambodia	3,850,000	7,280,000
China*	49,370,000	211,690,000
Lao PDR	6,110,000	10,860,000
Myanmar	7,620,000	15,350,000
Thailand	9,050,000	31,360,000
Vietnam	12,120,000	27,510,000

Note: * = figures for the whole country.

Looking forward, the largest GEF investment in the Indo-Burma Hotspot in the current GEF-5 work program is the Greater Mekong Subregion Forests and Biodiversity Program, supported with $20 million of GEF funding through ADB and the World Bank. This regional program addresses issues requiring a larger-scale, cross-border approach, and emphasizes joint capacity development for GMS countries. The program comprises four national projects, under the umbrella of a regional support project. The geographical focus of investment of the national projects will be the Cardamom Mountains in Cambodia, selected protected areas Lao PDR, the Western Forest Complex in Thailand, and the Central Annamites in Vietnam. China’s Guangdong province and Vietnam are also included (together with Indonesia and the Philippines) in a regional program, Scaling

Up Partnership Investments for Sustainable Development of the Large Marine Ecosystems of East Asia and their Coasts, supported with $43 million of GEF funding through the World Bank. This program will promote sustainable development of marine and coastal ecosystems, integrated coastal zone management, and sustainable marine fisheries.

ADB has been a major investor in biodiversity-conservation-linked activities in the hotspot over the last five years. As described in Section 5.3.1, ADB is investing heavily in promoting economic integration of the countries in the GMS, under the Regional Cooperation Strategy and Program. In order to mitigate the environmental impacts of these investments, ADB established a Core Environment Program, which had as its flagship a Biodiversity Conservation Corridors Initiative (BCI). Phase 1 of the BCI ran from 2006 to 2010 and invested at least $13.5 million in the hotspot, most of which was contributed by the governments of the Netherlands and Sweden. The majority of this investment supported national-level units and field sites in six biodiversity corridors, where pilot programs to mitigate the impacts of regional integration were tested. Activities supported by this program focused on building the capacity of local communities to manage forest resources, and to develop alternative incomes for forest communities. Most of the funding was spent on rural development activities, such as social forestry and revolving funds, with the aim of consolidating ecological connectivity between core areas. A second phase of the BCI is currently under development, as part of which the ADB has made grants to the governments of Cambodia and Lao PDR totaling $20 million and $19 million, respectively, as well as a loan of $30 million to the government of Vietnam. As in the first phase, the majority of these funds will be used for rural development activities in support of ecological connectivity within selected corridors. In addition, the funding will be channeled entirely through government, in comparison to the first phase, where significant amounts were awarded to NGOs as grants.

The trend for supporting multi-disciplinary landscape-level initiatives looks set to continue. GEF-5 should be an important source of funding, especially for Cambodia and Myanmar, which did not have a specific allocation under GEF-4. Another reported trend in recent years has been the movement of multilaterals away from investing in field projects and towards supporting national government programs and policy development, for example, the World Bank's support of the Cambodian National Forestry Program, and UNDP's support of Vietnam's MARD and MoNRE. This is leading to a decrease in funding opportunities for civil society. The most notable coming trend is for multilateral funding for climate change adaption and mitigation, which is growing significantly. UNDP, FAO, the World Bank and the European Commission all initiated significant funding streams related to climate change during the study period. As discussed in Chapter 8, very large sums are in the pipeline but it is hard to calculate what proportion will be used for activities that support biodiversity conservation.

Table 20: Overview of Conservation Investment by Multilateral Agencies, 2006-2010

Donor	Main Countries of Intervention	Main Areas of Intervention	Estimated Total Investment 2006-2010 ($)
UNDP/GEF	Cambodia, Lao PDR, Thailand, Vietnam	Five projects supported landscape-level activities to improve the management of protected areas, and surrounding areas. These included one marine (Con Dao, Vietnam), and one freshwater (Tonle Sap, Cambodia) initiative. Two projects supported the development of sustainable finance mechanisms. A regional project supported improved management of freshwater resources in the Mekong Basin.	18.1 million
World Bank/GEF	Cambodia, China, Lao PDR, Vietnam	Six projects supported landscape-level and protected areas management. One project supported protected area management through the Vietnam Conservation Fund. One project addressed wildlife trade in Vietnam.	15.8 million
ADB	Cambodia, China, Lao PDR, Thailand and Vietnam	Most support was through the GMS Biodiversity Corridors Initiative, which supported pilot sites in five countries, as well as providing national policy support. The project focused mainly on social development and livelihood support, with some assistance to protected areas. ADB also co-financed the UNDP/GEF project at Tonle Sap.	14.1 million
European Commission	Hotspot wide	Support to biodiversity conservation was provided through a contribution to Vietnam Conservation Fund, and the EU-China Biodiversity Programme, which supported one large project in the hotspot. Other support was provided for forest law enforcement and governance in the lower Mekong countries through the FLEGT Asia Programme.	5.2 million
UNDP/GEF Small Grants Program	Cambodia, Lao PDR, Thailand, Vietnam	Numerous small grants were made to national CSOs, mainly in support of livelihood interventions and development projects linked to sustainable use of natural resources.	4.3 million
World Bank other	Hotspot wide	The World Bank supported development initiatives with a biodiversity component, such as a wildlife trade component of a sustainable forestry program in Lao PDR, and protected area support in Lao PDR and Vietnam. The World Bank also supported forest land demarcation in Cambodia, including some protected areas. Additional support is being provided as part of the Global Tiger Initiative but figures for this were not available.	2.0 million
Other	Myanmar, Vietnam	UNEP/GEF supported the development of a biodiversity action plan in Myanmar. The multi-donor Trust Fund for Forests in Vietnam supported capacity building for government agencies responsible for forest and biodiversity conservation in Vietnam.	0.9 million
Total			**60.4 million**

Bilateral Agencies

Bilateral agencies comprise the single largest category of international conservation donor in the hotspot, investing at least $70.9 million over the period 2006 to 2010 (Table 21). However, two main trends emerge that have, over the last decade, resulted in a decreasing investment in civil-society-led conservation initiatives. The rapid economic development of most countries in the hotspot has led to several agencies pulling out or reducing their level of investment. For example Dutch and Swedish bilateral aid has been withdrawn from Vietnam in recent years. Earlier in the decade, both agencies made significant investments in biodiversity conservation in the country, for example the Dutch government's support for Cat Tien National Park, and its contribution to the Trust Fund for Forests (see below). UK's Department for International Development (DFID) withdrew from Cambodia at the end of 2010, and Danida will withdraw at the end of 2011. Danida in particular has made major investments in supporting forestry and conservation in Cambodia since 2000. They supported several large WCS-implemented projects, and were highly active in the development of the new National Forestry Program. Their withdrawal will result in a significant loss of funds for national and international CSOs that have made very successful contributions to community forestry and biodiversity conservation.

The second trend has been the increased use of direct budget support rather than large project grants. Not only does this result in reduced funding opportunities for civil society groups but it also makes it harder for civil society to influence the practices of national governments who may not prioritize biodiversity conservation. For example, the majority of Danida aid to Cambodia during the study period was through direct budget support to the Forestry and Fisheries Administrations, with only one funding mechanism supporting international and national civil society. Similarly, in Vietnam, the German government began a major new program in 2010 entitled *Conserving Biodiversity in Forest Ecosystems in Vietnam*, which is currently financed through Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). This program will provide direct support to MARD and has an initial investment of around $4.2 million (EUR 3 million) for the first three years, with a planned program life until 2020. It appears that very little, if any, of this investment will support local or international civil society. This project also highlights another trend that was apparent with multilateral investment, the move away from site-based conservation interventions and towards policy and capacity building. The stated objective of the project is to "strengthen personnel, professional, technical, financial and legal capacities to preserve and protect the biodiversity in forest ecosystems" (GIZ 2011). Although the project will have pilot sites at Ba Be National Park, Na Hang Nature Reserve, Bach Ma National Park, Pu Luong and Pu Hu Nature Reserves, it does not appear that the project will support on-the-ground biodiversity conservation activities. It will instead focus on local policies and guidelines as to how to implement the biodiversity law.

Table 21: Overview of Conservation Investment by Bilateral Agencies, 2006-2010

Donor	Main Countries of Intervention	Main Areas of Intervention	Estimated Total Investment 2006-2010 ($)
Germany* (DED, GTZ and KfW)	Lao PDR, Vietnam	Major support was provided for sustainable forest management, including special use forests, in Vietnam. Similar levels of support were provided for coastal protection and sustainable development. Programs piloted during the period are now being expanded and a large REDD program has been initiated in Lao PDR.	23.3 million
United States (USAID, USFWS)	Hotspot wide	USAID supported three major regional programs including hotspot countries. These focused on illegal wildlife trade (ASEAN WEN), forest management (Responsible Asia Forestry and Trade; RAFT) and payments for ecosystem services (ARBCP). USFWS provided 119 grants to projects in the hotspot, all for species-focused actions, such as research and monitoring, law enforcement and capacity building.	19.1 million
Japan (JICA)	Cambodia, Lao PDR, Myanmar, Thailand, Vietnam	Extensive support for forestry and sustainable natural resource management was provided, as well as targeted support for biodiversity conservation through CEPF. The only major project for which data were available was a coastal protection project in Myanmar.	8.8 million
Denmark (Danida)	Cambodia, Vietnam	In Cambodia, national forest policy support was provided through the NRMLP program, and local support was provided for improved natural resource management by civil society. In Vietnam, support was provided to marine and terrestrial protected areas.	8.2 million
United Kingdom (Defra, DFID)	Hotspot wide	Defra's Darwin Initiative awarded 32 grants to support activities in the hotspot; most focused on capacity building and research. DFID contributed to the Danida-funded NRMLP in Cambodia.	7.3 million
France (AFD)	Cambodia, Vietnam	Significant support was provided for social and economic development but the main support to biodiversity conservation was via CEPF. In addition, two projects were supported in Vietnam, on wild bovid conservation and ecotourism development. Other support was provided to Cambodia.	3.8 million
Other bilaterals	Thailand, Vietnam	Other bilateral agencies provided some support but this declined over the period. For instance, Netherland aid supported coastal and marine conservation in Thailand, and several initiatives in Vietnam. Data on closed projects are difficult to obtain and the figure presented here is likely an underestimate.	0.4 million
Total			**70.9 million**

Note: *= DED and GTZ now combined into GIZ.

The majority of these funds that were invested between 2006 and 2010 came from two countries: Germany ($23 million), which primarily supports activities in Vietnam; and the United States ($19 million), which supports conservation regionally via the US Fish and Wildlife Service (USFWS), and three major United States Agency for International Development (USAID) grants. Two newly awarded USAID grants will be implemented from 2011-2016: one for a new regional wildlife trade program entitled Asia's Regional Response to Endangered Species Trafficking (ARREST); and the other for a forest carbon program called Lowering Emissions in Asia's Forests (LEAF). These are both regional programs with a combined budget of $28 million, though it is currently unclear what proportion of this will support activities in the hotspot. Danida has provided significant support to the forestry and fisheries sectors in Cambodia, including to international conservation NGOs.

Most bilateral funding streams have supported natural resource management, national policy programs and community development, with biodiversity conservation a secondary goal of the programs. Significant exceptions however are from the USAID ASEAN WEN program on controlling wildlife trade, the USFWS grants, and the Darwin Initiative (of the United Kingdom Department for Environment, Food and Rural Affairs: Defra). The USFWS provided many, relatively small grants of typically less than $50,000 per award. These awards are species specific and targeted to supporting law enforcement, biodiversity research and monitoring, and capacity building. All respondents reported that these small but specific grants usually had much greater impact on protecting biodiversity than larger grants that had less targeted goals, such as improved natural resource management or development of livelihood alternatives.

Bilateral funding for climate change adaption and mitigation is growing significantly. For example, USAID and the German government initiated significant funding streams related to climate change during the study period. Large sums (in the hundreds of millions of dollars) are in the pipeline, principally for mitigation projects, but it is hard to calculate how much of these funds will support co-benefits, such as biodiversity conservation (see Chapter 8).

10.2.3 Foundations and Funds

Five main foundations supported biodiversity conservation in Indo-Burma between 2006 and 2010. Together, The John D. and Catherine T. MacArthur Foundation, the McKnight Foundation, the Blue Moon Fund, the Barbara Delano Foundation and the Ford Foundation invested around $24 million in the hotspot, mainly on projects led by civil society. In addition, CEPF invested $3 million, out of a total allocation of $9.5 million for the period 2008 to 2013. Although CEPF is not a foundation it shares several characteristics with them in the way it makes grants and so is included in this section of the analysis.

Grants from foundations and funds totaled at least $32.4 million over the period 2006 to 2010 (Table 22). This figure is likely an underestimate of the total investment by foundations and funds, as it was not possible to collate the many (often small) grants made by foundations and funds. In contrast to multilateral and bilateral funding, foundation grants have regularly been used to support core conservation activities, such as management support to protected areas, wildlife law enforcement and species conservation. They are, therefore, considered by recipients to be more effective sources of funding for achieving conservation goals. Other costs supported by the foundations and funds that interviewees reported to be very hard to support from other sources included: core running costs, which are especially important for domestic NGOs with no access to an international network; recurrent costs of law enforcement teams; and biodiversity research and monitoring. An additional reported advantage foundation support is the longer-term nature of funding, for example, the MacArthur Foundation's 12-year program of grant making in the Annamite Mountains and the wetlands of the Lower Mekong. Several interviewees voiced concern that changing priorities for future investment by MacArthur and other foundations may lead to a loss of continuity and put the achievements of some long-term conservation interventions at risk.

Some key support has been highly species focused (see Section 10.4.5). This has been advantageous to some sites, but does mean that some globally important sites may have reduced access to funds because some charismatic megafauna never were or are no longer present. Of even greater impact is the cessation of support if the target species are no longer thought to be present in sufficient numbers to be of interest to the donor. For example, since 2008, Panthera has withdrawn support from two sites in the hotspot, and LCAOF from one. These funds were vitally important in supporting law enforcement activities that were extremely hard to support from other investments. As a direct consequence of this, patrolling efforts had to be reduced within at least one site at a time when threats are increasing.

Another change to support from foundations over the last decade was the withdrawal of the Ford Foundation in 2009. Over the period 1996-2006, the Ford Foundation made $9.4 million in grants under its Environment and Development Program, with a focus on promoting sustainable wealth creation by disadvantaged communities dependent on natural resources (Ford Foundation 2006). The reason for the closure of the foundation's Vietnam office was reported to be a fall in the value of its assets following the global financial crisis of 2008 (Philantopic 2009).

Table 22. Overview of Conservation Investment by Foundations and Funds, 2006-2010

Donor	Main Countries of Intervention	Main Areas of Intervention	Estimated Total Investment 2006-2010 ($)
MacArthur Foundation	Hotspot wide	Support was provided for a wide range of initiatives, including capacity building, protected areas management (including law enforcement, development and research), research on climate change adaptation, and freshwater conservation.	8.9 million

Donor	Main Countries of Intervention	Main Areas of Intervention	Estimated Total Investment 2006-2010 ($)
McKnight Foundation	Cambodia, Lao PDR, Vietnam	Grants strengthened local institutions and initiatives that sustain and improve the livelihoods of vulnerable people. Roughly half of McKnight's grants in the hotspot addressed biodiversity conservation objectives, either directly or through addressing livelihoods/land rights of rural communities.	5.0 million
Blue Moon Fund	Hotspot wide	Significant support was provided for, among other things, protected area management in Myanmar, and pilot REDD and payments for ecosystem services initiatives in Cambodia and Lao PDR.	4.1 million
CEPF	Cambodia, Lao PDR, Thailand, Vietnam	Grants supported a range of interventions within the themes of species conservation, community-based conservation and mainstreaming conservation into development planning and policy. Freshwater conservation was a significant focus of grant making.	3.1 million
Barbara Delano Foundation	Cambodia	Support focused on landscape conservation efforts in southwestern Cambodia, and spearheading efforts to tackle the illegal wildlife trade.	3.0 million
Ford Foundation	Vietnam	Grants were awarded for a range of initiatives on sustainable natural resource management, including sustainable NTFP production and marketing, as well as climate change.	3.0 million
Panthera	Cambodia, Lao PDR, Myanmar, Thailand	Species-specific support was provided for tiger conservation, including monitoring and law enforcement.	1.7 million
Fondation Ensemble	Cambodia	Support was provided for projects on Bengal florican conservation, community forestry and community protected area management.	1.5 million
Arcus Foundation	Cambodia, China, Lao PDR, Myanmar, Vietnam	Species-specific support was provided for primate conservation and research.	0.9 million
Liz Claiborne Art Ortenberg Foundation	Cambodia, Lao PDR, Myanmar, Thailand	Species-specific support was provided for tiger and saola conservation.	0.8 million
Global GreenGrants Fund	Cambodia, China, Lao PDR, Thailand, Vietnam	Over 40 small and micro-grants were made to domestic CSOs for a range of initiatives including support to indigenous groups for natural resource management, combating illegal wildlife trade, and raising awareness about hydropower development.	0.2 million
Mohamed bin Zayed Species Conservation Fund	Hotspot wide	Several small grants were awarded for species conservation.	0.2 million
Total			32.4 million

10.2.4 Other Donors

The total amount of conservation investment by other donors in the Indo-Burma Hotspot over the period 2006 to 2010 was estimated to be at least $30.1 million (Table 23). Of this, the majority was contributed by NGOs, most notably members of the WWF Network, with a small but growing contribution from private companies. Again, the total figure is probably an underestimate of the actual investment by other donors, due to the difficulty of collating data on numerous small grants, donations and in-kind contributions made by NGOs and private companies.

Table 23: Overview of Conservation Investment by Other Donors 2006-2010

Donor	Main Countries of Intervention	Main Areas of Intervention	Estimated Total Investment 2006-2010 ($)
WWF Network	Cambodia, China, Lao PDR, Thailand, Vietnam	Diverse support was given to WWF China and, especially, WWF Greater Mekong Programme, including landscape level conservation of terrestrial ecosystems (including Mondulkiri Protected Forest in Cambodia), environmental education, and marine conservation in Vietnam.	26.7 million
Private companies	Hotspot wide	Various forms of support were provided, particularly for projects to compensate for the biodiversity impacts of major developments in the energy and mining sectors.	1.6 million
CI	Cambodia	CI's Conservation Stewards Program supported advancing the conservation agreements model in and around Central Cardamoms Protected Forest.	0.9 million
Other NGO core funds	Hotspot wide	Various NGOs made investments in the region from unrestricted funds. These funds were principally used to support core operating costs. Data on these investments were difficult to obtain, and the figure presented here is likely a significant under-estimate.	0.9 million
Total			30.1 million

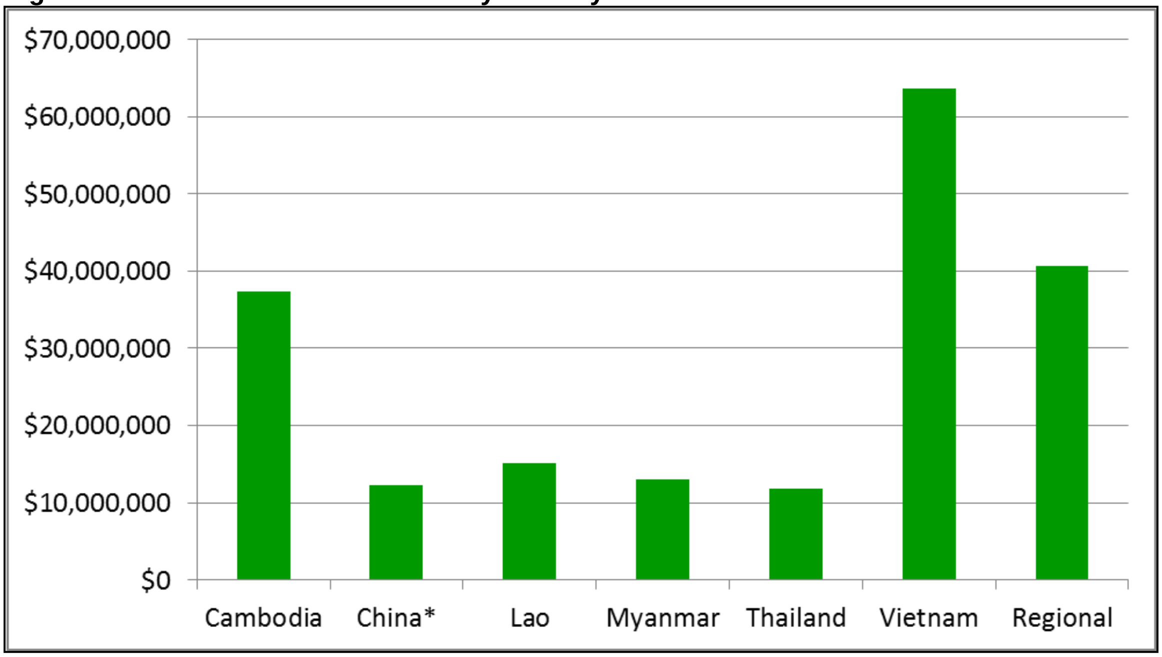
The WWF network is a very significant source of funding to WWF activities in the hotspot. Funds dispersed through the WWF Greater Mekong Programme office during 2006 to 2010 amounted to nearly $27 million, with small additional amounts being disbursed through WWF China for activities in the Chinese part of the hotspot. The contributions of other WWF network members (such as WWF-Denmark, WWF-Germany, WWF-Switzerland and WWF-US) to the WWF Greater Mekong Programme is a highly significant area of support for their diverse activities in the hotspot, and allows programs to be sustained for longer periods than typically covered by grants from multilateral and bilateral donors and foundations.

Information on investments by private companies in biodiversity conservation is hard to obtain but appears to be of increasing importance. Corporate social responsibility funds, for example, from mining companies, and grants from hydropower companies have contributed at least $1.6 million to biodiversity conservation in the hotspot. This trend is most notable in Lao PDR, where two large dam projects, Nam Theun 2 and Theun-Hinboun, are providing significant long term conservation funding for their catchment areas.

10.3 Summary of Investment by Country

The data on international donor funding (i.e. excluding investments by national governments) reveal a disparity in the level of investment in each county (Figure 19). Vietnam received approximately five times the level of funding as Lao PDR, Thailand or Myanmar. While it is possible that this may partly reflect a lack of data for the latter three countries, interviewees felt that it was an accurate indication of the true situation.

Figure 19. Conservation Investment by Country over the Period 2006 to 2010



Note: * = figures for the Indo-Burma Hotspot only.

10.3.1 Cambodia

Cambodia received at least $37 million in conservation investment during the study period. It benefited in particular from investment by Danida and the ADB BCI project (two of the six pilot sites were in Cambodia). Relatively little of this funding was used for core conservation activities, however, as it mainly supported landscape-level initiatives and community-based approaches to land management, with biodiversity conservation as a secondary goal. In addition Danida will be withdrawing from Cambodia in 2011, and it is likely that continued ADB support will be in the form of a loan for development activities rather than conservation. Site-based conservation activities remain a focus for large international NGOs supporting the Forestry Administration and Ministry of Environment in protected areas management in the Cardamoms Mountains, in Preah Vihear and Mondulkiri provinces, at various sites around the Tonle Sap Great Lake, and along the Mekong main channel. These sites receive very little government support and virtually the entire budget for the effective management of protected areas needs to be raised from external sources. NGOs have been relatively successful at raising funds from CEPF and the USFWS, and these funds have been critically important in funding core conservation activities.

The recent rapid pace of development in Cambodia is threatening any recent conservation gains. Large areas of wild lands outside the protected areas network are being converted to plantation crops. Since 2009 this trend has begun to impact on protected areas, with Ministry of Environment protected areas particularly threatened by re-zoning and degazettement. The trend for Cambodia therefore appears to be that of rapidly increasing threats and decreasing funds available for conservation. One opportunity may be through payments for ecosystem services, or REDD+ initiatives as outlined below. As with Lao PDR and Vietnam, there is a trend towards funding linked to climate change mitigation and adaptation. Implementers report the increased need to frame fundraising in terms of how it links to climate change. As with the earlier trends towards integrated conservation and development projects, and landscape-level approaches, there remains a need for donor funding targeted explicitly towards biodiversity conservation.

10.3.2 China

Data on conservation investments were relatively hard to obtain. More information needs to be gathered on the patterns of investment in this part of the hotspot. Stakeholders consulted during the thematic study reported that funding for protected areas management in Mainland China has increased significantly (from rather low levels) in the last decade. The Sino-Dutch Forest Conservation and Community Development Program provided funds supporting reserves in Yunnan province, including some in the hotspot, from 1998 to 2004, with an initial grant of $17 million from the Netherlands government and $7.5 million in co-financing from the government of China. KFBG in Hong Kong has also been a notable supporter of conservation in Hong Kong and the Mainland since 1998, particularly through site-based interventions in Hainan and Guangxi, publications for conservationists, and financial and technical support for researchers. Another significant intervention has been the support of Peking University researchers for conservation of white-headed leaf monkey habitat at Chongzuo KBA. The figures presented are dominated by two large projects: the EU-China Biodiversity Programme, which funded the Protecting Endangered Species in the Limestone Ecosystems of Guangxi project ($3.5 million including government of China matching funds), and the World Bank/GEF-funded Guangxi Integrated Forestry Development and Biodiversity Conservation project, with $5.6 million from the GEF and nearly $200 million on co-financing from the government of China. One ADB BCI pilot site was located at Xishuangbanna KBA. The Chinese part of the hotspot received no CEPF funding, and relatively little other species-specific funding. Given the likely importance of the remaining forest patches in the region, this is a significant gap in funding.

10.3.3 Lao PDR

Lao PDR received more than $15 million in conservation investment between 2006 and 2010. This is relatively low compared to neighboring counties, which is of concern given the low level of government investment and the importance of the country for many threatened species (notably primates and ungulates) and the threat levels. As with elsewhere, the most dominant theme was landscape-level projects, with significant investment coming from the World Bank, ADB and GIZ. Relative to other countries in the region, few international conservation organizations are active in Lao PDR; and only IUCN, WCS and WWF maintain a permanent presence there. Site-based work focusing on the protected area network remains the cornerstone of biodiversity conservation work, with international NGOs supporting the Lao government to improve management of several national protected areas (NPAs). Notable large-scale projects include WCS-supported work in Nam Et-Phou Louey and Nam Kading NPAs, and WWF-supported work in Xe Pian NPA. Lao has benefited from investments from USWFS, CEPF and the MacArthur Foundation.

Lao PDR is leading the way in the hotspot in the development of conservation payments from hydropower programs and mining operations. This funding was only starting during the study period, but may become significant in coming years, especially in catchment areas surrounding the reservoirs and areas neighboring mining concessions, which include some of the most biodiversity-rich areas in the country. How these payments may benefit biodiversity conservation nationwide is as yet unclear. As with Cambodia and Vietnam there is a trend towards funding linked to climate change mitigation and adaptation; significant funds have been promised for the future but, with the exception of a German-funded project in northern Lao PDR, these funds are yet to come on-stream.

10.3.4 Myanmar

Conservation investments in Myanmar remain relatively modest. Around $13 million was reported to have been invested in the country during the study period. This may be an underestimate as it was relatively hard to obtain information on the funding of smaller groups operating in Myanmar. Of this, $8.8 million was for a large Japan International Cooperation Agency (JICA) supported coastal program, Ayeyawady Delta Integrated Mangrove Rehabilitation and Management Project. This project focused on community-based natural resource management to improve livelihoods, with biodiversity conservation only a secondary goal. The modest level of investment in conservation in Myanmar is perhaps a reflection of two related factors: the reluctance of some international NGOs to engage in Myanmar; and the restrictions some donors have regarding investing in Myanmar. Currently only WCS has a significant presence in the country, with two large site-based projects, and several species level initiatives. People, Resources and Conservation Foundation, BirdLife International and FFI have small programs. With the exception of the JICA project, multilateral and bilateral investments are very limited in Myanmar, counter to the pattern region-wide. USFWS and the Darwin Initiative are the only notable exception to this, and have provided critically important support for species-specific initiatives and building local capacity. Most conservation investments have been made by foundations, most notably the Arcus Foundation, the Blue Moon Fund, Liz Claiborne Art Ortenberg Foundation, Panthera and the John D. and Catherine T MacArthur Foundation.

10.3.5 Thailand

Contrary to most other countries in the hotspot, the Thai government provides substantial support for conservation activities. Funding for protected areas varies depending on the level of staffing and facilities in each area, with the older and more established national parks receiving greater funding than the newer ones. This central funding supports staff salaries, vehicles, facilities and basic running costs. In several national parks, NGOs provide additional support for capacity building, biodiversity monitoring and research, and development activities for communities living in and around protected areas. Given this situation, reported conservation investment in civil society is relatively modest, at around $12 million. Nearly half of this investment is from multilateral agencies such as the ADB BCI project, UNDP small grants, and one UNDP/GEF project. Thailand's status as a middle income country has limited the investment from bilateral agencies and conservation groups are increasingly dependent on foundations for support. Notable donors supporting core conservation activities include USFWS, Liz Claiborne Art Ortenberg Foundation, Panthera and the WWF network. Investments have focused on supporting the protected area network, especially the Western Forest Complex, where both WCS and WWF have a notable presence. Coastal and marine conservation was reported to be relatively well supported in Thailand compared to other countries in the hotspot (although quantitative data were not available). Thailand has a well established network of marine protected areas, and NGOs including IUCN and the Bird Conservation Society of Thailand have ongoing projects in mangroves and mudflats of the inner Gulf of Thailand and the Andaman Coast.

10.3.6 Vietnam

Government support for conservation in Vietnam is mixed. While six national parks receive central government funding, all other protected areas receive limited or no funding from the relevant provincial government. The level of provincial funding is highly variable depending on the wealth and development priorities of the province. Vietnam received at least $64 million in support from international donors between 2006 and 2010. This is far more than any other country in the hotspot, and amounts to one-third of all investments in the entire hotspot. Of this investment, $52 million came from multilateral and bilateral agencies, with the World Bank, ADB, UNDP and the German government being the most significant donors. The World Bank (including GEF funds) and the German government alone contributed more than $30 million. Most of this money has supported large landscape projects with multiple objectives including livelihood improvement, rural development and biodiversity conservation. Three GEF-funded projects focusing on biodiversity conservation were active during the study period: the Green Corridor project; the Chu Yang Sin project; and a Con Dao National Park project. All of these projects have now closed, however, and conservation activities in these important areas are now significantly less well funded. Local and international

NGOs continue to work on site-based and species-specific approaches, but this appears to be less prevalent now than earlier in the decade. Notable exceptions are FFI's primate program, and WWF's activities in the Central Annamites. Important support for this work has come from CEPF, the John D. and Catherine T. MacArthur Foundation, USFWS and the Darwin Initiative.

Potentially the most important funding mechanism for conservation in Vietnam has been the Vietnam Conservation Fund (VCF) which has provided direct support to special-use forests nationwide. The effectiveness of these grants has not yet been evaluated, but this fund has provided critical funding to protected areas that do not otherwise receive central government support. Donor support is reported to be decreasing. Many bilateral donors have pulled out, or are in the process of phasing out. For example, Netherlands Aid support to the Trust Fund for Forests, a large multi-donor fund supporting many aspects of improved forest management, ended in 2010. International technical assistance for the VCF has ended, and current funding is coming to an end. Recapitalization of the fund has not yet been secured. What funding remains is being channeled through direct budget support. One theme that has seen notable growth, however, is funding related to climate change mitigation and adaption. A multi-agency investment involving the Norwegian and German governments, UNDP, UNEP and FAO, has committed $100 million for REDD readiness activities. It is unclear how much of this fund will be available for co-benefits and safeguards, including biodiversity conservation.

10.4 Thematic Distribution of Investment

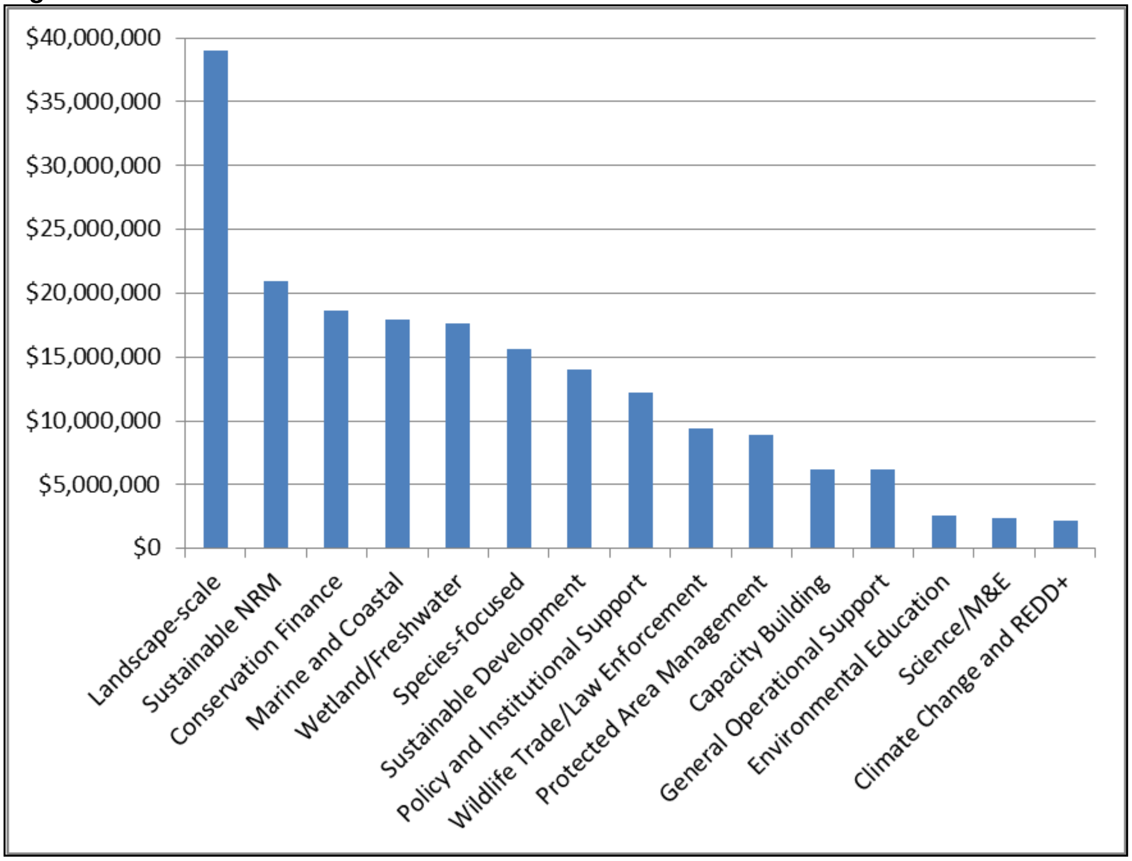
Investments were selected for investigation either because biodiversity conservation was one of the stated aims of the grant, or because the funding mechanism had been used by a conservation program. This is particularly important with many climate change or development-related investments for which biodiversity conservation may be only an ancillary benefit but which have been used by conservation projects to fund support operations. Each investment has been assigned to a theme based on its objectives. In many cases, particularly with the larger awards, classification within a single category was relatively subjective. Many grants cover a wide range of issues, and there is some overlap between themes. Several clear patterns emerged however (Figure 20).

All implementers who were consulted considered several interventions as core conservation activities: law enforcement to control hunting, illegal logging and encroachment; biodiversity research and monitoring; and core costs for essential staff and operating costs. Other themes were viewed as important support activities that improve the enabling environment and long-term sustainability of the core actions.

There was a clear trend towards supporting large landscape-level programs, often with a strong emphasis on rural development, and sustainable natural resource management. Some of these programs also provided some support for core activities, but they mainly funded support activities. More recently however the trend has been towards programs associated with climate change mitigation and adaptation. Fundraising is framed increasingly in terms of how activities will reduce greenhouse gas emissions or allow communities, habitats or wildlife adapt to predicted changes.

With either significant trend, be it landscape approaches or climate change related, implementers consider the hardest themes to fund are the core activities of law enforcement, science and monitoring and core costs.

Figure 20. Conservation Investment over the Period 2006 to 2010



10.4.1 Protected Area Management

Conservation investment in Indochina by both national governments and international donors has been heavily focused on site-based conservation. In particular, there has been significant investment in protected areas in most countries in the region. In many areas international and local NGOs provide technical and financial support to management agencies. Funding specifically targeting protected area management is relatively scarce but other funding themes, such as the large amounts dedicated to landscape approaches have also contributed to protected area management. Funds are typically used to support a wide range of activities including basic support of running costs, building the capacity of management staff, particularly in patrolling techniques, and in some cases biological monitoring.

Major investment in site-based conservation concentrates on several protected area clusters: the Western Forest Complex in Thailand, the Northern Forest Complex in Myanmar, the northern and eastern plains, and Cardamom mountains of Cambodia, and various protected areas in the greater Annamites of Lao PDR and Vietnam.

10.4.2 Wetland/Freshwater Conservation

Wetland ecosystems are generally poorly represented within national protected area systems. In part, this reflects unclear institutional responsibilities for wetland management in some countries, and, in part, it reflects the inappropriateness of conventional protected area approaches to the conservation of ecosystems that are subject to high levels of human use and dependence. Consequently, a significant proportion of investment in wetland conservation has focused outside of formal protected areas. In recent years wetland ecosystems have received more significant funding, such as the central section of the Mekong River, and Tonle Sap Lake and its inundation zone in Cambodia. Other investments that may have biodiversity benefits but have not been included in this analysis are those concerning the management for freshwater fisheries, such as Danida's support of the Cambodian Fisheries Administration. Continued development of wetlands for agriculture or proposed hydro-power schemes means, however, that these ecosystems are still highly threatened. Increased investment is clearly needed to secure these sites

10.4.3 Marine and Coastal Conservation

In addition to wetlands, marine ecosystems are the other major gap in protected area systems in the region, although they are relatively well represented within marine national parks in Thailand. Marine ecosystems have received significant amounts of conservation investment in Thailand and Vietnam, although much less so in Cambodia, Myanmar and southern China (Lao PDR having no coastline). Much of this investment closed during this study period however, for example the GEF supported program for Con Dao, Vietnam, and little new funding appears to be available. FFI, IUCN and the Bird Conservation Society of Thailand have important coastal conservation projects in Thailand and Cambodia but these globally important wetlands remain under-supported. The data obtained in this study may be taken as indicating that the theme is relatively well funded. These data however are dominated by two large programs, JICA in Myanmar and GIZ in Vietnam. Neither of these programs are strictly biodiversity conservation projects. They are more concerned with the sustainable management of coastal resources and mangrove rehabilitation. Coastal resources are receiving considerable interest regarding climate change adaptation and significant funds may be available in coming years to protect coastlines. As with ongoing projects, biodiversity conservation may benefit from these programs but is not their main objective.

10.4.4 Landscape-scale Conservation

This is the single most well funded theme in the hotspot and reflects a global trend in the last decade to support large landscape-level programs. Such approaches are perceived to have three main advantages over traditional site-based approaches. First, they are more appropriate for addressing the conservation needs of landscape species, which often cannot be conserved at isolated sites indefinitely. Second, by integrating biodiversity considerations into the policies and programs of other sectors, including infrastructure, forestry and energy, they can mitigate threats that cannot be addressed at the site level. Third, such approaches can leverage additional resources for biodiversity conservation from sources other than traditional donors. The main donors investing in landscape approaches were the ADB BCI program, GIZ programs in Vietnam, and several GEF projects (e.g. the Establishing Conservation Areas Landscape Management in the Northern Plains of Cambodia project, and the Green Corridor project in Vietnam). The nature of these projects means that there is considerable overlap with other themes. The ADB BCI program for example was a landscape-level approach, with a focus on rural livelihoods and improved natural resource management. These projects have provided significant funds to conservation programs in the last five years but, with so much of the investment targeted at development and natural resource management, implementers do not feel they have had a conservation impact that is proportional to the level of funding.

10.4.5 Species-focused Conservation

Several species specific conservation programs now exist in the region, for example, freshwater turtle conservation in Cambodia and Myanmar, Siamese crocodile programs in Thailand, Lao, Cambodia and Vietnam, and vulture, ibis and Bengal florican projects in Cambodia. These projects have benefited from several relatively small but targeted funding mechanisms, most importantly CEPF, USFWS, zoos and private donors. Some of these species specific grants, such as those from USFWS are target at a limited list of species (mainly tiger, Asian elephant, and gibbons, with a few grants for rhinos and other critically endangered species) but have been used widely to supplement protected areas management in many areas. These grants are relatively small (usually less than $50,000 per award), but can be used to support core activities such as law enforcement and biodiversity monitoring. These grants, particularly those from USFWS and CEPF are widely regarded to be amongst the most effective at meeting key conservation objectives. USFWS funding however has recently been cut by approximately $300,000 per fund. CEPF species funding is currently scheduled to end in mid-2013, and this reduction of funding will impact on conservation activities in the hotspot, particular species-focused ones.

10.4.6 Wildlife Trade/Law Enforcement

In addition to investment in species-focused conservation action for individual species, there has also been some investment in national and regional initiatives to combat illegal and unsustainable trade in wildlife and wildlife products, which represents one of the major underlying threats to globally threatened species in the region. This category focuses on trade-related initiatives such as those aimed at closing restaurants and markets serving wildlife, disrupting trade chains and awareness-raising campaigns. Implementers report, however, that this is a theme that remains under-funded. At least two large-scale projects operated during the study period, the ASEAN WEN program, and a World

Bank-GEF medium-sized project on wildlife consumption in Vietnam. The latter project, entitled *Vietnam: Wildlife Consumption: Reforming Policies and Practices to Strengthen Biodiversity Conservation*, is helping to develop an adequate regulatory environment for the effective protection of wildlife, improve baseline information on illegal wildlife consumption, and changing consumer behavior through communication campaigns.

A new USAID-funded regional project, ARREST, which began 2011, should also help address some issues but there is need for considerably more investment. There was a perception among stakeholders that many trade programs have focused on trying to reduce demand, and on law enforcement at the trade or consumer end (e.g. restaurants and markets) of the chain. While these remain important strategies, there is also a critical need to control the trade at the source end, which often means protected areas throughout the hotspot.

Explicit support for law-enforcement activities at the site level is very limited. This includes funding for training, equipping and operating anti-poaching or illegal logging patrols, as well as approaches to improve the effectiveness and transparency of law enforcement (for example use of Management Information SysTem (MIST) software). All respondents reported that this critically important theme has always been hard to raise funds for and is chronically under-funded. Threats levels are judged to have continued to increase over the last decade. For example, successes in the early parts of the last decade to control wildlife crime in Cambodia, after 30 years of civil war, now appear to be being undermined by the rapid economic growth in the region and demand for land, resources and wildlife. All interviewees reported increased support is needed to control illegal activities at a site level, particularly given that a large proportion of government investment in protected area management is actually directed towards infrastructure development and other capital costs, and not towards the recurrent costs of enforcement patrols.

10.4.7 Sustainable Natural Resource Management

Sustainable, and often community-based, natural resource management is the second best-funded theme in the hotspot. This reflects donor interest in supporting rural development (see below) and the use of such funds by conservation projects to improve biodiversity value of production landscapes, or as a livelihood improvement option for communities living in target sites. These programs include the support for improved management of non-timber forest products, community-based forestry programs in areas adjacent to protected areas, and other development programs for which there is a direct link between improved management, and positive impacts on biodiversity conservation. Continued interest by donors in rural livelihoods and poverty alleviation mean that it is likely to remain well funded.

10.4.8 Sustainable Development

A strong focus on human well-being and poverty reduction among all multilateral and bilateral agencies means that this theme continues to be well funded. This emphasis on development activities reflects the poverty-alleviation agendas of national governments and donor agencies, and the assumption that poverty reduction in rural communities will bring biodiversity conservation benefits. The relatively large sums available mean that conservation programs have adapted to access these funds over the last decade. There is considerable overlap with funding for sustainable natural resource management, and landscape approaches. However, this category includes activities that have fewer direct links to conservation, such as work on improving water supplies, or agricultural extension work. With all these themes the investments have been used to improve the enabling environment to support the application of core conservation activities. Some of the more effective approaches have included efforts to secure land tenure for ethnic minorities in Cambodia and community-based ecotourism ventures in Lao, Cambodia and Vietnam.

10.4.9 Capacity Building

Increasing investment is being made in capacity building both as stand-alone projects and as components of larger projects. In particular many site-based conservation projects include capacity-building components. Notable new programs include the FFI/Royal University of Phnom Penh masters program, with investment from the MacArthur Foundation and Darwin Initiative, and several other smaller projects supported by Darwin. Continued development of local capacity is essential for the long-term sustainability of conservation investments in the hotspot. As described below, lack of capacity is a critical obstacle for local civil society. Most important for successful biodiversity conservation is a lack of capacity in core scientific fields, including ecology, zoology and botany.

10.4.10 Environmental Education and Awareness Raising

Relatively little investment has been made specifically in environmental education and awareness projects. This is perhaps because these activities are being supported as components of larger projects. In particular, many site-based conservation projects include an education and awareness component. Also noteworthy are the region's magazines and websites produced by various NGOs, which play a key role in public engagement and in engendering a community of conservation practitioners, encompassing protected area managers. Examples include *The Babbler* (http://birdlifeindochina.org/content/babbler), produced by BirdLife International *in Indochina*, and *Living Forests* (www.kfbglivingforests.org), produced by KFBG.

10.4.11 Climate Change and REDD+

As previously mentioned the most notable funding trend in recent years has been the dramatic increase in funds available for activities related to climate change adaptation and mitigation. A relatively small amount of this investment occurred during the study period, but funding of an unprecedented level may be available for conservation in coming years. As the core purposes of these funds are to adapt communities for predicted climate change, and to reduce emissions of greenhouse gases, it is as yet unclear how much of the climate change financing will support biodiversity conservation. The most likely mechanisms are adaptation funds to protect coastal ecosystems, and REDD+ mechanisms to protect forest areas. Some REDD+ investments have already been made in the hotspot, for example the GIZ-funded *Climate Protection through Forest Preservation* project in northern Lao, and the pilot REDD project in the Seima Protection Forest, Cambodia. Very large sums have been committed for REDD readiness in Vietnam (at least $100 million) and Cambodia ($6.6 million). In addition various new multilateral- and bilateral-supported investments related to REDD will start in 2011. These include the USAID-funded regional (including Papua New Guinea) LEAF project ($20 million), and a regional EU-funded REDD project ($4.5 million). How these funds could be used for co-benefits including biodiversity remains to be seen, and there remains a critical need for investment in the protection of forests and biodiversity in the interim before proposed REDD+ funding becomes available. The potential use of avoided deforestation carbon credits to support biodiversity conservation is covered in Section 10.6.3.

10.5 Investments in Domestic Civil Society

Investment in domestic CSOs in the hotspot remains very limited. The majority of investments have been made with national governments and international conservation NGOs. Some investment mechanisms are widely used by local civil society, especially the McKnight Foundation Southeast Asia Grants Program, the Global GreenGrants Fund, and the UNDP/GEF Small Grants Program. These grants are used to support a range of activities, including networking, advocacy and pilot activities on sustainable natural resource management. However, few of these grants are used for activities such as species conservation, monitoring and supporting protected area management. These grants provide vital support to many domestic CSOs, and are one of the only sources of direct donor support to local NGOs and CBOs. They are useful in piloting new approaches, and in strengthening networking at grassroots level. One major limitation of these grants is that they are typically of short duration (one to two years), and the sustainability of their results may be unclear.

Perhaps the major limits to investment are the very few local biodiversity conservation NGOs in the region, and the limited capacity of the groups that do exist. Throughout the region there is a general lack of interest in biodiversity conservation, and hence only a small number of individuals interested in forming NGOs, societies or clubs. In Myanmar, China, Lao PDR and Vietnam, legal restrictions on the formation of independent NGOs have further limited the development of local organizations. There is a lively civil society in Cambodia and Thailand but very few organizations dedicated to biodiversity conservation. Most civil society groups are concerned with rural development, health, education and other human development fields. This reflects the greater interest of individuals in the NGOs to work on development issues, but also the relative ease for local groups to raise funds for sustainable development activities. There are reported to be fewer conservation NGOs in Thailand now than in the past. Several groups have closed or become dormant in recent years, in part due to governance issues and the challenge of retaining suitably skilled staff. Examples include groups such as Wildlife Fund Thailand and Seub Nakhasathien Foundation, which both operated successfully for over a decade before recently becoming moribund. This poses a significant dilemma for conservation investments. There is a clear need to support local civil society to enhance the long-term sustainability of investments; however, very few local groups are working on the issues that are most pressing for biodiversity conservation in the Indo-Burma Hotspot, i.e. control of illegal activities, protected area management, baseline research and biodiversity monitoring.

10.5.1 Perceived Barriers to Funding

The barriers to increased funding for local civil society mainly relate to lack of capacity. There is a general lack of capacity in the key academic backgrounds for biodiversity conservation. Although there is a growing middle class in each of the hotspot countries and an increasing number of university graduates, the quality of education is often lacking, and graduates typically lack the core skills needed for biodiversity conservation. As mentioned above there are now some programs designed to address this problem, and replication of these models throughout the region would be of great benefit. For those NGOs that do exist, there are two main funding barriers: limited capacity in fundraising for projects; and difficulties in accessing funds to cover core costs. Many NGOs lack the basic skills needed to complete the often complex application procedures for grants. For this reason, the CEPF regional implementation team includes a facility to assist local groups in completing CEPF applications. The extension of this sort of service to all countries of the region, and to include assistance for all applications would be highly beneficial. A few international NGOs have access to core funds to help cover general operating costs, including rent, utility bills and administrative staff, but most are largely or wholly supported by project funds. The limited resources of local NGOs and restrictions set by many donors mean that these core costs are often hard to cover. Inability to employ administrative staff or to cover core costs further limits the ability to raise new funds. Access to long-term unrestricted funds, often only in modest amounts, would be of great benefit to local civil society.

10.6 Strategic Funding Initiatives

New long-term funding mechanisms are being investigated in the hotspot. They are mainly in the early stages of development but, if successful, they will have a significant impact on funding for biodiversity conservation in the region.

10.6.1 Trust Funds

Trust funds are being investigated for several landscapes in the hotspot, including the Cardamom Mountains and Eastern Plains in Cambodia, or at the national level for Lao PDR and Vietnam. None of these funds has yet fully realized its potential as a sustainable funding mechanism for biodiversity conservation, and further investment is required in all countries in the hotspot to help resolve challenges, and cover the potentially high start-up costs of trust funds.

The Cardamoms trust fund is seeking donors to invest and AFD has already committed funds. The trust fund for the Eastern Plains of Cambodia is in a feasibility study phase, and may be used as mechanism for distribution of REDD payments (see below). In Vietnam, the Trust Fund for Forests was established in 2004 as a sinking fund to support implementation of the Forest Sector Support Partnership. Capitalized with contributions of $26 million from the governments of Finland, the Netherlands, Sweden and Switzerland, it provided grants to a range of activities in support of pro-poor and sustainable forest management, including some in support of biodiversity conservation.

In Lao PDR, the Environment Protection Fund was established in 2005 as an administratively and financially independent fund. Over the period 2006-2010, the fund awarded more than $5 million in grants for various environmental issues, including policy implementation, capacity building, solid waste management, sustainable natural resources management, and biodiversity conservation; most of these grants were awarded to government ministries and local administrations. The fund was capitalized with $13 million in grants and loans from the World Bank, ADB and UNESCO. It was intended that these funds be supplemented by a proportion of the revenues of each hydropower plant and mining project in the country. To date, however, the only contributions received have been from mining projects, due to difficulties in implementing the relevant policy.

10.6.2 Payments for Ecosystem Services

Payments for ecosystem services are another rapidly developing field, and one with great potential to provide long-term funding for biodiversity conservation. As mentioned above these payments may be ideal for capitalizing trust funds. Two main areas receiving attention are payments for avoided deforestation through REDD+ mechanisms, and payments for water services. This approach is rapidly expanding in China, where most initiatives are funded by national or provincial agencies.

10.6.3 REDD+

For more information on the status of REDD+ and climate-change-related programs in the hotspot (see Chapter 9). As mentioned above multilateral and bilateral donors are investing considerable amounts in the development of REDD+ programs in the hotspot. There is great hope among conservation practitioners that avoided-deforestation payments will provide a sustainable source of funds for biodiversity conservation. As yet, however, no countries or sites in the hotspot have received any payments for avoided deforestation. Pilot programs to develop tools for the implementation of REDD programs are being implemented in various locations in the hotspot. These are aiming to have carbon credits for sale on the voluntary market. PACT and the Forestry Administration are piloting a system based around small community forests in northwestern Cambodia; the project seeks to maintain and increase carbon stocks in these areas, enhancing the hydrology in the upper catchments of the Tonle Sap Basin as well as conserving biodiversity and threatened species. A second Cambodian pilot site is the Seima Protection Forest, where FA and WCS are developing a model specifically for use in conservation areas (with funding from WCS, Winrock International and the MacArthur Foundation). Both of these projects have been running since 2008, and due to the extreme complexity of the issues involved are yet to complete the appropriate project documents A similar pilot project is being implemented at Nam Et-Phou Louey in northern Lao PDR (with GIZ investment). Pilot projects are also being developed in Vietnam, for example, at Cat Tien National Park (being implemented by DARD Lam Dong and SNV with funding from the UK government's Darwin Initiative). It may yet be some time before any of these pilot sites, or other areas important for biodiversity, receive any REDD-related payments. In the interim it is vitally important that these sites continue to be supported through traditional funding mechanisms.

10.6.4 Other Initiatives

Two ground-breaking programs focused on payments for ecosystem services were established in the region during the study period. The USAID-funded Asia Regional Biodiversity Conservation Program (ARBCP), which was implemented by Winrock International from 2005 to 2011, developed working models for payments for ecosystem services for forest protection across 200,000 hectares of the catchments of Da Nhim and Dai Nhim hydropower projects in southern Vietnam's Lam Dong province. These models have proven successful at threat reduction and benefit sharing, and there are plans to replicate them elsewhere in Vietnam. The other operating mechanism was developed in Lao PDR, where the Nam Theun 2 Hydropower Company is making annual payments in support of forest conservation in the catchment of the dam. Specifically, the company is providing the Nam Theun 2 Watershed and Management Protection Authority (WMPA), a Lao government agency, with $1 million per year for 25 years. This money is used to fund a range of activities, including law enforcement and biodiversity surveys. The World Bank provides supervision and advice to WMPA.

In 2011, an EC-funded program began to develop mechanisms for payments for ecosystem services mechanisms related to hydropower developments in southwest Cambodia. The investment is in excess of $3.75 million over three years. As with REDD projects it is unlikely that these approaches will provide significant funds to most sites of biodiversity importance in the immediate future. Nevertheless, in particular situations, these models have great long-term potential, and there is already significant investment in developing them further. These models can be expected to work best in situations involving a single user, for example, when a dam or water authority is paying for the services from a discrete area (typically a clearly defined water catchment). In other locations, where there are multiple users, or a less clearly defined resource, these models are less applicable. However, given the potential expansion of hydropower programs across the region (see Section 5.3.2), notably along the tributaries and main course of the Mekong and in the Cardamoms, there may be the potential for the more widespread use of water catchment protection payments. Many of the proposed hydropower developments are at an early stage, however, so the short-term prospects for receipt of payments to support conservation are limited. In addition, the environmental impacts from the development of the proposed dams could be extremely high. It remains to be seen whether the potentially large funding opportunities will outweigh the environmental costs of dam construction.

10.7 Gap Analysis

10.7.1 Thematic Gaps

Based on the information gathered in the course of this study several investment gaps have been identified. Significant investments have been made, and are predicted to continue in landscape-level approaches, sustainable-development-linked activities and sustainable and community-based natural resource management initiatives. Major investments are in the pipeline to support initiatives related to climate change adaptation and mitigation, including REDD readiness. The most significant gaps, or areas that need continued and increased support, are:

- Site-based law enforcement to control illegal activities including hunting and trapping, encroachment and illegal logging.
- Control of wildlife trade, from source to market.
- Rigorous research and biological monitoring.
- Capacity building, particularly focusing on key scientific competencies.
- Support for local civil society, particularly long-term investment in core costs, as assistance in continued fundraising.

Beyond filling these thematic investment gaps, it must be recognized that funding is only one ingredient in the recipe for effective conservation. Conservation is as much a social process as it is a technical one, highly dependent upon sustained individual commitment and personal engagement. Within the limits inherent in a project approach to conservation, investments by CEPF and other funders should, as far as possible, focus on the human dimension, and create conditions within which individual conservationists and organizations can develop, collaborate and build constituencies for conservation at local, national and regional levels.

10.7.2 Geographic Gaps

There are a number of clear trends regarding the geographic distribution of conservation investment in Indo-Burma. Most notably, there is relatively little investment in biodiversity conservation in coastal, riverine and lowland evergreen forest ecosystems. This may partly reflect reluctance on the part of governments and donors to invest in conservation in ecosystems that are under heavy pressure from human populations, and where there is a perceived large opportunity cost of biodiversity conservation in terms of foregone economic opportunities, such as timber extraction, land conversion, and aquaculture development. Moreover, at least in the case of the former two ecosystems, it may possibly reflect a lack of appreciation of their biodiversity values. In addition, Myanmar as a whole is a major funding gap, reflecting ongoing economic sanctions against the country.

The current phase of CEPF has been very successful in directing funds to two previously underrepresented corridors: the Mekong River and Major Tributaries; and Sino-Vietnamese Limestone. Stakeholders felt strongly that this support should be continued, in order to consolidate and build upon achievements to date. Both of these corridors remain of high global importance for biodiversity conservation, and both are under markedly greater threat now than 10 years ago.

Consultations highlighted particular areas that would benefit from greater investment:

- Research into the conservation value of agricultural lands. Large areas of the hotspot are important for agricultural production. The value of traditional agricultural systems (as opposed to modern intensified, industrial systems) for biodiversity needs to be understood further. Some areas, such as the grasslands around the Tonle Sap Great Lake, are now known to be of international importance for birds, and perhaps other taxa. The importance of upland agricultural systems also needs to be understood, particularly as their long-term environmental impacts are contested (e.g. Cairns 2007).
- Gaps exist in funding in Thailand and Myanmar, especially for remnant lowland patches and in the internationally important forests of the Western Forest Complex of Thailand.
- Marine conservation in Cambodia and Vietnam needs increased investment following the closure of several large programs. Of particular interest are the mangroves, mudflats and seagrass areas of the Cambodian coast.

10.8 Recommendations

With more than $170 million of investment in the period 2006-2010, it may appear that biodiversity conservation is well funded in Indo-Burma. However, in the most threatened biodiversity hotspot in the world, this equates to an annual per capita investment of just $0.10. The continued degradation of habitats, high levels of poaching during this period demonstrate that this level of investment is wholly inadequate. In addition, the majority of these investments have been for non-core activities such as sustainable development, natural resource management and national policy initiatives. Another trend during the period has been the movement towards budget support by donors rather than direct investment in projects. Finally, the period has seen the phasing out of many bilateral donor agencies from the hotspot, and agencies such as the USFWS have had their budgets cut. Most of the agencies that remain engaged in the hotspot are likely to continue to focus funding on poverty alleviation projects, including improved natural resource management. The trend for support of large landscape-level programs will also continue. The most significant new area of investment is in interventions associated with climate change mitigation and adaptation. Fundraising is framed increasingly in terms of how activities will reduce green house gas emissions or allow communities, habitats or wildlife to adapt to predicted changes. It is as yet unclear how effective these funds will be at conserving the biodiversity values of the hotspot. These trends mean that it is likely that civil society will find it increasingly hard to fund core conservation activities in coming years.

Key areas that would benefit from CEPF investment and lead to maximum impact are:

- Activities to improve the scope and effectiveness of law enforcement activities, including programs to encourage best practices and promote transparency.
- Improved biodiversity monitoring to evaluate the effectiveness of different biodiversity conservation interventions and assess whether core conservation goals are being met.
- Expanded efforts to control wildlife trade from source to market.
- Capacity building for local scientists and conservationists.
- Long-term support for core funding of local CSOs dedicated to biodiversity conservation.
- Continued use of a regional implementation team.
- Targeted expansion of the CEPF program to Thailand, China and Myanmar
- Increased allocation for small grants with a larger limit for small grants (for example to a maximum of $50,000).

11. INVESTMENT NICHES FOR CEPF AND OTHER FUNDERS

The purpose of updating the ecosystem profile was to generate a shared situational analysis and overarching set of investment priorities to facilitate coordination among CEPF, the MacArthur Foundation, the Margaret A. Cargill Foundation and the McKnight Foundation with regard to potential future investments in biodiversity conservation and sustainable development led by civil society in the Greater Mekong Subregion. These funders will implement a shared strategy with independent but coordinated grantmaking processes.

Over the last five years, CEPF, the MacArthur Foundation and the McKnight Foundation have made a collective investment of $17 million in biodiversity conservation projects in the Indo-Burma Hotspot. Given the very significant investments made by bilateral and multilateral donors and governments of the hotspot countries, these funds only represent 3 percent of the total investment in biodiversity conservation over this period. Significantly, however, they represent 52 percent of the investment by foundations and funds, which are widely viewed as the most valuable source of funding for civil society organizations because of their accessibility and applicability to core conservation activities (see Section 10.2). Over the next five years, CEPF and the other funders that participated in updating the ecosystem profile are expected to become an even more important source of funding for conservation actions led by civil society, particularly if trends of reduced international donor support to the hotspot countries and realignment of goals away from biodiversity towards climate change and other priorities continue.

The updated ecosystem profile presents a common vision for action, formulated through an inclusive, participatory process that engaged more than 470 representatives of civil society, donor and government organizations. The profile articulates an investment strategy that focuses on those taxonomic, geographic and thematic priorities where additional resources can be used most effectively in support of civil society initiatives that complement and better target investments by national governments and other donors.

At the same time, the profile focuses attention on activities that can contribute to protection of the rights and assets of the rural poor while addressing biodiversity conservation. The basic premise underlying the investment strategy is that conservation investment should be targeted where it can have the maximum impact on the highest conservation priorities while supporting the livelihoods of some of the poorest sections of society. Chapter 12 outlines this comprehensive investment strategy. Using this shared strategy, each funder selected those elements that best fit with its strategies and approaches, and incorporated them into its own strategy and request for proposals for the region. Through this process, a niche for CEPF was defined that complements funding provided by other organizations while playing to CEPF's unique strengths and contributing to the fund's global objectives.

Specifically, the CEPF niche builds on the experience of the first phase of investment by focusing on approaches that have demonstrated success, moving from pilot projects to longer-term interventions, and integrating results more concretely into government programs. At the same time, the CEPF niche responds to emerging conservation issues, such as wildlife trade, hydropower development and expansion of agro-industry, with strategies developed through extensive consultation with practitioners in the field. These strategies are focused on the geographies where these conservation issues are most acutely felt: the Mekong River and its major tributaries; Tonle Sap Lake and its inundation zone; the limestone highlands along the Vietnam-China border; and the mountains of Hainan Island. The geographic scope of the CEPF niche also embraces Myanmar to take advantage of opportunities to strengthen capacity among civil society organizations in the country and enable them to address priority conservation actions in a rapidly changing political and development context.

The implementation of this shared strategy will be coordinated through regular meetings of the collaborating funders. Streamlining of planning or grantmaking processes to reduce transaction costs may be pursued selectively as it fits each funder's internal grants management needs. One promising arena for collaboration is in monitoring and evaluation. The MacArthur Foundation, for example, is investing in development of a regional set of indicators of ecosystem health that may provide a shared platform for long-term evaluation of the impacts and effectiveness of conservation investments.

This collaboration will rely on adaptive management by each funder. As the other funders make final decisions about investment in the hotspot and develop grant portfolios, CEPF must adapt the development of its own portfolio to avoid duplication, address gaps and take advantage of opportunities for leverage, synergy and amplification.

The shared investment strategy is both ambitious and indicative of the scale of the conservation challenges facing the Indo-Burma Hotspot. The amount of resources required to adequately support work under all parts of the strategy over the next five years very likely exceeds the amount of resources available to any individual funder for investing in civil society. For this reason, it is important that grant making remain competitive, and seek out value for money and leveraging opportunities with other donors, governments and the private sector.

12. CEPF INVESTMENT STRATEGY AND PROGRAM FOCUS

12.1 Priority Species, Sites and Corridors

To maximize the contribution to the goal of global biodiversity conservation within the Indo-Burma Hotspot by CEPF and other funders, it was necessary to refine the full lists of globally threatened species, KBAs and conservation corridors into a focused set of priority outcomes for investment (priority species, sites and corridors) over a five-year period. The purpose of selecting priority sites and corridors was to enable investment by CEPF and other funders in site-based and landscape-scale conservation actions to focus on geographic areas of the highest priority, while the purpose of selecting priority species was to enable investments in species-focused conservation actions to be directed at those globally threatened species for which conservation needs cannot adequately be addressed by general habitat protection (site-scale or landscape-scale) actions alone.

12.1.1 Prioritization of Species

Among species, prioritization was carried out comprehensively for vertebrates. However, a number of issues related to application of the prioritization criteria (see below) meant that the resulting list of priorities for fish is less objective than those for the other vertebrate groups. None of the stakeholder consultations tackled the prioritization of invertebrates and (recognizing also that most of the highly threatened invertebrate species have not yet even been assessed by the Red List) these species are not prioritized here. Plants are intermediate in treatment. Globally threatened plants were not comprehensively reviewed during any of the national consultations but most of the latter did identify some species as clear priorities. The identified priorities are included in the list of priority species but should not be considered an exclusive list. Other globally threatened plant species are also likely to meet the criteria for priority species, and the list of species eligible for species-specific funding should be reviewed on a periodic basis.

There were five criteria for selecting priority species from among the full list of globally threatened species in the region. The application of these criteria to the species in the Indo-Burma Hotspot is presented in Appendix 1.

The first criterion was whether the hotspot population is significant for conservation of the species, relative to the global population; or, in other words, whether actions in Indo-Burma are an essential part of a successful global conservation strategy. For most species, a notional quantitative threshold was used to retain species for the next stages of prioritization: Vulnerable species typically had at least 10 percent of their global population in Indo-Burma; Endangered species at least 5 percent; and Critically Endangered species at least 1 percent.

These thresholds were not inflexible in the case of species with a special claim for attention, such as those with a distinct subspecies endemic (or nearly endemic) to the hotspot and severely threatened. The Endangered hog deer provides an example: the entire population of its eastern subspecies *Axis porcinus annamiticus* inhabits Indo-

Burma, may comprise fewer than 100 animals, and receives no effective conservation management. Although this population may well be below 5 percent of the species's global population (two South Asian protected areas each support at least 1,000 animals of the nominate race; Biswas *et al*. 2002), the subspecies in the hotspot is still considered globally significant because of its taxonomic distinctiveness. The sarus crane subspecies *Grus antigone sharpii* furnishes a comparable example.

Other case-specific exceptions to the quantitative thresholds were made in consideration of maintaining the ancestral breadth of geographic distribution and habitat use, even where current subspecific taxonomy does not reflect this. For example, the few hundred (at maximum) Irrawaddy dolphins in the hotspot's rivers (Mekong and Ayeyarwady) are numerically trivial compared with the world's coastal populations but they comprise the majority of the world's permanent freshwater populations of the species. Being now isolated from the coastal populations, recolonization, if extirpated from the ecologically distinct freshwater habitats, is implausible.

Only those species for which the hotspot population was considered globally significant were assessed for the remaining four criteria. The second criterion was the need for species-focused conservation action; that is, where the species's conservation needs cannot adequately be addressed by general habitat protection alone. Many species that are not harvested can be confidently expected to survive, provided suitable habitat is preserved in large enough blocks to support viable populations, despite projected environmental change. For example, Gurney's pitta in southern Myanmar, a bird species that is threatened by conversion of its lowland forest habitat to oil palm plantations and other land uses, does not require species-focused action above and beyond protection of sufficient suitable habitat. By contrast, large tracts of suitable habitat in the hotspot are now bereft of many species of large mammals, large birds, large reptiles and large fish that used to inhabit them because sustained hunting and fishing has led to widespread local extirpations. Rhinoceroses were early examples of this, having been widespread and probably highly abundant in the hotspot up to a few centuries ago but already being reduced to small, isolated populations by the early 20th century, such was the trade demand for their horns. Many other species are now following suit. No amount of habitat protection will prevent the hotspot-wide extinction of, for example, most large waterbirds, many large ungulates and most turtles if hunting is not restrained.

The specific needs of some species relate to their ecology. For example, there is no lack of suitable habitat in the hotspot for *Gyps* vultures (which inhabit towns in some parts of their range), but the massive depletion of wild ungulates, coupled with changes in domestic stock husbandry, mean that for the present, food supplementation is probably essential for their survival in the hotspot (Gilbert *et al*. 2007).

Consideration of aquatic organisms, particularly migratory species, was more complicated. Much fishing is non-selective and longstanding, so people have been considered here as a fish predator, part of the "natural" system. Species-specific needs are accepted only for species with targeted fisheries of sufficient value to shape the fishing habits of people and to be directly driving major population declines of the species in question. The wider issue, of the need for fishing to be sustainable, is in part addressed by identifying most of the Mekong and its major tributaries (one of the hotspot's major catchments), and Tonle Sap lake and its inundation zone, as priority corridors.

The third criterion for prioritization was the need for greatly improved information on status and distribution in Indo-Burma to highlight species for which available information is so limited that it precludes any form of meaningful conservation action. As the conservation of all species would benefit from improved information, this category was reserved for species that are not known to persist at any site, or those few for which, even though they are known to persist somewhere, the actions needed are entirely unclear.

Species that met the first criterion and either the second or third were also evaluated against two further criteria: the urgency for conservation action and the level of opportunity for CEPF and funders of similar philosophy to enhance existing conservation efforts for the species significantly, given the level of funding they are likely to be able to invest over the "baseline" level.

The fourth criterion, urgency of conservation action, was relatively straightforward to apply and highly reflective of Red List category. In particular, few species categorized as Vulnerable, the safest of the three globally threatened categories, were considered as high priorities for action in the next five years. Of the few Vulnerable species so considered, some represent species where the Southeast Asian population is much more threatened than the global average, such as sarus crane and Indian skimmer. With the others, the level of urgency felt by workshop participants for their conservation urges a review of their current Red List category as Vulnerable. For Asian small-clawed otter (*Aonyx cinereus*) and smooth-coated otter (*Lutrogale perspicillata*), this is already underway (N. Duplaix pers. comm. 2011). For other species, such as Gejiu blind loach (*Triplophysa gejiuensis*) (about which participants commented "this species is only known from a single site where it is now believed to be extinct due to impacts from mining"), their selection as priority species suggests a review is urgently needed.

The fifth criterion, by contrast, was the most subjective and the one most likely to undergo abrupt change in the future. Nonetheless, it is important to consider whether CEPF and institutions of similar mode and scope of operation can meaningfully add to existing actions so that scarce resources are used wisely. It results, necessarily, in some of the most iconic and threatened species not being selected as priority species. Tiger is one of the species closest to extinction in Indo-Burma (its global Red List category of merely Endangered is ameliorated by populations outside the hotspot) but the total sum of money spent on tiger conservation globally is so large (Walston *et al*. 2010) that even if all CEPF's available resources for Indo-Burma were funneled into tiger-related activity, the incremental gains would be low.

Species were thus selected as priorities if: (i) the Indo-Burma population is significant to their global conservation prospects; and either (ii) species-focused action is required or (iii) there is a pressing need for a great improvement of the information base; and both (iv) the urgency for action and (v) the opportunity for additional investment are high. The first four criteria are reasonable for defining an objective list of hotspot priority species for the conservation community as a whole. By contrast, the fifth criterion, by introducing the element of shortfall in existing activities, precludes the use of the CEPF list as a general list of species priorities for Indo-Burma. Moreover, all the criteria were viewed from a hotspot perspective. Thus, for long-distance migrant birds, where the essential and urgent interventions for their conservation need to take place in the parts of their range outside the hotspot (an example being the Palaearctic-breeding Baer's pochard (*Aythya baeri*)), even if the hotspot is highly important for the population, the second criterion (requirement for species-focused action) and fourth criterion (urgency for conservation action) are not met within the hotspot. Thus, some species in urgent global need of assistance are not considered priorities here.

12.1.2 Prioritization of Sites

The sole criterion for selecting priority sites from among the full list of KBAs in the hotspot was whether or not the site lies within a priority corridor. All KBAs within a priority corridor were considered priority sites; no others were (Appendix 2; Table 24). The rationale for this is that location within a priority corridor gives site-based actions added conservation value.

12.1.3 Prioritization of Corridors

Five criteria were used to select priority corridors from among Indo-Burma's conservation corridors. First, only conservation corridors supporting globally significant populations of Critically Endangered and Endangered species were considered. Second, preference was given to conservation corridors supporting globally significant populations of one or more landscape species. Third, preference was given to conservation corridors supporting (near-)unique or otherwise exceptional examples of ecological and evolutionary processes. Fourth, the urgency of conservation action, and fifth, the opportunity for additional investment additional to the baseline level, were both considered. The application of the selection criteria to the conservation corridors in Indo-Burma is presented in Appendix 3. As with the prioritization of species, the fifth criterion, which highlighted shortfalls between baseline investment and needed investment that are within the budgetary realm of CEPF and other funders, precludes the use of this corridor prioritization as a general map of variation in conservation importance across the hotspot.

12.1.4 General Considerations

For all priority outcomes for CEPF investment, the most important selection criteria were urgency for conservation action and opportunity for additional investment. Priority species and corridors (and, through the latter, sites) were selected only where current threats, if not mitigated, were predicted to cause their extinction (in the case of species) or the loss of key elements of biodiversity (in the case of corridors) within the next 20 years. In addition, priority species and corridors (and, through the latter, sites) were only selected where there were considered to be great opportunities for CEPF and other organizations to invest in conservation actions by civil society that complement or improve targeting of other investments by governments and other donors.

Preliminary lists of priority species, sites and corridors for investment were prepared, taking the original ecosystem profile as a starting point. Wholesale changes to Red List assessments, particularly among mammals and fish, required major review of the priority species list but relatively minor changes to the lists of priority sites and corridors. The preliminary lists were reviewed and amended during the national stakeholder consultations, based on the collective opinion of representatives of national and international conservation organizations, academic institutions, donor agencies and government institutions. These lists were then synthesized and reviewed through reference to published and unpublished data and further consultations with relevant experts. The synthesized lists of priorities were then circulated for review as part of the draft ecosystem profile during December 2011. The lists were finalized, taking into account review comments from in-region stakeholders, as well as representatives of CEPF's donor partners and the other funders participating in the updating exercise.

Consensus was strong during the consultations that CEPF should retain its current geographical priorities (i.e. the Mekong River and Major Tributaries, and the Sino-Vietnamese Limestone (formerly, Northern Highlands Limestone) corridors, and the sites therein), adding additional priorities if resources allowed. There was also broad consensus to add the Tonle Sap Lake and Inundation Zone as a third priority corridor: this area is integral to the Mekong ecosystem, and the high levels of investment underway there when the original profile was prepared have ended, leaving a large and genuine need for further investment. In China, there was broad agreement that the Hainan Mountains warrant the status of priority corridor, reflecting their high endemism, massive funding gap and rapidly intensifying development threats.

In the case of Myanmar, the level of conservation investment is low relative to other parts of the hotspot (Figure 19), and many sites and corridors are facing severe threats that are only likely to intensify if the current process of political reconciliation leads to increased foreign investment in mining, forestry and other natural resource sectors (see BBC News 2012). Therefore, priority status would be justified for many if not most of the conservation corridors in the country. However, the types of site-based conservation actions needed in Myanmar are quite different from those in the other hotspot countries. In particular, the protected area system in Myanmar (where only 25 percent of KBAs are formally protected) is much less comprehensive than in the other countries (where, on average, 71 percent are formally protected). Consequently, while the priority for site-based conservation investment across most of the hotspot was considered to be refinement and amplification of effective approaches to protection and stewardship, in Myanmar it was considered to be a gap analysis of KBAs to inform the expansion of the national protected area network. For this reason, priority corridors were not identified in Myanmar but the whole country was recognized as a priority for this analysis.

Elsewhere, there was not such clear consensus about additional priorities, although a large number of conservation corridors and KBAs were put forward as priorities, and it is unlikely that the resources available to CEPF and other funders operating through civil society can stretch significantly beyond the four priority corridors plus complementary activities in Myanmar in any case. It should be re-emphasized here that investments in the conservation of priority species can be made irrespective of location, and are not restricted to the priority corridors and sites.

12.1.5 Priority Corridors and Sites

Four priority corridors were selected (Figure 21); the key biodiversity values of each are briefly summarized below. The four priority corridors contain a total of 74 KBAs, which were all automatically selected as priority sites (Table 24). In addition to the four priority corridors, Myanmar was identified as a priority for certain specified investments.

Figure 21. Priority Corridors for CEPF Investment in the Indo-Burma Hotspot

Note: as developed through the stakeholder consultation process, the Mekong River and Major Tributaries Corridor does not include the Mekong River downstream from Phnom Penh or upstream from the Lao-China border.

Priority Corridor 1: Hainan Mountains. Hainan is the second-largest island off the coast of China, after Taiwan. Because the island was connected to the mainland of Asia as recently as the Quaternary Period, there is relatively low endemism at the genus level (seven seed-plant genera; Francisco-Ortega *et al*. 2010), although considerable endemism at the species level. Of some 4,200 plant species recorded on the island, 397 are listed as endemic, including 19 that are recognized as globally threatened by IUCN, such as *Cycas changjiangensis*, *Dendropanax oligodontus*, *Firmiana hainanensis*, *Ilex shimeica*, *Pentastelma auritum* and *Saccopetalum prolificum* (Francisco-Ortega *et al*. 2010). Several of these species are restricted to single sites, such as *Paranephelium hainanensis*, which is known only from Sanya KBA in Yaxian county. Globally threatened mammals endemic to Hainan Island include Hainan hare (*Lepus hainanus*), Hainan gymnure (*Neohylomys hainanensis*) and Hainan gibbon. The latter species is believed to be entirely confined to Bawangling Nature Reserve, and is the most severely threatened primate in the world (Geissmann 2005). Other globally threatened vertebrate species endemic to Hainan include Hainan torrent frog, ocellated small treefrog (*Liuixalus ocellatus*), Hainan peacock-pheasant (*Polyplectron katsumatae*) and Hainan knobby newt. The priority corridor comprises the mountains and foothills that dominate the interior of Hainan Island. The original vegetation of the corridor was tropical deciduous monsoon forest. However, this has been extensively cleared for shifting cultivation or converted to rubber, coffee and oil palm plantations. The remaining forest fragments receive some protection within the nature reserve system but are facing new threats from disturbance, infrastructure development and other incompatible activities arising from Hainan's recent designation as a "national tourism island". With the exception of a long-term conservation program by KFBG, in collaboration with Hainan Forestry Department, and an environmental education program implemented by FFI, there is almost no external support to conservation efforts on Hainan by international donors.

Priority Corridor 2: Mekong River and Major Tributaries. Partly as a result of a limited appreciation of their biodiversity values among decision-makers, riverine ecosystems have, to date, received less conservation investment than have most other ecosystems in Indo-Burma, and are severely under-represented within national protected area systems. The Mekong River and its major tributaries, including the Srepok, Sesan, and Sekong (Xe Kong) rivers, represent one of the best remaining examples of the riverine ecosystems of Indo-Burma, and provide services vital to the livelihoods of millions of people. The biodiversity values of these rivers have yet to be fully evaluated but they are known to be vital for many globally threatened fish species, including some of the largest freshwater fish in the world. The corridor also supports significant populations of several high-priority turtle species, and many for which the need for effective conservation action is only slightly less urgent. Furthermore, the Mekong and its major tributaries support one of the fullest riverine bird communities remaining in Indo-Burma, including globally significant congregations of species such as white-shouldered ibis (not a river-channel nester, but seasonally strongly associated with channels as feeding habitat), river tern (*Sterna aurantia*), great thick-knee (*Esacus recurvirostris*), river lapwing (*Vanellus duvaucelii*) and small pratincole (*Glareola lactea*), and the entire world population of Mekong wagtail. Among mammals, one of the world's three freshwater populations of Irrawaddy dolphin inhabits the corridor, and patchy populations of otters remain. At the ecosystem level, there are some specialized habitats, including the best example of seasonally inundated within-channel true forest in Asia. Because of these values, one section of the corridor has been designated as a Ramsar site. Yet the values are highly threatened, both by locally originating threats and by major development projects driven by national development agendas, especially hydropower dams. CEPF investment in the Mekong catchment will focus on the Mekong River and its major tributaries, as defined by the stakeholder consultation process. Projects in the catchment of the Mekong River and its tributaries can be considered for support under the investment strategy, provided that they demonstrate clear linkages to the conservation of priority sites or species within the corridor, or of the Mekong system as a whole.

Priority Corridor 3: Sino-Vietnamese Limestone. The Sino-Vietnamese Limestone corridor is particularly important for the conservation of primates, as it supports the entire global population of two Critically Endangered species: Tonkin snub-nosed monkey and cao vit crested gibbon. The corridor is also of high global importance for plant conservation, supporting high levels of endemism in many groups, such as orchids. The corridor supports the richest assemblages of conifer species in the region, including several globally threatened species, such as *Amentotaxus yunnanensis*, *Cephalotaxus mannii* and *Cunninghamia konishii*. Most notably, the corridor supports two conifer species known globally from only two sites: the Endangered *Amentotaxus hatuyenensis*; and the Critically Endangered Golden Vietnam Cypress (*Xanthocyparis vietnamensis*). Through a land-use history of commercial logging and shifting cultivation, the natural habitats of the Sino-Vietnamese Limestone corridor (limestone, lowland evergreen and montane evergreen forest) have become fragmented, highly so in places, and remaining blocks are often threatened by overexploitation of forest products. Nevertheless, the corridor presents tremendous opportunities to engage civil society groups in biodiversity conservation. Many of the most important populations of threatened and endemic species occur outside formal protected areas, in sites that lend themselves to community-based conservation approaches. Furthermore, many KBAs are threatened by incompatible development initiatives, and there is an important role for civil society to play in reconciling conservation and development agendas in the corridor.

Priority Corridor 4: Tonle Sap Lake and Inundation Zone. Tonle Sap, the largest lake in mainland Southeast Asia, is an integral and essential part of the lower Mekong ecosystem. During the monsoon season, as the water level in the Mekong River rises, the Tonle Sap River, which drains the lake, reverses its direction, raising the water level in the lake by up to 8 meters and causing it to inundate an area of up to 16,000 square kilometers (six times the area of the lake during the peak of the dry season). This seasonal flood regime has led to the development of flooded forest and grassland habitats around the periphery of the lake, important for species of otters, waterbirds and the Critically Endangered Bengal florican. The flooded forests around the lake support the largest breeding colonies of large waterbirds remaining in Southeast Asia, including important congregations of globally threatened species such as greater adjutant (*Leptoptilos dubius*). The extensive area of flooded forest and high levels of nutrients transported by the annual flood result in very high levels of aquatic productivity, helping to make the lake the most important fishery in Cambodia, responsible for around 60 percent of protein intake by the country’s population. The system is also critically important for agricultural and fisheries production in Vietnam, as waters draining from the lake provide around 50 percent of the dry-season flow in the Mekong Delta. The Tonle Sap Lake and inundation zone provide critical breeding, spawning and feeding habitats for many species of migratory fish, including several globally threatened species, such as giant dog-eating catfish (*Pangasianodon hypophthalmus*) and Jullien's golden carp. The Tonle Sap system faces a wide array of threats, including agricultural development in the inundation zone, clearance of flooded forest, changes to fishing practices and management arrangements in the lake, and changes in hydrological flows due to upstream developments on the Mekong River and its tributaries. As is the case for the Mekong River and Major Tributaries corridor, there is great potential for conservation interventions that also address human livelihoods and other development goals, both directly and by securing the delivery of critical ecosystem services.

Table 24. Priority Corridors and Sites for Investment in the Indo-Burma Hotspot

Priority corridor	Priority sites	Countries	Area (km^2)
Hainan Mountains	Baimaling-Huishan; Bawangling; Datian; Diaoluoshan; Exianling and Changhuajiang; Fanjia; Ganshiling; Houmiling; Jianfengling; Jianling; Jiaxi; Ledong; Liji; Limushan; Nanmaoling; Nanweiling; Sanya; Shangxi; Tongtieling; Wuzhishan; Yinggeling	China	17,452
Mekong River and Major Tributaries	Lower Nam Ou; Mekong Confluence with Nam Kading; Mekong Confluence with Xe Bangfai; Mekong Channel near Pakchom; Mekong River from Kratie to Lao PDR; Mekong River from Phou Xiang Thong to Siphandon; Mekong River from Louangphabang to Vientiane; Pakxan Wetlands; Sekong River; Sesan River; Siphandon; Srepok River; Upper Lao Mekong; Upper Xe Kaman	Cambodia, Lao PDR and Thailand	16,475
Sino-Vietnamese Limestone	Ba Be; Ban Bung; Ban Thi-Xuan Lac; Bangliang; Bat Dai Son; Binh An; Cham Chu; Chongzuo; Daweishan; Diding; Du Gia; Gulongshan; Khau Ca; Lam Binh; Longhua; Longhushan; Longshan section of Nonggang; Malipo; Na Chi; Nonggang; Paiyangshan; Shangsi-Biannian; Sinh Long; Tat Ke; Tay Con Linh; Than Xa; Trung Khanh; Tung Vai; Xidamingshan	China and Vietnam	58,502
Tonle Sap Lake and Inundation Zone	Ang Trapeang Thmor; Boeung Chhmar-Moat Khla; Chhnuk Tru; Dei Roneat; Lower Stung Sen; Preah Net Preah-Kra Lanh-Pourk; Prek Toal; Stung-Chi Kreng-Kampong Svay; Stung Sen-Santuk-Baray; Veal Srongae	Cambodia	17,547

12.1.6 Priority Species

One hundred and four globally threatened vertebrate species were selected as priority species, representing 27 percent of the full list of 379 globally threatened vertebrate species in the hotspot (Table 25). These exclude various other species that are high, in some cases very high, global priorities for conservation but for which, for one reason or another, the CEPF modality is not appropriate. The priority species include 22 turtle species, 14 primates (12 endemic to the hotspot), seven ungulates (two endemic), three otters, and two pangolins, reflecting the high threat posed to all these groups by overexploitation, mostly driven by demand from the international wildlife trade. The priority species also include 13 large and medium-sized waterbird species, which are not heavily sought in trade but are either dispersed breeders or colonial breeders that disperse widely during the non-breeding season; these species require species-focused conservation action throughout their ranges in order to address incidental persecution, disturbance and loss of key habitats. All three vulture species breeding in the hotspot are also priorities, having seen heavy reduction in their food supply in recent decades and being at permanent risk from the possibility that veterinary drugs that have caused massive declines in India may be promoted in Southeast Asia. Twenty-seven fishes are identified as priority species. By contrast, only one amphibian met the criteria, indicating the predominance of broad-scale habitat factors in threatening amphibians in Indo-Burma in recent decades. The evolving new threat of the fungal disease chytridiomycosis, which by some estimates has already wiped out 200 species of amphibians in the last 30 years (Woodhams *et al*. 2011), has not been accounted for, because it is unclear which species will be strongly threatened by it, if any. A *prima facie* case can be made that any single-location species, being inherently vulnerable to disease, could be considered to be at elevated risk.

No invertebrate species were selected as priorities, in part because of the paucity of information with which to assess them against the criteria. All globally threatened species occurring in the hotspot were assessed as having globally significant populations in the hotspot, except the Sundaic dragonfly *Urothemis abbotti*, which extends marginally into far-southern Thailand. Any of the species with globally significant hotspot populations that can be independently shown to meet the other criteria could potentially be considered a priority species in a future revision of the list. The priority conservation action for globally threatened invertebrate species in the hotspot is research to establish their true distribution, conservation status and needs.

An additional 48 globally threatened plants were selected as priority species, representing 16 percent of the list of globally threatened plants occurring in the hotspot based on the current Red List (Table 25). It was not possible to undertake a comprehensive assessment of species-level priorities among plants for several reasons, not the least of which is that Red List assessments to date have been patchy, with a heavy emphasis on gymnosperms and timber trees, leaving major gaps with regard to groups widely considered to be heavily threatened with high levels of localized endemism, such as orchids. The list of priority plant species cannot be considered as a robustly agreed, balanced list, therefore. For example, no Thai endemic was included, because the stakeholders at the national consultation advocated (with some justification, given the paucity of data) for funding to concentrate on habitats and ecosystems, not individual species. Nevertheless, the list of 48 priority species does provide a useful lens through which to assess proposed projects aimed at developing and demonstrating species-focused approaches to plant conservation, especially responding to the threat of overexploitation. Moreover, the number of priority species is consistent with both the likely level of funding available and the capacity of civil society groups in the hotspot to implement species-focused plant conservation initiatives over the next five years.

In total, 23 vertebrate species and three plant species were selected as priorities because they have an over-riding need for greatly improved information on their status and distribution before conservation action can be taken for them in any meaningful way. For some of these, it is not clear whether they need species-specific actions (e.g. various fish that have had their sole known rivers converted to reservoirs and that have not been searched for since). For others, it is abundantly clear that they do but no populations are presently known (including some of the rarest and/or most enigmatic species in the world, such as white-eyed river-martin, pink-headed duck and Irrawaddy river shark). For yet others, populations are known but it is not clear why the species is so threatened and, therefore, the actions needed cannot be defined (e.g. white-bellied heron).

Table 25. Priority Species for CEPF Investment in the Indo-Burma Hotspot

Priority Species	English Name	Conservation Need(s) Requiring Species-Focused Action	Over-riding Need for Improved Information
MAMMALS			
Aonyx cinereus	Asian Small-clawed Otter	Control of overexploitation	
Axis porcinus	Hog Deer	Control of overexploitation; population management	
Bubalus arnee	Wild Water Buffalo	Control of overexploitation	
Dicerorhinus sumatrensis	Hairy Rhinoceros		Yes
Hipposideros halophyllus	Thailand Leaf-nosed Bat	Cave management	
Hoolock hoolock	Western Hoolock	Control of overexploitation	
Lutra sumatrana	Hairy-nosed Otter	Control of overexploitation	
Lutrogale perspicillata	Smooth-coated Otter	Control of overexploitation	
Manis javanica	Sunda Pangolin	Control of overexploitation	
Manis pentadactyla	Chinese Pangolin	Control of overexploitation	
Moschus berezovskii	Forest Musk Deer	Control of overexploitation	
Moschus fuscus	Black Musk Deer	Control of overexploitation	
Muntiacus vuquangensis	Large-antlered Muntjac	Control of overexploitation	
Nomascus concolor	Black Crested Gibbon	Control of overexploitation	
Nomascus hainanus	Hainan Gibbon	Population management; habitat restoration	
Nomascus leucogenys	Northern White-cheeked Gibbon	Control of overexploitation	
Nomascus nasutus	Cao Vit Crested Gibbon	Control of overexploitation; habitat restoration	
Orcaella brevirostris	Irrawaddy Dolphin	Reduction of fishing-related accidental death	
Prionailurus viverrinus	Fishing Cat		Yes
Pseudoryx nghetinhensis	Saola	Control of overexploitation	
Pygathrix cinerea	Grey-shanked Douc	Control of overexploitation	

Priority Species	English Name	Conservation Need(s) Requiring Species-Focused Action	Over-riding Need for Improved Information
Pygathrix nemaeus	Red-shanked Douc	Control of overexploitation	
Rhinopithecus avunculus	Tonkin Snub-nosed Monkey	Control of overexploitation	
Rhinopithecus strykeri	Myanmar Snub-nosed Monkey	Control of overexploitation	
Rucervus eldii	Eld's Deer	Control of overexploitation; population management	
Trachypithecus delacouri	Delacour's Leaf Monkey	Control of overexploitation	
Trachypithecus francoisi	François's Leaf Monkey	Control of overexploitation	
Trachypithecus germaini	Indochinese Silvered Leaf Monkey	Control of overexploitation	
Trachypithecus poliocephalus	White-headed Leaf Monkey	Control of overexploitation	
Trachypithecus shortridgei	Shortridge's Leaf Monkey	Control of overexploitation	
BIRDS			
Ardea insignis	White-bellied Heron		Yes
Cairina scutulata	White-winged Duck	Control of overexploitation	
Chrysomma altirostre	Jerdon's Babbler		Yes
Eurychelidon sirintarae	White-eyed River-martin		Yes
Eurynorhynchus pygmeus	Spoon-billed Sandpiper	Control of overexploitation	
Gorsachius magnificus	White-eared Night-heron	Control of overexploitation	
Grus antigone	Sarus Crane	Control of overexploitation	
Gyps bengalensis	White-rumped Vulture	Provision of adequate food supply; control of persecution	
Gyps tenuirostris	Slender-billed Vulture	Provision of adequate food supply; control of persecution	
Heliopais personata	Masked Finfoot		Yes
Houbaropsis bengalensis	Bengal Florican	Retention of suitable agricultural practices	
Leptoptilos dubius	Greater Adjutant	Control of overexploitation	
Leptoptilos javanicus	Lesser Adjutant	Control of overexploitation	
Lophura edwardsi	Edwards's Pheasant		Yes
Lophura hatinhensis	Vietnamese Pheasant		Yes
Mergus squamatus	Scaly-sided Merganser		Yes
Platalea minor	Black-faced Spoonbill	Control of overexploitation	
Polyplectron katsumatae	Hainan Peacock-pheasant	Control of overexploitation	
Pseudibis davisoni	White-shouldered Ibis	Control of overexploitation	
Rhodonessa caryophyllacea	Pink-headed Duck		Yes
Rynchops albicollis	Indian Skimmer		Yes
Sarcogyps calvus	Red-headed Vulture	Provision of adequate food supply; control of persecution	
Thaumatibis gigantea	Giant Ibis	Control of overexploitation	
REPTILES			
Batagur baska	Mangrove Terrapin	Control of overexploitation	

Priority Species	**English Name**	**Conservation Need(s) Requiring Species-Focused Action**	**Over-riding Need for Improved Information**
Batagur borneoensis	Painted Terrapin	Control of overexploitation	
Battagur trivittata	Burmese Roofed Turtle	Control of overexploitation	
Chitra chitra	Striped Narrow-headed Softshell Turtle	Control of overexploitation	
Chitra indica	Indian Narrow-headed Softshell Turtle	Control of overexploitation	
Crocodylus siamensis	Siamese Crocodile	Control of overexploitation	
Cuora galbinifrons	Indochinese Box Turtle	Control of overexploitation	
Cuora mccordi	McCord's Box Turtle	Control of overexploitation	
Cuora mouhotii	Keeled Box Turtle	Control of overexploitation	
Cuora trifasciata	Chinese Three-striped Box Turtle	Control of overexploitation	
Cuora yunnanensis	Yunnan Box Turtle	Control of overexploitation	
Cuora zhoui	Zhou's Box Turtle		Yes
Geochelone platynota	Burmese Star Tortoise	Reintroduction to wild	
Manouria emys	Asian Giant Tortoise	Control of overexploitation	
Mauremys annamensis	Vietnamese Pond Turtle	Control of overexploitation	
Mauremys mutica	Asian Yellow Pond Turtle	Control of overexploitation	
Mauremys nigricans	Red-necked Pond Turtle	Control of overexploitation	
Morenia ocellata	Burmese Eyed Turtle		Yes
Nilssonia formosa	Burmese Peacock Softshell	Control of overexploitation	
Pelochelys cantorii	Asian Giant Softshell Turtle	Control of overexploitation	
Platysternon megacephalum	Big-headed Turtle	Control of overexploitation	
Rafetus swinhoei	East Asian Giant Softshell Turtle		Yes
Sacalia bealei	Beale's Eyed Turtle	Control of overexploitation	
AMPHIBIANS			
Amolops hongkongensis	Hong Kong Cascade Frog		Yes
FISH			
Aaptosyax grypus	Mekong Giant Salmon Carp	Control of overexploitation	
Balantiocheilos ambusticauda	Siamese Bala-shark		Yes
Catlocarpio siamensis	Giant Carp	Control of overexploitation	
Ceratoglanis pachynema	Club-barbel Sheatfish	Localized control of water quality	
Dasyatis laosensis	Mekong Freshwater Stingray	Control of overexploitation	
Datnioides pulcher	Siamese Tiger Perch	Control of overexploitation	
Datnioides undecimradiatus	Thinbar Datnoid	Control of overexploitation	
Epalzeorhynchos bicolor	Redtail Shark Minnow	Localized control of water quality; reintroduction	
Glyphis siamensis	Irrawaddy River Shark		Yes
Himantura kittipongi	Roughback Whipray	Control of overexploitation	
Himantura oxyrhynchus	Marbled Freshwater Stingray	Control of overexploitation	

Priority Species	English Name	Conservation Need(s) Requiring Species-Focused Action	Over-riding Need for Improved Information
Himantura polylepis	Giant Freshwater Stingray	Control of overexploitation	
Himantura signifer	White-edged Freshwater Whipray	Control of overexploitation	
Luciocyprinus striolatus	Monkey-eating Fish	Control of overexploitation	
Pangasianodon gigas	Mekong Giant Catfish	Control of overexploitation	
Pangasianodon hypophthalmus	Striped Catfish	Control of overexploitation	
Pangasius sanitwongsei	Giant Dog-eating Catfish	Control of overexploitation	
Poropuntius deauratus	Yellow Tail Brook Barb	Control of overexploitation	
Probarbus jullieni	Jullien's Golden Carp	Control of overexploitation	
Probarbus labeamajor	Thick-lipped Barb	Control of overexploitation	
Scaphognathops theunensis	Nam Theun Barb		Yes
Schistura leukensis	Nam Leuk Loach		Yes
Schistura nasifilis	Vietnamese Loach		Yes
Schistura tenura	Slender-tailed Loach		Yes
Scleropages formosus	Asian Arowana	Control of overexploitation	
Trigonostigma somphongsi	Somphongs's Rasbora		Yes
Triplophysa gejiuensis	Gejiu Blind Loach		Yes
PLANTS			
Afzelia xylocarpa		Control of overexploitation	
Aglaia pleuropteris			Yes
Amentotaxus yunnanensis		Control of overexploitation	
Anisoptera costata		Control of overexploitation	
Anisoptera scaphula		Control of overexploitation	
Aquilaria crassna		Control of overexploitation	
Aquilaria sinensis		Control of overexploitation	
Burretiodendron tonkinense		Control of overexploitation	
Cinnamomum balansae		Control of overexploitation	
Craigia yunnanensis		Control of overexploitation	
Cunninghamia konishii		Control of overexploitation	
Cycas bifida		Control of overexploitation	
Cycas changjiangensis		Control of overexploitation	
Cycas collina		Control of overexploitation	
Cycas debaoensis		Control of overexploitation	
Cycas hainanensis		Control of overexploitation	
Cycas multipinnata		Control of overexploitation	
Cycas pectinata		Control of overexploitation	
Cycas shanyaensis		Control of overexploitation	
Dalbergia bariensis		Control of overexploitation	
Dalbergia cambodiana		Control of overexploitation	
Dalbergia cochinchinensis		Control of overexploitation	

Priority Species	English Name	Conservation Need(s) Requiring Species-Focused Action	Over-riding Need for Improved Information
Dalbergia tonkinensis		Control of overexploitation	
Dendrobium officinale	Official Dendrobium	Control of overexploitation	
Dendrobium sinense	Chinese Dendrobium	Control of overexploitation	
Diospyros mun	Ebony	Control of overexploitation	
Dipterocarpus gracilis		Control of overexploitation	
Dipterocarpus turbinatus		Control of overexploitation	
Glyptostrobus pensilis	Chinese Water Fir	Population management; habitat restoration	
Helicia shweliensis		Control of overexploitation	
Hopea chinensis		Control of overexploitation	
Hopea mollissima		Control of overexploitation	
Hopea pierrei		Control of overexploitation	
Malania oleifera		Control of overexploitation	
Manglietia sinica		Control of overexploitation	
Michelia coriacea		Control of overexploitation	
Myristica yunnanensis		Population management	
Paphiopedilum armeniacum	Golden Slipper Orchid	Control of overexploitation	
Paphiopedilum emersonii	Emerson's Paphiopedilum	Control of overexploitation	
Paphiopedilum tigrinum	Tiger-striped Paphiopedilum	Control of overexploitation	
Pinus squamata		Population management	
Pinus wangii		Control of overexploitation	
Pterospermum kingtungense		Population management	
Shorea falcata			Yes
Taiwania cryptomerioides		Control of overexploitation; population management	
Vatica guangxiensis			Yes
Vatica xishuangbannaensis		Control of overexploitation	
Xanthocyparis vietnamensis	Golden Vietnam Cypress	Control of overexploitation; population management	

See Appendix 1 for justification for selection of priority species.

In addition to the species in Table 25, 60 species of global conservation concern (31 vertebrates and 29 plants) were identified that cannot presently be assessed as priority species. Most are not presently listed as globally threatened on the Red List. Two of these species (kouprey and lesser one-horned rhinoceros) are probably extinct in the hotspot; should they be rediscovered within it, they would be among its highest conservation priorities. These 60 species were considered otherwise likely to meet the selection criteria for priority species; in particular, they all require species-focused conservation action or greatly improved information. They are, therefore, included on a list of provisional priority species that could become eligible for CEPF investment if their global threat status is reassessed as globally threatened (Appendix 4). However, because whatever new information allows their categorization may also affect their eligibility as CEPF priority species, review will be needed at that stage.

In addition, several species currently considered by the Red List in species-level synonymy may be valid species and, should they be treated as such, would probably be categorized as globally threatened and warrant consideration as priority species: ebony leaf monkey (*Trachypithecus ebenus*) (currently within *T. hatinhensis*); white-headed leaf monkey (*T. leucocephalus*) (currently within *T. poliocephalus*); northern yellow-cheeked gibbon (*Nomascus annamensis*) (currently within *N. gabriellae*); Chinese grassbird (*Graminicola striatus*) (currently within *G. bengalensis* but see Leader *et al*. 2010) and Burmese frog-faced softshell turtle (*Chitra vandijki*) (currently within *C. indica*). Related to this, the taxonomy of several globally threatened species currently recognized as priority species may change over coming years; one example is Indochinese box turtle (*Cuora galbinifrons*), which some authorities recognize as a complex of separate species. Should any sub-specific taxa within priority species be treated as valid species in future revisions of the Red List, they will automatically be considered as CEPF priority species, provided that the hotspot supports a globally important population.

12.2 Strategic Directions and Investment Priorities

This section presents a comprehensive investment strategy for CEPF and other donors interested in supporting conservation efforts led by civil society. The strategy comprises 11 strategic directions, grouped into five components. Each strategic direction is defined broadly but contains a number of investment priorities, which outline the particular types of activities that will be eligible for support. The strategic directions and investment priorities are summarized in Table 26, and described in more detail afterwards.

The investment strategy for the Indo-Burma Hotspot is based upon the local, national and regional stakeholder consultations, and also draws on the findings of the thematic studies. Throughout these exercises, stakeholders were asked to identify activities likely to address the highest priority threats to biodiversity in the hotspot, where civil society could play a leading role in their implementation (in collaboration with government, where appropriate), and where additional funding would make a significant difference compared with baseline levels of conservation investment from governments and major international donors. The investment strategy addresses many of the priorities identified by stakeholders during the consultations but to incorporate them all would have been unrealistic, given the level of funding that is likely to be available for the strategy. A synthesis of the rankings made by the stakeholders at the consultations was used to determine which investment priorities to include in the final strategy.

Of the 11 strategic directions in the overall strategy, six were included within the CEPF investment niche (Table 26). These six strategic directions contain 21 of the 38 investment priorities in the overall strategy, focusing on ones that play to the unique strengths of the fund and contribute directly to its global objectives, while complementing the investment strategies of the other three funders that participated in the development of the joint strategy (see Chapter 11). These six strategic directions form the thematic priorities for CEPF investment in the Indo-Burma Hotspot.

Table 26. Strategic Directions and Investment Priorities in the Indo-Burma Hotspot

Strategic Directions	Investment Priorities
COMPONENT I: CONSERVATION OF PRIORITY SPECIES	
1. Safeguard priority globally threatened species by mitigating major threats [CEPF priority]	1.1 Transform pilot interventions for core populations of priority species into long-term conservation programs
	1.2 Develop best-practice approaches for conservation of highly threatened and endemic freshwater species
	1.3 Conduct research on globally threatened species for which there is a need for greatly improved information on status and distribution
	1.4 Support existing funds to become effective tools for the conservation of priority species in the hotspot
2. Demonstrate innovative responses to illegal trafficking and consumption of wildlife [CEPF priority]	2.1 Support enforcement agencies to unravel high-level wildlife trade networks by introducing them to global best practice with investigations and informants
	2.2 Facilitate collaboration among enforcement agencies and non-traditional actors to reduce cross-border trafficking of wildlife
	2.3 Work with selected private sector companies to promote the adoption of voluntary restrictions on the international transportation, sale and consumption of wildlife
	2.4 Support campaigns, social marketing, hotlines and other long-term communication programs to reduce consumer demand for wildlife and build public support for wildlife law enforcement
COMPONENT II: PROTECTION AND STEWARDSHIP OF PRIORITY SITES	
3. Strengthen management effectiveness at protected areas as a tool to conserve priority key biodiversity areas	3.1 Develop verifiable standards and objectives for protected area management and pilot at priority sites
	3.2 Institutionalize training programs for protected area managers within domestic academic institutions
	3.3 Develop best-practice approaches for direct civil society involvement in protected area management
4. Empower local communities to engage in conservation and management of priority key biodiversity areas [CEPF priority]	4.1 Raise awareness about biodiversity conservation legislation among target groups at priority sites
	4.2 Pilot and amplify community forests, community fisheries and community-managed protected areas
	4.3 Develop co-management mechanisms for formal protected areas that enable community participation in all levels of management
	4.4 Conduct a gap analysis of key biodiversity areas in Myanmar and support expansion of the protected area network using community-based models

5. Strengthen local initiatives to sustain and improve the livelihoods of local communities at priority key biodiversity areas	5.1 Pilot alternative livelihood projects to reduce dependence on natural resources at priority sites
	5.2 Directly link livelihood support to conservation actions through negotiated agreements
	5.3 Develop best-practice ecotourism initiatives at priority sites
COMPONENT III: ENHANCEMENT OF ECOLOGICAL CONNECTIVITY AND RESILIENCE	
6. Engage key actors in mainstreaming biodiversity, communities and livelihoods into development planning in the priority corridors [CEPF priority]	6.1 Support civil society efforts to analyze development policies, plans and programs, evaluate their impact on biodiversity, communities and livelihoods, and propose alternative development scenarios and appropriate mitigating measures where needed
	6.2 Integrate the biodiversity and ecosystem service values of priority corridors into land-use and development planning at all levels
	6.3 Develop protocols and demonstration projects for ecological restoration that improve the biodiversity performance of national forestry programs
	6.4 Engage the media as a tool to increase awareness and inform public debate of environmental issues
7. Minimize the social and environmental impacts of agro-industrial plantations and hydropower dams in the priority corridors	7.1 Support land registration for local and indigenous communities at priority sites
	7.2 Upgrade the legal status of unprotected priority sites threatened by incompatible land uses
	7.3 Strengthen the voice of affected communities in approval processes for agro-industrial plantations and hydropower dams
	7.4 Work with the private sector to develop guidelines for siting and developing agro-industrial plantations and hydropower dams in an environmentally and socially responsible manner
COMPONENT IV: DEVELOPMENT OF A CONSERVATION CONSTITUENCY	
8. Strengthen the capacity of civil society to work on biodiversity, communities and livelihoods at regional, national, local and grassroots levels [CEPF priority]	8.1 Support networking activities that enable collective civil society responses to priority and emerging threats
	8.2 Provide core support for the organizational development of domestic civil society organizations
	8.3 Establish clearing house mechanisms to match volunteers to civil society organizations' training needs

9. Conduct targeted education, training and awareness raising to build capacity and support for biodiversity conservation among all sections of society	9.1 Invest in the professional development of future conservation leaders through support to graduate programs at domestic academic institutions
	9.2 Foster leadership for sustainable development by investing in professional development of key individuals
	9.3 Pilot programs of experiential education to connect school children to nature in priority corridors
	9.4 Conduct targeted outreach and awareness raising for urban populations about the values of natural ecosystems and the impacts of consumption patterns
COMPONENT V: COORDINATION AND MONITORING OF CONSERVATION INVESTMENT	
10.Evaluate the impacts of conservation investment on biodiversity and human well-being through systematic monitoring	10.1 Develop common standards and systems for monitoring the impacts and effectiveness of conservation actions across multiple scales
	10.2 Support systematic efforts to build capacity for monitoring among domestic organizations
	10.3 Develop and test mechanisms for ensuring that monitoring results inform national policy debates and local adaptive management
11.Provide strategic leadership and effective coordination of conservation investment through a regional implementation team [CEPF priority]	11.1 Operationalize and coordinate CEPF's grant-making processes and procedures to ensure effective implementation of the investment strategy throughout the hotspot
	11.2 Build a broad constituency of civil society groups working across institutional and political boundaries towards achieving the shared conservation goals described in the ecosystem profile

Strategic Direction 1: Safeguard Priority Globally Threatened Species by Mitigating Major Threats

Indo-Burma is one of the most important hotspots in the world for the conservation of globally threatened species. It supports 754 globally threatened species, including many found nowhere else. For certain taxonomic groups, such as primates and turtles, Indo-Burma supports more globally threatened species than any other hotspot. Moreover, conservation of threatened species is recognized as a high priority by the CBD, and addressed by Aichi Biodiversity Target 12, that "by 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained" (SCBC 2010).

Despite the importance of Indo-Burma for globally threatened species, species-focused conservation receives almost no attention from national governments in the hotspot. Moreover, although several international donors (including CEPF) have opened specific funding windows for species-focused conservation, it still only receives a modest proportion of overall conservation investment (8 percent during 2006-2010; see Section 10.4). In part, this reflects an assumption on the part of governments and some donors that conservation of representative examples of natural ecosystems, principally through the establishment of protected areas, will be sufficient to maintain viable populations of the species that occur there. While this is true for many species, a significant number require additional action, particularly to address overexploitation, as evidenced by the "empty-forest syndrome" of protected areas with high levels of forest cover but heavily depleted wildlife populations. Consequently, species-focused conservation was proposed as the number three priority for additional conservation investment at the consultations in China, the number four priority in Vietnam, and the number five priority in Cambodia.

The first phase of CEPF investment has demonstrated that many CSOs active in the hotspot have good capacity to take actions for globally threatened species, particularly INGOs. These actions often provide opportunities for collaboration with domestic CSOs, and with them opportunities for skills transfer. Wherever possible, projects should include capacity building for domestic CSOs in species-focused research and action as an explicit objective. This strategic direction is restricted to the priority species listed in Table 25 but is not geographically restricted to the priority sites and corridors.

Investment Priority 1.1: Transform Pilot Interventions for Core Populations of Priority Species into Long-term Conservation Programs

One hundred and fifty-two of the 754 globally threatened species in Indo-Burma were selected as priority species. The most common conservation action required for these species is identifying and securing core populations from overexploitation. Particularly important is reduction in indiscriminate snaring, which frequently results in the capture of non-target species, and control of targeted collection of high-value species, such as turtles and orchids. Learning from past experience with site-based protection of species and their habitats, more attention should be focused on major improvements in protection and enforcement of laws against poaching, while consideration should be given to the role of each partner and to respective accountabilities (Brook *et al.* 2011). In addition to identifying and securing core populations from overexploitation, a small number of priority species require additional species-focused actions, such as supplementary feeding in the case of Critically Endangered vulture species, and assurance colonies combined with reintroduction in the case of Critically Endangered turtle species.

Most of the priority species are benefiting from focused conservation interventions, including many supported by CEPF under the first investment phase. While many of these interventions are beginning to show positive results, including reduction in pressure on core populations, very few of them have access to long-term funding sources, which places at risk the gains made to date. Projects supported under this investment priority should, therefore, focus on transforming pilot interventions into long-term conservation programs with appropriate funding strategies and, where possible, sustainable financing mechanisms. In many cases, this transformation may require linking species conservation to sustainable livelihoods and community development, in order to ensure long-term support from local stakeholders. Given the fact that many priority species range across international borders, regional initiatives may be required in some cases.

Investment Priority 1.2: Develop Best-practice Approaches for Conservation of Highly Threatened and Endemic Freshwater Species

Freshwater species make critical contributions to the diet and livelihood of a large proportion of the rural population of the hotspot. This dependency is illustrated by a study on rural livelihoods in Attapu province, Lao PDR, where some 200 species of aquatic plants and animals were found to be used by villagers (Meusch *et al.* 2003). As well as supporting rural livelihoods, freshwater species are also among the most threatened in Indo-Burma, as a result of unsustainable fishing practices, invasive species, and habitat alteration and loss. Under the first phase of CEPF investment, the status and distribution of freshwater species in the Indo-Burma Hotspot were comprehensively assessed for the first time, while the effectiveness of community-based fisheries management was demonstrated at various pilot sites. There is now a need to build on the results of this assessment and initial experience, and develop best-practice approaches for the conservation of highly threatened and endemic species, focusing on the 33 priority fish species in Table 25. Experience gained from these pilots can be used to refine the approaches and replicate them for other threatened freshwater species in the future. This investment priority directly addresses Aichi Biodiversity Target 6 (SCBD 2010), which states that "by 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem-based approaches, so that overfishing is avoided [...] fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits."

Investment Priority 1.3: Conduct Research on Globally Threatened Species for which there is a Need for Greatly Improved Information on Status and Distribution

Twenty-six priority species require greatly improved information on their status and distribution before conservation action can be taken in any meaningful way. Therefore, support will be provided for applied research on the status, abundance, ecology, threats and distribution of these species, and to apply the results to conservation planning, protected area management, awareness raising and/or community outreach. If potentially viable populations of any of the 26 species are located, they will immediately become eligible for focused conservation actions under Investment Priority 1.1 or 1.2. This investment priority is particularly suited to domestic academic institutions, and can provide an opportunity for graduate students, such as those being trained under Investment Priority 8.4, to gain valuable field experience.

Investment Priority 1.4: Support Existing Funds to Become Effective Tools for the Conservation of Priority Species in the Hotspot

The specific actions that are needed to conserve threatened species and avert a wave of extinctions across the hotspot do not find a natural home within the strategies of national governments or most multilateral and bilateral agencies. In this context, the advent of new global funding mechanisms for species conservation, such as the World Bank/GEF-funded Save Our Species initiative and the Mohamed bin Zayed Species Conservation Fund, is a significant development. However, due to the limited size of these funds relative to their global mandates, the amount of resources available for species conservation in the Indo-Burma Hotspot is grossly insufficient to support even the highest priority actions. Thus, there is a need to enhance the availability of funding for priority species conservation in the hotspot.

Establishment of a permanent conservation fund for priority species in the hotspot was proposed at several of the stakeholder consultations. However, setting up a dedicated fund entails considerable transaction costs for design and establishment, not to mention development of an effective delivery mechanism. Therefore, projects supported under this investment priority should assist existing funding mechanisms to develop specific windows for conservation of priority species in Indo-Burma, and leverage the necessary funds to operationalize them. Although the traditional conservation donors may represent one source of funding, projects should also explore innovative sources, such as private-sector contributions and government budget allocations.

Strategic Direction 2: Demonstrate Innovative Responses to Illegal Trafficking and Consumption of Wildlife

Hunting and trade of wildlife was prioritized as the top-ranked threat to biodiversity in the Indo-Burma Hotspot during the stakeholder consultations (Figure 16). Demand from the illegal wildlife trade is the major factor driving overexploitation of threatened wildlife species in the hotspot (see Section 9.2.3), and is the largest single factor contributing to the declines of the priority species listed in Table 25. Nevertheless, wildlife trade/law enforcement receives relatively little conservation investment from international donors (it received 5 percent of the total investment during 2006-2010; see Section 10.4); support is dominated by a few large initiatives, most notably the USAID-supported ARREST program; and current efforts are highly unstrategic (Parr 2011). During the national stakeholder consultations, combating the illegal wildlife trade was identified as the number two priority for additional conservation investment in Vietnam and the number four priority in Lao PDR. During the regional stakeholder workshop, a detailed conservation strategy to respond to the threat posed by the wildlife trade was formulated, and specific funding gaps were identified that are addressed by the investment priorities described below. A strong message from stakeholders was that, in contrast to certain other threats to biodiversity, there is little consensus among conservationists about what represents best practice with regard to addressing illegal trade and consumption of wildlife, and thus there remains a strong need to develop and test innovative approaches.

Investment Priority 2.1: Support Enforcement Agencies to Unravel High-level Wildlife Trade Networks by Introducing Them to Global Best Practice with Investigations and Informants

Through the concerted efforts of governments and civil society over the last decade, the capacity of enforcement officers has been increased, coordination among agencies has improved, and the illegal wildlife trade has been destabilized and driven further underground. Nevertheless, demand for wildlife still exists at many levels, and the profits to be made from meeting this demand are enormous. As a result of these factors, the illegal trade in wildlife is increasingly coming under the control of organized crime syndicates, which are overpowering enforcement efforts by corrupting officers, circumventing weak laws, and exploiting a lack of high-level political will to tackle the issue. Efforts to control the wildlife trade will not be successful as long as arrests and prosecutions are confined to low-level dealers and middlemen, and the crime bosses are able to operate with impunity. Stakeholders thought that as few as five criminal networks may control the majority of the illegal wildlife trade in the Indo-Burma Hotspot, and believed that unraveling at least one of these networks over the next five years was a realistic goal. The necessary activities, such as conducting professional investigations and running informants, are not necessarily expensive but few enforcement agencies have the necessary capacity to implement them effectively. Projects supported under this investment priority will assist government enforcement agencies by introducing them to global best practice with regard to these techniques.

Investment Priority 2.2: Facilitate Collaboration among Enforcement Agencies and Non-traditional Actors to Reduce Cross-border Trafficking of Wildlife

Over the last decade, the illegal trade in wildlife has been exacerbated by increasing liberalization of trade in the ASEAN region, simplification of border controls, and investments in transnational transport infrastructure. While international cooperation on cross-border wildlife trafficking is on the increase, due in part to the establishment of the ASEAN WEN, there is still significant room for improvement. In many cases, enforcement officials simply remain unaware of the illegality of international trade in endangered species, or do not consider it a serious issue. There is a need, therefore, for pilot initiatives that develop approaches for reducing cross-border wildlife trafficking, which can later be replicated at border crossings throughout the hotspot. The roles for CSOs in these initiatives include facilitating cooperation among different enforcement agencies within and between countries, providing training and materials on wildlife law and identification skills for border officials, engaging non-traditional actors (such as the United Nations Office on Drugs and Crime) in collaborative efforts, and promoting the integration of wildlife crime into mainstream law enforcement agendas. Projects funded under this investment priority will be expected to align with existing regional initiatives.

Investment Priority 2.3: Work with Selected Private Sector Companies to Promote the Adoption of Voluntary Restrictions on the International Transportation, Sale and Consumption of Wildlife

One of the barriers to initiatives to combat illegal trafficking and illegal consumption of wildlife trade to date has been the low priority given to the issue among government officials at all levels. On the rare occasions when there have been high-profile pronouncements by senior government figures, for instance following the 2003 outbreak of Severe Acute Respiratory Syndrome, the impacts have been marked and immediate but rarely sustained. An alternative strategy, of engaging the private sector, has been piloted under the first CEPF investment phase and has shown some potential for success.

Recognizing that much illegal consumption of wildlife takes place within the context of business interactions in social settings, initiatives that support companies to adopt codes of conduct or other restrictions on wildlife consumption by their employees are eligible for support under this investment priority. Also, a number of private companies, such as airlines, shipping firms and logistics companies, are important, if unwitting, agents in trafficking wildlife, not only within the hotspot but also from source countries in other parts of the world (such as southern Africa) to the hotspot. There are opportunities for civil society to engage with these companies, because trafficking of endangered wildlife only forms a small part of their business and the profits they make from it may be outweighed by the potential reputational risks of being branded as wildlife traffickers.

Investment Priority 2.4: Support Campaigns, Social Marketing, Hotlines and Other Long-term Communication Programs to Reduce Consumer Demand for Wildlife and Build Public Support for Wildlife Law Enforcement

Although some of the key markets for priority species threatened by overexploitation and trade lie outside of Indo-Burma, and are, therefore, ineligible for CEPF funding under this investment strategy, a significant proportion of the wildlife illegally exploited in the hotspot is consumed there, either close to the point of source or in urban centers. In this regard, Thailand, Vietnam, and southern China are the major consumer markets. While strengthened enforcement of wildlife protection and trade legislation may reduce pressure on wild populations of priority species, at least at specific sites, a significant reduction in consumer demand is needed to secure these populations in the long term. Pilot civil society initiatives to promote changes in attitudes toward consumption of priority species and their products through public awareness campaigns have met with initial success, at least in terms of increasing public awareness of the issue. However, their impacts on consumption levels have not been systematically assessed and, in any case, any decline would be very difficult to attribute to a particular initiative. The consensus among stakeholders consulted during the update of the ecosystem profile was that initiatives to reduce consumer demand take time to deliver results, so must be sustained, and must be linked to strengthened enforcement of laws against wildlife consumption. This investment priority presents good opportunities to build on the results of the first phase of CEPF investment, such as by involving the general public in conservation actions through wildlife trade hotlines and volunteer groups.

Strategic Direction 3: Strengthen Management Effectiveness at Protected Areas as a Tool to Conserve Priority Key Biodiversity Areas

Over the period 2006-2010, protected area management received around 5 percent of conservation investment in the hotspot by international donors, although protected areas also benefited directly from investments under other themes, such as landscape-scale conservation (see Section 10.4). Protected areas were also a principal focus of conservation investment by national governments, although the bulk of this funding went to infrastructure and staff salaries, not operational management (see Chapter 10). Civil society representatives interviewed during the thematic study on conservation investment reported that support to protected areas for operational management was one of the most difficult themes for which to raise funding. Strengthening enforcement of management regulations was also identified as a high priority for additional conservation investment at the stakeholder consultation workshops, being the number two priority in China and Vietnam, and the number three priority in Thailand.

An important niche for conservation donors is to fund CSOs to provide support to protected area managers and enforcement agencies in systematic, sustained ways, which are a departure from the short-term interventions and one-off training courses of the past, whose impacts were rapidly diluted by turnover in staff, limitations in government budgetary support and lack of incentive systems. A recent review of the relative success of different approaches to site-based conservation in the hotspot concluded that, to be effective, site-based approaches require committed support of relevant government officials, as well as capable, trained staff with proper incentives and motivation (Eberhardt 2011). Projects eligible for support under this strategic direction are limited to the 48 priority sites that contain formal protected areas, comprising three in the Mekong River and Major Tributaries corridor, seven in the Tonle Sap Lake and Inundation Zone corridor, 20 in the Sino-Vietnamese Limestone corridor and 18 in the Hainan Mountains corridor.

Investment Priority 3.1: Develop Verifiable Standards and Objectives for Protected Area Management and Pilot at Priority Sites

Overall, despite significant investments by national governments and a long succession of interventions at individual sites funded by international donors, only a few protected areas in the hotspot are effectively preventing erosion of their biodiversity values. For example, the Seima Protected Forest in southeastern Cambodia is frequently cited as a model for integrated site-based conservation (Eberhardt 2011). A small number of exceptional protected areas notwithstanding, the general pattern is one of unchecked exploitation of high-value timber, NTFP and animal species, coupled with gradual degradation and encroachment of natural habitats. To be more effective, protected areas need a substantial number of trained forest rangers, stable budgets to ensure adequate patrolling operations, systematized enforcement patrolling, monitoring and management, and a national system of protected area management accountability for directors and staff (Brook *et al.* 2011). Some of these elements are already available, such as the internationally used MIST system for monitoring patrolling operations, and a set of *Competence Standards for Protected Area Jobs in South East Asia* developed by the ASEAN Regional Centre for Biodiversity Conservation (Appleton *et al.* 2003). However, one investment gap identified during the stakeholder consultations was for clear standards for management and clear objectives against which protected area management effectiveness can be assessed independently by civil society. Development of such standards and objectives, together with a system for monitoring the performance and impact of protected areas, requires very close relations between civil society and government.

Investment Priority 3.2: Institutionalize Training Programs for Protected Area Managers within Domestic Academic Institutions

Given the large number of priority sites with protected status where enhanced management effectiveness is urgently required, developing separate training initiatives at individual sites is unlikely to be cost effective. Therefore, this investment priority supports training programs for protected area managers at the national or sub-national level. The curricula used for these training programs should draw on best practice with protected area management from within and outside of the hotspot, and could incorporate standards developed under Investment Priority 3.1. While training needs may differ among priority sites, training programs could be built around a core set of competencies, and then tailored to the needs of particular groups of trainees. A strong message from the stakeholder consultations was that training needs to be reinforced over long periods if it is to lead to sustained improvements in management effectiveness. For this reason, funding under this investment priority is limited to training programs that are institutionalized within domestic academic institutions, such as forestry colleges and universities.

Investment Priority 3.3: Develop Best-practice Approaches for Direct Civil Society Involvement in Protected Area Management

The shortcomings of formal protected areas are widely acknowledged, and the factors limiting their effectiveness are consistently diagnosed, such as lack of incentive systems for managers and enforcement staff, insufficient and inappropriate budgets, and limited opportunities for local revenue generation. However, many of these limiting factors can only be addressed as part of comprehensive public administration reform processes, which CSOs working on biodiversity conservation have little if no ability to influence. For this reason, an alternative approach to enhancing protected area management effectiveness has been recently piloted in the region, whereby the role of CSOs is not limited to capacity building and technical advice but extends to a direct role in management and enforcement. This approach has the potential to break the impasse and demonstrate significant and lasting improvements in protected area management effectiveness.

Strategic Direction 4: Empower Local Communities to Engage in Conservation and Management of Priority Key Biodiversity Areas

Throughout the Indo-Burma Hotspot, governments lack the necessary capacity, resources and political will to effectively manage formal protected area systems, let alone sites outside of these systems. At many sites, however, mobilized local communities, if sufficiently informed and empowered, can effectively prevent biodiversity loss, and, in many cases, are already doing so, following traditional management practices. Moreover, given the constraints on local participation and access to resources imposed by existing protected area regulations in most countries in the region, community-based conservation initiatives can provide greater opportunities for meaningful participation in decision making regarding the use of natural resources than conventional protected areas approaches. Consequently, such initiatives can contribute to improved livelihoods for rural people, especially those with high levels of dependence on natural resources. For these reasons, community-based approaches to conservation were widely recommended during the stakeholder consultations, including as the top-ranked priority for additional conservation investment in Lao PDR, the number-three priority in China and the number five priority in Thailand.

In the early part of the 2000s, a number of community-based approaches to conservation were piloted in the hotspot, including community-based protection of the waterbird colony at Prek Toal in Cambodia (Goes and Hong Chamnan 2002), community-based primate conservation groups in northern Vietnam (Swan and O’Reilly 2004), and village-protected Fish Conservation Zones in deepwater pools in southern Lao PDR (Baird 2001) and, independently, in Hainan (Padilla and Fellowes 2010). These pilots demonstrated that community-based approaches could be a viable alternative to protectionist approaches, and one with potential to empower local communities and deliver livelihood benefits. During the second half of the 2000s, these pilot approaches were replicated throughout the hotspot (e.g. Pilgrim *et al*. 2011), including under the first CEPF investment phase. The lessons learned from this decade of experience were recently reviewed, and the primary conditions for success were found to be "a commitment to participatory process, clear land tenure regimes, community institutions capable of equitably representing their 'constituencies' and of negotiating their interests, and an interest in conservation, whether through benefits of sustainable harvest, or economic gain through direct payments" (Eberhardt 2011). There is now a need for CSOs to refine these approaches to internalize these lessons, and to amplify them widely.

With the exception of Investment Priority 4.4, which focuses on Myanmar, to be eligible for support under this strategic direction, projects must focus on one or more of the 74 priority sites. Recognizing the critical role of gender relations in determining men and women's access to and participation in management of natural resources (see Section 5.2.5), projects must also integrate gender considerations into their design and implementation.

Investment Priority 4.1: Raise Awareness about Biodiversity Conservation Legislation among Target Groups at Priority Sites

Projects supported under this investment priority will distill biodiversity conservation regulations and laws into appropriate communication materials and disseminate them to local communities and other target groups, such as migrant workers and gold prospectors, at priority sites. The aim will be to increase understanding of their rights with regard to access and benefit sharing, as well as their responsibilities in terms of restrictions on use of natural resources. In order to be eligible for support, projects must go beyond conducting conventional 'conservation propaganda', and employ more creative and enduring techniques. These may make use of new innovations, such as social media, but may also draw on indigenous traditions of restraint and respect for nature, such as the use of traditional Li markers to demarcate no-catch fishing zones in Hainan.

Investment Priority 4.2: Pilot and Amplify Community Forests, Community Fisheries and Community-managed Protected Areas

Although the majority of donor and government investment in site-based conservation over the last two decades has focused on protected areas, there has been an increasing recognition of the potential for innovative, community-based conservation of natural ecosystems outside of formal protected areas, whether through the establishment of community forests, community fisheries or community-managed protected areas. This is recognized in the Seventh Conference of the Parties to the CBD's Decision on Protected Areas, which "underlines the importance of conservation of biodiversity not only within but also outside protected areas" and suggests that parties "recognize and promote a broad set of protected area governance types... which may include areas conserved by indigenous and local communities". A similar conclusion was reached by a recent study by Porter-Bolland *et al*. (2011), which found community forests to be as, if not more, effective at reducing rates of deforestation, compared with formal protected areas.

Pilot experience with community forests is particularly well advanced in Cambodia, where the National Forest Programme sets an objective of bringing 2 million hectares of forest under community management by 2030 (Royal Government of Cambodia 2010). Community fisheries are well established in Lao PDR and being tested in Cambodia, China, Thailand and Vietnam, with support from CEPF and other donors. Community-managed wetlands have also been piloted in the hotspot, for example at Goot Ting marshes in northeastern Thailand (Parr *et al.* 2011). There is a need to amplify these approaches to a greater number of priority sites, particularly in the Mekong River and Major Tributaries, and Sino-Vietnamese Limestone corridors, which contain 11 and 10 unprotected KBAs, respectively.

The hotspot also contains various models of indigenous and community conserved areas, some established autonomously by communities, others induced by outside actors. Such areas can provide cost effective conservation investments, especially where local communities are motivated to conserve them for their spiritual values. The challenge is in supporting community autonomy over these areas and getting outsiders to support communities rather than dictate how they should manage them (J. Ironside *in litt.* 2012). One approach may be to establish sub-granting mechanisms to support CBOs more directly, as an alternative to conventional top-down conservation models.

Investment Priority 4.3: Develop Co-management Mechanisms for Formal Protected Areas that Enable Community Participation in All Levels of Management

Even within protected areas, there are many opportunities to engage local stakeholders in protected area management, for example, through joint patrolling or community representation on management boards or advisory committees, and a number of pilot initiatives have been implemented in this direction. For example, at Kuiburi National Park in Thailand, local people and other stakeholders participated in the management planning process through a 'park management board working group' (Parr *et al.* 2008). Through such pilots, a number of important lessons have been learned, particularly related to the need for participatory project and activity planning, increased attention to provision of tangible benefits that meet both conservation and development objectives and are tailored to heterogeneous communities, increased support for awareness-raising activities, clear monitoring of activities and impacts, and truly committed partner support for implementation. Several stakeholders consulted during the thematic study on civil society context emphasized the need for participatory mapping of protected area boundaries and management zones with local people, and to align these with traditional territories of indigenous people, where they exist. This approach can enhance acceptance of protected area objectives among local people, and establish a basis for joint planning and implementation of conservation activities. To be eligible for support under this investment priority, projects must demonstrate meaningful participation of local communities that gives them a genuine voice in protected area management decision making at priority sites. Given the fact that ethnic minority groups have a disproportionate influence on (and, by implication, are disproportionately impacted by) formal protected areas (see Section 5.2.3), priority will be given to mechanisms that engage ethnic minorities in protected area management. This may require provision of capacity building to enable more effective and equitable involvement in management actions and decision making.

Investment Priority 4.4: Conduct a Gap Analysis of Key Biodiversity Areas in Myanmar and Support Expansion of the Protected Area Network Using Community-based Models

Myanmar's protected area system has developed in an *ad hoc* fashion over time, beginning with a series of royal and colonial hunting reserves and gradually expanding as new populations of species of conservation importance have been found. To date, no systematic review of the distribution Myanmar's biodiversity and ecosystems has been conducted to identify gaps in the protected area network. In particular, coastal and freshwater ecosystems are underrepresented. A KBA gap analysis looking at the full range of species and ecosystems is needed to ensure comprehensive coverage of Myanmar's rich biodiversity. This may require targeted field surveys to fill gaps in knowledge on the distribution of priority species, as well as on poorly known taxonomic groups, such as amphibians, fish and invertebrates.

Despite the best efforts of the relevant agencies, it is unlikely that the government will be able to directly manage all KBAs in the country. There is a need, therefore, to develop alternative models for site conservation that empower local communities to manage and benefit from natural resources. These models may include community-managed protected areas, as well as co-management between the Department of Forestry and local communities, both of which should lead to more effective conservation with tangible livelihood benefits.

Strategic Direction 5: Strengthen Local Initiatives to Sustain and Improve the Livelihoods of Local Communities at Priority Key Biodiversity Areas

Almost without exception, the KBAs in the Indo-Burma Hotspot have people living in or around them, sometimes in large numbers. Many of these people's livelihoods are dependent upon the biodiversity within these sites, either directly, through extraction of fish, wildlife, timber and NTFPs, or indirectly, through provision of water for irrigation and domestic use, flood control and other ecosystem services. For example, some 70 percent of the population of rural Cambodia relies at least partly on NTFPs for food and cash income (Blaser *et al.* 2011), while a recent study in northern Myanmar found NTFP collection to be the highest source of income for 31 percent of respondents: second only to farming, with 45 percent (Rao *et al*. 2010). The contribution that KBAs make to livelihoods and human well-being can provide a strong incentive for local communities to conserve them. However, for this to happen, local people's rights to access resources sustainably need to be recognized, grassroots institutions for natural resource management need to be established and strengthened, and clear linkages need to be formed between livelihood interventions and conservation goals.

During the stakeholder consultations, livelihood improvement for local people was ranked as the top priority for additional conservation investment in Cambodia and the number-three priority in China. However, unfocused investments in livelihood improvement are unlikely to have positive impacts on biodiversity conservation, and may even have negative ones, for instance through increasing local consumption of natural resources. Across the hotspot, government and donor investment in livelihood improvement dwarfs investment in biodiversity conservation. Even among projects with explicit conservation objectives, sustainable natural resource management is the theme with the second-highest level of donor investment (see Section 10.4). The main gap in investment is for projects that directly link livelihood improvement to conservation objectives. A number of projects in this area were supported under the first CEPF investment phase, featuring negotiated agreements, direct payments for nest protection, ecolabelling of agricultural products and other innovative approaches. There is a need to refine these approaches, understand the key success factors and replicate them widely.

Recognizing the critical role of gender relations in determining men and women's access to and participation in management of natural resources (see Section 5.2.5), projects must integrate gender considerations into their design and implementation.

Investment Priority 5.1: Pilot Alternative Livelihood Projects to Reduce Dependence on Natural Resources at Priority Sites

In many cases, threats to biodiversity from overexploitation of natural resources can be addressed by putting in place regulations and management structures to regulate their sustainable use. Such measures include community forests and community fisheries, provided for under Investment Priority 4.2. In some cases, however, sustainable use may not be a feasible strategy. For instance, if the resource in question requires a total halt on extraction in order to recover. This is the case for many high-value timber species and animals such as turtles, whose populations are already at such low levels that they cannot sustain even the lowest level of off-take. To date, most initiatives to control overexploitation of natural resources in Asia have aimed at enforcing the law rather than finding alternatives (SCBD 2011a). However, these have not been tremendously successful, at least not within the Indo-Burma Hotspot, due to the economic cost of changing behavior. Many stakeholders consulted during the update of the ecosystem profile felt that neither enforcement nor alternative livelihoods work well in isolation but can do if they are applied in unison. People involved in the exploitation of wildlife, timber and NTFPs can be persuaded to switch to other activities, if faced with a combination of disincentives (fines, confiscations, etc.) and economic alternatives; honey and beeswax production is an example of an alternative that can provide better revenue (Kim *et al*. 2008, SCBD 2011a).

Investment Priority 5.2: Directly Link Livelihood Support to Conservation Actions through Negotiated Agreements

There is a growing body of experience in the hotspot that negotiated agreements provide an effective tool for linking livelihood support to conservation actions. Best-practice examples include initiatives led by WCS in the Northern Plains of Cambodia that link direct payments, ecotourism revenue and access to markets for sustainable commodities to compliance with participatory land-use plans regulating where local people can farm and access resources, and initiatives led by CI and partners across Cambodia that apply 'Conservation Agreements', with clearly defined benefits for compliance with mutually agreed conservation goals, as well as sanctions for non-compliance. The need to consolidate and amplify such approaches was identified as a priority for additional conservation investment during the stakeholder consultations, and was one of the main recommendations of the thematic study on civil society, which also emphasized the need to link livelihood support to markets, in order to ensure sustainability.

Investment Priority 5.3: Develop Best-practice Ecotourism Initiatives at Priority Sites

One alternative livelihood that is widely promoted as a means of addressing poverty alleviation and biodiversity conservation goals is ecotourism. However, most self-styled "ecotourism" ventures in the hotspot are very far from the definition and principles of ecotourism espoused by The International Ecotourism Society (1990): "responsible travel to natural areas that conserves the environment and improves the well-being of local people". There is, therefore, a need to develop best-practice models that are developed with the consent and ownership for local communities, and that deliver livelihood benefits that are clearly linked to conservation objectives. The need for such models is especially great in the Hainan Mountains corridor, where uncontrolled tourism development with scant regard for environmental or social impacts is increasing within and around KBAs, following Hainan's designation as a national tourism island.

Strategic Direction 6: Engage Key Actors in Mainstreaming Biodiversity, Communities and Livelihoods into Development Planning in the Priority Corridors

Natural ecosystems across the hotspot are becoming increasingly fragmented and their ecological integrity is diminishing. Consequently, they have a reduced ability to sustain viable populations of globally threatened species, adapt to climate change, and deliver services essential to human well-being, such as water regulation. As a general rule, conservation interventions in the hotspot have tended to focus on tackling immediate threats, rather than addressing the underlying causes, which include economic growth, changes in consumption patterns, regional economic integration, and weak regulatory and governance frameworks (see Section 9.8). Rather than these underlying causes being viewed as unassailable obstacles, they should rather be seen as opportunities for civil society to mainstream biodiversity, communities and livelihoods into economic development and secure broader political, institutional and financial support for these goals. In this way, the natural ecosystems of the hotspot will be able to underpin pro-poor and sustainable growth strategies, and be resilient in the face of climate change.

This strategic direction is in line with Millennium Development Goal No. 7 of the United Nations, which sets a target for the global community to "integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources." It also addresses Aichi Biodiversity Targets 2, that "by 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes," and 7, that "by 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity" (SCBD 2010).

Mainstreaming biodiversity into development planning was identified as a high priority for additional conservation investment during the stakeholder consultations in Cambodia, Myanmar, Thailand and Vietnam. It is also a direct continuation of a strategic direction of the first CEPF investment phase, under which a number of promising approaches were demonstrated by civil society, particularly with regard to mining and hydropower development. To be eligible for support under this strategic direction, activities must target one of the four priority corridors (Hainan Mountains, Mekong River and Major Tributaries, Tonle Sap Lake and Inundation Zone, and Sino-Vietnamese Limestone).

Investment Priority 6.1: Support Civil Society Efforts to Analyze Development Policies, Plans and Programs, Evaluate their Impact on Biodiversity, Communities and Livelihoods, and Propose Alternative Development Scenarios and Appropriate Mitigating Measures where Needed

Many of the major threats in the priority corridors originate from land-use and development policies, plans and programs formulated with insufficient consideration of their impacts on biodiversity, communities and livelihoods. As a result, site-based conservation interventions, such as protected area management or community forestry, are frequently undermined by incompatible development activities, such as agro-industrial plantations, hydropower dams, mines, quarries and linear infrastructure (see Section 9.3). A major factor contributing to this trend is the limited integration of conservation objectives into development planning processes, especially in sectors with potentially significant impacts on natural ecosystems: industry; energy; transport; forestry; agriculture; fisheries; and tourism.

There are several means by which civil society can promote better integration of conservation objectives into development policies, plans and programs, including: conducting and disseminating research into alternatives; undertaking economic valuation of affected sites; undertaking independent reviews of EIAs and SEAs; and monitoring and evaluating the impacts of development policies, plans and programs on biodiversity. Projects supported under this investment priority will engage civil society in analyzing the impacts of development policies, plans and programs on biodiversity, researching and promoting alternative development options and mitigation measures, promoting meaningful participation of affected communities in development decision making, and encouraging the reform or elimination of economic incentives that encourage environmentally and socially harmful development. Experience from the first phase of CEPF investment suggests that civil society networks can be an effective means of delivering an integrated response from grassroots to regional levels.

Investment Priority 6.2: Integrate the Biodiversity and Ecosystem Service Values of Priority Corridors into Land-use and Development Planning at All Levels

Introduction of comprehensive land-use policies and land-use planning, consistent with sustainable rural livelihoods and biodiversity conservation, is a pressing need. This calls for a landscape approach, recognizing the co-existence of various ecosystem services for multiple stakeholders pursuing different land/resource use objectives, and the need to balance trade-offs between different land/resource uses. Multi-stakeholder partnerships among conservation NGOs, development NGOs, academic institutions, governmental agencies and the private sector can provide a robust framework for intervention. Agricultural, environmental and rural development strategies must be integrated so as to jointly support the goals of agricultural supply, poverty reduction, ecosystem services and biodiversity conservation (McNeely and Scherr 2003). To achieve this in the priority corridors, however, there is first a need to address the gap in research that exists with regard to how different aspects of human well-being are influenced by changes in ecosystem services (Raudsepp-Hearne *et al*. 2010). Next, there is a need to use the results to promote the integration of biodiversity and ecosystem service values into land-use and development plans, so that negative impacts are minimized and opportunities for enhancing these values are taken advantage of. For instance, there are opportunities to revise the siting and species selection of forest restoration programs in the hotspot to enhance ecological connectivity within the priority corridors. An increased understanding of the biodiversity and ecosystem service values of the priority corridors could also be used to inform the development of pro-poor financing mechanisms for forest conservation, such as payments for ecosystem services and REDD+.

Investment Priority 6.3: Develop Protocols and Demonstration Projects for Ecological Restoration that Improve the Biodiversity Performance of National Forestry Programs

In certain parts of the Hainan Mountains and Sino-Vietnamese Limestone corridors, habitat fragmentation is now so advanced that it is questionable whether remaining blocks of natural habitat are large enough to maintain the biodiversity values they are important for into the long term, even with significant improvements in management effectiveness. One group of threatened species that is particularly at risk due to habitat fragmentation is the primates endemic to northern Vietnam and southern China: a group that includes some of the most threatened primates on the planet. Habitat restoration efforts are required to enhance the integrity of core areas in the short term, and to establish ecological connectivity between them in the longer term. The governments of China and Vietnam are currently making large investments in reforestation but much of this is currently with monocultures of exotic species, which do little or nothing to enhance ecological connectivity at the landscape scale. The specific niche for conservation investment identified during the stakeholder consultations was for development and demonstration of restoration protocols specifically adapted to local ecological conditions, including research, field trials and amplification, followed by preparation of guidelines and promotion of their adoption in national forestry programs.

Investment Priority 6.4: Engage the Media as a Tool to Increase Awareness and Inform Public Debate of Environmental Issues

To date, the major steps taken by governments and donors to mainstream biodiversity into economic development have been to introduce safeguard policies (including EIA) and to make provisions for limited public participation in development decision-making processes. Significant though these steps have been, they have proven insufficient to fully integrate biodiversity into other sectors. Individual CSOs and, especially, civil society networks are often well placed to promote biodiversity mainstreaming, because they have good connections at the grassroots level and a good understanding of the impacts of policies and projects on biodiversity and local communities. One of the approaches adopted by civil society with demonstrated effectiveness has been use of the media as a tool for raising awareness about development issues with major social and environmental implications, and thereby increasing the quality of public debate. This investment priority will consolidate and amplify this approach.

Strategic Direction 7: Minimize the Social and Environmental Impacts of Agro-industrial Plantations and Hydropower Dams in the Priority Corridors

During the stakeholder consultations, agro-industrial plantations and hydropower dams were prioritized as the second and third ranked threats to biodiversity in the Indo-Burma Hotspot (Figure 16). To some degree, these threats are addressed by Strategic Direction 6, which aims to mainstream biodiversity, community and livelihood concerns into development planning. However, recognizing the extreme immediacy and scale of these two threats, stakeholders identified a need for immediate, targeted activities, specifically addressing them. Consequently, during the regional workshop, detailed strategies were developed to respond to each of these threats.

The strategy for addressing the threat presented by agro-industrial plantations identified four areas with high potential for impact where additional conservation investment would make a significant difference. The first of these (undertaking economic valuation of alternatives) is addressed by Strategic Direction 6. The remaining three areas (strengthening prior claims by communities to key sites, strengthening the voice of affected communities during the project approval process, and developing industry guidelines or policies on siting plantations) are addressed by Investment Priorities 7.1, 7.3 and 7.4, respectively.

The strategy for addressing the threat posed by hydropower dams also identified a number of areas with high potential for impact where there was a high need for additional conservation investment. The first of these (build capacity of domestic NGOs and CBOs, especially in technical skills, messaging and communication, and negotiation skills) is addressed by Strategic Direction 8, while the second and third (conduct research into energy alternatives, energy conservation and realistic assessments of power demand; and conduct research to address gaps identified in Mekong River Commission SEA) are covered by Strategic Direction 6. The remaining two areas (conduct activities supporting conservation of fisheries and biodiversity, including protected area designation, management, patrolling and monitoring; and fund professional media that are accurate, attractive, concise and compelling and can be used to influence decision makers) are addressed by Investment Priorities 7.2 and 7.3, respectively.

To be eligible for support under this Strategic Direction, activities must address threats posed by agro-industrial plantations and/or hydropower dams, and target one of the four priority corridors (Hainan Mountains, Mekong River and Major Tributaries, Tonle Sap Lake and Inundation Zone, and Sino-Vietnamese Limestone).

Investment Priority 7.1: Support Land Registration for Local and Indigenous Communities at Priority Sites

During the stakeholder consultations, agro-industrial plantations were identified as the second-ranked threat to biodiversity in the hotspot, and as the number-one threat in Cambodia and China (Figure 16, Section 9.3.1). One of the approaches with significant potential for impact identified during the regional consultation was strengthening communities' prior claims to key sites, through a combination of systematic legal land legislation for local and indigenous communities, and designation of community forests, fisheries and conservation reserves. The latter is addressed by Investment Priority 4.2 and the former by this investment priority. Projects supported under this investment priority will support registration of land ownership and tenure by communities living in and around priority sites, particularly indigenous people. In addition to strengthening their prior claims over agricultural and forest land in the face of economic land concessions, this will also establish a foundation for sustainable natural resource management, by creating conditions for long-term thinking, and help communities to be better placed to share benefits from future REDD+ projects that may be developed at the priority sites.

Investment Priority 7.2: Upgrade the Legal Status of Unprotected Priority Sites Threatened by Incompatible Land Uses

This investment priority is especially relevant to the Mekong and Major Tributaries and Sino-Vietnamese Limestone corridors, which, between them, contain 20 unprotected priority sites and three others that are only partially protected. Several of these unprotected sites are imminently threatened by incompatible land uses, including agro-industrial plantations and hydropower dams. As one element of the strategy to respond to the threat posed by hydropower dams, stakeholders recommended that the status of certain state-owned lands within priority sites be upgraded to protected forest, protected area or other suitable legal designation. Although they may have limitations in terms of mitigating logging, hunting and grazing, protected areas in tropical countries have proven to be successful at stopping land clearance (Bruner *et al.* 2001), and thus they can be an important tool in mitigating the impacts of large-scale development projects.

Investment Priority 7.3: Strengthen the Voice of Affected Communities in Approval Processes for Agro-industrial Plantations and Hydropower Dams

Recent experience from across the hotspot shows that government decision makers and project proponents remain largely unaware of the impacts of large-scale development projects, and voices of concern from local communities and CSOs are not being heard. This is especially true for agro-industrial plantations and hydropower dams, which are typically not financed by international financial institutions or Equator Banks, and not, therefore, subject to stringent social and environmental safeguards. As the economies of the hotspot countries develop and their dependence on ODA diminishes, the influence of international CSOs and multilateral and bilateral donors on development decision making is waning. However, there are signs that governments can show responsiveness when local people tell their own story, verified by credible research and analysis. This investment priority is intended to support initiatives that strengthen the voice of communities affected by development projects with major impacts on biodiversity, including through action research, strengthening of community institutions and networks, and policy advocacy.

Investment Priority 7.4: Work with the Private Sector to Develop Guidelines for Siting and Developing Agro-industrial Plantations and Hydropower Dams in an Environmentally and Socially Responsible Manner

A moratorium on agro-industrial plantations and hydropower dams across the hotspot is not a realistic objective; neither is it necessarily a desirable one, given that, with adequate safeguards and compensation, it is theoretically possible to develop plantations and dams with net positive impacts on biodiversity and local communities. What is required, however, is to ensure that such developments are sited in areas of marginal biodiversity and ecosystem service value, using methods with low impacts, with the informed consent of affected communities, and with appropriate compensation for any negative social or environmental impacts. Projects supported under this investment priority will engage private sector companies involved in agro-industrial plantations and hydropower dam development to formulate voluntary guidelines for siting and developing these developments in an environmentally and socially responsible manner. In some cases, such as palm oil, tea and coffee, markets for sustainably produced commodities already exist, providing a clear economic incentive for companies to improve the environmental and social standards of their plantations. In other cases, the business case presented to companies may need to be built upon a mixture of reputational risk (which is more likely to be of concern to international rather than domestic companies) and social license to operate (i.e. companies that have a reputation for environmental and social responsibility are likely to face less opposition from local communities and CSOs, and have less risk of their projects being contested).

Strategic Direction 8: Strengthen the Capacity of Civil Society to Work on Biodiversity, Communities and Livelihoods at Regional, National, Local and Grassroots Levels

As mentioned in Section 7.1, the leverage that INGOs have with governments and their ability to influence development policy and planning is starting to diminish. At the same time, domestic NGOs are growing in influence and stature, and beginning to play leading roles in efforts to address key threats to biodiversity. While the contribution of INGOs to conservation efforts is likely to remain critical for some time to come, responsibility is gradually shifting onto a new generation of domestic CSOs that are proving their worth and exploring new avenues for influencing the development trajectories in the hotspot. All of the stakeholder consultations emphasized the need for international donors to invest directly in the development of domestic civil society, in order to develop skilled, authoritative and well coordinated advocates for biodiversity conservation at regional, national, local and grassroots levels. Capacity building for civil society was identified as the top-ranked priority for additional conservation investment in Cambodia, Lao PDR and Thailand. The thematic study on conservation investment also identified this as a major funding gap (see Section 10.4). Only the government of Thailand makes significant funding available for civil society, and this is not specifically for capacity building, while only 3 percent of international donor investment in conservation between 2006 and 2010 was on capacity building, with the target often being government agencies not CSOs.

Given the need for greater investment in capacity building for female conservation practitioners in the hotspot (see Section 5.2.5), projects must integrate gender considerations into their design and implementation, and demonstrate strategies to ensure gender equity in access to capacity building.

Investment Priority 8.1: Support Networking Activities that Enable Collective Civil Society Responses to Priority and Emerging Threats

A key finding of the thematic study on civil society context was that one of the most effective strategies adopted by CSOs to respond to conservation issues has been establishment of multi-tier, issue-based networks (see Section 7.7). One of the most effective networks at present is the Save the Mekong Coalition, coordinated by International Rivers out of Bangkok, and involving CSOs, academics, journalists and concerned individuals throughout the hotspot. Network approaches leverage the skills, networks and geographical coverage of different organizations to form a whole that is greater than the sum of its parts. They also provide an avenue for engaging actors who might not usually be part of the conservation movement but are natural allies when common interests are at stake, particularly rural development and rights-based NGOs. The need for further support for networking activities was strongly emphasized at the regional consultation by the working group on civil society capacity strengthening. The group stressed that donor support should be targeted at cost-effective approaches that can be sustained with locally available funds, and that are as inclusive as possible.

Investment Priority 8.2: Provide Core Support for the Organizational Development of Domestic Civil Society Organizations

Another key finding from the thematic study on civil society context was that providing funding only for project activities is not helping domestic CSOs to develop their own priorities and programs, or to recruit and retain appropriately qualified and experienced staff. Most donor funding available to domestic CSOs is in the form of micro- and small grants with short timeframes (two years at maximum). Consequently, most of their staff are on short-term contracts, leading to rapid turnover, and many report capacity limitations in terms of human and financial resources (see Section 7.6). During the stakeholder consultations, there was broad (but not complete) consensus that an effective approach to fostering the organizational development of domestic CSOs would be to cover their core operating costs for a fixed period, and enable them to invest in developing a core of skilled staff and diversifying their funding sources to reduce reliance on short-term grants.

Investment Priority 8.3: Establish a Clearing House Mechanism to Match Volunteers to Civil Society Organizations' Training Needs

One of the most innovative ideas to come out of the working group on civil society capacity strengthening at the regional consultation was for clearing house mechanisms to match CSOs with training needs to independent volunteers. Domestic CSOs in the Indo-Burma Hotspot have various training needs; some, such as proposal writing, are common to many, while others are specific to individual organizations. The lasting impact of one-off training courses was questioned by many stakeholders at the consultations, and the general consensus was that hands-on training and support from individual experts would yield better results. Several international schemes, such as Australian Volunteers International and Voluntary Service Overseas, place volunteers with CSOs in the hotspot for periods of up to two years, although current demand greatly outstrips supply. Another potential, but underutilized, resource is independent volunteers who are willing to donate their time to capacity building. The limiting factor for domestic CSOs is not necessarily a lack of availability of suitable volunteers but a lack of means to contact them. There is, therefore, a need for clearing house mechanisms to match up capacity needs with suitable volunteers.

Strategic Direction 9: Conduct Targeted Education, Training and Awareness Raising to Build Capacity and Support for Biodiversity Conservation among All Sections of Society

While conservationists have done a reasonable job of documenting the values of Indo-Burma's natural ecosystems and the threats that they face, they have not done a good job of communicating these values to others outside the conservation community, or to building this community. As a result, the constituency of support for conservation goals among decision makers, opinion formers and the general public remains small, as does the number of trained conservationists able to promote them, at a time when conservation issues are increasingly becoming a topic of public debate (insofar as this is permitted). Low conservation awareness was widely cited as a contributory factor to biodiversity loss, and was considered the top-ranked root cause by stakeholders consulted in Myanmar. At the same time, shortage of suitably qualified staff was cited as a major challenge by CSOs active in the hotspot (see Section 7.4).

Environmental education and awareness raising remains one of the largest funding gaps in the hotspot, receiving just 1 percent of conservation investment from international donors over the period 2006 to 2009 (see Section 10.4). In part, this reflects the fact, acknowledged during the stakeholder consultations, that education and awareness activities need a long time to show measurable results and do not, therefore, lend themselves to short-term grant support. Formal training of conservationists has also received patchy, limited support, as evidenced by the continued reliance on international technical expertise by many of the larger conservation organizations working in the hotspot. However, education, training and awareness raising all present significant opportunities to engage domestic academic institutions in the delivery of an integrated conservation strategy and, thereby, leverage the capacities of one of the strongest sections of local civil society.

The need for additional conservation investment in education, training and awareness raising was identified at most of the stakeholder consultations but only in Lao PDR and Myanmar was it ranked among the top five priorities. This is, perhaps, a reflection of the priority given by stakeholders to investments with more immediate returns, given the severe and immediate nature of many of the threats facing the hotspot's biodiversity. Nevertheless, without further investment in education, training and awareness raising, it is likely that such threats will continue to arise and intensify, and support for addressing them will be found lacking. In this way, this strategic direction will make a direct contribution to Aichi Biodiversity Target 1 that "by 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably" (SCBC 2010).

Recognizing that capacity building and support for the development of female conservation practitioners in the hotspot needs greater investment (see Section 5.2.5), projects must integrate gender considerations into their design and implementation, and demonstrate strategies to ensure gender equity in access to education, training and awareness raising.

Investment Priority 9.1: Invest in the Professional Development of Future Conservation Leaders through Support to Graduate Programs at Domestic Academic Institutions

In addition to financial constraints facing domestic CSOs and the low appeal of the non-profit sector as a career choice for young people, a shortage of suitably qualified conservation professionals is a major barrier to development of local conservation movements in the Indo-Burma Hotspot. One of the most important initiatives to address this shortage is the masters course in biodiversity conservation at the Royal University of Phnom Penh, funded by the MacArthur Foundation and supported technically by FFI. During the stakeholder consultations, it was recommended that this course be continued as a high priority, and, if possible, similar courses be developed in other hotspot countries, especially Lao PDR and Vietnam. There may be opportunities for students on these courses to be affiliated with projects supported under other investment priorities, and forging such linkages would be a possible role for the regional implementation team established under Strategic Direction 11.

Investment Priority 9.2: Foster Leadership for Sustainable Development by Investing in Professional Development of Key Individuals

Alongside graduate training programs, a complementary approach to fostering leadership for sustainable development is by investing in the professional development of key individuals. Such investments may include structured training courses but may also include exchange visits, internships, mentoring arrangements and networking. Priority for such investments will be given to individuals in leadership positions within domestic CSOs and networks. Compared with Investment Priority 9.1, which focuses on professional development of young people embarking on a career in sustainable development, the emphasis of this investment priority is on supporting the development of mid-career professionals.

Investment Priority 9.3: Pilot Programs of Experiential Education to Connect School Children to Nature in Priority Corridors

The effectiveness of conventional methods of environmental education in the Indo-Burma Hotspot has not been demonstrated, even when these have been integrated into school curricula. Stakeholders at the national consultations suggested that experiential methods might achieve more, such as organizing visits to protected areas for school children. For such activities, protected area staff can play a role as nature interpreters (Hau 2005, Fellowes *et al.* 2008) and CSOs providing long-term support to the protected areas can facilitate visits. The stakeholders recommended that international donors invest some resources in piloting such experiential approaches within the priority corridors, and that the impacts be monitored in a systematic way, in order that the effectiveness of these approaches can be compared with more conventional methods.

Investment Priority 9.4: Conduct Targeted Outreach and Awareness Raising for Urban Populations about the Values of Natural Ecosystems and the Impacts of Consumption Patterns

Without a constituency of support for conservation goals among the general public, governments are unlikely to forego short-term economic gains in favor of long term environmental sustainability. CSOs have a key role to play in raising awareness of the values of natural ecosystems and the impacts of consumption patterns upon them. The key audiences for such activities are urban populations, who typically are the major consumers of energy, forest products and other natural resources. There are many specific issues that CSOs may wish to raise awareness about and priority will be given to projects that support other investment priorities under this strategy.

Strategic Direction 10: Evaluate the Impacts of Conservation Investment on Biodiversity and Human Well-being through Systematic Monitoring

International donors invested at least $193 million in biodiversity conservation in the hotspot between 2006 and 2010. The impacts of much of this investment are difficult to demonstrate, because they were monitored in an unsystematic fashion or not at all. As a result, it is difficult to evaluate the effectiveness of different approaches, and adapt implementation and funding strategies to concentrate on actions with the greatest chance of success. One factor contributing to this problem is that most monitoring to date has been undertaken within the context of conservation projects. Issues of objectivity notwithstanding, the timeframes of these projects are substantially shorter than the timeframes over which the impacts of conservation investments typically occur, particularly in terms of changes in the state of biodiversity. Stakeholders consulted during the update of the ecosystem profile advocated for long-term monitoring programs that are delinked from individual conservation projects. Research and monitoring was the highest priority for additional conservation investment to come out of the stakeholder consultations, as it was the top-ranked priority in China, Lao PDR, Thailand and Vietnam.

Reflecting the high priority given to the theme, a dedicated working group was established at the regional consultation, and developed a detailed strategy on monitoring. This strategy recognized that a comprehensive, systematic monitoring system covering the entire hotspot was an aspirational goal for the long term, and identified four areas where action could realistically be taken over the next five years towards the goal of developing model approaches that contribute to national and regional monitoring systems and processes. The first area (development of systems that can be applied coherently by different countries and stakeholders to monitor conservation effectiveness across multiple scales) is addressed by Investment Priority 10.1. The second area (systematic efforts to build capacity for monitoring, including development of training curricula, guidelines and methods) is addressed by Investment Priority 10.2. The third area (mechanisms to ensure that monitoring initiatives inform policy debates and adaptive management at local level) is addressed by Investment Priority 10.3. The fourth area (greater priority given to monitoring to support evidence-based decision making, and long-term financing for monitoring and securing government uptake) is a set of general principles that are adopted by the strategic direction as a whole. In these ways, the strategic direction contributes directly to Aichi Biodiversity Target 19 that "by 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied" (SCBC 2010).

Investment Priority 10.1: Develop Common Standards and Systems for Monitoring the Impacts and Effectiveness of Conservation Actions across Multiple Scales

Stakeholders consulted during the profiling process strongly recommended a shift towards more evidence-based decision making in conservation investment and implementation. While some well resourced groups have adopted organization-specific monitoring systems, there is as yet no common framework that would allow for comparisons to be made across programs of similar work or among sites (Eberhardt 2011). Common standards and systems must allow the impacts of conservation actions on biodiversity to be measured but their scope should be wider than this. Experience from Africa suggests that improved indicators of social, economic and wide environmental impacts of projects against baselines are a clear need, if lessons from field experience are to be captured and capitalized upon (Roe *et al*. 2009). As a basis for long-term financial sustainability and mainstreaming of biodiversity into other sectors, it may also be useful to integrate biodiversity monitoring with monitoring the impacts of climate change and forest carbon projects. In general, the standards and systems developed under this investment priority should draw on international best practice but be locally appropriate, and suitable for indefinite continuation with resources and expertise available within the hotspot.

Investment Priority 10.2: Support Systematic Efforts to Build Capacity for Monitoring among Domestic Organizations

Due to the timeframes over which changes to threats and, especially, the state of biodiversity and the benefits it provides to humans, take place, monitoring programs must be long-term if they are to generate robust and meaningful information. For reasons of financial and institutional sustainability, therefore, there is a need for domestic organizations, especially NGOs and academic institutions, to take a leading role in implementing long-term monitoring programs. To this end, there is a need to support systematic efforts to build capacity for monitoring among these organizations, including the development of training curricula, guidelines and methods. These training efforts should adopt the common standards and systems developed under Investment Priority 10.1, and, where possible, link to graduate training programs supported under Investment Priority 8.4.

Investment Priority 10.3: Develop and Test Mechanisms for Ensuring that Monitoring Results Inform National Policy Debates and Local Adaptive Management

The final investment priority under this strategic direction is intended to support the development and testing of innovative and effective mechanisms for communicating monitoring results. One key audience will be decision makers and opinion formers at the national level, including senior government officials, journalists, managers of development NGOs and executives in private companies, so that the monitoring results have a bearing on national policy debates relevant to biodiversity conservation. The other key audience is protected area managers and conservation project managers, so that the results inform adaptive management.

Strategic Direction 11: Provide Strategic Leadership and Effective Coordination of Conservation Investment through a Regional Implementation Team

In every hotspot approved for investment as of July 2007, CEPF will support a regional implementation team to convert the plans in the ecosystem profile into a cohesive portfolio of grants that exceeds in impact the sum of its parts. Each regional implementation team will consist of one or more civil society organizations active in conservation in the hotspot. For example, a team could be a partnership of civil society groups or could be a lead organization with a formal plan to engage others in overseeing implementation, such as through an inclusive advisory committee.

The regional implementation team will be selected by the CEPF Donor Council based on an approved terms of reference, competitive process and selection criteria available at www.cepf.net. The team will operate in a transparent and open manner, consistent with CEPF's mission and all provisions of the CEPF Operational Manual. Organizations that are members of the regional implementation team will not be eligible to apply for other CEPF grants within the same hotspot. Applications from formal affiliates of those organizations that have an independent board of directors will be accepted and will be subject to additional external review.

The regional implementation team will provide strategic leadership and local knowledge to build a broad constituency of civil society groups working across institutional and political boundaries toward achieving the conservation goals described in the ecosystem profile. The team's major functions and specific activities will be based on an approved terms of reference. Each major function is regarded as being distinctly administrative, or distinctly programmatic. As these types of function are very different, they are assigned to separate investment priorities.

Investment Priority 11.1: Operationalize and Coordinate CEPF's Grant-making Processes and Procedures to Ensure Effective Implementation of the Investment Strategy throughout the Hotspot

This investment priority covers the three functions in the regional implementation team's terms of reference that are administrative in nature:

- Establish and coordinate a process for proposal solicitation and review.
- Manage a program of small grants (less than $20,000).
- Provide reporting and monitoring.

Administrative costs are those expenses incurred by the regional implementation team to support the various aspects of managing CEPF small and large grant contracts. The regional implementation team assumes significant administrative responsibilities as manager of CEPF's small granting mechanism, including budgeting, processing proposals, and drafting and monitoring contracts. For large grants, the regional implementation team assists applicants and the CEPF Secretariat by reviewing and processing grant applications, ensuring compliance with CEPF policies, and facilitating on-time and accurate grantee and portfolio reporting and monitoring.

In particular, the regional implementation team has a very important role to play in solicitation of proposals and their review. The activities span a wide range, from sending out calls for proposals to establishing review committees to making final recommendations for approval or rejection. While much of this work is labeled as administrative, it does have a sound programmatic foundation, as grants need to be strategic and of high quality. As such, the activities covered under this investment priority include evaluation of applications and making recommendations on which projects to support. These tasks require technical expertise, knowledge of strategy, and the ability to understand that all selected projects will make a unique contribution to the achievement of CEPF's objectives.

This investment priority also covers the management of a small grants program. Small grants play an extremely important role in the CEPF portfolio. These grants can address themes or geographic areas of importance, serve as planning grants, or provide opportunities to engage local and grassroots groups that may not have the capacity to implement large grants. The strategic role that these grants should play cannot be underestimated. Therefore, although most of the activities pertaining to this function are administrative, two very important ones must be highlighted: (i) conduct strategic oversight of the small grants portfolio to ensure coherence with the overall grant portfolio, CEPF donor partners and others active in the hotspot; and (ii) decide on the award of all grant applications. Without these activities, both of which ensure that small grants are integrated and strategic, the small grants program would not be able to contribute to the achievement of CEPF's objectives.

This investment priority also covers reporting and monitoring. This entails collecting data on portfolio performance, ensuring compliance with reporting requirements, ensuring that grantees understand and comply with social and environmental safeguard policies, and reviewing reports. It also includes site visits to grants and may lead to follow-up capacity building. This will ensure effective project implementation and monitoring, and requires technical expertise to be performed effectively and inform adaptive management.

Investment Priority 11.2: Build a Broad Constituency of Civil Society Groups Working across Institutional and Political Boundaries towards Achieving the Shared Conservation Goals Described in the Ecosystem Profile

This investment priority covers the two functions in the regional implementation team's terms of reference that are programmatic in nature:

- Coordinate and communicate CEPF investment, build partnerships and promote information exchange in the hotspot.
- Build the capacity of grantees.

These regional implementation team activities include programmatic duties that directly support strategic development of the portfolio and contribute in their own right to the achievement of critical conservation results that yield portfolio-wide benefits. Such activities may include facilitating learning exchanges between grantees and stakeholders, identifying leverage opportunities for CEPF, or collaborating with other donors and their conservation projects. Programmatic activities require the regional implementation team to maintain in-house conservation expertise to ensure that CEPF funds are strategically channeled to optimize the achievement of its conservation objectives.

This investment priority also covers capacity building, a function that is regarded as being at the core of the regional implementation team's responsibilities. It places the regional implementation team at the heart of strategy implementation by making it responsible for coordination, communication, collaboration and liaison with donors, partners, governments and other stakeholders. It also puts the regional implementation team in charge of assuring that the CEPF grant portfolio is geared to meeting the objectives laid out in the ecosystem profile. It includes the promotion of synergies between CEPF's objectives and local, national and regional initiatives.

This function includes all aspects of capacity building. It is a cornerstone of CEPF's work, ensuring that partners have the institutional and individual ability to design and implement projects that are essential to the achievement of CEPF's objectives. This is not capacity building for its own sake; rather, it is targeted specifically to appropriate strategic stakeholders to ensure delivery of CEPF's objectives through improved projects and higher quality implementation. Experience has shown that these capacity building efforts are essential to ensuring good projects that are integrated into a wider hotspot strategy and a common conservation vision.

13. SUSTAINABILITY

Sustainability of CEPF's investments in the Indo-Burma Hotspot will be achieved if their results endure well beyond the investment period. Recognizing that threats to biodiversity in the hotspot are at a scale that precludes easy fixes, and which will require sustained effort over decades to fully address, sustainability was a paramount consideration throughout the process to update the ecosystem profile. In particular, the investment strategy was developed with sustainability in mind, and many of the investment priorities explicitly address it.

Institutional sustainability is addressed through an explicit focus on strengthening the capacity of CSOs (Strategic Direction 8) and training future conservation leaders (Strategic Direction 9). This focus, which is integral to CEPF's global mission, recognizes that the emergence of domestic CSOs creates opportunities to support the growth of conservation movements with sufficient credibility and legitimacy to influence national and regional debates on the future direction of natural ecosystems. Strengthening the capacity of conservation movements in the hotspot will contribute to sustainability by reducing dependence on external technical and financial support. Furthermore, specific capacity building measures, such as training programs for protected area managers

(Investment Priority 3.3) and conservation professionals (Investment Priority 9.1), will be institutionalized within domestic academic institutions.

Financial sustainability is addressed in various parts of the investment strategy. Under Strategic Direction 1, pilot interventions for priority species initiated under the first phase of CEPF investment will be transformed into long-term conservation programs, while a permanent fund for the conservation of these species will be established, to reduce the dependence on short-term, uncertain, project funding, which has been a major barrier to conservation effectiveness. Under Investment Priorities 2.3, 5.3 and 7.4, grantees will engage with the private sector companies, develop joint conservation actions, and leverage support for their implementation. Other opportunities to engage the private sector in supporting innovative conservation actions are presented by Investment Priorities 2.4, 5.2 and 9.4.

Political sustainability is addressed by mainstreaming biodiversity, communities and livelihoods into development plans, policies and programs (Strategic Direction 6). Economic arguments for the conservation of biodiversity, based on ecosystem service values, will be developed and widely promoted among different sectors, such as agriculture, energy and industry. Major government investments in protected areas (Strategic Direction 3) and reforestation (Investment Priority 6.3) will be leveraged towards conservation goals through demonstration projects and promotion of best practice.

Societal sustainability for the goals of the investment strategy will be achieved through a major emphasis in engaging wider civil society as positive stakeholders in conservation in various ways. Local communities will be empowered to engage in management of priority sites (Strategic Direction 4), to adopt alternative livelihoods (Strategic Direction 5) and to formalize their traditional rights over land and resources (Strategic Direction 7). The wider public, especially urban dwellers, will be involved in programs to reduce consumer demand for wildlife and support enforcement agencies to tackle wildlife crime (Strategic Direction 2), and engaged by targeted education, training and awareness raising aimed at building support for biodiversity conservation (Strategic Direction 9).

Finally, the sustainability of the strategy will be ensured by the means of its creation: through a participatory process supported by four funders and engaging more than 470 stakeholders from across the hotspot. The investments by the other funders will complement those of CEPF and ensure delivery of the strategy as a whole, which would be beyond the resources available to the fund alone. Moreover, they will extend the time period of support well beyond the end of the next CEPF investment period, ensuring that key results of CEPF investment can be sustained and replicated. Most importantly, the investment strategy is truly a common vision for action, jointly owned by civil society groups of many types and outlooks. This will ensure that, as in the first phase of CEPF, civil society organizations will leverage significant additional resources to ensure that the ambitious goals of the strategy are realized.

14. CONCLUSION

In terms of species diversity and endemism, Indo-Burma is one of the most biologically important regions on the planet. A spate of discoveries of new species during the 1990s focused the attention of the global conservation community on the hotspot. Changing political climates in several countries meant that increasing amounts of international donor assistance, including conservation investment, flowed into most countries in the hotspot during the 1990s and early 2000s. During this period, national governments also made significant investments in conservation, particularly through the expansion of national protected-area networks. Since the mid-2000s, levels of international conservation investment in the hotspot have begun to decline, and the accessibility of these resources to civil society groups has, on the whole, decreased.

In spite of the considerable sums invested in conservation in the hotspot, there remain several major and immediate threats to biodiversity, most significantly hunting and trade of wildlife, agro-industrial plantations, hydropower dams, linear infrastructure and agricultural encroachment by smallholders. The underlying causes of these threats include population growth, urbanization and migration patterns, economic growth and increasing consumption, and regional economic integration. Civil society is well placed to address both immediate threats to species, sites, and ecosystems, and their underlying causes. However, current investment does not always target the highest conservation priorities or promote the most effective approaches, and the potential to engage civil society in biodiversity conservation has yet to be fully realized. In this context, the opportunities for CEPF and other funders to support biodiversity conservation in the hotspot are almost limitless.

In order to focus potential future investment by CEPF and other funders, the ecosystem profile for Indo-Burma was updated through an eight-month consultative process. The process involved three provincial workshops, seven national workshops and a regional workshop, complemented by a series of thematic studies. More than 470 stakeholders from CSOs, government and donor agencies participated in the process, which resulted in a shared investment strategy for CEPF and other funders. This strategy comprises 38 investment priorities, grouped into 11 strategic directions under five broad components.

Over the next investment phase, CEPF funding will concentrate on six of these strategic directions, containing 21 investment priorities. The geographic focus will be four priority corridors (the Hainan Mountains, the Mekong River and Major Tributaries, the Sino-Vietnamese Limestone, and the Tonle Sap Lake and Inundation Zone), and the 74 priority sites they contain. In addition, a small number of investment priorities will specifically target Myanmar, recognizing the unique circumstances in this country, where conservation investment has been restricted by economic sanctions. Moreover, CEPF investment will focus on 151 priority species that require species-focused action in addition to site-based and landscape-scale conservation. Although ambitious, the CEPF investment strategy is realistic, and represents an important opportunity to realize the potential of civil society in the hotspot, and to make a lasting contribution to the conservation of Indo-Burma’s unique and irreplaceable biodiversity values.

INDO-BURMA HOTSPOT LOGICAL FRAMEWORK: 2013-2018

Objective	Targets	Means of Verification	Important Assumptions
Engage civil society in the conservation of globally threatened biodiversity through targeted investments with maximum impact on the highest conservation priorities	At least 50 civil society organizations, including at least 30 domestic organizations actively participate in conservation actions guided by the ecosystem profile. At least 8 alliances and networks formed among civil society actors to avoid duplication of effort and maximize impact in support of the CEPF ecosystem profile. At least 25 key biodiversity areas targeted by CEPF grants have new or strengthened protection and management. At least 5 development plans or policies influenced to accommodate biodiversity. Improved management for biodiversity conservation or sustainable use within production landscapes in 4 conservation corridors covering 109,976 square kilometers or 5 percent of the hotspot.	Grantee and Regional Implementation Team performance reports. Annual portfolio overview reports; portfolio midterm and final assessment reports. Protected Areas Tracking Tool (SP1 METT).	The CEPF ecosystem portfolio will effectively guide and coordinate conservation action in the Indo-Burma Hotspot. Investments by other funders will support complementary activities that reduce threats to priority corridors, sites and species, and improve the operating environment for civil society.

Intermediate Outcomes	Intermediate Indicators	Means of Verification	Important Assumptions
Outcome 1: Priority globally threatened species safeguarded by mitigating major threats. $1,800,000	Pilot interventions for core populations of at least 20 priority species transformed into long-term conservation programs. At least 3 best practice approaches for conservation of highly threatened and endemic freshwater species developed. Knowledge of the status and distribution of at least 10 priority species improved through research. Funding for the conservation of priority species in the hotspot from existing funds increased by at least 25 percent.	Grantee and Regional Implementation Team performance reports. CEPF Secretariat supervision mission reports. IUCN Red List species accounts.	National and international laws provide an appropriate basis for species-focused conservation action. Government conservation agencies are receptive to new information on globally threatened species. Sufficient civil society capacity to implement species-focused conservation exists among civil society or can be built. Governments and international donors remain committed to species conservation, and are able to provide support for long-term programs. Non-traditional funding sources for species conservation (private companies, high net worth individuals, etc.) can be identified and accessed.

Intermediate Outcomes	Intermediate Indicators	Means of Verification	Important Assumptions
Outcome 2: Innovative responses to illegal trafficking and consumption of wildlife demonstrated. $1,200,000	At least 1 high-level wildlife trade network unraveled by enforcement agencies employing global best practice with investigations and informants. At least 2 initiatives to reduce cross-border trafficking of wildlife piloted by enforcement agencies in collaboration with non-traditional actors. At least 5 private sector companies promote the adoption of voluntary restrictions on the international transportation, sale and consumption of wildlife. At least 3 campaigns, social marketing programs, hotlines or other long-term communication programs implemented to reduce consumer demand for wildlife and build public support for wildlife law enforcement.	Grantee and Regional Implementation Team performance reports. CEPF Secretariat supervision mission reports.	Sufficient political will to control overexploitation of wildlife species exists or can be generated. Government conservation agencies are receptive to working with civil society to address illegal trafficking of wildlife. Private sector companies are willing to engage with civil society to address consumption of wildlife by their employees. Local media are willing to support public awareness campaigns. General public is receptive to conservation messages about consumption of wildlife.

Intermediate Outcomes	Intermediate Indicators	Means of Verification	Important Assumptions
Outcome 3: Local communities empowered to engage in conservation and management of priority key biodiversity areas. $2,600,000	Awareness of biodiversity conservation legislation raised among target groups within at least 10 priority sites. Community forests, community fisheries and/or community-managed protected areas piloted or replicated within at least 15 priority sites. Co-management mechanisms that enable community participation in management of formal protected areas developed for at least 10 priority sites. Gap analysis of key biodiversity areas in Myanmar conducted, and protected area network expanded through the creation of at least 5 new protected areas using community-based models. At least 75 percent of local communities targeted by site-based projects show tangible well-being benefits.	Grantee and Regional Implementation Team performance reports. CEPF Secretariat supervision mission reports. Protected Areas Tracking Tool (SP1 METT). Formal legal declarations or community agreements designating new protected areas. Human well-being monitoring reports.	Local communities are willing to play an active role in site-based conservation. Government policies provide for community management of forests, fisheries and other natural resources. Protected area managers are receptive to involving local communities in all levels of management. Appropriate, cost-effective site-based monitoring protocols for human well-being impacts can be developed. Sufficient civil society capacity to implement site-based conservation exists or can be built

Intermediate Outcomes	Intermediate Indicators	Means of Verification	Important Assumptions
Outcome 4: Key actors engaged in mainstreaming biodiversity, communities and livelihoods into development planning in the priority corridors. $2,400,000	At least 5 development policies, plans or programs analyzed, with impacts on biodiversity and ecosystem services evaluated and alternative development scenarios and appropriate mitigating measures proposed. The biodiversity and ecosystem service values of at least 2 priority corridors integrated into land-use and/or development plans. New protocols for ecological restoration demonstrated in the priority corridors and integrated into the national forestry programs of at least 1 hotspot country. Public debate and awareness of at least 3 key environmental issues increased through coverage in domestic media.	Grantee and Regional Implementation Team performance reports. CEPF Secretariat supervision mission reports. Official land-use and development plans and policies covering the priority corridors.	Governments and donors remain committed to environmentally sustainable development. Governments create space for civil society to engage in the review and formulation of development policies, plans and programs. Government decision making can be influenced by arguments about the biodiversity and ecosystem service values of natural ecosystems. Increased awareness of environmental issues will translate into increased support for conservation initiatives. Sufficient civil society capacity to undertake biodiversity mainstreaming exists or can be built.

Intermediate Outcomes	Intermediate Indicators	Means of Verification	Important Assumptions
Outcome 5: Civil society capacity to work on biodiversity, communities and livelihoods strengthened at regional, national, local and grassroots levels. $1,000,000	At least 5 civil society networks enable collective responses to priority and emerging threats. At least 20 domestic civil society organizations demonstrate improvements in organizational capacity. At least 1 clearing house mechanism established to match volunteers to civil society organizations' training needs.	Grantee and Regional Implementation Team performance reports. CEPF Secretariat supervision mission reports. Civil society organizational capacity tracking tool.	Civil society actors able to work collaboratively to respond to conservation challenges. The operating environment for civil society remains constant or improves across the hotspot. Key capacity limitations of civil society organizations can be addressed through grant support.
Outcome 6: A Regional Implementation Team provides strategic leadership and effectively coordinates CEPF investment in the Indo-Burma Hotspot. $1,400,000	At least 50 civil society organizations, including at least 30 domestic organizations actively participate in conservation actions guided by the ecosystem profile. At least 80 percent of domestic civil society organizations receiving grants demonstrate more effective capacity to design and implement conservation actions. At least 2 participatory assessments are undertaken and documented.	Regional Implementation Team performance reports. CEPF Secretariat supervision mission reports. Civil society organizational capacity tracking tool.	Qualified organizations will apply to serve as the Regional Implementation Team in line with the approved terms of reference and the ecosystem profile. The CEPF call for proposals will elicit appropriate proposals that advance the goals of the ecosystem profile. Civil society organizations will collaborate with each other, government agencies, and private sector actors in a coordinated regional conservation program in line with the ecosystem profile.
Funding Summary	**Amount**		
Total Budget	$10,400,000		

ABBREVIATIONS USED IN THE TEXT

ADB	Asian Development Bank
AFD	l’Agence Française de Développement
AIPP	Asian Indigenous Peoples Pact
ARBCP	Asia Regional Biodiversity Conservation Program
ARREST	Asia’s Regional Response to Endangered Species Trafficking
ASEAN	Association of South-East Asian Nations
ASEAN WEN	ASEAN Wildlife Enforcement Network
BANCA	Biodiversity and Nature Conservation Association
BCI	Biodiversity Conservation Corridors Initiative
BCST	Bird Conservation Society of Thailand
CBD	Convention on Biological Diversity
CEPF	Critical Ecosystem Partnership Fund
CI	Conservation International
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CPI	Corruption Perceptions Index
CSO	civil society organization
Danida	Danish International Development Assistance
DFID	Department for International Development
DoF	Department of Forestry (Lao PDR)
EIA	Environmental Impact Assessment
ELC	economic land concession
ENV	Education for Nature Vietnam
FA	Forestry Administration (Cambodia)
FFI	Fauna & Flora International
FLEGT	Forest Law Enforcement, Governance and Trade
FREDA	Forest Resources, Environment, Development and Conservation Association
GAPE	Global Association for People and the Environment
GDP	gross domestic product
GEF	Global Environment Facility
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GMS	Greater Mekong Subregion
GNI	gross national income
GONGO	government-organized nongovernmental organization
IBA	Important Bird Area
IPCC	Intergovernmental Panel on Climate Change
ITTO	International Tropical Timber Organization
IUCN	International Union for the Conservation of Nature
JICA	Japan International Cooperation Agency
KFBG	Kadoorie Farm & Botanic Garden
LEAF	Lowering Emissions in Asia’s Forests
MAFF	Ministry of Agriculture, Forestry and Fisheries (Cambodia)
MARD	Ministry of Agriculture and Rural Development (Vietnam)

MEP	Ministry of Environmental Protection (China)
MIST	Management Information SysTem
MoE	Ministry of Environment (Cambodia)
MoFi	Ministry of Fisheries (Vietnam)
MoNRE	Ministry of Natural Resources and Environment (Lao PDR, Thailand and Vietnam)
MRC	Mekong River Commission
NBSAP	National Biodiversity Strategy and Action Plan
NCEA	National Commission for Environmental Affairs (Myanmar)
NGO	nongovernmental organization
NPA	national protected area
NSEDP	National Socioeconomic Development Plan
NTFP	non-timber forest product
ODA	Overseas Development Assistance
RAFT	Responsible Asia Forestry and Trade
RECOFTC	Center for People and Forests
REDD	Reducing Emissions from Deforestation and Forest Degradation
SEA	Strategic Environmental Assessment
SEPA	State Environmental Protection Administration (China)
TNC	The Nature Conservancy
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNF	United Nations Foundation
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
USFWS	U.S. Fish and Wildlife Service
VCF	Vietnam Conservation Fund
WARECOD	Center for Water Resources Conservation and Development
WCS	Wildlife Conservation Society
WMPA	Watershed and Management Protection Authority
WREA	Water Resources and Environment Agency (Lao PDR)
WWF	World Wide Fund for Nature; World Wildlife Fund

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APPENDICES

Appendix 1. Globally Threatened Species in the Indo-Burma Hotspot

No.	Scientific Name	Common Name	Global Threat Status: Critically Endangered	Global Threat Status: Endangered	Global Threat Status: Vulnerable	Distribution by Country: Cambodia	China	Lao PDR	Myanmar	Thailand	Vietnam	Selection Criteria for Priority Species: Indo-Burmese Population is Globally Signif.	Species-focused Action Required	Over-riding Need for Improved Info	Urgency for Conservation Action	Opportunity for Additional Investment
	MAMMALS (comprehensive Red List assessment in 2008)		**12**	**37**	**39**	**31**	**35**	**40**	**43**	**47**	**46**					
1	*Ailurus fulgens*	Red Panda			VU		+		+			Yes	No	No	N/A	N/A
2	***Aonyx cinereus***	**Asian Small-clawed Otter**			**VU**	**+**	**+**	**+**	**+**	**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
3	*Arctictis binturong*	Binturong			VU	+	+	+	+	+	+	Yes	Yes	No	Medium	High
4	***Axis porcinus***	**Hog Deer**		**EN**		**+**	**ex?**	**ex**	**+**	**ex**	**ex**	**Yes**	**Yes**	**No**	**High**	**High**
5	*Bos gaurus*	Gaur			VU	+	+	+	+	+	+	Yes	Yes	No	Medium	High
6	*Bos javanicus*	Banteng		EN		+	?	+	+	+	+	Yes	Yes	No	Medium	High
7	*Bos sauveli*	Kouprey	CR			ex?		ex		ex	ex	Yes?	N/A	Yes	Low*	High
8	***Bubalus arnee***	**Wild Water Buffalo**		**EN**		**+**		**ex**	**ex?**	**+**	**ex**	**Yes**	**Yes**	**No**	**High**	**High**
9	*Budorcas taxicolor*	Takin			VU		+		+			Yes	Yes	No	Medium	High
10	*Capricornis sumatraensis*	Southern Serow			VU					+		No	N/A	N/A	N/A	N/A
11	*Chrotogale owstoni*	Owston’s Civet			VU	?	+	+			+	Yes	Yes	No	Medium	High
12	*Craseonycteris thonglongyai*	Kitti’s Hog-nosed Bat			VU				+	+		Yes	No	No	N/A	N/A
13	*Cuon alpinus*	Dhole		EN		+	+	+	+	+	+	Yes	Yes	No	Medium	High
14	*Cynogale bennettii*	Otter Civet		EN						+	?	No	N/A	N/A	N/A	N/A
15	***Dicerorhinus sumatrensis***	**Hairy Rhinoceros**	**CR**			**ex**		**ex**	**ex?**	**ex?**	**ex**	**Yes?**	**N/A**	**Yes**	**High**	**High**
16	*Elephas maximus*	Asian Elephant		EN		+	+	+	+	+	+	Yes	Yes	No	High	Low

No.	Scientific Name	Common Name	Global Threat Status			Distribution by Country						Selection Criteria for Priority Species				
			Critically Endangered	Endangered	Vulnerable	Cambodia	China	Lao PDR	Myanmar	Thailand	Vietnam	Indo-Burmese Population is Globally Signif.	Species-focused Action Required	Over-riding Need for Improved Info	Urgency for Conservation Action	Opportunity for Additional Investment
17	*Hapalomys delacouri*	Lesser Marmoset Rat			VU		+	+			+	Yes	N/A	Yes	Medium	High
18	*Hapalomys longicaudatus*	Greater Marmoset Rat		EN					+	+		Yes	N/A	Yes	Medium	High
19	*Helarctos malayanus*	Sun Bear			VU	+	+	+	+	+	+	Yes	Yes	No	Medium	High
20	*Hemigalus derbyanus*	Banded Civet			VU				+	+		No	N/A	N/A	N/A	N/A
21	*Hesperoptenus tomesi*	Large False Serotine			VU					+		No	N/A	N/A	N/A	N/A
22	*Hipposideros khaokhouayensis*	Phou Khaokhouay Leaf-nosed Bat			VU			+				Yes	No	No	N/A	N/A
23	*Hipposideros scutinares*	Shield-nosed Leaf-nosed Bat			VU			+			+	Yes	No	No	N/A	N/A
24	***Hipposideros halophyllus***	**Thailand Leaf-nosed Bat**		**EN**						**+**		**Yes**	**Yes**	**No**	**High**	**High**
25	***Hoolock hoolock***	**Western Hoolock**		**EN**					**+**			**Yes**	**Yes**	**No**	**High**	**High**
26	*Hoolock leuconedys*	Eastern Hoolock			VU		+		+			Yes	No	No	N/A	N/A
27	*Hylobates agilis*	Agile Gibbon		EN						+		No	N/A	N/A	N/A	N/A
28	*Hylobates lar*	White-handed Gibbon		EN			ex?	+	+	+		Yes	No	No	N/A	N/A
29	*Hylobates pileatus*	Pileated Gibbon		EN		+		+		+		Yes	Yes	No	Medium	Medium
30	*Laonastes aenigmamus*	Kha-nyou		EN				+			+	Yes	No	No	N/A	N/A
31	*Lepus hainanus*	Hainan Hare			VU		+					Yes	No	No	Low	Medium
32	***Lutra sumatrana***	**Hairy-nosed Otter**		**EN**		**+**			**+**	**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
33	***Lutrogale perspicillata***	**Smooth-coated Otter**			**VU**	**+**	**+**	**+**	**+**	**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
34	*Macaca arctoides*	Bear Macaque			VU	+	+	+	+	+	+	Yes	No	No	N/A	N/A
35	*Macaca leonina*	Northern Pig-tailed Macaque			VU	+	+	+	+	+	+	Yes	No	No	N/A	N/A
36	*Macaca nemestrina*	Sundaland Pig-tailed Macaque			VU					+		No	N/A	N/A	N/A	N/A
37	***Manis javanica***	**Sunda Pangolin**		**EN**		**+**	**?**	**+**	**+**	**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
38	***Manis pentadactyla***	**Chinese Pangolin**		**EN**			**+**	**+**	**+**	**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**

No.	Scientific Name	Common Name	Global Threat Status			Distribution by Country						Selection Criteria for Priority Species				
			Critically Endangered	Endangered	Vulnerable	Cambodia	China	Lao PDR	Myanmar	Thailand	Vietnam	Indo-Burmese Population is Globally Signif.	Species-focused Action Required	Over-riding Need for Improved Info	Urgency for Conservation Action	Opportunity for Additional Investment
39	*Maxomys rajah*	Rajah Sundaic Maxomys			VU					+		No	N/A	N/A	N/A	N/A
40	*Maxomys whiteheadi*	Whitehead's Sundaic Maxomys			VU					+		No	N/A	N/A	N/A	N/A
41	***Moschus berezovskii***	**Forest Musk Deer**		**EN**			**+**				**+**	**Yes**	**Yes**	**No**	**High**	**High**
42	***Moschus fuscus***	**Black Musk Deer**		**EN**			**+**		**+**			**Yes**	**Yes**	**No**	**High**	**High**
43	***Muntiacus vuquangensis***	**Large-antlered Muntjac**		**EN**		**+**		**+**			**+**	**Yes**	**Yes**	**No**	**High**	**High**
44	*Murina aenea*	Bronze Tube-nosed Bat			VU					+		No	N/A	N/A	N/A	N/A
45	*Naemorhedus baileyi*	Red Goral			VU				+			Yes	Yes	No	Medium	High
46	*Naemorhedus griseus*	Chinese Goral			VU		+		+	+		Yes	Yes	No	Medium	Medium
47	*Neofelis nebulosa*	Indochinese Clouded Leopard			VU	+	+	+	+	+	+	Yes	Yes	No	Medium	Medium
48	*Neohylomys hainanensis*	Hainan Gymnure		EN			+					Yes	No	Yes	Medium	Medium
49	*Niviventer cremoriventer*	Sundaic Arboreal Niviventer			VU					+		No	N/A	N/A	N/A	N/A
50	***Nomascus concolor***	**Black Crested Gibbon**	**CR**				**+**	**+**			**+**	**Yes**	**Yes**	**No**	**High**	**High**
51	*Nomascus gabriellae*	Yellow-cheeked Gibbon		EN		+		+			+	Yes	Yes	No	Medium	Medium
52	***Nomascus hainanus***	**Hainan Gibbon**	**CR**				**+**					**Yes**	**Yes**	**No**	**High**	**High**
53	***Nomascus leucogenys***	**Northern White-cheeked Gibbon**	**CR**				**ex?**	**+**			**+**	**Yes**	**Yes**	**No**	**High**	**High**
54	***Nomascus nasutus***	**Cao Vit Crested Gibbon**	**CR**				**+**				**+**	**Yes**	**Yes**	**No**	**High**	**High**
55	*Nomascus siki*	Southern White-cheeked Gibbon		EN				+			+	Yes	Yes	No	Medium	Medium
56	*Nycticebus bengalensis*	Bengal Slow Loris			VU	+	+	+	+	+	+	Yes	No	No	N/A	N/A
57	*Nycticebus coucang*	Greater Slow Loris			VU					+		No	N/A	N/A	N/A	N/A
58	*Nycticebus pygmaeus*	Pygmy Loris			VU	+	+	+			+	Yes	No	No	N/A	N/A
59	***Orcaella brevirostris***	**Irrawaddy Dolphin**			**VU**	**+**		**+**	**+**			**Yes**	**Yes**	**No**	**High**	**High**

No.	Scientific Name	Common Name	Global Threat Status			Distribution by Country						Selection Criteria for Priority Species				
			Critically Endangered	Endangered	Vulnerable	Cambodia	China	Lao PDR	Myanmar	Thailand	Vietnam	Indo-Burmese Population is Globally Signif.	Species-focused Action Required	Over-riding Need for Improved Info	Urgency for Conservation Action	Opportunity for Additional Investment
60	*Panthera tigris*	Tiger		EN		+	+	+	+	+	+	Yes	Yes	No	High	Low
61	*Pardofelis marmorata*	Marbled Cat			VU	+	+	+	+	+	+	Yes	Yes	No	Medium	High
62	*Petinomys setosus*	Temminck's Flying Squirrel			VU				+	+	+	Yes	No	No	N/A	N/A
63	*Petinomys vordermanni*	Vordermann's Flying Squirrel			VU				+	?		No	N/A	N/A	N/A	N/A
64	*Prionailurus planiceps*	Flat-headed Cat		EN						+		No	N/A	N/A	N/A	N/A
65	***Prionailurus viverrinus***	**Fishing Cat**		**EN**		**+**		**?**	**+**	**+**	**+**	**Yes**	**N/A**	**Yes**	**High**	**High**
66	***Pseudoryx nghetinhensis***	**Saola**	**CR**					**+**			**+**	**Yes**	**Yes**	**No**	**High**	**High**
67	*Pteromyscus pulverulentus*	Smoky Flying Squirrel		EN						+		No	N/A	N/A	N/A	N/A
68	*Pteropus lylei*	Lyle's Flying Fox			VU	+	?			+	+	Yes	Yes	No	Medium	High
69	***Pygathrix cinerea***	**Grey-shanked Douc**	**CR**								**+**	**Yes**	**Yes**	**No**	**High**	**High**
70	***Pygathrix nemaeus***	**Red-shanked Douc**		**EN**		**?**		**+**			**+**	**Yes**	**Yes**	**No**	**High**	**High**
71	*Pygathrix nigripes*	Black-shanked Douc		EN		+					+	Yes	Yes	No	Medium	High
72	***Rhinopithecus avunculus***	**Tonkin Snub-nosed Monkey**	**CR**				**?**				**+**	**Yes**	**Yes**	**No**	**High**	**High**
73	***Rhinopithecus strykeri***	**Myanmar Snub-nosed Monkey**	**CR**						**+**			**Yes**	**Yes**	**No**	**High**	**High**
74	***Rucervus eldii***	**Eld's Deer**		**EN**		**+**	**+**	**+**	**+**	**ex**	**ex?**	**Yes**	**Yes**	**No**	**High**	**High**
75	*Rusa unicolor*	Sambar			VU	+	+	+	+	+	+	Yes	Yes	No	Medium	High
76	*Symphalangus syndactylus*	Siamang		EN						+		No	N/A	N/A	N/A	N/A
77	*Tapirus indicus*	Asian Tapir		EN					+	+		Yes	No	No	N/A	N/A
78	***Trachypithecus delacouri***	**Delacour's Leaf Monkey**	**CR**								**+**	**Yes**	**Yes**	**No**	**High**	**High**
79	***Trachypithecus francoisi***	**François's Leaf Monkey**		**EN**			**+**				**+**	**Yes**	**Yes**	**No**	**High**	**High**
80	***Trachypithecus germaini***	**Indochinese Silvered Leaf Monkey**		**EN**		**+**		**+**	**+**	**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
81	*Trachypithecus hatinhensis*	Hatinh Leaf Monkey		EN				+			+	Yes	Yes	No	Medium	High

No.	Scientific Name	Common Name	Global Threat Status			Distribution by Country						Selection Criteria for Priority Species				
			Critically Endangered	Endangered	Vulnerable	Cambodia	China	Lao PDR	Myanmar	Thailand	Vietnam	Indo-Burmese Population is Globally Signif.	Species-focused Action Required	Over-riding Need for Improved Info	Urgency for Conservation Action	Opportunity for Additional Investment
82	*Trachypithecus laotum*	Lao Leaf Monkey			VU			+				Yes	Yes	No	Medium	High
83	*Trachypithecus phayrei*	Phayre's Leaf Monkey		EN			+	+	+	+	+	Yes	Yes	No	Medium	High
84	*Trachypithecus pileatus*	Capped Leaf Monkey		EN					+			Yes	Yes	No	Medium	High
85	***Trachypithecus poliocephalus***	**White-headed Leaf Monkey**	**CR**				**+**				**+**	**Yes**	**Yes**	**No**	**High**	**High**
86	***Trachypithecus shortridgei***	**Shortridge's Leaf Monkey**		**EN**			**+**		**+**			**Yes**	**Yes**	**No**	**High**	**High**
87	*Ursus thibetanus*	Asian Black Bear			VU	+	+	+	+	+	+	Yes	Yes	No	Medium	High
88	*Viverra megaspila*	Large-spotted Civet			VU	+	ex?	+	+	+	+	Yes	Yes	No	Medium	High
	BIRDS (comprehensive Red List assessment regularly reviewed)		**12**	**19**	**54**	**28**	**37**	**24**	**41**	**46**	**42**					
89	*Aceros nipalensis*	Rufous-necked Hornbill			VU		ex?	+	+	+	+	Yes	Yes	No	Medium	Medium
90	*Aceros subruficollis*	Plain-pouched Hornbill			VU				+	+		Yes	Yes	No	Medium	Low
91	*Acrocephalus sorghophilus*	Streaked Reed-warbler			VU		+					No	N/A	N/A	N/A	N/A
92	*Acrocephalus tangorum*	Manchurian Reed-warbler			VU	+	+	+		+	+	Yes	Yes	No	Medium	Medium
93	*Actinodura sodangorum*	Black-crowned Barwing			VU			+			+	Yes	No	No	N/A	N/A
94	*Alcedo euryzona*	Blue-banded Kingfisher			VU				+	+		Yes	No	No	N/A	N/A
95	*Anas formosa***	Baikal Teal			VU		+		+	+		No	N/A	N/A	N/A	N/A
96	*Anser cygnoides*	Swan Goose			VU			v		v		No	N/A	N/A	N/A	N/A
97	*Apus acuticauda*	Dark-rumped Swift			VU				?	v?		No	N/A	N/A	N/A	N/A
98	*Aquila clanga*	Greater Spotted Eagle			VU	+	+	+	+	+	+	Yes	Yes	No	Medium	High
99	*Aquila hastata*	Indian Spotted Eagle			VU	+			+			Yes?	N/A	Yes	Medium	High
100	*Aquila heliaca*	Eastern Imperial Eagle			VU	+	+	+	+	+	+	No	N/A	N/A	N/A	N/A

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101	*Arborophila ardens*	Hainan Partridge			VU		+					Yes	No	No	N/A	N/A
102	***Ardea insignis***	**White-bellied Heron**	**CR**				**ex?**		**+**			**Yes**	**N/A**	**Yes**	**High**	**High**
103	*Aythya baeri*	Baer's Pochard		EN			+	v?	+	+	v?	Yes	No	No	Medium	High
104	***Cairina scutulata***	**White-winged Duck**		**EN**		**+**		**+**	**+**	**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
105	*Calidris tenuirostris*	Great Knot			VU	+	+		+	+	+	Yes	No	No	N/A	N/A
106	*Centropus rectunguis*	Short-toed Coucal			VU					+		No	N/A	N/A	N/A	N/A
107	***Chrysomma altirostre***	**Jerdon's Babbler**			**VU**				**ex?**			**Yes**	**N/A**	**Yes**	**High**	**High**
108	*Ciconia boyciana*	Oriental Stork		EN			+		?			No	N/A	N/A	N/A	N/A
109	*Ciconia stormi*	Storm's Stork		EN					+	+		No	N/A	N/A	N/A	N/A
110	*Columba punicea*	Pale-capped Pigeon			VU	+	+	+	+	+	+	Yes	No	No	N/A	N/A
111	*Crocias langbianis*	Grey-crowned Crocias		EN							+	Yes	No	No	N/A	N/A
112	*Egretta eulophotes*	Chinese Egret			VU		+	v		+	+	No	N/A	N/A	N/A	N/A
113	*Emberiza aureola*	Yellow-breasted Bunting			VU	+	+	+	+	+	+	Yes	Yes	No	Medium	High
114	*Emberiza sulphurata*	Yellow Bunting			VU		v?					No	N/A	N/A	N/A	N/A
115	***Eurychelidon sirintarae***	**White-eyed River-martin**	**CR**							**ex?**		**Yes**	**N/A**	**Yes**	**High**	**High**
116	***Eurynorhynchus pygmeus***	**Spoon-billed Sandpiper**	**CR**				**+**		**+**	**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
117	*Falco naumanni*	Lesser Kestrel			VU	v?		ex?	+			No	N/A	N/A	N/A	N/A
118	*Fregata andrewsi*	Christmas Island Frigatebird	CR			+	+			+	+	No	N/A	N/A	N/A	N/A
119	*Gallinago nemoricola*	Wood Snipe			VU		+	+	+	+	+	Yes	N/A	Yes	Medium	High
120	*Garrulax konkakinhensis*	Chestnut-eared Laughingthrush			VU						+	Yes	No	No	N/A	N/A
121	*Garrulax ngoclinhensis*	Golden-winged Laughingthrush			VU						+	Yes	No	No	N/A	N/A
122	*Garrulax yersini*	Collared Laughingthrush		EN							+	Yes	No	No	N/A	N/A

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123	*Gorsachius goisagi*	Japanese Night-heron		EN			+					No	N/A	N/A	N/A	N/A
124	***Gorsachius magnificus***	**White-eared Night-heron**		**EN**			**+**				**+**	**Yes**	**Yes**	**No**	**High**	**High**
125	***Grus antigone***	**Sarus Crane**			**VU**	**+**	**ex**	**+**	**+**	**ex**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
126	***Gyps bengalensis***	**White-rumped Vulture**	**CR**			**+**	**ex**	**+**	**+**	**ex**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
127	***Gyps tenuirostris***	**Slender-billed Vulture**	**CR**			**+**		**+**	**+**	**ex**	**ex**	**Yes**	**Yes**	**No**	**High**	**High**
128	*Haliaeetus leucoryphus*	Pallas's Fish-eagle			VU	ex/v			+	ex/v		No	N/A	N/A	N/A	N/A
129	***Heliopais personata***	**Masked Finfoot**		**EN**		**+**		**+**	**+**	**+**	**+**	**Yes**	**N/A**	**Yes**	**High**	**High**
130	***Houbaropsis bengalensis***	**Bengal Florican**	**CR**			**+**					**+**	**Yes**	**Yes**	**No**	**High**	**High**
131	*Larus relictus*	Relict Gull			VU		v?				v?	No	N/A	N/A	N/A	N/A
132	*Larus saundersi*	Saunders's Gull			VU		+				+	Yes	Yes	No	Medium	High
133	***Leptoptilos dubius***	**Greater Adjutant**		**EN**		**+**		**ex?**	**ex?**	**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
134	***Leptoptilos javanicus***	**Lesser Adjutant**			**VU**	**+**		**+**	**+**	**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
135	*Locustella pleskei*	Styan's Grasshopper Warbler			VU		+				+	Yes	Yes	No	Medium	High
136	*Lophophorus sclateri*	Sclater's Monal			VU		+		+			Yes	Yes	No	Medium	High
137	***Lophura edwardsi***	**Edwards's Pheasant**		**EN**							**+**	**Yes**	**N/A**	**Yes**	**High**	**High**
138	***Lophura hatinhensis***	**Vietnamese Pheasant**		**EN**							**+**	**Yes**	**N/A**	**Yes**	**High**	**High**
139	*Luscinia obscura*	Black-throated Blue Robin			VU		+			v?		Yes	N/A	Yes	Medium	High
140	*Megapodius nicobariensis*	Nicobar Megapode			VU				?			No	N/A	N/A	N/A	N/A
141	***Mergus squamatus***	**Scaly-sided Merganser**		**EN**			**+**		**v?**	**v?**	**+**	**Yes?**	**N/A**	**Yes**	**High**	**High**
142	*Mulleripicus pulverulentus*	Great Slaty Woodpecker			VU	+	+	+	+	+	+	Yes	Yes	No	Medium	High
143	*Mycteria cinerea*	Milky Stork			VU	+				+	+	No	N/A	N/A	N/A	N/A
144	*Nisaetus nanus*	Wallace's Hawk-eagle			VU				+	+		Yes	No	No	N/A	N/A

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145	*Numenius madagascariensis*	Far-eastern Curlew			VU	+	+			+	+	Yes	No	No	N/A	N/A
146	*Oriolus mellianus*	Silver Oriole			VU	+	+			+		Yes	No	No	N/A	N/A
147	*Otus sagittatus*	White-fronted Scops-owl			VU				+	+		Yes	No	No	N/A	N/A
148	*Pavo muticus*	Green Peafowl		EN		+	+	+	+	+	+	Yes	Yes	No	Medium	High
149	*Pelecanus crispus*	Dalmatian Pelican			VU		+					No	N/A	N/A	N/A	N/A
150	*Phylloscopus hainanus*	Hainan Leaf-warbler			VU		+					Yes	No	No	N/A	N/A
151	*Pitta gurneyi*	Gurney's Pitta		EN					+	+		Yes	No	No	N/A	N/A
152	*Pitta nympha*	Fairy Pitta			VU		+			v?	v?	No	N/A	N/A	N/A	N/A
153	***Platalea minor***	**Black-faced Spoonbill**		**EN**		**+**	**+**			**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
154	***Polyplectron katsumatae***	**Hainan Peacock-pheasant**		**EN**			**+**					**Yes**	**Yes**	**No**	**High**	**High**
155	*Polplectron inopinatum*	Mountain Peacock-pheasant			VU					+		No	N/A	N/A	N/A	N/A
156	*Polyplectron malacense*	Malaysian Peacock-pheasant			VU					+		No	N/A	N/A	N/A	N/A
157	***Pseudibis davisoni***	**White-shouldered Ibis**	**CR**			**+**	**ex**	**+**	**ex?**	**ex**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
158	*Pycnonotus zeylanicus*	Straw-headed Bulbul			VU				+	+		No	N/A	N/A	N/A	N/A
159	*Rhinomyias brunneatus*	Brown-chested Jungle-flycatcher			VU		+			+		Yes	No	No	N/A	N/A
160	***Rhodonessa caryophyllacea***	**Pink-headed Duck**	**CR**						**ex?**			**Yes?**	**N/A**	**Yes**	**High**	**High**
161	***Rynchops albicollis***	**Indian Skimmer**			**VU**	**ex**	**?**	**ex**	**+**	**v**	**ex**	**Yes?**	**N/A**	**Yes**	**High**	**High**
162	***Sarcogyps calvus***	**Red-headed Vulture**	**CR**			**+**	**ex**	**+**	**+**	**ex?**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
163	*Sitta formosa*	Beautiful Nuthatch			VU		+	+	+	+	+	Yes	Yes	No	Medium	High
164	*Sitta magna*	Giant Nuthatch			VU		+		+	+		Yes	Yes	No	Medium	High
165	*Sitta victoriae*	White-browed Nuthatch		EN					+			Yes	No	No	N/A	N/A
166	*Stachyris oglei*	Snowy-throated Babbler			VU				+			Yes	No	No	N/A	N/A

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167	*Sterna bernsteini*	Chinese Crested Tern	CR							v?		No	N/A	N/A	N/A	N/A
168	***Thaumatibis gigantea***	**Giant Ibis**	**CR**			**+**		**+**		**ex**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
169	*Tragopan blythii*	Blyth's Tragopan			VU				+			Yes	No	No	N/A	N/A
170	*Treron capellei*	Large Green-pigeon			VU				+	+		Yes	No	No	N/A	N/A
171	*Tringa guttifer*	Spotted Greenshank		EN		+	+		+	+	+	Yes	No	No	N/A	N/A
172	*Turdoides longirostris*	Slender-billed Babbler			VU				?			No	N/A	N/A	N/A	N/A
173	*Turdus feae*	Grey-sided Thrush			VU			v?	+	+		Yes	No	No	N/A	N/A
	REPTILES (not yet any comprehensive Red List assessment)		**13**	**20**	**14**	**14**	**20**	**16**	**23**	**19**	**25**					
174	*Amyda cartilaginea*	Asiatic Softshell Turtle			VU	+		+	+	+	+	Yes	Yes	No	Medium	High
175	***Batagur baska***	**Mangrove Terrapin**	**CR**			**+**			**+**	**+**		**Yes**	**Yes**	**No**	**High**	**High**
176	***Batagur borneoensis***	**Painted Terrapin**	**CR**							**+**		**Yes**	**Yes**	**No**	**High**	**High**
177	***Battagur trivittata***	**Burmese Roofed Turtle**		**EN**					**+**			**Yes**	**Yes**	**No**	**High**	**High**
178	*Bronchocela smaragdina*	Gunther's Bloodsucker			VU	+					+	Yes	No	No	N/A	N/A
179	***Chitra chitra***	**Striped Narrow-headed Softshell Turtle**	**CR**							**+**		**Yes**	**Yes**	**No**	**High**	**High**
180	***Chitra indica***	**Indian Narrow-headed Softshell Turtle**		**EN**					**+**			**Yes**	**Yes**	**No**	**High**	**High**
181	***Crocodylus siamensis***	**Siamese Crocodile**	**CR**			**+**		**+**	**ex?**	**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
182	*Cuora amboinensis*	Asian Box Turtle			VU	+		+	+	+	+	Yes	Yes	No	Low	Low
183	***Cuora galbinifrons***	**Indochinese Box Turtle**	**CR**				**+**	**+**			**+**	**Yes**	**Yes**	**No**	**High**	**High**
184	***Cuora mccordi***	**McCord's Box Turtle**	**CR**				**+**					**Yes**	**Yes**	**No**	**High**	**High**
185	***Cuora mouhotii***	**Keeled Box Turtle**		**EN**			**+**	**+**	**+**		**+**	**Yes**	**Yes**	**No**	**High**	**High**

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186	***Cuora trifasciata***	**Chinese Three-striped Box Turtle**	**CR**				**+**	**+**			**+**	**Yes**	**Yes**	**No**	**High**	**High**
187	***Cuora yunnanensis***	**Yunnan Box Turtle**	**CR**				**+**					**Yes**	**Yes**	**No**	**High**	**High**
188	***Cuora zhoui***	**Zhou's Box Turtle**	**CR**				**?**				**?**	**Yes**	**N/A**	**Yes**	**High**	**High**
189	*Enhydris longicauda*	Tonle Sap Water Snake			VU	+						Yes	Yes	No	Medium	Medium
190	*Enhydris vorisi*	Voris's Water Snake		EN					+			Yes	N/A	Yes	Medium	High
191	***Geochelone platynota***	**Burmese Star Tortoise**	**CR**						**+**			**Yes**	**Yes**	**No**	**High**	**High**
192	*Geoemyda spengleri*	Black-breasted Leaf Turtle		EN			+	+			+	Yes	Yes	No	Medium	High
193	*Heosemys annandalii*	Yellow-headed TempleTurtle		EN		+		+	+	+	+	Yes	Yes	No	Medium	High
194	*Heosemys depressa*	Arakan Forest Turtle	CR						+			Yes	Yes	No	Medium	High
195	*Heosemys grandis*	Giant Asian Pond Turtle			VU	+		+	+	+	+	Yes	Yes	No	Low	Low
196	*Heosemys spinosa*	Spiny Turtle		EN					+	+		Yes	Yes	No	Medium	High
197	*Indotestudo elongata*	Elongated Tortoise		EN		+	+	+	+	+	+	Yes	Yes	No	Medium	High
198	*Lycodon paucifasciatus*	Rendahl's Wolf Snake			VU						+	Yes	No	No	N/A	N/A
199	*Malayemys subtrijuga*	Malayan Snail-eating Turtle			VU	+		+	+	+	+	Yes	Yes	No	Low	Low
200	***Manouria emys***	**Asian Giant Tortoise**		**EN**					**+**	**+**		**Yes**	**Yes**	**No**	**High**	**High**
201	*Manouria impressa*	Impressed Tortoise			VU	+	+	+	+	+	+	Yes	Yes	No	Medium	High
202	***Mauremys annamensis***	**Vietnamese Pond Turtle**	**CR**								**+**	**Yes**	**Yes**	**No**	**High**	**High**
203	***Mauremys mutica***	**Asian Yellow Pond Turtle**		**EN**			**+**				**+**	**Yes**	**Yes**	**No**	**High**	**High**
204	***Mauremys nigricans***	**Red-necked Pond Turtle**		**EN**			**+**					**Yes**	**Yes**	**No**	**High**	**High**
205	*Mauremys reevesii*	Chinese Three-keeled Pond Turtle		EN			+					Yes	Yes	No	Medium	High

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206	*Mauremys sinensis*	Chinese Stripe-necked Turtle		EN			+				+	Yes	Yes	No	Medium	High
207	***Morenia ocellata***	**Burmese Eyed Turtle**			**VU**				**+**			**Yes**	**N/A**	**Yes**	**High**	**High**
208	***Nilssonia formosa***	**Burmese Peacock Softshell**		**EN**					**+**			**Yes**	**Yes**	**No**	**High**	**High**
209	*Notochelys platynota*	Malayan Flat-shelled Turtle			VU				+	+		No	N/A	N/A	N/A	N/A
210	*Ophiophagus hannah*	King Cobra			VU	+	+	+	+	+	+	Yes	Yes	No	Medium	Medium
211	*Ophisaurus hainanensis*	Hainan Glass Lizard			VU		+					Yes	Yes	No	Low	Medium
212	*Palea steindachneri*	Wattle-necked Softshell Turtle		EN			+				+	Yes	Yes	No	Medium	High
213	***Pelochelys cantorii***	**Asian Giant Softshell Turtle**		**EN**		**+**	**+**	**+**	**+**	**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
214	*Pelodiscus sinensis*	Chinese Softshell Turtle			VU		+				+	No	N/A	N/A	N/A	N/A
215	***Platysternon megacephalum***	**Big-headed Turtle**		**EN**			**+**	**+**	**+**	**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
216	***Rafetus swinhoei***	**East Asian Giant Softshell Turtle**	**CR**				**ex?**				**+**	**Yes**	**N/A**	**Yes**	**High**	**High**
217	***Sacalia bealei***	**Beale's Eyed Turtle**		**EN**			**+**					**Yes**	**Yes**	**No**	**High**	**High**
218	*Sacalia quadriocellata*	Four-eyed Turtle		EN			+	+			+	Yes	Yes	No	Medium	High
219	*Siebenrockiella crassicollis*	Black Marsh Turtle			VU	+			+	+	+	Yes	Yes	No	Low	Medium
220	*Tomistoma schlegelii*	False Gharial		EN						+		No	N/A	N/A	N/A	N/A
	AMPHIBIANS (comprehensive Red List assessment in 2004)		**0**	**16**	**32**	**4**	**33**	**5**	**0**	**4**	**15**					
221	*Amolops hainanensis*	Hainan Torrent Frog		EN			+					Yes	No	No	N/A	N/A
222	***Amolops hongkongensis***	**Hong Kong Cascade Frog**		**EN**			**+**					**Yes**	**Yes**	**Yes**	**High**	**High**
223	*Amolops torrentis*				VU		+					Yes	Yes	Yes	Medium	Medium

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224	*Amolops tuberodepressus*				VU		+					Yes	No	No	N/A	N/A
225	*Ansonia siamensis*	Siamese Stream Toad			VU					+		Yes	No	No	N/A	N/A
226	*Brachytarsophrys intermedia*	Annam Spadefoot Toad			VU	+					+	Yes	No	No	N/A	N/A
227	*Buergeria oxycephala*	Hainan Stream Frog			VU		+					Yes	No	No	N/A	N/A
228	*Gracixalus jinxiuensis*	Jinxiu Small Treefrog			VU						?	Yes	No	No	N/A	N/A
229	*Hylarana attigua*	frog species			VU			+			+	Yes	No	No	N/A	N/A
230	*Hylarana spinulosa*				VU		+					Yes	No	No	N/A	N/A
231	*Ingerana liui*	Liu's Papillae-tonged Frog			VU		+					Yes	No	No	N/A	N/A
232	*Ingerana tasanae*	Tasan Frog			VU					+		Yes	No	No	N/A	N/A
233	*Kurixalus baliogaster*	tree frog species			VU			+			+	Yes	No	No	N/A	N/A
234	*Leptobrachium banae*	Red-legged Leaflitter Toad			VU			+			+	Yes	No	No	N/A	N/A
235	*Leptobrachium echinatum*	Hoang Lien Moustache Toad		EN							+	Yes	No	No	N/A	N/A
236	*Leptobrachium hainanensis*	Hainan Pseudomoustache Toad			VU		+					Yes	No	No	N/A	N/A
237	*Leptolalax alpinus*			EN			+					Yes	No	No	N/A	N/A
238	*Leptolalax tuberosus*	Asian toad species			VU						+	Yes	No	No	N/A	N/A
239	*Limnonectes fragilis*				VU		+					Yes	No	No	N/A	N/A
240	*Limnonectes toumanoffi*	Toumanoff's Wart Frog			VU	+					+	Yes	No	No	N/A	N/A
241	*Liuixalus ocellatus*	Ocellated Small Treefrog		EN			+					Yes	No	No	N/A	N/A
242	*Liuixalus romeri*	Romer's Treefrog		EN			+					Yes	No	No	N/A	N/A
243	*Nanorana liui*				VU		+					Yes	No	No	N/A	N/A
244	*Nanorana maculosa*			EN			+					Yes	Yes	Yes	Medium	Medium
245	*Nanorana unculuanus*	Yunnan Asian Frog		EN			+					Yes	No	No	N/A	N/A

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246	*Nanorana yunnanensis*	Yunnan Spiny Frog		EN			+				+	Yes	No	No	N/A	N/A
247	*Odorrana hainanensis*				VU		+					Yes	No	No	N/A	N/A
248	*Odorrana jingdongensis*	Jingdong Stinking Frog			VU		+				+	Yes	No	No	N/A	N/A
249	*Odorrana nasuta*				VU		+					Yes	Yes	Yes	Low	Low
250	*Oreolalax granulosus*				VU		+					Yes	Yes	Yes	Low	Low
251	*Oreolalax jingdongensis*				VU		+					Yes	Yes	Yes	Low	Low
252	*Paramesotriton deloustali*	Vietnamese Salamander			VU						+	Yes	No	No	N/A	N/A
253	*Paramesotriton guangxiensis*	Guangxi Warty Newt		EN			+					Yes	No	Yes	Medium	Medium
254	*Parapelophryne scalpta*	Hainan Little Toad		EN			+					Yes	No	No	N/A	N/A
255	*Quasipaa boulengeri*	Spiny-bellied Frog		EN			+					Yes	No	No	N/A	N/A
256	*Quasipaa exilispinosa*	Little Spiny Frog			VU		+					No	N/A	N/A	N/A	N/A
257	*Quasipaa fasciculispina*				VU	+				+		Yes	No	No	N/A	N/A
258	*Quasipaa shini*	Spiny-flanked Frog			VU		+					No	N/A	N/A	N/A	N/A
259	*Quasipaa spinosa*	Giant Spiny Frog			VU		+				+	Yes	Yes	No	Medium	High
260	*Rhacophorus annamensis*	Annam Flying Frog			VU	+					+	Yes	No	No	N/A	N/A
261	*Rhacophorus exechopygus*	treefrog species			VU			+			+	Yes	No	No	N/A	N/A
262	*Rhacophorus kio*	treefrog species			VU		+	+		+	+	Yes	Yes	Yes	Medium	Medium
263	*Rhacophorus yaoshanensis*	Yaoshan Treefrog		EN			+					No	N/A	N/A	N/A	N/A
264	*Rhacophorus yinggelingensis*	treefrog species			VU		+					Yes	Yes	Yes	Low	Low
265	*Theloderma bicolor*			EN							+	Yes	No	No	N/A	N/A
266	*Tylototriton hainanensis*	Hainan Knobby Newt		EN			+					Yes	No	No	N/A	N/A
267	*Xenophrys brachykolos*	Short-legged Toad		EN			+					Yes	No	No	N/A	N/A

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268	*Xenophrys giganticus*	Giant Piebald Horned Toad			VU		+					Yes	Yes	Yes	Medium	High
	FISH (comprehensive Red List assessment in 2011)		**25**	**28**	**58**	**31**	**17**	**44**	**16**	**58**	**34**					
269	***Aaptosyax grypus***	**Mekong Giant Salmon Carp**	**CR**			**ex?**		**+**		**+**		**Yes**	**Yes**	**No**	**High**	**High**
270	*Acipenser sinensis*	Chinese Sturgeon	CR				ex?					No	N/A	N/A	N/A	N/A
271	*Amblypharyngodon chulabhornae*				VU	+		+		+		Yes	Yes	No	Medium	High
272	*Anoxypristis cuspidata*	Knifetooth Sawfish	CR				+		+	+	+	No	N/A	N/A	N/A	N/A
273	***Balantiocheilos ambusticauda***	**Siamese Bala-shark**	**CR**							**+**		**Yes**	**N/A**	**Yes**	**High**	**High**
274	*Bangana behri*				VU	+	+	+		+	+	Yes	No	No	N/A	N/A
275	*Bangana musaei*				VU			+				Yes	Yes	No	Medium	High
276	*Bangana tonkinensis*				VU		+				+	Yes	No	No	N/A	N/A
277	*Barilius dogarsinghi*	Manipur Baril			VU				+			No	N/A	N/A	N/A	N/A
278	*Betta simplex*	Simple Mouthbrooder	CR							+		Yes	No	No	N/A	N/A
279	*Betta splendens*	Siamese Fighting Fish			VU					+		Yes	Yes	No	Medium	High
280	***Catlocarpio siamensis***	**Giant Carp**	**CR**			**+**		**+**		**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
281	***Ceratoglanis pachynema***	**Club-barbel Sheatfish**	**CR**					**?**		**+**		**Yes**	**Yes**	**No**	**High**	**High**
282	*Cirrhinus microlepis*	Small-scaled Mud Carp			VU	+		+		+	+	Yes	No	No	N/A	N/A
283	*Crossocheilus reticulatus*				VU	+	+	+		+	+	Yes	No	No	N/A	N/A
284	*Cryptotora thamicola*	Waterfall-climbing Cave Fish			VU					+		Yes	No	No	N/A	N/A
285	*Cyprinus intha*	Inle Carp		EN					+			Yes	N/A	N/A	N/A	N/A
286	*Danio erythromicron*			EN					+			Yes	N/A	N/A	N/A	N/A
287	***Dasyatis laosensis***	**Mekong Freshwater Stingray**		**EN**		**+**		**+**		**+**		**Yes**	**Yes**	**No**	**High**	**High**

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288	***Datnioides pulcher***	**Siamese Tiger Perch**	**CR**			**+**		**ex?**		**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
289	***Datnioides undecimradiatus***	**Thinbar Datnoid**			**VU**	**+**		**+**		**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
290	*Devario auropurpureus*			EN					+			Yes	N/A	N/A	N/A	N/A
291	*Devario browni*				VU				+			Yes	N/A	N/A	N/A	N/A
292	*Devario yuensis*				VU				+			Yes	N/A	N/A	N/A	N/A
293	*Ellopostoma mystax*			EN						+		Yes	No	No	N/A	N/A
294	***Epalzeorhynchos bicolor***	**Redtail Shark Minnow**	**CR**							**+**		**Yes**	**Yes**	**No**	**High**	**High**
295	*Epalzeorhynchos munense*	Red Fin Shark Minnow			VU	+		+		+		Yes	No	No	N/A	N/A
296	*Garra flavatra*				VU				+			Yes	N/A	N/A	N/A	N/A
297	*Gibbibarbus cyphotergous*	Golden-line fish species			VU		+					Yes	Yes	No	Medium	Medium
298	***Glyphis siamensis***	**Irrawaddy River Shark**	**CR**						**+**			**Yes**	**N/A**	**Yes**	**High**	**High**
299	***Himantura kittipongi***	**Roughback Whipray**		**EN**						**+**		**Yes**	**Yes**	**No**	**High**	**High**
300	***Himantura oxyrhynchus***	**Marbled Freshwater Stingray**		**EN**		**+**				**+**		**Yes**	**Yes**	**No**	**High**	**High**
301	***Himantura polylepis***	**Giant Freshwater Stingray**		**EN**		**+**		**+**		**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
302	***Himantura signifer***	**White-edged Freshwater Whipray**		**EN**						**+**		**Yes**	**Yes**	**No**	**High**	**High**
303	*Hypsibarbus lagleri*				VU	+		+		+		Yes	No	No	N/A	N/A
304	*Indostomus crocodilus*	Armoured Stickleback			VU					+		Yes	Yes	No	Medium	High
305	*Labeo pierrei*				VU	+		+		+	+	Yes	No	No	N/A	N/A
306	*Laubuca caeruleostigmata*	Flying Minnow	CR			+		+		+		Yes	Yes	No	Medium	High
307	***Luciocyprinus striolatus***	**Monkey-eating Fish**		**EN**				**+**				**Yes**	**Yes**	**No**	**High**	**High**
308	*Mastacembelus oatesii*			EN					+			Yes	N/A	N/A	N/A	N/A
309	*Microrasbora rubescens*	Red Dwarf Rasbora		EN					+			Yes	N/A	N/A	N/A	N/A
310	*Mystacoleucus lepturus*				VU		+	+		+		Yes	Yes	No	Medium	Medium

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311	*Mystus bocourti*				VU	+		+		+	+	Yes	No	No	N/A	N/A
312	*Nemacheilus banar*				VU						+	Yes	No	No	N/A	N/A
313	*Nemacheilus troglocataractus*	cave loach species	CR							+		Yes	No	No	N/A	N/A
314	*Neolissochilus subterraneus*	Cave Brook Carp			VU					+		Yes	No	No	N/A	N/A
315	*Ompok fumidus*				VU					+		No	N/A	N/A	N/A	N/A
316	*Opsarius pulchellus*				VU	+	+	+		+		Yes	No	No	N/A	N/A
317	*Oreoglanis siamensis*	Freshwater Batfish		EN						+		Yes	No	No	N/A	N/A
318	*Oreonectes anophthalmus*	cave loach species			VU		+					Yes	Yes	No	Medium	High
319	*Osphronemus exodon*	Elephant Ear Gourami			VU	+		+		+		Yes	No	No	N/A	N/A
320	*Oxygaster pointoni*				VU	+		+		+		Yes	No	No	N/A	N/A
321	***Pangasianodon gigas***	**Mekong Giant Catfish**	**CR**			**+**		**+**		**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
322	***Pangasianodon hypophthalmus***	**Striped Catfish**		**EN**		**+**		**+**		**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
323	*Pangasius krempfi*	Krempf's Catfish			VU	+	+	+		+	+	Yes	Yes	No	Medium	High
324	***Pangasius sanitwongsei***	**Giant Dog-eating Catfish**	**CR**			**+**	**ex**	**+**		**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
325	*Poropuntius bolovenensis*			EN				+				Yes	No	No	N/A	N/A
326	***Poropuntius deauratus***	**Yellow Tail Brook Barb**		**EN**							**+**	**Yes**	**Yes**	**No**	**High**	**High**
327	*Poropuntius speleops*	blind cavefish species			VU					+		Yes	No	No	N/A	N/A
328	*Pristis microdon*	Largetooth Sawfish	CR			+				?		Yes	N/A	Yes	Medium	High
329	*Pristis zijsron*	Narrowsnout Sawfish	**CR**			+	+		+	+	+	No	N/A	N/A	N/A	N/A
330	***Probarbus jullieni***	**Jullien's Golden Carp**		**EN**		**+**		**+**		**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
331	***Probarbus labeamajor***	**Thick-lipped Barb**		**EN**		**+**		**+**		**+**		**Yes**	**Yes**	**No**	**High**	**High**
332	*Pseudohemiculter dispar*				VU		+	+			+	Yes	No	No	N/A	N/A
333	*Pseudolaubuca hotaya*				VU						+	Yes	No	No	N/A	N/A

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334	*Puntius compressiformis*		CR						+			Yes	N/A	N/A	N/A	N/A
335	*Puntius ornatus*				VU				+			Yes	N/A	N/A	N/A	N/A
336	*Rhinogobius chiengmaiensis*				VU					+		Yes	No	No	N/A	N/A
337	*Sawbwa resplendens*	Burmese Rammy Nose		EN					+			Yes	N/A	N/A	N/A	N/A
338	*Scaphognathops bandanensis*	Bandan Sharp-mouth Barb			VU	+		+		+	+	Yes	No	No	N/A	N/A
339	***Scaphognathops theunensis***	**Nam Theun Barb**	**CR**					**ex?**				**Yes**	**N/A**	**Yes**	**High**	**High**
340	*Schistura bairdi*			EN		+		+				Yes	No	No	N/A	N/A
341	*Schistura bolavenensis*			EN				+				Yes	No	No	N/A	N/A
342	*Schistura cataracta*				VU			+				Yes	No	No	N/A	N/A
343	*Schistura deansmarti*				VU					+		Yes	No	No	N/A	N/A
344	*Schistura jarutanini*	Srisawat Blind Cave Loach			VU					+		Yes	No	No	N/A	N/A
345	*Schistura kaysonei*				VU			+				Yes	No	No	N/A	N/A
346	***Schistura leukensis***	**Nam Leuk Loach**	**CR**					**+**				**Yes**	**N/A**	**Yes**	**High**	**High**
347	***Schistura nasifilis***	**Vietnamese Loach**	**CR**								**+**	**Yes**	**N/A**	**Yes**	**High**	**High**
348	*Schistura oedipus*				VU					+		Yes	No	No	N/A	N/A
349	*Schistura personata*				VU			+				Yes	No	No	N/A	N/A
350	*Schistura pridii*	Mini Dragon Loach		EN						+		Yes	No	No	N/A	N/A
351	*Schistura spekuli*				VU						+	Yes	No	Yes	Medium	High
352	*Schistura spiloptera*		CR								+	Yes	No	Yes	Medium	High
353	*Schistura susannae*				VU						+	Yes	No	No	N/A	N/A
354	***Schistura tenura***	**Slender-tailed Loach**	**CR**					**+**				**Yes**	**N/A**	**Yes**	**High**	**High**
355	*Schistura tubulinaris*				VU			+				Yes	No	No	N/A	N/A
356	***Scleropages formosus***	**Asian Arowana**		**EN**		**+**			**+**	**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**

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357	*Serpenticobitis cingulata*				VU			+		+		Yes	No	No	N/A	N/A
358	*Sewellia albisuera*		CR								+	Yes	No	No	N/A	N/A
359	*Sewellia breviventralis*		CR								+	Yes	No	No	N/A	N/A
360	*Sewellia lineolata*				VU						+	Yes	No	No	N/A	N/A
361	*Sewellia marmorata*			EN							+	Yes	No	No	N/A	N/A
362	*Sewellia patella*			EN							+	Yes	No	No	N/A	N/A
363	*Sewellia pterolineata*			EN							+	Yes	No	No	N/A	N/A
364	*Sinocyclocheilus anatirostris*	Duck-billed Golden-line Fish			VU		+					Yes	No	No	N/A	N/A
365	*Sinocyclocheilus angularis*	Golden-line Angle Fish			VU		+					Yes	No	No	N/A	N/A
366	*Sinocyclocheilus anophthalmus*	Eyeless Golden-line Fish			VU		+					Yes	No	No	N/A	N/A
367	*Sinocyclocheilus hyalinus*	Hyaline Fish			VU		+					Yes	No	No	N/A	N/A
368	*Sinocyclocheilus microphthalmus*	Small-eyed Golden-line Fish			VU		+					Yes	No	No	N/A	N/A
369	*Tenualosa thibaudeaui*	Laotian Shad			VU	+		+		+	+	Yes	No	No	N/A	N/A
370	*Tetraodon baileyi*	Hairy Puffer			VU			+		+		Yes	No	No	N/A	N/A
371	*Tetraodon cambodgiensis*				VU	+		+		+		Yes	No	No	N/A	N/A
372	*Tor ater*				VU			+				Yes	No	No	N/A	N/A
373	*Tor putitora*	Putitoe Mahseer		EN			+			+		Yes	No	No	N/A	N/A
374	***Trigonostigma somphongsi***	**Somphongs's Rasbora**	**CR**							**+**		**Yes**	**N/A**	**Yes**	**High**	**High**
375	***Triplophysa gejiuensis***	**Gejiu Blind Loach**			**VU**		**ex?**					**Yes**	**N/A**	**Yes**	**High**	**High**
376	*Troglocyclocheilus khammouanensis*				VU			+				Yes	No	No	N/A	N/A
377	*Yasuhikotakia sidthimunki*	Dwarf Botia		EN				?		+		Yes	Yes	No	Medium	High
378	*Yasuhikotakia splendida*				VU			+		+		Yes	No	No	N/A	N/A

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379	*Yunnanilus brevis*				VU				+			Yes	N/A	N/A	N/A	N/A
	INVERTEBRATES (not yet any comprehensive Red List assessment)		**9**	**21**	**36**	**0**	**10**	**6**	**4**	**28**	**25**					
380	*Bayadera hyalina*	Order: Odonata			VU					+		Yes	N/A	N/A	N/A	N/A
381	*Brotia solemiana*	Order: Sorbeoconcha			VU					+		Yes	N/A	N/A	N/A	N/A
382	*Caliphaea angka*	Order: Odonata		EN						+		Yes	N/A	N/A	N/A	N/A
383	*Chlorogomphus gracilis*	Order: Odonata			VU		+					Yes	N/A	N/A	N/A	N/A
384	*Chlorogomphus nakamurai*	Order: Odonata			VU						+	Yes	N/A	N/A	N/A	N/A
385	*Cristaria truncata*	Order: Unionoida		EN							+	Yes	N/A	N/A	N/A	N/A
386	*Cryptophaea saukra*	Order: Odonata	CR							+		Yes	N/A	N/A	N/A	N/A
387	*Cuneopsis demangei*	Order: Unionoida	CR								+	Yes	N/A	N/A	N/A	N/A
388	*Doimon doichiangdao*	Order: Decapoda		EN						+		Yes	N/A	N/A	N/A	N/A
389	*Doimon doisutep*	Order: Decapoda		EN						+		Yes	N/A	N/A	N/A	N/A
390	*Echo maxima*	Order: Odonata	CR								+	Yes	N/A	N/A	N/A	N/A
391	*Euphaea pahyapi*	Order: Odonata			VU					+		Yes	N/A	N/A	N/A	N/A
392	*Euploea andamanensis*	Order: Lepidoptera			VU				+			Yes	N/A	N/A	N/A	N/A
393	*Gabbia alticola*	Order: Littorinimorpha	CR						+			Yes	N/A	N/A	N/A	N/A
394	*Gomphidia kelloggi*	Order: Odonata	CR				+					Yes	N/A	N/A	N/A	N/A
395	*Hainanpotamon orientale*	Order: Decapoda		EN			+					Yes	N/A	N/A	N/A	N/A
396	*Heterothelphusa fatum*	Order: Decapoda			VU					+		Yes	N/A	N/A	N/A	N/A
397	*Indochinamon bhumibol*	Order: Decapoda		EN						+		Yes	N/A	N/A	N/A	N/A
398	*Indochinamon cua*	Order: Decapoda			VU						+	Yes	N/A	N/A	N/A	N/A
399	*Indochinamon guttum*	Order: Decapoda			VU			+				Yes	N/A	N/A	N/A	N/A
400	*Indochinamon mieni*	Order: Decapoda			VU						+	Yes	N/A	N/A	N/A	N/A

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401	*Indochinamon villosum*	Order: Decapoda		EN				+				Yes	N/A	N/A	N/A	N/A
402	*Iomon luangprabangense*	Order: Decapoda			VU			+				Yes	N/A	N/A	N/A	N/A
403	*Iomon nan*	Order: Decapoda		EN						+		Yes	N/A	N/A	N/A	N/A
404	*Lamelligomphus tutulus*	Order: Odonata			VU		+					Yes	N/A	N/A	N/A	N/A
405	*Lamprotula blaisei*	Order: Unionoida			VU						+	Yes	N/A	N/A	N/A	N/A
406	*Lamprotula contritus*	Order: Unionoida		EN							+	Yes	N/A	N/A	N/A	N/A
407	*Lamprotula crassa*	Order: Unionoida	CR								+	Yes	N/A	N/A	N/A	N/A
408	*Lamprotula liedtkei*	Order: Unionoida	CR								+	Yes	N/A	N/A	N/A	N/A
409	*Lamprotula nodulosa*	Order: Unionoida	CR								+	Yes	N/A	N/A	N/A	N/A
410	*Lamprotula ponderosa*	Order: Unionoida		EN							+	Yes	N/A	N/A	N/A	N/A
411	*Lanceolaria bilirata*	Order: Unionoida	CR								+	Yes	N/A	N/A	N/A	N/A
412	*Macromia katae*	Order: Odonata			VU		+	+				Yes	N/A	N/A	N/A	N/A
413	*Margaritifera laosensis*	Order: Unionoida		EN							+	Yes	N/A	N/A	N/A	N/A
414	*Mekhongthelphusa kengsaphu*	Order: Decapoda			VU					+		Yes	N/A	N/A	N/A	N/A
415	*Mekhongthelphusa tetragona*	Order: Decapoda			VU					+		Yes	N/A	N/A	N/A	N/A
416	*Modellnaia siamensis*	Order: Unionoida		EN						+		Yes	N/A	N/A	N/A	N/A
417	*Nemoron nomas*	Order: Decapoda			VU						+	Yes	N/A	N/A	N/A	N/A
418	*Oligoaeschna niisatoi*	Order: Odonata			VU		+				+	Yes	N/A	N/A	N/A	N/A
419	*Orthetrum poecilops*	Order: Odonata			VU		+					Yes	N/A	N/A	N/A	N/A
420	*Oxynaia diespiter*	Order: Unionoida		EN							+	Yes	N/A	N/A	N/A	N/A
421	*Oxynaia micheloti*	Order: Unionoida		EN							+	Yes	N/A	N/A	N/A	N/A
422	*Petaliaeschna flavipes*	Order: Odonata			VU					+	+	Yes	N/A	N/A	N/A	N/A
423	*Philosina alba*	Order: Odonata			VU		+	+				Yes	N/A	N/A	N/A	N/A
424	*Phricotelphusa callianira*	Order: Decapoda			VU				+	+		Yes	N/A	N/A	N/A	N/A

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425	*Phricotelphusa elegans*	Order: Decapoda			VU				+			Yes	N/A	N/A	N/A	N/A
426	*Phricotelphusa limula*	Order: Decapoda			VU					+		Yes	N/A	N/A	N/A	N/A
427	*Phricotelphusa ranongi*	Order: Decapoda			VU					+		Yes	N/A	N/A	N/A	N/A
428	*Planaeschna celia*	Order: Odonata			VU		+					Yes	N/A	N/A	N/A	N/A
429	*Protosticta khaosoidaoensis*	Order: Odonata			VU					+		Yes	N/A	N/A	N/A	N/A
430	*Protunio messageri*	Order: Unionoida		EN							+	Yes	N/A	N/A	N/A	N/A
431	*Pseudodon resupinatus*	Order: Unionoida		EN							+	Yes	N/A	N/A	N/A	N/A
432	*Pupamon phrae*	Order: Decapoda			VU					+		Yes	N/A	N/A	N/A	N/A
433	*Rhinagrion hainanense***	Order: Odonata			VU		+	+			+	Yes	N/A	N/A	N/A	N/A
434	*Rhinocypha orea*	Order: Odonata		EN							+	Yes	N/A	N/A	N/A	N/A
435	*Salangathelphusa anophrys*	Order: Decapoda		EN						+		Yes	N/A	N/A	N/A	N/A
436	*Sayamia maehongsonensis*	Order: Decapoda			VU					+		Yes	N/A	N/A	N/A	N/A
437	*Sayamia melanodactylus*	Order: Decapoda		EN						+		Yes	N/A	N/A	N/A	N/A
438	*Siamthelphusa holthuisi*	Order: Decapoda		EN						+		Yes	N/A	N/A	N/A	N/A
439	*Stelomon erawanense*	Order: Decapoda			VU					+		Yes	N/A	N/A	N/A	N/A
440	*Stelomon kanchanaburiense*	Order: Decapoda			VU					+		Yes	N/A	N/A	N/A	N/A
441	*Stoliczia panhai*	Order: Decapoda			VU					+		Yes	N/A	N/A	N/A	N/A
442	*Thaksinthelphusa yongchindaratae*	Order: Decapoda		EN						+		Yes	N/A	N/A	N/A	N/A
443	*Tiwaripotamon edostilus*	Order: Decapoda			VU						+	Yes	N/A	N/A	N/A	N/A
444	*Urothemis abbotti*	Order: Odonata			VU					+		No	N/A	N/A	N/A	N/A
445	*Watanabeopetalia uenoi*	Order: Odonata			VU						+	Yes	N/A	N/A	N/A	N/A

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	PLANTS (not yet any comprehensive Red List assessment)		**69**	**89**	**151**	**33**	**153**	**25**	**45**	**98**	**148**					
446	*Abies yuanbaoshanensis*		CR				+					N/A	N/A	N/A	N/A	N/A
447	*Abies ziyuanensis*		CR				+					N/A	N/A	N/A	N/A	N/A
448	*Acanthephippium sinense*			EN			+					N/A	N/A	N/A	N/A	N/A
449	*Actinodaphne ellipticbacca*				VU						+	Yes	N/A	N/A	N/A	N/A
450	*Aesculus wangii*				VU		+				+	Yes	N/A	N/A	N/A	N/A
451	***Afzelia xylocarpa***			**EN**		**+**		**+**	**+**	**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
452	*Aglaia chittagonga*				VU					+		N/A	N/A	N/A	N/A	N/A
453	*Aglaia perviridis*				VU		+			+	+	Yes	N/A	Yes	N/A	N/A
454	***Aglaia pleuropteris***		**CR**			**+**					**+**	**Yes**	**N/A**	**Yes**	**High**	**High**
455	*Aglaia tenuicaulis*		CR							+		N/A	N/A	N/A	N/A	N/A
456	*Alleizettella rubra*				VU						+	Yes	N/A	N/A	N/A	N/A
457	*Alphonsea hainanensis*			EN			+					Yes	N/A	N/A	N/A	N/A
458	*Alseodaphne hainanensis*				VU		+				+	N/A	N/A	N/A	N/A	N/A
459	*Alseodaphne rugosa*			EN			+					N/A	N/A	N/A	N/A	N/A
460	*Alstonia annamensis*			EN							+	Yes	Yes	N/A	N/A	N/A
461	*Amentotaxus hatuyenensis*			EN							+	Yes	N/A	Yes	N/A	N/A
462	*Amentotaxus poilanei*				VU						+	Yes	N/A	N/A	N/A	N/A
463	***Amentotaxus yunnanensis***			**EN**			**+**				**+**	**Yes**	**Yes**	**No**	**High**	**High**
464	*Amoora dasyclada*				VU		+				+	N/A	N/A	Yes	N/A	N/A
465	***Anisoptera costata***			**EN**		**+**			**+**	**+**	**+**	**Yes**	**No**	**Yes**	**High**	**High**
466	*Anisoptera curtisii*		CR						+	+		N/A	N/A	N/A	N/A	N/A

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467	***Anisoptera scaphula***		**CR**						**+**	**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
468	*Annamocarya sinensis*			EN			+				+	Yes	N/A	Yes	N/A	N/A
469	*Apterosperma oblata*				VU		+					N/A	N/A	N/A	N/A	N/A
470	*Aquilaria banaensae*				VU						+	Yes	N/A	N/A	N/A	N/A
471	***Aquilaria crassna***		**CR**			**+**		**+**		**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
472	*Aquilaria malaccensis*				VU				+	+		N/A	N/A	N/A	N/A	N/A
473	***Aquilaria sinensis***				**VU**		**+**					**Yes**	**Yes**	**No**	**High**	**High**
474	*Aristolochia hainanensis*				VU		+					N/A	N/A	N/A	N/A	N/A
475	*Artocarpus hypargyreus*				VU		+					N/A	N/A	N/A	N/A	N/A
476	*Begonia hainanensis*			EN			+					Yes	N/A	N/A	N/A	N/A
477	*Begonia peltatifolia*			EN			+					Yes	N/A	N/A	N/A	N/A
478	*Bennettiodendron cordatum*				VU						+	Yes	N/A	N/A	N/A	N/A
479	*Bhesa sinica*		CR				+					N/A	N/A	N/A	N/A	N/A
480	*Borassodendron machadonis*				VU					+		N/A	N/A	N/A	N/A	N/A
481	*Bretschneidera sinensis*			EN			+				+	Yes	N/A	Yes	N/A	N/A
482	*Burretiodendron esquirolii*				VU		+		+	+		N/A	N/A	N/A	N/A	N/A
483	*Burretiodendron hsienmu*				VU		+					N/A	N/A	N/A	N/A	N/A
484	***Burretiodendron tonkinense***			**EN**			**+**				**+**	**Yes**	**Yes**	**No**	**High**	**High**
485	*Bursera tonkinensis*				VU						+	Yes	N/A	N/A	N/A	N/A
486	*Caesalpinia nhatrangense*				VU						+	Yes	N/A	N/A	N/A	N/A
487	*Calamus egregius*				VU		+					Yes	N/A	N/A	N/A	N/A
488	*Calocedrus macrolepis*				VU		+	+	+	+	+	Yes	N/A	N/A	N/A	High
489	*Calocedrus rupestris*			EN							+	Yes	N/A	Yes	N/A	N/A

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490	*Camellia chrysantha*				VU		+				+	Yes	N/A	N/A	N/A	N/A
491	*Camellia crapnelliana*				VU		+					N/A	N/A	N/A	N/A	N/A
492	*Camellia euphlebia*				VU		+				+	Yes	N/A	N/A	N/A	N/A
493	*Camellia fleuryi*				VU						+	Yes	N/A	N/A	N/A	N/A
494	*Camellia gilbertii*				VU						+	Yes	N/A	N/A	N/A	N/A
495	*Camellia grijsii*				VU		+					N/A	N/A	N/A	N/A	N/A
496	*Camellia pleurocarpa*				VU						+	Yes	N/A	N/A	N/A	N/A
497	*Camellia pubipetala*				VU		+					N/A	N/A	N/A	N/A	N/A
498	*Camellia tunghinensis*				VU		+					N/A	N/A	N/A	N/A	N/A
499	*Canarium pseudodecumanum*				VU					+		N/A	N/A	N/A	N/A	N/A
500	*Castanopsis concinna*				VU		+					N/A	N/A	N/A	N/A	N/A
501	*Cephalomappa sinensis*				VU		+				+	Yes	N/A	N/A	N/A	N/A
502	*Cephalotaxus hainanensis*			EN			+					N/A	N/A	N/A	N/A	N/A
503	*Cephalotaxus mannii*				VU		+	+	+	+	+	Yes	N/A	N/A	N/A	N/A
504	*Cephalotaxus oliveri*				VU		+					N/A	N/A	N/A	N/A	N/A
505	*Chunia bucklandioides*				VU		+					N/A	N/A	N/A	N/A	N/A
506	*Chuniophoenix hainanensis*			EN			+					N/A	N/A	N/A	N/A	N/A
507	***Cinnamomum balansae***			**EN**							**+**	**Yes**	**Yes**	**No**	**High**	**High**
508	*Cleidiocarpon cavaleriei*				VU		+		+		+	Yes	N/A	N/A	N/A	N/A
509	*Cleidiocarpon laurinum*			EN					+		+	Yes	N/A	N/A	N/A	N/A
510	*Cleistanthus petelotii*				VU						+	Yes	N/A	N/A	N/A	N/A
511	*Corylus chinensis*			EN			+					N/A	N/A	N/A	N/A	N/A
512	*Cosmostigma hainanense*				VU		+					Yes	N/A	N/A	N/A	N/A
513	*Cotylelobium lanceolatum*				VU					+		N/A	N/A	N/A	N/A	N/A

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514	*Craibiodendron scleranthum*				VU						+	Yes	N/A	N/A	N/A	N/A
515	***Craigia yunnanensis***			**EN**			**+**				**+**	**Yes**	**Yes**	**No**	**High**	**High**
516	*Croton phuquocensis*				VU						+	Yes	N/A	N/A	N/A	N/A
517	*Croton touranensis*				VU						+	Yes	N/A	N/A	N/A	N/A
518	*Crudia lanceolata*				VU					+		N/A	N/A	N/A	N/A	N/A
519	***Cunninghamia konishii***				**VU**			**+**			**+**	**Yes**	**Yes**	**No**	**High**	**High**
520	*Cupressus duclouxiana*			EN			+					N/A	N/A	N/A	N/A	N/A
521	*Cycas aculeata*				VU						+	Yes	N/A	N/A	N/A	N/A
522	***Cycas bifida***				**VU**		**+**				**+**	**Yes**	**Yes**	**No**	**High**	**High**
523	*Cycas chamaoensis*		CR							+		N/A	N/A	N/A	N/A	N/A
524	***Cycas changjiangensis***			**EN**			**+**					**Yes**	**Yes**	**No**	**High**	**High**
525	***Cycas collina***				**VU**		**+**				**+**	**Yes**	**Yes**	**No**	**High**	**High**
526	***Cycas debaoensis***		**CR**				**+**					**Yes**	**Yes**	**No**	**High**	**High**
527	*Cycas condaoensis*				VU						+	Yes	N/A	N/A	N/A	N/A
528	*Cycas elephantipes*			EN						+		N/A	N/A	N/A	N/A	N/A
529	*Cycas elongata*			EN							+	Yes	N/A	N/A	N/A	N/A
530	*Cycas fugax*		CR								+	Yes	N/A	N/A	N/A	N/A
531	***Cycas hainanensis***			**EN**			**+**					**Yes**	**Yes**	**No**	**High**	**High**
532	*Cycas hoabinhensis*			EN							+	Yes	N/A	N/A	N/A	N/A
533	*Cycas inermis*				VU						+	Yes	N/A	N/A	N/A	N/A
534	*Cycas lindstromii*			EN							+	Yes	N/A	N/A	N/A	N/A
535	*Cycas macrocarpa*				VU					+		N/A	N/A	N/A	N/A	N/A
536	*Cycas micholitzii*				VU			+			+	Yes	N/A	N/A	N/A	N/A
537	***Cycas multipinnata***			**EN**			**+**				**+**	**Yes**	**Yes**	**No**	**High**	**High**

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538	*Cycas nongnoochiae*				VU					+		N/A	N/A	N/A	N/A	N/A
539	*Cycas pachypoda*		CR								+	Yes	N/A	N/A	N/A	N/A
540	***Cycas pectinata***				**VU**	**+**	**+**	**+**	**+**	**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
541	*Cycas pranburiensis*				VU					+		N/A	N/A	N/A	N/A	N/A
542	***Cycas shanyaensis***				**VU**		**+**					**Yes**	**Yes**	**No**	**High**	**High**
543	*Cycas siamensis*				VU	+			+	+	+	Yes	N/A	N/A	N/A	N/A
544	*Cycas tansachana*		CR							+		N/A	N/A	N/A	N/A	N/A
545	*Cymbidium nanulum*			EN			+					N/A	N/A	N/A	N/A	N/A
546	*Cynometra inaequifolia*				VU					+		N/A	N/A	N/A	N/A	N/A
547	*Dalbergia annamensis*			EN							+	Yes	N/A	N/A	N/A	N/A
548	*Dalbergia balansae*				VU		+				+	Yes	N/A	N/A	N/A	N/A
549	***Dalbergia bariensis***			**EN**		**+**		**+**		**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
550	***Dalbergia cambodiana***			**EN**		**+**					**+**	**Yes**	**Yes**	**No**	**High**	**High**
551	***Dalbergia cochinchinensis***				**VU**	**+**		**+**		**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
552	*Dalbergia mammosa*			EN							+	Yes	N/A	Yes	N/A	N/A
553	*Dalbergia odorifera*				VU		+					N/A	N/A	N/A	N/A	N/A
554	*Dalbergia oliveri*			EN					+	+	+	Yes	N/A	N/A	N/A	N/A
555	***Dalbergia tonkinensis***				**VU**		**+**				**+**	**Yes**	**Yes**	**No**	**High**	**High**
556	*Dalzellia ranongensis*				VU					+		N/A	N/A	N/A	N/A	N/A
557	*Dendrobium changjiangense*			EN			+					N/A	N/A	N/A	N/A	N/A
558	***Dendrobium officinale***	**Official Dendrobium**	**CR**				**+**					**Yes**	**Yes**	**No**	**High**	**High**
559	***Dendrobium sinense***	**Chinese Dendrobium**		**EN**			**+**					**Yes**	**Yes**	**No**	**High**	**High**
560	*Dendropanax oligodontus*		CR									Yes	N/A	N/A	N/A	N/A
561	***Diospyros mun***	**Ebony**	**CR**					**+**			**+**	**Yes**	**Yes**	**No**	**High**	**High**

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562	*Diospyros vaccinioides*		CR				+					N/A	N/A	N/A	N/A	N/A
563	*Diplopanax stachyanthus*				VU		+				+	Yes	N/A	N/A	N/A	N/A
564	*Dipterocarpus alatus*			EN		+		+	+	+	+	Yes	N/A	N/A	N/A	N/A
565	*Dipterocarpus baudii*		CR			+			+	+	+	Yes	N/A	N/A	N/A	N/A
566	*Dipterocarpus chartaceus*		CR							+		N/A	N/A	N/A	N/A	N/A
567	*Dipterocarpus costatus*			EN		+		+	+	+	+	Yes	N/A	N/A	N/A	N/A
568	*Dipterocarpus crinitus*			EN						+		N/A	N/A	N/A	N/A	N/A
569	*Dipterocarpus dyeri*		CR			+			+	+	+	Yes	N/A	N/A	N/A	N/A
570	***Dipterocarpus gracilis***		**CR**				**+**		**+**	**+**		**Yes**	**Yes**	**No**	**High**	**High**
571	*Dipterocarpus grandiflorus*		CR						+	+	+	N/A	N/A	Yes	N/A	N/A
572	*Dipterocarpus hasseltii*		CR							+	+	Yes	N/A	N/A	N/A	N/A
573	*Dipterocarpus kerrii*		CR						+	+	+	Yes	N/A	N/A	N/A	N/A
574	*Dipterocarpus retusus*				VU		+		+	+	+	Yes	N/A	N/A	N/A	N/A
575	***Dipterocarpus turbinatus***		**CR**			**+**	**+**	**+**	**+**	**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
576	*Dipteronia dyeriana*			EN			+					N/A	N/A	N/A	N/A	N/A
577	*Dysosma versipellis*				VU		+					N/A	N/A	N/A	N/A	N/A
578	*Elaeocarpus apiculatus*				VU						+	Yes	N/A	N/A	N/A	N/A
579	*Endocomia canarioides*				VU					+	?	N/A	N/A	N/A	N/A	N/A
580	*Erythrophleum fordii*			EN			+				+	Yes	N/A	N/A	N/A	N/A
581	*Eunonymus lanceifolia*				VU		+					N/A	N/A	N/A	N/A	N/A
582	*Euryodendron excelsum*		CR				+					N/A	N/A	N/A	N/A	N/A
583	*Fagus longipetiolata*				VU		+				+	Yes	N/A	N/A	N/A	N/A
584	*Firmiana hainanensis*				VU		+					N/A	N/A	N/A	N/A	N/A
585	*Fissistigma tungfangense*		CR				+					Yes	N/A	N/A	N/A	N/A
586	*Fordia pauciflora*				VU					+		N/A	N/A	N/A	N/A	N/A

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587	*Garcinia paucinervis*			EN			+				+	Yes	N/A	N/A	N/A	N/A
588	***Glyptostrobus pensilis***	**Chinese Water Fir**		**EN**			**+**	**+**			**+**	**Yes**	**Yes**	**No**	**High**	**High**
589	*Gmelina hainanensis*				VU		+				+	Yes	N/A	N/A	N/A	N/A
590	*Goniothalamus macrocalyx*				VU						+	Yes	N/A	N/A	N/A	N/A
591	*Halesia macgregorii*				VU		+					N/A	N/A	N/A	N/A	N/A
592	*Halophila beccarii*				VU		+				+	N/A	N/A	N/A	N/A	N/A
593	*Hanseniella heterophylla*				VU					+		N/A	N/A	N/A	N/A	N/A
594	*Helicia grandifolia*				VU						+	Yes	N/A	N/A	N/A	N/A
595	***Helicia shweliensis***			**EN**			**+**					**Yes**	**Yes**	**No**	**High**	**High**
596	*Heritiera fomes*			EN					+	+		N/A	N/A	N/A	N/A	N/A
597	*Heritiera parvifolia*				VU		+					N/A	N/A	N/A	N/A	N/A
598	*Hopea apiculata*		CR						+	+		N/A	N/A	N/A	N/A	N/A
599	*Hopea beccariana*		CR							+		N/A	N/A	N/A	N/A	N/A
600	***Hopea chinensis***		**CR**				**+**				**+**	**Yes**	**Yes**	**No**	**High**	**High**
601	*Hopea cordata*		CR								+	Yes	N/A	N/A	N/A	N/A
602	*Hopea exalata*				VU		+					N/A	N/A	N/A	N/A	N/A
603	*Hopea ferrea*			EN		+			+	+	+	N/A	N/A	N/A	N/A	N/A
604	*Hopea griffithii*				VU				+	+		N/A	N/A	N/A	N/A	N/A
605	*Hopea hainanensis*		CR				+				+	Yes	N/A	N/A	N/A	N/A
606	*Hopea helferi*		CR			+			+	+		N/A	N/A	N/A	N/A	N/A
607	*Hopea hongayanensis*		CR								+	Yes	N/A	N/A	N/A	N/A
608	*Hopea latifolia*		CR			+				+		N/A	N/A	N/A	N/A	N/A
609	***Hopea mollissima***		**CR**				**+**				**+**	**Yes**	**Yes**	**No**	**High**	**High**
610	*Hopea odorata*				VU	+		+	+	+	+	N/A	N/A	N/A	N/A	N/A
611	*Hopea pedicellata*			EN		+				+		N/A	N/A	N/A	N/A	N/A

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612	***Hopea pierrei***			**EN**		**+**		**+**		**+**	**+**	**Yes**	**Yes**	**No**	**High**	**High**
613	*Hopea recopei*			EN		+		+		+	+	Yes	N/A	N/A	N/A	N/A
614	*Hopea reticulata*		CR							+	+	N/A	N/A	N/A	N/A	N/A
615	*Hopea sangal*		CR						+	+		N/A	N/A	N/A	N/A	N/A
616	*Hopea siamensis*		CR			+				+	+	Yes	N/A	N/A	N/A	N/A
617	*Hopea thorelii*		CR					+		+		N/A	N/A	N/A	N/A	N/A
618	*Horsfieldia longiflora*				VU						+	Yes	N/A	N/A	N/A	N/A
619	*Horsfieldia pandurifolia*			EN			+					N/A	N/A	N/A	N/A	N/A
620	*Huodendron parviflorum*				VU						+	Yes	N/A	N/A	N/A	N/A
621	*Hydnocarpus annamensis*				VU		+	+			+	Yes	N/A	N/A	N/A	N/A
622	*Hydnocarpus hainanensis*				VU		+				+	Yes	N/A	N/A	N/A	N/A
623	*Ilex shimeica*			EN			+					Yes	N/A	N/A	N/A	N/A
624	*Illicium ternstroemioides*				VU		+				+	Yes	N/A	N/A	N/A	N/A
625	*Intsia bijuga*				VU	+			+	+	+	N/A	N/A	N/A	N/A	N/A
626	*Ixonanthes chinensis*				VU		+				+	Yes	N/A	N/A	N/A	N/A
627	*Knema austrosiamensis*				VU					+		N/A	N/A	N/A	N/A	N/A
628	*Knema conica*				VU					+		N/A	N/A	N/A	N/A	N/A
629	*Knema hookerana*				VU					+		N/A	N/A	N/A	N/A	N/A
630	*Knema mixta*				VU						+	Yes	N/A	N/A	N/A	N/A
631	*Knema pachycarpa*				VU						+	Yes	N/A	N/A	N/A	N/A
632	*Knema pierrei*				VU						+	Yes	N/A	N/A	N/A	N/A
633	*Knema poilanei*				VU						+	Yes	N/A	N/A	N/A	N/A
634	*Knema saxatilis*				VU						+	Yes	N/A	N/A	N/A	N/A
635	*Knema sessiflora*				VU						+	Yes	N/A	N/A	N/A	N/A
636	*Knema squamulosa*				VU						+	Yes	N/A	N/A	N/A	N/A

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637	*Knema tonkinensis*				VU			+			+	Yes	N/A	N/A	N/A	N/A
638	*Lagerstroemia intermedia*				VU		+			+		N/A	N/A	N/A	N/A	N/A
639	*Laportea urentissima*			EN			+				+	Yes	N/A	N/A	N/A	N/A
640	*Larix mastersiana*				VU		+					N/A	N/A	N/A	N/A	N/A
641	*Liparis bautingensis*			EN			+					N/A	N/A	N/A	N/A	N/A
642	*Litsea dilleniifolia*			EN			+					N/A	N/A	N/A	N/A	N/A
643	*Madhuca hainanensis*				VU		+					N/A	N/A	N/A	N/A	N/A
644	*Madhuca pasquieri*				VU		+				+	Yes	N/A	N/A	N/A	N/A
645	*Magnolia aromatica*				VU		+				+	Yes	N/A	Yes	N/A	N/A
646	*Magnolia delavayi*			EN			+					N/A	N/A	N/A	N/A	N/A
647	*Magnolia nitida*				VU				+			N/A	N/A	N/A	N/A	N/A
648	*Magnolia phanerophlebia*			EN			+					N/A	N/A	N/A	N/A	N/A
649	*Magnolia rostrata*				VU				+			N/A	N/A	N/A	N/A	N/A
650	*Magnolia sargentiana*			EN			+					N/A	N/A	N/A	N/A	N/A
651	***Malania oleifera***				**VU**		**+**					**Yes**	**Yes**	**No**	**High**	**High**
652	*Mangifera dongnaiensis*			EN							+	Yes	N/A	N/A	N/A	N/A
653	*Mangifera flava*				VU	+					+	Yes	N/A	N/A	N/A	N/A
654	*Mangifera minutifolia*				VU						+	Yes	N/A	N/A	N/A	N/A
655	*Mangifera macrocarpa*				VU					+		N/A	N/A	N/A	N/A	N/A
656	*Mangifera pentandra*				VU					+		N/A	N/A	N/A	N/A	N/A
657	*Manglietia grandis*				VU		+					N/A	N/A	N/A	N/A	N/A
658	*Manglietia megaphylla*				VU		+					N/A	N/A	N/A	N/A	N/A
659	*Manglietia ovoidea*			EN			+					N/A	N/A	N/A	N/A	N/A
660	***Manglietia sinica***		**CR**				**+**					**Yes**	**Yes**	**No**	**High**	**High**
661	*Maytenus curtissii*				VU					+		N/A	N/A	N/A	N/A	N/A

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662	*Meiogyne hainanensis*				VU		+					N/A	N/A	N/A	N/A	N/A
663	*Merrillia caloxylon*				VU					+		N/A	N/A	N/A	N/A	N/A
664	*Michelia aenea*			EN			+				+	Yes	N/A	N/A	N/A	N/A
665	***Michelia coriacea***			**EN**			**+**					**Yes**	**Yes**	**No**	**High**	**High**
666	*Michelia hypolampra*				VU		+					N/A	N/A	N/A	N/A	N/A
667	*Michelia ingrata*			EN			+					N/A	N/A	N/A	N/A	N/A
668	*Michelia xanthantha*			EN			+					N/A	N/A	N/A	N/A	N/A
669	*Mouretia tonkinensis*				VU						+	Yes	N/A	N/A	N/A	N/A
670	***Myristica yunnanensis***		**CR**				**+**					**Yes**	**Yes**	**No**	**High**	**High**
671	*Neobalanocarpus heimii*				VU					+		N/A	N/A	N/A	N/A	N/A
672	*Nothotsuga longibracteata*			EN			+					N/A	N/A	N/A	N/A	N/A
673	*Nyssa yunnanensis*		CR				+					N/A	N/A	N/A	N/A	N/A
674	*Oleandra hainanensis*			EN			+					N/A	N/A	N/A	N/A	N/A
675	*Panisea yunnanensis*			EN			+				+	N/A	N/A	N/A	N/A	N/A
676	***Paphiopedilum armeniacum***	**Golden Slipper Orchid**		**EN**			**+**		**+**			**Yes**	**Yes**	**No**	**High**	**High**
677	***Paphiopedilum emersonii***	**Emerson's Paphiopedilum**	**CR**				**+**				**+**	**Yes**	**Yes**	**No**	**High**	**High**
678	***Paphiopedilum tigrinum***	**Tiger-striped Paphiopedilum**	**CR**				**+**		**+**			**Yes**	**Yes**	**No**	**High**	**High**
679	*Palaquium impressinervium*				VU					+		N/A	N/A	N/A	N/A	N/A
680	*Paranephelium hainanensis*			EN			+					N/A	N/A	N/A	N/A	N/A
681	*Parashorea chinensis*			EN			+				+	Yes	N/A	N/A	N/A	N/A
682	*Parashorea stellata*		CR						+	+	+	Yes	N/A	N/A	N/A	N/A
683	*Pellacalyx yunnanensis*			EN			+					N/A	N/A	N/A	N/A	N/A
684	*Pentastelma auritum*		CR				+					Yes	N/A	N/A	N/A	N/A

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685	*Phalaenopsis hainanensis*		CR				+					N/A	N/A	N/A	N/A	N/A
686	*Phoebe nanmu*			EN			+					N/A	N/A	N/A	N/A	N/A
687	*Phoebe poilanei*				VU						+	Yes	N/A	N/A	N/A	N/A
688	*Pholidocarpus macrocarpus*				VU					+		N/A	N/A	N/A	N/A	N/A
689	*Photinia lasiogyna*				VU		+					N/A	N/A	N/A	N/A	N/A
690	*Picea brachytyla*				VU		+					N/A	N/A	N/A	N/A	N/A
691	*Picea farreri*			EN			+		+			N/A	N/A	N/A	N/A	N/A
692	*Pinus krempfii*				VU						+	Yes	Yes	N/A	N/A	N/A
693	*Pinus merkusii*				VU	+		+			+	N/A	N/A	N/A	N/A	N/A
694	***Pinus squamata***		**CR**				**+**					**Yes**	**Yes**	**No**	**High**	**High**
695	***Pinus wangii***			**EN**			**+**				**+**	**Yes**	**Yes**	**No**	**High**	**High**
696	*Pistacia cucphuongensis*				VU						+	Yes	N/A	N/A	N/A	N/A
697	*Platanus kerrii*				VU			+			+	Yes	N/A	N/A	N/A	N/A
698	*Potameia lotungensis*				VU		+				+	Yes	N/A	N/A	N/A	N/A
699	*Premna szemaoensis*				VU		+					N/A	N/A	N/A	N/A	N/A
700	*Pseudotaxus chienii*			EN			+					N/A	N/A	N/A	N/A	N/A
701	*Pterocarpus indicus*				VU	+	+		+	+	+	N/A	N/A	N/A	N/A	N/A
702	***Pterospermum kingtungense***		**CR**				**+**					**Yes**	**Yes**	**No**	**High**	**High**
703	*Pterospermum menglunense*		CR				+					N/A	N/A	N/A	N/A	N/A
704	*Pterospermum yunnanense*		CR				+					N/A	N/A	N/A	N/A	N/A
705	*Pterostyrax psilophylla*				VU		+					N/A	N/A	N/A	N/A	N/A
706	*Reevesia rotundifolia*		CR				+					N/A	N/A	N/A	N/A	N/A
707	*Rhoiptelea chiliantha*				VU		+				+	Yes	N/A	N/A	N/A	N/A

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708	*Richella hainanensis*				VU		+					N/A	N/A	N/A	N/A	N/A
709	*Saccopetalum prolificum*				VU		+					N/A	N/A	N/A	N/A	N/A
710	*Santalum album*				VU		+					N/A	N/A	N/A	N/A	N/A
711	*Scaphophyllum speciosum*				VU		+					N/A	N/A	N/A	N/A	N/A
712	*Schefflera chapana*				VU		+				+	Yes	N/A	N/A	N/A	N/A
713	*Schefflera kontumensis*			EN							+	Yes	N/A	N/A	N/A	N/A
714	*Schefflera palmiformis*			EN							+	Yes	N/A	N/A	N/A	N/A
715	*Shistochila macrodonta*			EN			+					N/A	N/A	N/A	N/A	N/A
716	*Shorea faguetiana*			EN						+		N/A	N/A	N/A	N/A	N/A
717	***Shorea falcata***		**CR**								**+**	**Yes**	**N/A**	**Yes**	**High**	**High**
718	*Shorea farinosa*		CR						+	+		N/A	N/A	N/A	N/A	N/A
719	*Shorea foxworthyi*		CR							+		N/A	N/A	N/A	N/A	N/A
720	*Shorea glauca*			EN						+		N/A	N/A	N/A	N/A	N/A
721	*Shorea gratissima*			EN					+	+		N/A	N/A	N/A	N/A	N/A
722	*Shorea guiso*		CR							+	+	N/A	N/A	N/A	N/A	N/A
723	*Shorea henryana*			EN		+		+	+	+	+	N/A	N/A	N/A	N/A	N/A
724	*Shorea hypochra*		CR			+				+	+	N/A	N/A	N/A	N/A	N/A
725	*Shorea leprosula*			EN						+		N/A	N/A	N/A	N/A	N/A
726	*Shorea roxburghii*			EN		+		+	+	+	+	N/A	N/A	N/A	N/A	N/A
727	*Shorea singkawang*		CR							+		N/A	N/A	N/A	N/A	N/A
728	*Shorea sumatrana*		CR							+		N/A	N/A	N/A	N/A	N/A
729	*Shorea thorelii*		CR			+		+		+	+	Yes	N/A	N/A	N/A	N/A
730	*Sinoradlkofera minor*				VU					+	+	Yes	N/A	N/A	N/A	N/A
731	*Sonneratia griffithii*		CR						+	+		N/A	N/A	N/A	N/A	N/A
732	*Sonneratia hainanensis*		CR				+					N/A	N/A	N/A	N/A	N/A

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733	*Stenochlaena hainanensis*			EN			+					N/A	N/A	N/A	N/A	N/A
734	*Styrax litseoides*				VU						+	Yes	N/A	N/A	N/A	N/A
735	***Taiwania cryptomerioides***				**VU**		**+**		**+**		**+**	**Yes**	**Yes**	**No**	**High**	**High**
736	*Tapiscia sinensis*				VU		+					N/A	N/A	N/A	N/A	N/A
737	*Tetrathyrium subcordatum*				VU		+					N/A	N/A	N/A	N/A	N/A
738	*Terniopsis chanthaburiensis*			EN						+		N/A	N/A	N/A	N/A	N/A
739	*Terniopsis ubonensis*		CR							+		N/A	N/A	N/A	N/A	N/A
740	*Trigonostemon fragilis*				VU						+	Yes	N/A	N/A	N/A	N/A
741	*Vatica cinerea*			EN		+			+	+	+	Yes	N/A	N/A	N/A	N/A
742	*Vatica diospyroides*		CR							+	+	Yes	N/A	N/A	N/A	N/A
743	***Vatica guangxiensis***		**CR**				**+**					**Yes**	**N/A**	**Yes**	**High**	**High**
744	*Vatica lanceaefolia*		CR						+			N/A	N/A	N/A	N/A	N/A
745	*Vatica mangachapoi*			EN			+			+	+	N/A	N/A	N/A	N/A	N/A
746	*Vatica pauciflora*			EN						+		N/A	N/A	N/A	N/A	N/A
747	*Vatica stapfiana*			EN						+		N/A	N/A	N/A	N/A	N/A
748	***Vatica xishuangbannaensis***		**CR**				**+**					**Yes**	**Yes**	**No**	**High**	**High**
749	*Vitex ajugaeflora*				VU						+	Yes	N/A	N/A	N/A	N/A
750	*Wrightia lanceolata*				VU					+		N/A	N/A	N/A	N/A	N/A
751	*Wrightia lecomtei*				VU	+				+		N/A	N/A	N/A	N/A	N/A
752	*Wrightia viridifolia*				VU					+		N/A	N/A	N/A	N/A	N/A
753	***Xanthocyparis vietnamensis***	**Golden Vietnam Cypress**	**CR**								**+**	**Yes**	**Yes**	**No**	**High**	**High**
754	*Xylopia pierrei*				VU	+					+	Yes	N/A	N/A	N/A	N/A
	Total		**140**	**230**	**384**	**141**	**305**	**160**	**172**	**300**	**335**					

Notes: Bold denotes priority species.
+ = species recorded in the country (or portion of the country within the hotspot, in the case of China); not necessarily of regular occurrence or still occurring.
? = unconfirmed report of the species from the country (or portion of the country within the hotspot, in the case of China) (listing not exhaustive).
ex = species formerly occurred in the country (or portion of the country within the hotspot, in the case of China) but now extinct there.
ex? = species formerly occurred in the country (or portion of the country within the hotspot, in the case of China) but now very probably extinct there.
v = species recorded in the country (or portion of the country within the hotspot, in the case of China), as a vagrant (note: paucity of records is not of itself sufficient to warrant listing as a vagrant, given overall patchiness of survey).
v? = species recorded in the country (or portion of the country within the hotspot, in the case of China), probably as a vagrant.
* = a recent review concluded that the investment needed to determine whether kouprey survives was too high to be justified given: the number of other pressing conservation priorities in the region; the near-certainty that, if it does survive, it is likely to be within a conservation landscape already identified as of priority; and that its management needs are overwhelmingly likely to be the general ones of control of hunting.
** = Now listed as Least Concern in Version 2011.2 (November 2011) of *The IUCN Red List of Threatened Species*.

Appendix 2. Key Biodiversity Areas in the Indo-Burma Hotspot

Code	Key Biodiversity Area	Mammals	Birds	Reptiles	Amphibians	Fish	Plants	Protected Area*	Conservation Corridor
KMH	**CAMBODIA**								
1	Ang Tropeang Thmor	+	+	+				PA	Tonle Sap Lake and Inundation Zone
2	Bassac Marsh		+						North-western Mekong Delta Wetlands
3	Boeung Chhmar/Moat Khla		+	+				PA	Tonle Sap Lake and Inundation Zone
4	Boeung Prek Lapouv		+					PA	North-western Mekong Delta Wetlands
5	Central Cambodia Lowlands	+							none
6	Central Cardamoms	+	+	+			+	PA	Cardamom and Elephant Mountains
7	Central Oddar Meanchey	+	+	+					none
8	Chhep	+	+	+			+	PA	Northern Plains Dry Forests
9	Chhnuck Tru		+	+				PA	Tonle Sap Lake and Inundation Zone
10	Dei Roneat		+	+				PA	Tonle Sap Lake and Inundation Zone
11	Kampong Trach		+					PA	North-western Mekong Delta Wetlands
12	Kirirom	+	+	+			+	PA	Cardamom and Elephant Mountains
13	Koh Kapik		+					PA	none
14	Koh Tang Archipelago		+						none
15	Lomphat	+	+	+				PA	Eastern Plains Dry Forests
16	Lower Stung Sen		+	+				PA	Tonle Sap Lake and Inundation Zone
17	Mekong River from Kratie to Lao PDR	+	+	+		+	+	PA	Mekong River and Major Tributaries
18	Mondulkiri-Kratie Lowlands	+	+	+				PA	Eastern Plains Dry Forests
19	O Skach	+	+	+					Northern Plains Dry Forests
20	Phnom Aural	+	+				+	PA	Cardamom and Elephant Mountains
21	Phnom Bokor	+	+				+	PA	Cardamom and Elephant Mountains
22	Phnom Samkos	+	+					PA	Cardamom and Elephant Mountains
23	Preah Net Preah/Kra Lanh/Pourk		+						Tonle Sap Lake and Inundation Zone

Code	Key Biodiversity Area	Mammals	Birds	Reptiles	Amphibians	Fish	Plants	Protected Area*	Conservation Corridor
24	Prek Chhlong				+				None
25	Prek Toal	+	+					PA	Tonle Sap Lake and Inundation Zone
26	Sekong River		+	+		+			Mekong River and Major Tributaries
27	Sesan River		+	+		+			Mekong River and Major Tributaries
28	Snoul/Keo Sema/O Reang	+	+	+				PA	Southern Annamites Western Slopes
29	Southern Cardamoms	+	+	+		+		PA	Cardamom and Elephant Mountains
30	Sre Ambel	+	+	+				PA	none
31	Srepok River		+	+		+		PA	Mekong River and Major Tributaries
32	Stung Kampong Smach		+						none
33	Stung Sen/Santuk/Baray		+						Tonle Sap Lake and Inundation Zone
34	Stung/Chi Kreng/Kampong Svay		+						Tonle Sap Lake and Inundation Zone
35	Stung/Prasat Balang		+	+					none
36	Upper Srepok Catchment	+	+	+				PA	Eastern Plains Dry Forests
37	Upper Stung Sen Catchment	+	+	+			+	PA	Northern Plains Dry Forests
38	Veal Srongae		+					PA	Tonle Sap Lake and Inundation Zone
39	Virachey	+	+	+			+	PA	Cambodia-Lao PDR-Vietnam Tri-border Forests
40	Western Siem Pang	+	+	+					Sekong Plains
CHN	**CHINA**								
1	Ailaoshan	+	+					PA	Ailao/Hoang Lien Mountains
2	Babianjiang	+					+		Nam Ha-Xishuangbanna-Phou Dendin
3	Baimaling-Huishan		+					PA	Hainan Mountains
4	Baixu-Qinpai		+						Damingshan Range
5	Bajianjing					+			none
6	Bangliang	+						PA	Sino-Vietnamese Limestone
7	Bawangling	+	+	+	+		+	PA	Hainan Mountains

Code	Key Biodiversity Area	Mammals	Birds	Reptiles	Amphibians	Fish	Plants	Protected Area*	Conservation Corridor
8	Caiyanghe	+	+	+			+	PA	Nam Ha-Xishuangbanna-Phou Dendin
9	Chongzuo	+	+				+	PA	Sino-Vietnamese Limestone
10	Damingshan	+	+			+	+	PA	Damingshan Range
11	Datian	+						PA	Hainan Mountains
12	Daweishan	+					+	PA	Sino-Vietnamese Limestone
13	Dawuling	+			+		+	PA	Yunwushan Range
14	Dehong Zizhizhou		+					PA	Tongbiguan-Gaoligongshan
15	Diaoluoshan	+	+	+	+		+	PA	Hainan Mountains
16	Diding	+						PA	Sino-Vietnamese Limestone
17	Dinghushan			+				PA	None
18	Dongzhaigang		+					PA	Hainan Coastal Zone
19	Ehuangzhang						+	PA	Yunwushan Range
20	Exianling and Changhuajiang		+				+	PA	Hainan Mountains
21	Fangcheng		+					PA	South China Shorebird Flyway
22	Fangcheng Shangyue						+	PA	Shiwandashan Range
23	Fanjia			+			+	PA	Hainan Mountains
24	Fenshuiling	+		+	+		+	PA	Ailao/Hoang Lien Mountains
25	Futian		+					PA	South China Shorebird Flyway
26	Ganshiling		+				+	PA	Hainan Mountains
27	Gaoligongshan	+	+					PA	Tongbiguan-Gaoligongshan
28	Guangtouling		+						South China Shorebird Flyway
29	Gudoushan						+	PA	None
30	Gulongshan		+				+	PA	Sino-Vietnamese Limestone
31	Gutian				+			PA	None
32	Heishiding			+				PA	None
33	Heweishan						+		Yunwushan Range

Code	Key Biodiversity Area	Mammals	Birds	Reptiles	Amphibians	Fish	Plants	Protected Area*	Conservation Corridor
34	Hong Kong Island and Associated Islands			+	+		+	PA	Hong Kong-Shenzhen Mountains
35	Houmiling		+				+	PA	Hainan Mountains
36	Huanglianshan	+	+		+		+	PA	Ailao/Hoang Lien Mountains
37	Inland New Territories		+	+	+		+	PA	Hong Kong-Shenzhen Mountains
38	Jianfengling		+	+	+		+	PA	Hainan Mountains
39	Jianling						+	PA	Hainan Mountains
40	Jiaxi		+	+	+		+	PA	Hainan Mountains
41	Lantau Island and Associated Islands			+	+		+	PA	Hong Kong-Shenzhen Mountains
42	Ledong						+		Hainan Mountains
43	Leizhou Peninsula		+						South China Shorebird Flyway
44	Liji						+	PA	Hainan Mountains
45	Limushan		+		+		+	PA	Hainan Mountains
46	Longhua		+					PA	Sino-Vietnamese Limestone
47	Longhushan		+					PA	Sino-Vietnamese Limestone
48	Longshan section of Nonggang						+	PA	Sino-Vietnamese Limestone
49	Mai Po and Inner Deep Bay		+	+			+	PA	South China Shorebird Flyway
50	Malipo	+					+		Sino-Vietnamese Limestone
51	Nangunhe	+	+	+	+		+	PA	Nangunhe-Yongde Daxueshan
52	Nangliujiang Hekou		+					PA	South China Shorebird Flyway
53	Nanmaoling		+	+					Hainan Mountains
54	Nanweiling		+					PA	Hainan Mountains
55	Nonggang	+	+				+	PA	Sino-Vietnamese Limestone
56	Paiyangshan				+				Sino-Vietnamese Limestone
57	Qixingkeng						+	PA	Yunwushan Range
58	Sanya						+		Hainan Mountains
59	Sanya Seagrass Beds						+		Hainan Coastal Zone

Code	Key Biodiversity Area	Mammals	Birds	Reptiles	Amphibians	Fish	Plants	Protected Area*	Conservation Corridor
60	Shangsi-Biannian		+					PA	Sino-Vietnamese Limestone
61	Shangxi				+		+	PA	Hainan Mountains
62	Shankou		+					PA	South China Shorebird Flyway
63	Shenzhen Wutongshan						+	PA	none
64	Shiwandashan	+	+	+			+	PA	Shiwandashan Range
65	Taipa-Coloane		+				+		South China Shorebird Flyway
66	Tongbiguan	+	+				+	PA	Tongbiguan-Gaoligongshan
67	Tongguling				+			PA	Hainan Coastal Zone
68	Tongtieling	+					+	PA	Hainan Mountains
69	Weizhou Dao		+					PA	none
70	Wuliangshan	+	+					PA	Ailao/Hoang Lien Mountains
71	Wuzhishan	+	+		+		+	PA	Hainan Mountains
72	Xianhu Reservoir		+						Damingshan Range
73	Xidamingshan		+					PA	Sino-Vietnamese Limestone
74	Xieyang Dao		+					PA	none
75	Xishuangbanna	+	+		+		+	PA	Nam Ha-Xishuangbanna-Phou Dendin
76	Yangchun Baiyong			+				PA	Yunwushan Range
77	Yinggeling		+	+	+		+	PA	Hainan Mountains
78	Yiwa						+		Nam Ha-Xishuangbanna-Phou Dendin
79	Yongde Daxueshan	+	+		+			PA	Nangunhe-Yongde Daxueshan
80	Youluoshan						+		Nam Ha-Xishuangbanna-Phou Dendin
LAO	**LAO PDR**								
1	Bolaven Northeast	+						PA	Bolaven Plateau
2	Chonabuly	+						PA	none
3	Dakchung Plateau	+	+	+					none

Code	Key Biodiversity Area	Mammals	Birds	Reptiles	Amphibians	Fish	Plants	Protected Area*	Conservation Corridor
4	Dong Ampham	+	+				+	PA	Cambodia-Lao PDR-Vietnam Tri-border Forests
5	Dong Hua Sao	+		+				PA	Bolaven Plateau
6	Dong Khanthung	+	+	+			+		Northern Plains Dry Forests
7	Dong Phou Vieng	+		+				PA	none
8	Eastern Bolikhamxay Mountains	+	+					PA	Northern Annamites
9	Hin Namno	+	+	+			+	PA	Central Indochina Limestone
10	Khammouan Limestone	+	+	+		+	+	PA	Central Indochina Limestone
11	Laving-Laveun	+						PA	Quang Binh-Quang Tri-Xe Bangfai Lowlands
12	Lower Nam Ou					+			Mekong River and Major Tributaries
13	Mekong Confluence with Nam Kading					+			Mekong River and Major Tributaries
14	Mekong Confluence with Xe Bangfai					+			Mekong River and Major Tributaries
15	Mekong River from Louangphabang to Vientiane		+			+			Mekong River and Major Tributaries
16	Mekong River from Phou Xiang Thong to Siphandon		+			+			Mekong River and Major Tributaries
17	Nakai Plateau	+	+	+			+	PA	Northern Annamites
18	Nakai-Nam Theun	+	+	+			+	PA	Northern Annamites
19	Nam Et	+		+				PA	Nam Et-Phou Louey
20	Nam Ghong	+		+				PA	Cambodia-Lao PDR-Vietnam Tri-border Forests
21	Nam Ha	+						PA	Nam Ha-Xishuangbanna-Phou Dendin
22	Nam Kading	+		+				PA	none
23	Nam Kan	+						PA	Nam Ha-Xishuangbanna-Phou Dendin
24	Nam Phoun	+						PA	Doi Phuka-Mae Yom
25	Nam Xam	+	+					PA	none
26	Nong Khe Wetlands			+					Xe Khampho-Xe Pian
27	Pakxan Wetlands		+						none
28	Phou Ahyon	+	+						Central Annamites
29	Phou Dendin	+	+					PA	Nam Ha-Xishuangbanna-Phou Dendin

Code	Key Biodiversity Area	Mammals	Birds	Reptiles	Amphibians	Fish	Plants	Protected Area*	Conservation Corridor
30	Phou Kathong	+							none
31	Phou Khaokhoay	+	+	+				PA	none
32	Phou Loeuy	+	+					PA	Nam Et-Phou Louey
33	Phou Xang He	+		+			+	PA	none
34	Phou Xiang Thong	+	+	+				PA	none
35	Siphandon	+	+	+		+			Mekong River and Major Tributaries
36	Upper Lao Mekong		+			+			Mekong River and Major Tributaries
37	Upper Xe Bangfai	+	+			+		PA	Quang Binh-Quang Tri-Xe Bangfai Lowlands
38	Upper Xe Kaman		+			+		PA	Mekong River and Major Tributaries
39	Xe Bang-Nouan	+		+				PA	none
40	Xe Champhon			+				PA	none
41	Xe Khampho-Xe Pian		+						Xe Khampho-Xe Pian
42	Xe Pian	+	+	+			+	PA	Xe Khampho-Xe Pian
43	Xe Sap	+	+	+	+			PA	Central Annamites
MMR	**MYANMAR**								
1	Alaungdaw Kathapa	+	+	+				PA	Lower Chindwin Forest
2	Ayeyarwady River: Bagan Section		+	+					Ayeyarwady River
3	Ayeyarwady River: Bhamo Section	+	+	+					Ayeyarwady River
4	Ayeyarwady River: Myitkyina to Sinbo Section		+	+					Ayeyarwady River
5	Ayeyarwady River: Shwegu Section	+	+	+					Ayeyarwady River
6	Ayeyarwady River: Sinbyugyun to Minbu Section		+	+					Ayeyarwady River
7	Ayeyarwady River: Singu Section	+	+	+					Ayeyarwady River
8	Babulon Htan	+	+						Ayeyarwady Catchment
9	Bumphabum	+	+	+				PA	Ayeyarwady Catchment
10	Bwe Pa		+						Chin Hills Complex

Code	Key Biodiversity Area	Mammals	Birds	Reptiles	Amphibians	Fish	Plants	Protected Area*	Conservation Corridor
11	Central Bago Yoma	+		+					Bago Yoma Range
12	Central Tanintharyi Coast	+		+			+		Tanintharyi Range
13	Chatthin	+	+	+				PA	Lower Chindwin Forest
14	Chaungmagyi Reservoir		+						none
15	Chaungmon-Wachaung		+	+					Tanintharyi Range
16	Dawna Range			+					none
17	Fen-shui-ling Valley						+		Ayeyarwady Catchment
18	Gayetgyi Island	+		+			+		none
19	Great Coco Island		+	+					none
20	Gulf of Mottama	+	+						Sittaung River
21	Gyobin		+						Rakhine Yoma Range
22	Hkakaborazi	+	+				+	PA	Ayeyarwady Catchment
23	Hlawga Park	+	+					PA	none
24	Hlawga Reservoir	+					+		none
25	Hpa-an	+		+					none
26	Hponkanrazi	+	+	+			+	PA	Ayeyarwady Catchment
27	Htamanthi	+	+	+			+	PA	Chindwin Catchment
28	Htaung Pru	+	+	+					Tanintharyi Range
29	Hukaung Valley	+	+	+			+	PA	Chindwin Catchment
30	Hukaung Valley extension	+	+	+			+	PA	Chindwin Catchment
31	Indawgyi Grassland and Indaw Chaung Wetland		+				+		Ayeyarwady Catchment
32	Indawgyi Wildlife Sanctuary	+	+	+			+	PA	Ayeyarwady Catchment
33	Inle Lake		+	+		+		PA	none
34	Irrawaddy Dolphin	+		+				PA	Ayeyarwady River
35	Kadongalay Island	+		+			+		none
36	Kadonkani		+	+					none

Code	Key Biodiversity Area	Mammals	Birds	Reptiles	Amphibians	Fish	Plants	Protected Area*	Conservation Corridor
37	Kaladan River	+	+	+					Rakhine Yoma Range
38	Kamaing	+	+	+					Ayeyarwady Catchment
39	Karathuri		+	+					Tanintharyi Range
40	Kawthaung District Lowlands		+	+					Tanintharyi Range
41	Kelatha			+				PA	Western Shan Yoma Range
42	Kennedy Peak		+						Chin Hills Complex
43	Khaing Thaung Island		+	+					none
44	Kyaikhtiyoe			+				PA	Western Shan Yoma Range
45	Kyauk Pan Taung	+	+	+					Chin Hills Complex
46	Kyaukphyu (Wunbike)			+			+		Rakhine Yoma Range
47	Kyee-ni Inn		+						none
48	Lampi Island	+	+	+			+	PA	Tanintharyi Range
49	Lenya	+	+	+					Tanintharyi Range
50	Loimwe			+				PA	none
51	Lwoilin/Ginga Mountain		+						none
52	Mahamyaing	+	+	+			+		Lower Chindwin Forest
53	Mahanandar Kan		+	+					none
54	Maletto Inn		+						none
55	Mali Hka Area	+	+				+		Ayeyarwady Catchment
56	Man Chaung			+					none
57	Manaung Kyun	+		+					Rakhine Yoma Range
58	Maw She	+		+					none
59	Mawlamyine	+		+					none
60	May Hka Area	+	+	+			+		Ayeyarwady Catchment
61	May Yu	+							Rakhine Yoma Range
62	Mehon (Doke-hta Wady River)		+	+					None

Code	Key Biodiversity Area	Mammals	Birds	Reptiles	Amphibians	Fish	Plants	Protected Area*	Conservation Corridor
63	Meinmahla Kyun	+	+	+			+	PA	Ayeyarwady River
64	Minzontaung			+				PA	none
65	Momeik-Mabein	+		+					Ayeyarwady Catchment
66	Mone Chaung			+					none
67	Moscos Kyun	+		+			+	PA	none
68	Moyingyi		+	+				PA	none
69	Myaleik Taung			+					none
70	Myebon	+	+	+					Rakhine Yoma Range
71	Myeik Archipelago	+	+	+					none
72	Myinmoletkhat	+					+		Tanintharyi Range
73	Myitkyina-Nandebad-Talawgyi	+	+	+			+		Ayeyarwady Catchment
74	Myittha Lakes		+						none
75	Nadi Kan		+						none
76	Nam Sam Chaung		+	+					Ayeyarwady Catchment
77	Nam San Valley		+						none
78	Nantha Island		+						Rakhine Yoma Range
79	Nat-yekan	+	+	+					Rakhine Yoma Range
80	Natmataung (Mount Victoria)	+	+	+				PA	Chin Hills Complex
81	Ngawun (Lenya extension)		+						Tanintharyi Range
82	Ngwe Saung	+		+					none
83	Ngwe Taung		+						Rakhine Yoma Range
84	Ninety-six Inns		+						Ayeyarwady Catchment
85	North Zarmayi		+				+		Bago Yoma Range
86	North Zarmayi Elephant Range	+		+					Bago Yoma Range
87	Northern Rakhine Yoma	+		+					Rakhine Yoma Range
88	Nyaung Kan-Minhla Kan		+						none

Code	Key Biodiversity Area	Mammals	Birds	Reptiles	Amphibians	Fish	Plants	Protected Area*	Conservation Corridor
89	Oyster Island			+					none
90	Pachan		+	+					Tanintharyi Range
91	Panlaung-Pyadalin Cave	+		+				PA	Western Shan Yoma Range
92	Pauk Area						+		Lower Chindwin Forest
93	Paunglaung Catchment Area	+		+					Western Shan Yoma Range
94	Payagyi		+						none
95	Peleik Inn		+	+					none
96	Phokyar Elephant Camp		+	+					Bago Yoma Range
97	Pidaung	+		+			+	PA	Ayeyarwady Catchment
98	Popa	+		+				PA	none
99	Pyaungbya River		+						Rakhine Yoma Range
100	Pyin-ah-lan		+	+					none
101	Pyindaye		+	+			+		none
102	Rakhine Yoma Elephant Range	+	+	+				PA	Rakhine Yoma Range
103	Saramati Taung	+	+						Chindwin Catchment
104	Sheinmaga Tawyagyi	+		+					Ayeyarwady River
105	Shinmataung	+	+						none
106	Shwe U Daung	+		+				PA	Ayeyarwady Catchment
107	Shwesettaw	+	+	+			+	PA	Lower Chindwin Forest
108	Tanai River		+	+					Chindwin Catchment
109	Tanintharyi National Park			+					Tanintharyi Range
110	Tanintharyi Nature Reserve	+		+			+	PA	Tanintharyi Range
111	Taung Kan at Sedawgyi		+						none
112	Taunggyi			+				PA	none
113	Taungtaman Inn		+						none
114	Thamihla Kyun			+				PA	none

Code	Key Biodiversity Area	Mammals	Birds	Reptiles	Amphibians	Fish	Plants	Protected Area*	Conservation Corridor
115	Thaungdut			+					Lower Chindwin Forest
116	U-do		+						none
117	Upper Chindwin River: Kaunghein to Padumone Section	+	+	+					Chindwin River
118	Upper Mogaung Chaung Basin		+	+			+		Ayeyarwady Catchment
119	Uyu River		+	+					Chindwin Catchment
120	Yelegale		+						None
121	Yemyet Inn		+	+					None
122	Zeihmu Range		+						Chin Hills Complex
THA	**THAILAND**								
1	Ao Bandon		+						None
2	Ao Pattani		+						None
3	Ao Phang-nga	+					+	PA	Mu Ko Similan-Phi Phi-Andaman
4	Ban Khlong Marakor Tai		+						None
5	Bang Lang	+	+	+			+	PA	Hala-Bala
6	Bu Do-Sungai Padi		+				+	PA	Hala-Bala
7	Bung Boraphet	+	+					PA	None
8	Bung Khong Lhong		+				+	PA	None
9	Chaloem Pra Kiet (Pa Phru To Daeng)	+	+	+			+	PA	Hala-Bala
10	Chao Phraya River from Nonthaburi to Nakon Sawan					+			none
11	Doi Chiang Dao	+	+	+			+	PA	Lum Nam Pai-Salawin
12	Doi Inthanon	+	+	+			+	PA	Lum Nam Pai-Salawin
13	Doi Pha Chang	+	+					PA	Doi Phuka-Mae Yom
14	Doi Phu Nang		+				+	PA	Doi Phuka-Mae Yom
15	Doi Phukha		+				+	PA	Doi Phuka-Mae Yom
16	Doi Suthep-Pui	+	+	+			+	PA	Lum Nam Pai-Salawin

Code	Key Biodiversity Area	Mammals	Birds	Reptiles	Amphibians	Fish	Plants	Protected Area*	Conservation Corridor
17	Erawan	+					+	PA	Western Forest Complex
18	Hala-Bala	+	+	+			+	PA	Hala-Bala
19	Hat Chao Mai	+	+				+	PA	Mu Ko Similan-Phi Phi-Andaman
20	Hat Nopharat Thara-Mu Ko Phi Phi		+				+	PA	Mu Ko Similan-Phi Phi-Andaman
21	Huai Kha Khaeng	+	+	+			+	PA	Western Forest Complex
22	Huai Nam Dang						+	PA	Lum Nam Pai-Salawin
23	Inner Gulf of Thailand		+						Inner Gulf of Thailand
24	Kaeng Krachan	+	+	+			+	PA	Kaeng Krachan
25	Kaeng Krung	+					+	PA	Khlong Saeng-Khao Sok
26	Khao Ang Ru Nai	+	+	+				PA	Lower Eastern Forest Complex
27	Khao Banthad	+	+	+	+		+	PA	Khao Banthad
28	Khao Chamao-Khao Wong	+					+	PA	Lower Eastern Forest Complex
29	Khao Chong				+				none
30	Khao Khitchakut	+					+	PA	Lower Eastern Forest Complex
31	Khao Laem	+	+				+	PA	Western Forest Complex
32	Khao Lak-Lam Ru			+	+		+	PA	Khlong Saeng-Khao Sok
33	Khao Luang	+	+	+			+	PA	Khao Luang
34	Khao Nam Khang						+	PA	Hala-Bala
35	Khao Nor Chuchi	+	+	+			+	PA	Mu Ko Similan-Phi Phi-Andaman
36	Khao Phanom Bencha	+					+	PA	Mu Ko Similan-Phi Phi-Andaman
37	Khao Pu-Khao Ya	+					+	PA	Khao Banthad
38	Khao Sabab-Namtok Phlew			+			+	PA	Lower Eastern Forest Complex
39	Khao Sam Roi Yot	+	+				+	PA	Inner Gulf of Thailand
40	Khao Soi Dao	+	+	+			+	PA	Lower Eastern Forest Complex
41	Khao Sok	+					+	PA	Khlong Saeng-Khao Sok
42	Khao Yai	+	+				+	PA	Upper Eastern Forest Complex

Code	Key Biodiversity Area	Mammals	Birds	Reptiles	Amphibians	Fish	Plants	Protected Area*	Conservation Corridor
43	Khlong Lan	+		+			+	PA	Western Forest Complex
44	Khlong Nakha	+			+		+	PA	Khlong Saeng-Khao Sok
45	Khlong Saeng	+		+	+		+	PA	Khlong Saeng-Khao Sok
46	Ko Li Bong		+				+	PA	Mu Ko Similan-Phi Phi-Andaman
47	Ko Phra Tong		+						Khlong Saeng-Khao Sok
48	Kuiburi	+					+	PA	Kaeng Krachan
49	Laem Pakarang		+						Mu Ko Similan-Phi Phi-Andaman
50	Lam Khlong Ngu						+	PA	Western Forest Complex
51	Lower Central Basin		+						none
52	Lum Nam Pai	+				+		PA	Lum Nam Pai-Salawin
53	Mae Fang		+					PA	none
54	Mae Jarim NP		+					PA	Doi Phuka-Mae Yom
55	Mae Jarim WS		+					PA	Doi Phuka-Mae Yom
56	Mae Klong Basin			+		+			none
57	Mae Lao-Mae Sae	+	+					PA	Lum Nam Pai-Salawin
58	Mae Ping						+	PA	Mae Ping-Om Koi
59	Mae Tuen	+						PA	Mae Ping-Om Koi
60	Mae Wong	+	+				+	PA	Western Forest Complex
61	Mae Yom	+	+	+			+	PA	Doi Phuka-Mae Yom
62	Mekong Channel near Pakchom		+			+			Mekong River and Major Tributaries
63	Mu Ko Chang						+	PA	none
64	Mu Ko Similan		+				+	PA	Mu Ko Similan-Phi Phi-Andaman
65	Mu Ko Surin		+				+	PA	none
66	Na Muang Krabi		+						Mu Ko Similan-Phi Phi-Andaman
67	Nam Nao	+	+	+			+	PA	Phu Khieo-Nam Nao
68	Nam River					+			none
69	Namtok Huai Yang						+	PA	Chumphon

Code	Key Biodiversity Area	Mammals	Birds	Reptiles	Amphibians	Fish	Plants	Protected Area*	Conservation Corridor
70	Namtok Khlong Kaew						+	PA	none
71	Namtok Sai Khao						+	PA	Hala-Bala
72	Namtok Yong						+	PA	Khao Luang
73	Nanthaburi		+				+	PA	Doi Phuka-Mae Yom
74	Nong Bong Kai		+			+		PA	none
75	Om Koi	+	+					PA	Mae Ping-Om Koi
76	Pak Nam Prasae		+						none
77	Palian Lang-ngu		+						Mu Ko Similan-Phi Phi-Andaman
78	Pang Sida	+		+			+	PA	Upper Eastern Forest Complex
79	Phu Jong Na Yoi			+			+	PA	Phanom Dongrak-Pha Tam
80	Phu Khieo	+	+	+			+	PA	Phu Khieo-Nam Nao
81	Phu Kradung	+		+			+	PA	Phu Khieo-Nam Nao
82	Phu Luang	+		+			+	PA	Phu Khieo-Nam Nao
83	Phu Miang-Phu Thong	+					+	PA	Phu Miang-Phu Thong
84	Phu Phan	+					+	PA	none
85	Prince Chumphon Park	+	+				+	PA	Chumphon
86	Sai Yok	+		+		+	+	PA	Western Forest Complex
87	Sakaerat			+			+	PA	Upper Eastern Forest Complex
88	Salak Phra	+		+				PA	Western Forest Complex
89	Salawin	+						PA	Lum Nam Pai-Salawin
90	San Kala Khiri						+	PA	Hala-Bala
91	Sanambin		+					PA	none
92	Sri Lanna						+	PA	Sri Lanna-Khun Tan
93	Sri Nakarin	+	+				+	PA	Western Forest Complex
94	Sri Nan		+				+	PA	Doi Phuka-Mae Yom
95	Sri Phang-nga	+					+	PA	Khlong Saeng-Khao Sok
96	Sub Langkha	+					+	PA	Phu Khieo-Nam Nao

Code	Key Biodiversity Area	Mammals	Birds	Reptiles	Amphibians	Fish	Plants	Protected Area*	Conservation Corridor
97	Tai Rom Yen	+					+	PA	Khao Luang
98	Tarutao	+					+	PA	Mu Ko Similan-Phi Phi-Andaman
99	Tha Yang		+						none
100	Thab Lan	+					+	PA	Upper Eastern Forest Complex
101	Thale Noi		+					PA	none
102	Thale Sap Songkhla		+				+	PA	none
103	Thaleban	+	+				+	PA	Khao Banthad
104	Tham Ba Dan					+			Western Forest Complex
105	Thung Kha		+					PA	none
106	Thung Salaeng Luang	+					+	PA	Phu Miang-Phu Thong
107	Thung Tha Laad		+						none
108	Thung Yai-Naresuan	+	+	+			+	PA	Western Forest Complex
109	Ton Nga Chang	+		+			+	PA	Khao Banthad
110	Tonpariwat		+					PA	Khlong Saeng-Khao Sok
111	Trat Wetlands					+			none
112	Umphang	+	+	+				PA	Western Forest Complex
113	Wiang Lo		+					PA	Doi Phuka-Mae Yom
114	Yot Dom			+				PA	Phanom Dongrak-Pha Tam
VNM	**VIETNAM**								
1	A Luoi-Nam Dong	+		+				PA	Central Annamites
2	A Yun Pa	+	+				+		none
3	An Hai		+						Red River Delta Coastal Zone
4	Ba Be	+			+		+	PA	Sino-Vietnamese Limestone
5	Ba Tri		+						Mekong Delta Coastal Zone
6	Bac Lieu		+					PA	Mekong Delta Coastal Zone
7	Bach Ma	+	+				+	PA	Central Annamites

Code	Key Biodiversity Area	Mammals	Birds	Reptiles	Amphibians	Fish	Plants	Protected Area*	Conservation Corridor
8	Bai Boi		+						Mekong Delta Coastal Zone
9	Ban Bung	+	+	+			+	PA	Sino-Vietnamese Limestone
10	Ban Thi-Xuan Lac	+	+	+				PA	Sino-Vietnamese Limestone
11	Bao Loc-Loc Bac	+							Lowland Dong Nai Watershed
12	Bat Dai Son						+	PA	Sino-Vietnamese Limestone
13	Ben En	+					+	PA	none
14	Bi Dup-Nui Ba	+	+				+	PA	Southern Annamites Main Montane Block
15	Bien Lac-Nui Ong	+						PA	Di Linh
16	Bim Son	+							Northern Indochina Limestone
17	Binh An	+							Sino-Vietnamese Limestone
18	Binh Dai		+						Mekong Delta Coastal Zone
19	Binh Khuong			+					none
20	Bu Gia Map	+						PA	Southern Annamites Western Slopes
21	Ca Mau		+						none
22	Can Gio		+						Mekong Delta Coastal Zone
23	Cat Ba	+					+	PA	none
24	Cat Loc	+	+					PA	Lowland Dong Nai Watershed
25	Cham Chu	+							Sino-Vietnamese Limestone
26	Che Tao	+	+				+	PA	Ailao/Hoang Lien Mountains
27	Chu Prong	+	+	+			+		Eastern Plains Dry Forests
28	Chu Yang Sin	+	+				+	PA	Southern Annamites Main Montane Block
29	Chua Hang		+						Mekong Delta Coastal Zone
30	Chua Huong	+						PA	Northern Indochina Limestone
31	Co Nhi River			+					none
32	Cong Troi		+						Southern Annamites Main Montane Block
33	Cu Jut	+							Eastern Plains Dry Forests
34	Cuc Phuong	+	+	+			+	PA	Northern Indochina Limestone

Code	Key Biodiversity Area	Mammals	Birds	Reptiles	Amphibians	Fish	Plants	Protected Area*	Conservation Corridor
35	Dak Dam		+						Eastern Plains Dry Forests
36	Dakrong	+	+				+	PA	Central Annamites
37	Dat Mui		+					PA	Mekong Delta Coastal Zone
38	Deo Ca-Hon Nua			+				PA	Southern Annamites Main Montane Block
39	Deo Nui San	+							Di Linh
40	Dong Mo Lake			+					none
41	Du Gia	+	+		+			PA	Sino-Vietnamese Limestone
42	Ea So	+	+					PA	none
43	Fan Si Pan	+	+		+		+	PA	Ailao/Hoang Lien Mountains
44	Ha Nam		+						Red River Delta Coastal Zone
45	Ha Tien		+						North-western Mekong Delta Wetlands
46	Hoa Lu-Tam Coc-Bich Dong	+						PA	Northern Indochina Limestone
47	Huong Son	+							Northern Annamites
48	Ke Bang	+	+				+	PA	Central Indochina Limestone
49	Ke Go	+	+					PA	Ke Go and Khe Net Lowlands
50	Khau Ca	+							Sino-Vietnamese Limestone
51	Khe Net	+	+				+		Ke Go and Khe Net Lowlands
52	Kien Luong		+						North-western Mekong Delta Wetlands
53	Kon Cha Rang-An Toan	+	+	+	+		+	PA	Central Annamites
54	Kon Ka Kinh	+	+	+	+		+	PA	Central Annamites
55	Kon Plong	+	+	+			+		Central Annamites
56	Lac Thuy-Kim Bang	+							Northern Indochina Limestone
57	Lam Binh	+							Sino-Vietnamese Limestone
58	Lang Sen		+				+		North-western Mekong Delta Wetlands
59	Lo Go-Xa Mat	+	+					PA	none
60	Lo Xo Pass	+	+				+	PA	Central Annamites
61	Macooih	+							Central Annamites

Code	Key Biodiversity Area	Mammals	Birds	Reptiles	Amphibians	Fish	Plants	Protected Area*	Conservation Corridor
62	Mom Ray	+						PA	Cambodia-Lao PDR-Vietnam Tri-border Forests
63	Na Chi	+			+				Sino-Vietnamese Limestone
64	Nam Cat Tien	+	+	+		+	+	PA	Lowland Dong Nai Watershed
65	Nghia Hung		+						Red River Delta Coastal Zone
66	Ngoc Linh	+	+		+		+	PA	Central Annamites
67	Ngoc Son	+						PA	Northern Indochina Limestone
68	Northern Hien	+						PA	Central Annamites
69	Nui Boi Yao	+							Northern Indochina Limestone
70	Nui Chua	+						PA	none
71	Nui Giang Man	+							Northern Annamites
72	Phong Dien	+	+				+	PA	Central Annamites
73	Phong Nha	+	+				+	PA	Central Indochina Limestone
74	Phu Ninh	+							Central Annamites
75	Phuoc Binh	+	+				+		Southern Annamites Main Montane Block
76	Pu Huong	+					+	PA	Upper Chu River Watershed
77	Pu Luong	+						PA	Northern Indochina Limestone
78	Pu Mat	+	+	+			+	PA	Northern Annamites
79	Que Son	+							Central Annamites
80	Sinh Long	+					+		Sino-Vietnamese Limestone
81	Son Tra	+						PA	Central Annamites
82	Song Hinh			+					Southern Annamites Main Montane Block
83	Song Thanh	+		+			+	PA	Central Annamites
84	Ta Dung				+			PA	Lowland Dong Nai Watershed
85	Tam Dao				+			PA	none
86	Tat Ke	+					+	PA	Sino-Vietnamese Limestone
87	Tay Con Linh		+		+			PA	Sino-Vietnamese Limestone
88	Thai Thuy		+						Red River Delta Coastal Zone

Code	Key Biodiversity Area	Mammals	Birds	Reptiles	Amphibians	Fish	Plants	Protected Area*	Conservation Corridor
89	Than Xa	+						PA	Sino-Vietnamese Limestone
90	Thiet Ong	+							Northern Indochina Limestone
91	Tien Hai		+					PA	Red River Delta Coastal Zone
92	Tien Lang		+						Red River Delta Coastal Zone
93	Tien Phuoc	+							Central Annamites
94	Tra Co		+						none
95	Tra Cu		+						Mekong Delta Coastal Zone
96	Tram Chim		+					PA	North-western Mekong Delta Wetlands
97	Tram Lap-Dakrong	+							Central Annamites
98	Trung Khanh	+					+	PA	Sino-Vietnamese Limestone
99	Truong Son	+	+					PA	Quang Binh-Quang Tri-Xe Bangfai Lowlands
100	Tung Vai	+		+					Sino-Vietnamese Limestone
101	Tuyen Lam	+	+						Southern Annamites Main Montane Block
102	U Minh Thuong	+	+	+				PA	none
103	Van Ban	+	+	+	+		+		Ailao/Hoang Lien Mountains
104	Van Long	+						PA	Northern Indochina Limestone
105	Vinh Cuu	+				+		PA	Lowland Dong Nai Watershed
106	Vu Quang	+	+	+			+	PA	Northern Annamites
107	Xuan Lien	+					+	PA	Upper Chu River Watershed
108	Xuan Thuy		+					PA	Red River Delta Coastal Zone
109	Ya Lop	+	+						Eastern Plains Dry Forests
110	Yok Don	+	+	+	+			PA	Eastern Plains Dry Forests

Notes: * = KBA is wholly or partly included within a gazetted protected area.

Appendix 3. Conservation Corridors in the Indo-Burma Hotspot

No.	Conservation Corridor	Key Biodiversity Areas	Countries	Area (km^2)	Selection Criteria for Priority Corridors				
					Globally Significant Populations of CR and EN Species	Globally Significant Populations of Landscape Species	Unique or Exceptional Ecological & Evolutionary Processes	Urgency for Conservation Action	Opportunity for Additional Investment
1	Ailaoshan/Hoang Lien Mountains	Ailaoshan; Che Tao; Fan Si Pan; Fenshuiling; Huanglianshan; Van Ban; Wuliangshan	China and Vietnam	28,076	*Leptobrachium echinata; Nanorana unculuanus; Nanorana yunnanensis; Nomascus concolor; Pavo muticus; Quasipaa boulengeri; Theloderma bicolor*		altitudinal migration	High	Medium
2	Ayeyarwady Catchment	Babulon Htan; Bumphabum; Fen-shui-ling Valley; Hkakaborazi; Hponkanrazi; Indawgyi Grassland and Indaw Chaung Wetland; Indawgyi Wildlife Sanctuary; Kamaing; Mali Kha Area; May Kha Area; Momeik-Mabein; Myitkyina-Nandebad-Talawgyi; Nam Sam Chaung; Ninety-six Inns; Pidaung; Shwe U Daung; Upper Mogaung Chaung Basin	Myanmar	101,382	*Ailurus fulgens; Ardea insignis; Axis porcinus; Cairina scutulata; Chitra indica; Cuora mouhotii; Elephas maximus; Gyps bengalensis; Gyps tenuirostris; Hoolock leuconedys; Indotestudo elongata; Manis pentadactyla; Moschus fuscus; Nilssonia formosa; Trachypithecus shortridgei*	Rufous-necked Hornbill; Takin; White-bellied Heron	altitudinal migration of birds	High	High
3	Ayeyarwady River	Ayeyarwady River: Bagan Section; Ayeyarwady River: Bhamo Section; Ayeyarwady River: Myitkyina to Sinbo Section; Ayeyarwady River: Shwegu Section; Ayeyarwady River: Sinbyugyun to Minbu Section; Ayeyarwady River: Singu Section; Irrawaddy Dolphin; Meinmahla Kyun; Sheinmaga Tawyagyi	Myanmar	19,758	*Ardea insignis; Chitra indica; Gyps bengalensis; Gyps tenuirostris; Nilssonia formosa*	Irrawaddy Dolphin; sandbar-nesting birds; vultures; White-bellied Heron	migration of fish	High	High
4	Bago Yoma Range	Central Bago Yoma; North Zarmayi; North Zarmayi Elephant Range; Phokyar Elephant Camp	Myanmar	16,119	*Bos javanicus; Elephas maximus; Indotestudo elongata; Manis pentadactyla; Trachypithecus phayrei*	Asian Elephant		Medium	High

No.	Conservation Corridor	Key Biodiversity Areas	Countries	Area (km^2)	Selection Criteria for Priority Corridors				
					Globally Significant Populations of CR and EN Species	Globally Significant Populations of Landscape Species	Unique or Exceptional Ecological & Evolutionary Processes	Urgency for Conservation Action	Opportunity for Additional Investment
5	Bolaven Plateau	Bolaven Northeast; Dong Hua Sao	Lao PDR	4,411	*Elephas maximus*	Asian Elephant		Medium	High
6	Cambodia-Lao PDR-Vietnam Tri-border Forests	Dong Ampham; Mom Ray; Nam Ghong; Virachey	Cambodia, Lao PDR and Vietnam	10,617	*Elephas maximus; Nomascus gabriellae; Pygathrix nemaeus; Pygathrix nigripes*	Asian Elephant		Medium	Medium
7	Cardamom and Elephant Mountains	Central Cardamoms; Kirirom; Phnom Aural; Phnom Bokor; Phnom Samkos; Southern Cardamoms	Cambodia	17,660	*Crocodylus siamensis; Elephas maximus; Hylobates pileatus; Scleropages formosus*	Asian Elephant		High	Medium
8	Central Annamites	A Luoi-Nam Dong; Bach Ma; Dakrong; Kon Cha Rang-An Toan; Kon Ka Kinh; Kon Plong; Lo Xo Pass; Macooih; Ngoc Linh; Northern Hien; Phong Dien; Phou Ahyon; Phu Ninh; Que Son; Son Tra; Song Thanh; Tien Phuoc; Tram Lap-Dakrong; Xe Sap	Lao PDR and Vietnam	32,873	*Cuora galbinifrons; Lophura edwardsi; Muntiacus vuquangensis; Nomascus siki*; *Pseudoryx nghetinhensis; Pygathrix cinerea; Pygathrix nemaeus*		altitudinal migration	High	Medium
9	Central Indochina Limestone	Hin Namno; Ke Bang; Khammouan Limestone; Phong Nha	Lao PDR and Vietnam	7,990	*Laonastes aenigmamus; Pygathrix nemaeus; Trachypithecus hatinhensis*			Medium	Medium
10	Chin Hills Complex	Bwe Pa; Kennedy Peak; Kyauk Pan Taung; Natmataung (Mount Victoria); Zeihmu Range	Myanmar	36,013	*Gyps bengalensis; Hoolock hoolock; Indotestudo elongata; Manis pentadactyla; Sitta victoriae; Trachypithecus phayrei*	Rufous-necked Hornbill; vultures	altitudinal migration of birds	Medium	High

No.	Conservation Corridor	Key Biodiversity Areas	Countries	Area (km^2)	Selection Criteria for Priority Corridors				
					Globally Significant Populations of CR and EN Species	Globally Significant Populations of Landscape Species	Unique or Exceptional Ecological & Evolutionary Processes	Urgency for Conservation Action	Opportunity for Additional Investment
11	Chindwin Catchment	Htamanthi; Hukaung Valley; Hukaung Valley extension; Saramati Taung; Tanai River; Uyu River	Myanmar	50,072	*Ardea insignis; Axis porcinus; Batagur trivittata; Bubalus arnee; Cairina scutulata; Chitra indica; Cuora mouhotii; Elephas maximus; Hoolock hoolock; Hoolock leuconedys; Gyps bengalensis; Gyps tenuirostris; Indotestudo elongata; Kachuga trivittata; Nilssonia formosa; Panthera tigris; Pavo muticus; Trachypithecus pileatus; Trachypithecus shortridgei*	Asian Elephant; Tiger; White-bellied Heron; sandbar-nesting birds	altitudinal migration of birds; migration of fish	High	High
12	Chindwin River	Upper Chindwin River: Kaunghein to Padumone Section	Myanmar	5,281	*Cairina scutulata; Chitra indica; Hoolock hoolock; Hoolock leuconedys; Indotestudo elongata; Kachuga trivittata; Nilssonia formosa*	sandbar-nesting birds	migration of fish	High	High
13	Chumphon	Namtok Huai Yang; Prince Chumphon Park	Thailand	1,740			migration of raptors	Medium	High
14	Damingshan Range	Baixu-Qinpai; Damingshan; Xianhu Reservoir	China	5,685	*Gorsachius magnificus; Trachypithecus francoisi*			High	Medium
15	Di Linh	Bien Lac-Nui Ong; Deo Nui San	Vietnam	5,166	*Pygathrix nigripes*			Medium	High
16	Doi Phuka-Mae Yom	Doi Pha Chang; Doi Phukha; Doi Phu Nang; Mae Jarim NP; Mae Jarim WS; Mae Yom; Nam Phoun; Nanthaburi; Sri Nan; Wiang Lo	Lao PDR and Thailand	17,053	*Cuon alpinus; Elephas maximus; Pavo muticus*	Asian Elephant		Medium	High

No.	Conservation Corridor	Key Biodiversity Areas	Countries	Area (km^2)	Selection Criteria for Priority Corridors				
					Globally Significant Populations of CR and EN Species	Globally Significant Populations of Landscape Species	Unique or Exceptional Ecological & Evolutionary Processes	Urgency for Conservation Action	Opportunity for Additional Investment
17	Eastern Plains Dry Forests	Chu Prong; Cu Jut; Dak Dam; Lomphat; Mondulkiri-Kratie Lowlands; Upper Srepok Catchment; Ya Lop; Yok Don	Cambodia and Vietnam	21,160	*Bos javanicus; Bubalus arnee; Cuon alpinus; Crocodylus siamensis; Elephas maximus; Gyps bengalensis; Gyps tenuirostris; Hieremys annandalii; Indotestudo elongata; Pavo muticus; Pseudibis davisoni; Rucervus eldii; Sarcogyps calvus; Thaumatibis gigantea*	Asian Elephant; vultures; large waterbirds	extreme seasonality, fire regime and other processes characteristic of dry forests	High	Medium
18	Hainan Coastal Zone	Dongzhaigang; Sanya Seagrass Beds; Tongguling	China	8,311	*Amolops hainanensis*		migration of shorebirds	Medium	High
19	Hainan Mountains	Baimaling-Huishan; Bawangling; Datian; Diaoluoshan; Exianling and Changhuajiang; Fanjia; Ganshiling; Houmiling; Jianfengling; Jianling; Jiaxi; Ledong; Liji; Limushan; Nanmaoling; Nanweiling; Sanya; Shangxi; Tongtieling; Wuzhishan; Yinggeling	China	17,452	*Amolops hainanensis; Cuora galbinifrons; Liuixalus ocellatus; Mauremys mutica; Neohylomys hainanensis; Nomascus hainanus; Platysternon megacephalum; Polyplectron katsumatae; Rucervus eldii; Sacalia quadriocellata; Tylototriton hainanensis*			High	High
20	Hala-Bala	Bang Lang; Bu Do-Sungai Padi; Chaloem Pra Kiat (Pa Phru To Daeng); Hala-Bala; Khao Nam Khang; Namtok Sai Khao; San Kala Khiri	Thailand	7,423	*Cynogale bennettii; Heosemys spinosa; Hylobates agilis; Panthera tigris; Pelochelys cantorii; Symphalangus syndactylus; Tapirus indicus*	Plain-pouched Hornbill, Rhinoceros Hornbill	near-intact lowland evergreen forest ecosystem	High	Low
21	Hong Kong-Shenzhen Mountains	Hong Kong Island and Associated Islands; Inland New Territories; Lantau Island and Associated Islands	China	1,337	*Amolops hongkongensis; Cuora trifasciata; Liuixalus romeri; Mauremys reevesii; Sacalia bealei; Xenophrys brachykolos*			Medium	Low
22	Inner Gulf of Thailand	Inner Gulf of Thailand; Khao Sam Roi Yot	Thailand	1,408	*Eurynorhynchus pygmeus; Pristis microdon; Tringa guttifer*		migration of shorebirds	Medium	High

No.	Conservation Corridor	Key Biodiversity Areas	Countries	Area (km^2)	Selection Criteria for Priority Corridors				
					Globally Significant Populations of CR and EN Species	Globally Significant Populations of Landscape Species	Unique or Exceptional Ecological & Evolutionary Processes	Urgency for Conservation Action	Opportunity for Additional Investment
23	Kaeng Krachan	Kaeng Krachan; Kuiburi	Thailand	5,479	*Crocodylus siamensis; Elephas maximus; Panthera tigris; Tapirus indicus*	Asian Elephant; Great Hornbill; Plain-pouched Hornbill		High	Medium
24	Ke Go and Khe Net Lowlands	Ke Go; Khe Net	Vietnam	1,011	*Lophura hatinhensis*			Medium	High
25	Khao Banthad	Khao Banthad; Khao Pu-Khao Ya; Thaleban; Ton Nga Chang	Thailand	4,064	*Manouria emys; Tapirus indicus*			Medium	High
26	Khao Luang	Khao Luang; Namtok Yong; Tai Rom Yen	Thailand	2,439	*Elephas maximus; Tapirus indicus*	Great Hornbill		Medium	High
27	Khlong Saeng-Khao Sok	Kaeng Krung; Khao Lak-Lam Ru; Khao Sok; Khlong Nakha; Khlong Saeng; Ko Pra Thong; Sri Phang-nga; Tonpariwat	Thailand	8,132	*Elephas maximus*			Medium	Medium
28	Lower Chindwin Forest	Alaungdaw Kathapa; Chatthin; Mahamyaing; Pauk Area; Shwesettaw; Thaungdut	Myanmar	39,926	*Bos javanicus; Cairina scutulata; Elephas maximus; Geochelone platynota; Hoolock leuconedys; Indotestudo elongata; Manis pentadactyla; Nilssonia formosa; Pavo muticus; Rucervus eldi; Trachypithecus pileatus*	Asian Elephant		Medium	High
29	Lower Eastern Forest Complex	Khao Ang Ru Nai; Khao Chamao-Khao Wong; Khao Khitchakut; Khao Sabab-Namtok Phlew; Khao Soi Dao	Thailand	4,139	*Bos javanicus; Elephas maximus; Hylobates pileatus*	Asian Elephant		Medium	High
30	Lowland Dong Nai Watershed	Bao Loc-Loc Bac; Cat Loc; Nam Cat Tien; Ta Dung; Vinh Cuu	Vietnam	8,293	*Pavo muticus; Pygathrix nigripes; Scleropages formosus*	Great Hornbill		Medium	Medium
31	Lum Nam Pai-Salawin	Doi Chiang Dao; Doi Inthanon; Doi Suthep-Pui; Huai Nam Dang; Lum Nam Pai; Mae Lao-Mae Sae; Salawin	Thailand	24,333	*Platysternon megacephalum*			Medium	High

No.	Conservation Corridor	Key Biodiversity Areas	Countries	Area (km^2)	Selection Criteria for Priority Corridors				
					Globally Significant Populations of CR and EN Species	Globally Significant Populations of Landscape Species	Unique or Exceptional Ecological & Evolutionary Processes	Urgency for Conservation Action	Opportunity for Additional Investment
32	Mae Ping-Om Koi	Mae Ping; Mae Tuen; Om Koi	Thailand	8,666				Medium	High
33	Mekong Delta Coastal Zone	Ba Tri; Bac Lieu; Bai Boi; Binh Dai; Can Gio; Chua Hang; Dat Mui; Tra Cu	Vietnam	3,933	*Tringa guttifer*		migration of shorebirds	High	Medium
34	Mekong River and Major Tributaries	Lower Nam Ou; Mekong Confluence with Nam Kading; Mekong Confluence with Xe Bangfai; Mekong Channel near Pakchom; Mekong River from Kratie to Lao PDR; Mekong River from Phou Xiang Thong to Siphandon; Mekong River from Louangphabang to Vientiane; Pakxan Wetlands; Sekong River; Sesan River; Siphandon; Srepok River; Upper Lao Mekong; Upper Xe Kaman	Cambodia, Lao PDR and Thailand	16,475	*Aaptosyax grypus; Catlocarpio siamensis; Crocodylus siamensis; Datnioides pulcher; Dasyatis laosensis; Himantura oxyrhyncha; Himantura polylepis; Laubuca caeruleostigmata; Pangasianodon gigas; Pangasianodon hypophthalmus; Pangasius sanitwongsei; Pelochelys cantorii; Pristis microdon; Probarbus jullieni; Probarbus labeamajor; Pseudibis davisoni; Schistura bairdi; Tenualosa thibaudeaui*	Irrawaddy Dolphin; migratory freshwater fish; sandbar-nesting birds	migration of fish species; migration of Manchurian Reed-warbler	High	High
35	Mu Ko Similan-Phi Phi-Andaman	Ao Phang-nga; Hat Chao Mai; Hat Nopharat Thara-Mu Ko Phi Phi; Khao Nor Chuchi; Khao Phanom Bencha; Ko Li Bong; Laem Pakarang; Mu Ko Similan; Na Muang Krabi; Palian Lang-ngu; Tarutao	Thailand	26,317	*Fregata andrewsi; Heosemys spinosa; Pitta gurneyi; Tringa guttifer*		migration of shorebirds	Medium	High
36	Nam Et-Phou Louey	Nam Et; Phou Louey	Lao PDR	4,391	*Panthera tigris*			Medium	High
37	Nam Ha-Xishuangbanna-Phou Dendin	Babianjiang; Caiyanghe; Nam Ha; Nam Kan; Phou Dendin; Xishuangbanna; Yiwa; Youluoshan	China and Lao PDR	21,523	*Elephas maximus; Nomascus concolor; Palea steindachneri; Panthera tigris; Platysternon megacephalum*	Asian Elephant		High	Medium
38	Nangunhe-Yongde Daxueshan	Nangunhe; Yongde Daxueshan	China	2,588	*Elephas maximus; Nomascus concolor; Palea steindachneri*	Asian Elephant		Medium	High

No.	Conservation Corridor	Key Biodiversity Areas	Countries	Area (km^2)	Selection Criteria for Priority Corridors				
					Globally Significant Populations of CR and EN Species	Globally Significant Populations of Landscape Species	Unique or Exceptional Ecological & Evolutionary Processes	Urgency for Conservation Action	Opportunity for Additional Investment
39	North-western Mekong Delta Wetlands	Bassac Marsh; Boeung Prek Lapouv; Ha Tien; Kampong Trach; Kien Luong; Lang Sen; Tram Chim	Cambodia and Vietnam	7,854		large waterbirds	seasonal flood regime; migration of large waterbirds	High	Medium
40	Northern Annamites	Eastern Bolikhamxay Mountains; Huong Son; Nakai-Nam Theun; Nakai Plateau; Nui Giang Man; Pu Mat; Vu Quang	Lao PDR and Vietnam	21,112	*Cuora galbinifrons; Cuora trifasciata; Elephas maximus; Muntiacus vuquangensis; Nomascus leucogenys; Panthera tigris; Platysternon megacephalum; Pseudoryx nghetinhensis; Pygathrix nemaeus; Sacalia quadriocellata*	Asian Elephant; Rufous-necked Hornbill		High	Medium
41	Northern Indochina Limestone	Bim Son; Chua Huong; Cuc Phuong; Hoa Lu-Tam Coc-Bich Dong; Lac Thuy-Kim Bang; Ngoc Son; Nui Boi Yao; Pu Luong; Thiet Ong; Van Long	Vietnam	6,793	*Trachypithecus delacouri*			Medium	Medium
42	Northern Plains Dry Forests	Chhep; Dong Khanthung; O Skach; Upper Stung Sen Catchment	Cambodia and Lao PDR	19,322	*Cairina scutulata; Gyps bengalensis; Gyps tenuirostris; Hieremys annandalii; Indotestudo elongata; Pavo muticus; Rucervus eldii; Sarcogyps calvus; Thaumatibis gigantea*	vultures; large waterbirds	extreme seasonality fire regime and other processes typical of dry forests	High	Medium
43	Phanom Dongrak-Pha Tam	Phu Jong Na Yoi; Yot Dom	Thailand	3,510	*Elephas maximus; Hylobates pileatus*			High	Medium
44	Phu Khieo-Nam Nao	Nam Nao; Phu Khieo; Phu Kradung; Phu Luang; Sub Langkha	Thailand	13,395	*Cairina scutulata; Elephas maximus; Hylobates lar; Panthera tigris; Platysternon megacephalum; Trachypithecus phayrei*	Asian Elephant		High	Low
45	Phu Miang-Phu Thong	Phu Miang-Phu Thong; Thung Salaeng Luang	Thailand	9,944				Medium	High

No.	Conservation Corridor	Key Biodiversity Areas	Countries	Area (km^2)	Selection Criteria for Priority Corridors				
					Globally Significant Populations of CR and EN Species	Globally Significant Populations of Landscape Species	Unique or Exceptional Ecological & Evolutionary Processes	Urgency for Conservation Action	Opportunity for Additional Investment
46	Quang Binh-Quang Tri-Xe Bangfai Lowlands	Laving-Laveun; Truong Son; Upper Xe Bangfai	Lao PDR and Vietnam	3,819	*Nomascus siki; Pseudoryx nghetinhensis; Pygathrix nemaeus*			High	Medium
47	Rakhine Yoma Range	Gyobin; Kaladan River; Kyaukphyu (Wunbike); Manaung Kyun; May Yu; Myebon; Nantha Island; Nat-yekan; Ngwe Taung; Northern Rakhine Yoma; Pyaungbya River; Rakhine Yoma Elephant Range	Myanmar	47,614	*Batagur trivittata; Bos javanicus; Chitra indica; Elephas maximus; Heosemys depressa; Hoolock hoolock; Indotestudo elongata; Manouria emys; Nilssonia formosa; Pavo muticus*	Asian Elephant; Rufous-necked Hornbill	migration of shorebirds; recruitment of fish	Medium	High
48	Red River Delta Coastal Zone	An Hai; Ha Nam; Nghia Hung; Thai Thuy; Tien Hai; Tien Lang; Xuan Thuy	Vietnam	2,255	*Eurynorhynchus pygmeus; Platalea minor; Tringa guttifer*	Black-faced Spoonbill	migration of shorebirds	High	Medium
49	Sekong Plains	Western Siem Pang	Cambodia	3,845	*Gyps bengalensis; Gyps tenuirostris; Pavo muticus; Pseudibis davisoni; Rucervus eldii; Sarcogyps calvus; Thaumatibis gigantea*	vultures; large waterbirds		High	Medium
50	Shiwandashan Range	Fangchen Shanue; Shiwandashan	China	2,458	*Sacalia quadriocellata*			Medium	High
51	Sino-Vietnamese Limestone	Ba Be; Ban Bung; Ban Thi-Xuan Lac; Bangliang; Bat Dai Son; Binh An; Cham Chu; Chongzuo; Daweishan; Diding; Du Gia; Gulongshan; Khau Ca; Lam Binh; Longhua; Longhushan; Longshan section of Nonggang; Malipo; Na Chi; Nonggang; Paiyangshan; Shangsi-Biannian; Sinh Long; Tat Ke; Tay Con Linh; Than Xa; Trung Khanh; Tung Vai; Xidamingshan	China and Vietnam	58,502	*Gorsachius magnificus; Nomascus nasutus; Quasipaa boulengeri; Rhinopithecus avunculus; Trachypithecus francoisi; Trachypithecus poliocephalus; Xenophrys brachykolos*			High	High
52	Sittaung River	Gulf of Mottama	Myanmar	47,614	*Eurynorhynchus pygmeus; Tringa guttifer*	sandbar-nesting birds	migration of fish and shorebirds	Medium	High

No.	Conservation Corridor	Key Biodiversity Areas	Countries	Area (km^2)	Selection Criteria for Priority Corridors				
					Globally Significant Populations of CR and EN Species	Globally Significant Populations of Landscape Species	Unique or Exceptional Ecological & Evolutionary Processes	Urgency for Conservation Action	Opportunity for Additional Investment
53	South China Shorebird Flyway	Fangcheng; Futian; Guangtouling; Leizhou Peninsula; Mai Po and Inner Deep Bay; Nangliujiang Hekou; Shankou; Taipa-Coloane	China	22,665	*Platalea minor; Tringa guttifer*	Black-faced Spoonbill	migration of raptors and shorebirds	High	Medium
54	Southern Annamites Main Montane Block	Bi Dup-Nui Ba; Chu Yang Sin; Cong Troi; Deo Ca-Hon Nua; Phuoc Binh; Song Hinh; Tuyen Lam	Vietnam	11,976	*Crocias langbianis; Cuora galbinifrons; Garrulax yersini*		altitudinal migration	Medium	Medium
55	Southern Annamites Western Slopes	Bu Gia Map; Snoul-Keo Sema-O Reang	Cambodia and Vietnam	3,945	*Pygathrix nigripes*			High	Medium
56	Sri Lanna-Khun Tan	Sri Lanna	Thailand	20,164				Medium	High
57	Tanintharyi Range	Central Tanintharyi Coast; Chaungmon-Wachaung; Htaung Pru; Karathuri; Kawthaung District Lowlands; Lampi Island; Lenya; Myinmoletkhat; Ngawun (Lenya extension); Pachan; Tanintharyi National Park; Tanintharyi Nature Reserve	Myanmar	42,912	*Batagur baska; Ciconia stormi; Elephas maximus; Heosemys spinosa; Hylobates lar; Manis pentadactyla; Panthera tigris; Pitta gurneyi*	Asian Elephant; Plain-pouched Hornbill; Tiger	migration of shorebirds; recruitment of fish	High	High
58	Thanlwin River		Myanmar	7,696		sandbar-nesting birds	migration of fish	High	High
59	Tongbiguan-Gaoligongshan	Dehong Zizhizhou; Gaoligongshan; Tongbiguan	China	11,216	*Elephas maximus; Pavo muticus*	Asian Elephant		High	Medium
60	Tonle Sap Lake and Inundation Zone	Ang Tropeang Thmor; Boeung Chhmar-Moat Khla; Chhnuk Tru; Dei Roneat; Lower Stung Sen; Preah Net Preah-Kra Lanh-Pourk; Prek Toal; Stung-Chi Kreng-Kampong Svay; Stung Sen-Santuk-Baray; Veal Srongae	Cambodia	17,547	*Catlocarpio siamensis; Himantura oxyrhyncha; Himantura polylepis; Houbaropsis bengalensis; Leptoptilos dubius; Pangasianodon gigas; Pangasianodon hypophthalmus; Pristis microdon; Probarbus jullieni*	migratory freshwater fish; large waterbirds	seasonal flood regime; migration of large waterbird and fish species	High	High

No.	Conservation Corridor	Key Biodiversity Areas	Countries	Area (km^2)	Selection Criteria for Priority Corridors				
					Globally Significant Populations of CR and EN Species	Globally Significant Populations of Landscape Species	Unique or Exceptional Ecological & Evolutionary Processes	Urgency for Conservation Action	Opportunity for Additional Investment
61	Upper Chu River Watershed	Pu Huong; Xuan Lien	Vietnam	4,505	*Nomascus leucogenys*			Medium	High
62	Upper Eastern Forest Complex	Khao Yai; Pang Sida; Sakaerat; Thab Lan	Thailand	9,685	*Bos javanicus; Elephas maximus; Hylobates lar; Hylobates pileatus; Indotestudo elongata; Panthera tigris*	Asian Elephant; Great Hornbill	contact zone of Pileated and White-handed Gibbons	High	Medium
63	Western Forest Complex	Erawan; Huai Kha Khaeng; Khao Laem; Khlong Lan; Lam Khlong Ngu; Mae Wong; Sai Yok; Salak Phra; Sri Nakarin; Tham Ba Dan; Thung Yai-Naresuan; Umphang	Thailand	24,112	*Bos javanicus; Bubalus arnee; Cairina scutulata; Elephas maximus; Indotestudo elongata; Manouria emys; Manouria impressa; Panthera tigris; Pavo muticus; Tapirus indicus*	Asian Elephant; Plain-pouched Hornbill; Rufous-necked Hornbill		Medium	Low
64	Western Shan Yoma Range	Kelatha; Kyaikhtiyoe; Panlaung Pyadalin Cave; Paunglaung Catchment Area	Myanmar	27,732	*Indotestudo elongata; Platysternon megacephalum*			Medium	High
65	Xe Khampho-Xe Pian	Nong Khe Wetlands; Xe Khampho; Xe Pian	Lao PDR	4,723	*Cairina scutulata; Crocodylus siamensis; Elephas maximus; Pavo muticus*	Asian Elephant; Great Hornbill		High	Medium
66	Yunwushan Range	Dawuling; Ehuangzhang; Heweishan; Qixingkeng; Yangchun Baiyong	China	8,408	*Manis pentadactyla*			High	Medium

Appendix 4. Provisional Priority Species for CEPF Investment in the Indo-Burma Hotspot*

Species Name and Red List Category on July 1, 2011	**Conservation Need(s) Requiring Species-focused Action**	**Over-Riding Need for Greatly Improved Information**
MAMMALS		
Kouprey *Bos sauveli*, CR (?EX)**	Control of overexploitation, population management	Yes
Red Serow *Capricornis rubidus*, NT	Possible control of overexploitation	Yes
East Asian Porcupine *Hystrix brachyura*, LC	Control of overexploitation	
Cuc Phuong Ferret Badger *Melogale cucphuongensis*, NE		Yes
Harrison's Tube-nosed Bat *Murina harrisoni*, NE		Yes
Walston's Tube-nosed Bat *Murina walstoni*, NE		Yes
Annamite Striped Rabbit *Nesolagus timminsi*, DD	Possible control of overexploitation	Yes
Wroughton's Free-tailed Bat *Otomops wroughtoni*, DD		Yes
Lesser One-horned Rhinoceros *Rhinoceros sondaicus*, CR**	Control of overexploitation, population management	Yes
Heude's Pig *Sus bucculentus*, DD	Taxonomic clarification	Yes
Tenasserim Leaf Monkey *Trachypithecus barbei*, DD	Possible control of overexploitation	Yes
Silver-backed Chevrotain *Tragulus versicolor*, DD	Possible control of overexploitation	Yes
Northern Chevrotain *Tragulus williamsoni*, DD	Possible control of overexploitation	Yes
BIRDS		
Large-billed Reed Warbler *Acrocephalus orinus*, DD		Yes
Black-necked Stork *Ephippiorhynchus asiaticus*, NT	Control of overexploitation	
Rufous-rumped Grassbird *Graminicola bengalensis*, NT		Yes
White-throated Wren-babbler *Rimator pasquieri*, LC***	Specific habitat management	
Nonggang Babbler *Stachyris nonggangensis*, NT		Yes
Black-bellied Tern *Sterna acuticauda*, NT	Active population management	Yes
REPTILES		
Chinese Crocodile Lizard *Shinisaurus crocodilurus*, NE	Control of overexploitation	
AMPHIBIANS		
Ailao Toad *Bufo ailaoanus*, DD		Yes
Balloon Frog *Glyphoglossus molossus*, NT	Control of overexploitation	
Yellow-strip Caecilian *Ichthyophis bannanicus*, LC	Control of overexploitation	
Ailao Spiny Toad *Leptobrachium ailaonicum*, NT	Control of overexploitation	
Dawei Spiny Toad *Leptobrachium promustache*, DD	Control of overexploitation	
Pointed-tongued Floating Frog *Occidozyga lima*, NE****		Yes
Laos Warty Newt *Paramesotriton laoensis*, DD	Control of overexploitation	

Species Name and Red List Category on July 1, 2011	**Conservation Need(s) Requiring Species-focused Action**	**Over-Riding Need for Greatly Improved Information**
FISH		
Hong Kong Black Paradise Fish *Macropodus hongkongensis*, NE		Yes
White Cloud Mountain Minnow *Tanichthys albonubes*, DD		Yes
Panda Goby *Protomyzon pachychilus*, LC	Control of overexploitation	
Yunnan Loach *Yunnanilus macrogaster*, DD		Yes
PLANTS		
Enchanting Dendrobium *Dendrobium bellatulum*	Control of overexploitation	Yes
Keel-carrying Dendrobium *Dendrobium cariniferum*	Control of overexploitation	Yes
Golden-bow Dendrobium *Dendrobium chrysotoxum*	Control of overexploitation	Yes
Christy's Dendrobium *Dendrobium christyanum*		Yes
Shoe-lipped Dendrobium *Dendrobium crepidatum*	Control of overexploitation	Yes
Shiny Crystal Dendrobium *Dendrobium crystallinum*	Control of overexploitation	Yes
Pineapple Dendrobium *Dendrobium densiflorum*	Control of overexploitation	Yes
Fimbriate-lipped Dendrobium *Dendrobium fimbriatum*	Control of overexploitation	Yes
Findlay's Dendrobium *Dendrobium findlayanum*	Control of overexploitation	Yes
Rampart-lipped Dendrobium *Dendrobium hercoglossum*	Control of overexploitation	Yes
Necklace-shaped Dendrobium *Dendrobium monoliforme*	Control of overexploitation	Yes
Noble Dendrobium *Dendrobium nobile*	Control of overexploitation	Yes
Pendant-growing Dendrobium *Dendrobium pendulum*	Control of overexploitation	Yes
Many-flowered Dendrobium *Dendrobium polyanthum*	Control of overexploitation	Yes
Thyrse-flowered Dendrobium *Dendrobium thyrsiflorum*	Control of overexploitation	Yes
Triangular-column- foot Dendrobium *Dendrobium trigonopus*	Control of overexploitation	Yes
Ward's Dendrobium *Dendrobium wardianum*	Control of overexploitation	Yes
Charlesworth's Paphiopedilum *Paphiopedilum charlesworthii*	Control of overexploitation	Yes
Delenat's Paphiopedilum *Paphiopedilum delenatii*	Control of overexploitation	Yes
Gratix's Paphiopedilum *Paphiopedilum gratrixianum*	Control of overexploitation	Yes
Hang's Paphiopedilum *Paphiopedilum hangianum*	Control of overexploitation	Yes
Helen's Paphiopedilum *Paphiopedilum helenae*	Control of overexploitation	Yes
Henry's Paphiopedilum *Paphiopedilum henryanum*	Control of overexploitation	Yes
Splendid Paphiopedilum *Paphiopedilum insigne*	Control of overexploitation	Yes
Sukhakul's Paphiopedilum *Paphiopedilum sukhakulii*	Control of overexploitation	Yes
Vietnam Paphiopedilum *Paphiopedilum vietnamense*	Control of overexploitation	Yes
Ward's Paphiopedilum *Paphiopedilum wardii*	Control of overexploitation	Yes
Red Vanda *Renanthera imschootiana*	Control of overexploitation	Yes
Blue Vanda *Vanda coerulea*	Control of overexploitation	Yes

Notes: * = Any of these species could become eligible for CEPF investment if their global threat status is reassessed as globally threatened during the 5-year investment period.

** = These species are believed to be extinct within the hotspot. However, should a population be found, conservation action would be of immense urgency.
*** = This species was reassessed as Endangered in 2011.
**** = The species as a whole is LC, but if suspicions that the southern Chinese taxon is a distinct species are confirmed, then it would warrant serious consideration as a priority species. The process did not systematically consider as-yet-unproposed segregates from species as currently accepted on the Red List.

Appendix 5. Example NGOs with Biodiversity Conservation Linkages in the Indo-Burma Hotspot

Area	Description of Situation	Example NGOs
Land Rights	Due to the socialist philosophies of their governments, China, Lao PDR and Vietnam lead the way in terms of recognition of household's long-term land rights in forests. In other countries, while legal provisions for community forestry may exist, it can be very difficult for local communities to secure legal recognition of their rights to forest land in practice. Working on land rights requires engagement with government agencies and universities with good credibility.	The Rights and Resources Initiative has partnerships in China, Vietnam, and other parts of the hotspot. It produces authoritative analysis of land rights, co-authored by local groups or university partners, which are used for advocacy with government. This 'co-authorship' is a form of participatory action research, under which funds are also available for rapid response. Other groups working in this area include: Bridges Across Borders Southeast Asia, Center on Housing Rights and Evictions, Community Economic Development, and EarthRights International (Cambodia) and AIPP (Thailand).
Livelihoods	Interventions include supporting forest-based livelihoods and enterprise building for smallholder agricultural producers. There are a good number of NGOs working in this area, largely with government counterparts. In China and Vietnam, there are collective rights to private community forest, and household rights for long-term use. In Vietnam, the law stipulates that long-term usufruct rights should, for most lands, be issued to non-state entities, including households, groups of households, and organizations.	In Myanmar, FFI, BANCA and local CSOs in Kachin and Chin States are enabling local communities to participate in forest and protected area management, ensuring continued provision of ecosystem services essential for the development of sustainable livelihoods. Other groups working in this area include: Cambodian Centre for Agricultural Research and Development, Cambodian Rural Development Team, My Village and Oxfam (all in Cambodia); Winrock International (China); Village Focus International (Lao PDR); Network Activities Group and Oxfam (both in Myanmar); Oxfam (Thailand); and Asia Forest Network (Vietnam).
Home-based Workers and Artisans	Home-based workers and artisans producing handicrafts and other products are present everywhere in the hotspot and yet they are seldom visible or heard by those in government or involved in local participatory governance processes. They are generally poor and generate very low income from home-based work. Most of them are women engaged in various home-based economic activities and their families are struggling to overcome persistent poverty. Support to home-based workers provided by NGOs includes facilitating fair trade, social marketing, product development and social entrepreneurship, as well as advocacy on social protection.	Groups working in this area include: Artisans' Association of Cambodia (ACC) (Cambodia); Homenet Laos and Non-Profit Association of Lao Development and Environment (both Lao PDR); and Homenet Southeast Asia (covering Cambodia, Laos PDR, Myanmar, Thailand and Vietnam).

Area	Description of Situation	Example NGOs
Indigenous People	Throughout the hotspot, ethnic minority groups reside in landscapes important for biodiversity conservation, and frequently have high levels of dependence on forest resources. Many of these groups have traditional land and forest management practices, although these may have fallen into disuse or may conflict with government policy on natural resource management. Although no specific national laws recognize the traditional rights of indigenous people to forest resources, they do have collective rights in some countries. For instance, in Vietnam, groups of ethnic minority people can be considered as forest collectives, while, in China, they can be recognized as collective forest management units.	AIPP is a regional alliance of indigenous peoples strong in voicing issues and initiating multi-stakeholder dialogues. Among its members in the hotspot are: Cambodia Indigenous Youth Association, Organization to Promote Kui Culture and Indigenous Rights Active Members (all in Cambodia); Community Knowledge Support Association, and Gender and Development Group (both in Lao PDR); and Assembly of Indigenous and Tribal Peoples of Thailand, Hmong Association for Development in Thailand, Inter-Mountain People's Education and Culture in Thailand, Karen Network for Culture and Environment (all in Thailand).
Poor Rural Women	All countries in the hotspot are signatories to the Convention on the Elimination of All Forms of Discrimination Against Women. Most women manage their resources (gardens, medicinal plants, agro-forest systems, etc.) for food and fodder. However, full recognition of women's rights and their potential remains dismal as they: constitute the majority of the poor; lack access and control over land and resources; lack access to education and health services; and have limited participation in decision-making bodies. Poor rural women are typically among the most economically and politically marginalized people in the hotspot. Some NGOs are providing support for women's social, political and economic leadership, in the hope of increase the participation of women and in balancing gender power relations in the household, community and society. However, such support is not yet widespread.	In Cambodia, Myanmar, Thailand and Vietnam, members of the Oxfam confederation are implementing livelihood programs that directly benefit poor women and promote their economic leadership, for instance in smallholder production in the agriculture and fisheries sectors. These interventions aim to create opportunities for women and marginalized smallholder producers to work their way out of poverty, as well as to address power imbalances in market systems. Other groups working in this area include: Kampuchea Women Welfare Action and Social Action for Change (both in Cambodia); Winrock International (China); GAPE and Lao Biodiversity Association (both in Lao PDR); and Indigenous Women's Network of Thailand (Thailand).
Disaster Risk Reduction	Countries in the hotspot are prone to natural disasters. Recent increases in flooding and drought have exacerbated the vulnerabilities of women and men in poor communities. Natural disasters not only affect people's health but also their livelihoods. NGOs working in the hotspot are making a range of interventions in this area, including: building communities' resilience against disasters; developing multi-stakeholder disaster risk reduction mechanisms; policy advocacy and research; emergency response to disasters and humanitarian assistance; and gender and disaster risk reduction.	Groups working in this area include: Capacity Building Initiatives, Malteser, Network Activities Group and Oxfam (Myanmar); Oxfam and Pattani Bay Watch (Thailand); and Oxfam (Vietnam).

Area	Description of Situation	Example NGOs
Natural Resource Management	In Cambodia, China, Myanmar and Vietnam, community-based natural resource management falls within more general regulations governing management of forests and natural resources, which tend to rely on village-based groups as the unit of management. These regulations provide is a good entry point for community empowerment and has provided justification for work in 'sensitive' areas, such as those along the Thai-Myanmar border. Community-based natural resource management is often linked to NTFP production/value addition and marketing, as a means of building incentives for community participation. As a general rule, few NGOs are well positioned to link communities to markets. Exceptions include the NTFP-Exchange Program, Oxfam, and the Interchurch Organisation for Development Cooperation in the Netherlands.	Groups working in this area include: Community Capacities for Development, Mangrove Action Project (both in Cambodia); WARECOD (in Vietnam); and NTFP-Exchange Program, Oxfam and RECOFTC (all working in multiple countries).

Appendix 6. Preliminary List of REDD Projects and Other Forest Carbon Projects in the Indo-Burma Hotspot

Country	Agency	Target	Donor	Year	Project Title	Approach / Activities	Source
Regional	IUCN	Government	Sida / SENSA	2010	Preparing REDD in Vietnam, Lao PDR and Cambodia	Review existing forest revenue approaches, design a REDD-compliant Benefit Distribution System	14
Regional	IUCN	Multi-sectoral	Sida / SENSA	2010	Carbon financing potential for mangrove conservation in the Mekong Delta and forest landscape restoration in northern Thailand	Feasibility study to identify potential of coastal / upland forests for Voluntary Carbon Standards	15
Regional	SNV / WI / CF	Multi-sectoral	USAID / RDMA	2011-current	Lowering Emission in Asia's Forests Program – Cambodia, Lao PDR, Thailand, Vietnam	Assess, improve, implement REDD+-related forest policies, equitable benefits sharing	16
Regional	WWF	Multi-sectoral	?	2011-2014	Avoidance of deforestation/degradation in border area of southern Lao PDR/central Vietnam to preserve carbon sinks and biodiversity	Improve PA management, restore corridors, sustainable timber trade, prepare for REDD funding	18
Cambodia	CFI / Pact	Civil society	GoD / CCI/TGC	2007-current	Oddar Meanchey REDD Project	Test emerging REDD policies and measurement methods	2
Cambodia	FA	Multi-sectoral	CCI	2009-current	REDD+ Demonstration Project – direct support to Forestry Administration to develop 37 community forestry sites	Technical training (carbon measurements, data analysis), provision of GIS software, data kits; workshops	29
Cambodia	CI	Civil society	Multi-donor	2009	REDD Tier 1 Feasibility Study in Prey Long	Assess potential for creating carbon offsets for a pilot project	10
Cambodia	ONFI	Government	AFD	2008-2009	Technical support to the Forestry Administration to determine REDD feasibility and guide national decisions	Training on REDD modalities, procedures, tools, policy implementation options	10
Cambodia	IGES	Government	IGES	2011	Review of Cambodia's REDD Readiness: Progress and Challenges	Review of status and implementation priorities	12
Cambodia	CCAP	Government	GoN	2009-current	Preliminary REDD feasibility study – Koh Kong Province, including some protected areas	Measure historical carbon stocks, future deforestation trends, role of protected areas for REDD	30
Cambodia	RECOFTC	Multi-sectoral	Multi-donor	2010-current	REDD capacity building and policy development for national and provincial governments and civil society groups	Community carbon accounting, regional dialogue, planning, grassroots capacity building	31
Cambodia	IUCN / TFD	Multi-sectoral	NORAD / IIED	2010	Fifth REDD Readiness Field Dialogue	Study visit of international stakeholder groups to first REDD project site in Cambodia (Oddar Meanchey)	13

Country	Agency	Target	Donor	Year	Project Title	Approach / Activities	Source
Cambodia	JICA	Government	JICA	2011-2016	Facilitating the Implementation of REDD+ Strategy and Policy	Strengthen national framework for REDD implementation, capacity building of national agencies	19
Cambodia	WCS	Civil society	Multi-donor	2008-current	Carbon for Conservation – Cambodia project site: Seima Protection Forest	1st PA to conserve forest carbon as a key goal, provide local economic incentives biodiversity landscapes	20
Cambodia	WCS	Multi-sectoral	Multi-donor	2009-2010	REDD feasibility study, Northern Plains, Preah Vihear Province	Review status of forest and carbon stocks, deforestation rates and drivers	21
Cambodia	WA / ONFI	Multi-sectoral	?	2009-current	Southern Cardamom REDD Project – Koh Kong Province	Develop biomass inventory, apply carbon measurements, develop approach to enable REDD	10, 34
China	GIZ	Biodiversity	GIZ	2008-2011	Sino-German cooperation platform for the conservation of species-rich, carbon-storing ecosystems (currently no pilots in Hotspot)	Identify areas important for carbon storage and species richness, develop a 'Carbon and Biodiversity Atlas'	8
China	GoCh	Multi-sectoral	World Bank	2006-2012	Guangxi Integrated Forestry Development and Conservation Project	Improve sustainable forest resource use. Activities include carbon sequestration pilot program	3
China	GoCh	Government	?	2010-current	Low-carbon pilot program in selected provinces, including Guangdong and Yunnan	Local governments have committed to draft low-carbon development plans	5
China	TNC / CI	Civil society	USAID	2005-2010	Forest Restoration for Climate, Community, and Biodiversity in Tengchong County, Yunnan	Pilot project implemented, farmers trained in forest management, carbon sold on voluntary carbon market	6, 35
Lao PDR	GIZ	Multi-sectoral	GIZ	2010-2018	Lao-German Climate Protection through Avoided Deforestation Program – pilots in Nam Phoun and Nam Et-Phou Louey	Policy advice, capacity development, pilot projects and institutional support	21
Lao PDR	GoL	Multi-sectoral	JICA	2009-current	Participatory Land and Forest Management Project for Reducing Deforestation in Lao PDR	Reduce deforestation in northern Lao PDR, participatory land and forest management	22
Lao PDR	RECOFT	Civil society	NORAD	2009-2013	Building Grassroots Capacity for REDD+ (pilot sites in 8 northern provinces)	Training for ethnic groups/government, establish pilot sites, clarify stakeholder needs	32
Lao PDR	SNV	Multi-sectoral	Multi-donor	2011-current	World Bank Forest Investment Program: REDD+ (within the Strategic Climate Fund). Pilot country	Strengthen forest policies/practices, pilot models, lessons learnt to UNFCCC	17
Lao PDR	WCS	Multi-sectoral	GTZ	2011-current	REDD in Nam Et Phou Loey National Protected Area	Feasibility studies to develop voluntary carbon market, community management of carbon stocks	23

Country	Agency	Target	Donor	Year	Project Title	Approach / Activities	Source
Lao PDR	WCS	Multi-sectoral	MF / other	2009-2011	Carbon sequestration in Nam Kading National Protected Area, Bolikhamxay Province	Assess forest carbon stocks, protect them by strengthening local land-use management	4
Myanmar	UN-REDD	Government	UN-REDD	2010	National workshop to identify priorities for REDD implementation in Myanmar, with government, companies and NGOs	Role of forestry, how to link with UN-REDD program, implement REDD nationally	7
Myanmar	GoM	Government	UNDP	2011	Attendance at workshop: Combined Safeguards and Subregional Capacity Building Workshop on REDD-plus, Singapore, March	Presentation on current status of REDD preparation in Myanmar; no pilot projects yet	26
Myanmar	GoM	Civil society	?	2010	Community Small Scale Reforestation Project in Mangrove Forest of Ayeyarwady Delta	Rehabilitate mangroves for climate change, biodiversity and livelihoods	27
Thailand	GoT	Civil society	GEF	1996-1998	Global Alternatives to Slash and Burn Agriculture Phase II	Reduce GHG emissions. Promote alternatives to slash/burn agriculture	1
Vietnam	GIZ / CartONG	Multi-sectoral	Google	2009-current	UN-REDD pilot project - Lam Dong Province	Capacity building for REDD readiness, cross-border displacement of emissions	24
Vietnam	GoV	Government	UN REDD	2009-2011	Vietnam National REDD+ Program	Expand area under sustainable forest management, enhance carbon stocks, improve livelihoods	9
Vietnam	ICRAF	Multi-sectoral	EU	2009-2012	REDD through alternative land-uses in rainforests of the tropics (REDD-ALERT) – Bac Kan Province	Understand factors influencing attitudes to deforestation and GHGs	24
Vietnam	IUCN	Government	UN REDD	2009	Study to develop recommendations for designing a Benefit Distribution System for REDD revenues in Vietnam	Review forest revenue approaches, identify recommendations for benefit distribution	11
Vietnam	RECOFT	Civil society	NORAD	2009-2013	Building Grassroots Capacity for REDD+ (build upon other international REDD projects in Lam Dong, Bac Kan, Ca Mau)	Training for ethnic groups/government, establish pilot sites, clarify stakeholder needs	33
Vietnam	SNV / IIED / ITB	Biodiversity	Multi-donor	2011-2014	Exploring mechanisms to promote High-Biodiversity REDD+: Piloting in Vietnam (pilot activities in Lam Dong Province)	Identify and test mechanisms to promote high biodiversity REDD+; prepare forest carbon maps	36
Vietnam	SNV / WWF	Multi-sectoral	USAID / RDMA	2010-current	Cat Tien Landscape Pilot Pro-poor REDD+ Project	Pilot benefit distribution system through community-based carbon/biodiversity monitoring	16

Country	Agency	Target	Donor	Year	Project Title	Approach / Activities	Source
Vietnam	WAF	Multi-sectoral	WAF	2010-2012	Alternatives to Slash and Burn Partnership for the Tropical Forest Margins – pilot, Dak Nong Province	'REALU' - Reducing Emissions From All Land Uses. Pilot project	25

Sources: 1 = www.gefonline.org; 2 = Poffenberger (2009); 3 = http://www.worldbank.org/projects/; 4 = www.cbd.int/lifeweb/ecoservices2.shtml; 5 = www.climate-connect.co.uk/Home/?q=node/484; 6 = http://www.nature.org/ourinitiatives/urgentissues/climatechange/placesweprotect/tengchong-forest-yunan-province-china.xml; 7 = www.illegal-logging.info/item_single.php?it_id=4618&it=news; 8 = www.gtz.de/en/weltweit/asien-pazifik/vietnam; 9 = www.un-redd.org/UNREDDProgramme/CountryActions/VietNam; 10 = Bradley (2011); 11 = R. Mather *in litt.* 2011; 12 = IGES (2011);
13 = http://environment.yale.edu/tfd/dialogue/forests-and-climate/fifth-redd-readiness-field-dialogue/; 14 = Mather (2010); 15 = SENSA (2010);
16 = www.snvworld.org/en/regions/asia/ourwork/Pages/REDDnewsevent3.aspx; 17 = www.climateinvestmentfunds.org/cif/fip_pilot_programs;
18 = assets.panda.org/downloads/tor_pa_enforcement_ta_final.pdf; 19 = Y. Shibuya *in litt.* 2011; 20 = www.wcscambodia.org/conservation-challenges/climate-change/redd-demonstration-sites.html; 21 = /www.dof.maf.gov.la/eng/clipad.html; 22 = www.dof.maf.gov.la/eng/paredd.html;
23 = www.focusweb.org/sites/www.focusweb.org/files/Aug 10 2010 Lao REDD.pdf; 24 = www.redd-monitor.org/2010/09/07/redd-in-the-mekong-region;
25 = www.worldagroforestrycentre.org/sea/sites/default/files/download/documents/UPDATE-ProjectProfiles/PP update_REDD ALERT.pdf; 26 = Le Le Thein and Than Naing (2011); 28 = www.cbd.int/forest/doc/wscb-fbdcc-01/Sept2/presentation-myanmar-en.pdf;
29 = www.clintonfoundation.org/files/cci_newsletter_2010summer.pdf; 30 = www.ccap.org/docs/resources/1002/MOgonowski_Cambodia_Study_REDD_Event_5_April_2011.pdf; 31 = www.recoftc.org/site/RECOFTC-in-Cambodia; 32 = www.recoftc.org/site/Building-Grassroots-Capacity-in-Lao-PDR;
33 = www.recoftc.org/site/Building-Grassroots-Capacity-in-Vietnam; 34 = www.wildlifealliance.org/wildlife-protection; 35 = (Translinks 2009);
36 = www.snvworld.org/en/regions/asia/ourwork/Pages/HighBiodiversityREDDnews2.aspx.
Key: AFD = l'Agence Française de Développement; CCAP = The Centre for Clean Air Policy; CCI = Clinton Climate Initiative; CF = Climate Focus; CFI = Community Forestry International; CI = Conservation International; FA = Forestry Administration; GoCh = Government of China; GoD = Government of Denmark; GEF = Global Environment Facility; GERES = Groupe Energies Renouvelables, Environnement et Solidarités; GIZ = Deutsche Gesellschaft für Internationale Zusammenarbeit (formerly GTZ); GoL = Government of Lao PDR; GoM = Government of Myanmar; GoN = Government of Norway; GoT = Government of Thailand; IIED = International Institute for Environment and Development; ITB = Institute for Tropical Biology; IUCN = International Union for the Conservation of Nature; JICA = Japan International Cooperation Agency; MF = John D. and Catherine T. MacArthur Foundation; NORAD = Norwegian Agency for Development Cooperation; ONFI = Organisation National des Forets-International; RECOFTC = The Centre for People and Forests; RDMA = Regional Development Mission for Asia; Sida = Swedish International Development Cooperation Agency; SENSA = Swedish Environment Secretariat for Asia; SNV = Netherlands Development Organisation; TFD = The Forests Dialogue; TGC = Terra Global Capital; TNC = The Nature Conservancy; USAID = United States Agency for International Development; WAF = World Agroforestry Centre; WCS = Wildlife Conservation Society; WI = Winrock International.

Appendix 7. Preliminary List of Climate Change Adaptation Projects Relevant to Biodiversity Conservation in the Indo-Burma Hotspot

Country	Agency	Target	Donor	Year	Project title	Approach / activities	Source
Regional	IUCN	Multi-sectoral	EU	2011-2014	Building coastal resilience in Vietnam, Cambodia and Thailand	Strengthen planning capacity of local government and communities to plan for climate change (8 provinces)	4
Regional	IUCN	Multi-sectoral	GoF	2008-2014	Mekong Water Dialogues in Cambodia, Lao PDR, Thailand, Vietnam	Improve water governance, facilitate decision-making to improve livelihood security, human and ecosystem health	2
Regional	World Bank	Civil society	Multi-donor	Pipe-line	Mekong Integrated Water Resources Management	Strengthen water resource management, sanitation and flood protection	3
Regional	ICEM/IUCN/ST/WF	Government	MRC	2009-2025	Design and implementation of MRC Climate Change Adaptation Initiative – Cambodia, Lao PDR, Thailand, Vietnam	Increase national capacity to address CC, mainstream CC adaptations into planning, assess impacts to flow regimes	20,23
Regional	MRC / ICEM	Government	MRC	2011	Basin-wide CC Impact and Vulnerability Assessment for Wetlands of Lower Mekong Basin for Adaptation Planning	Develop and trial pilot methods for assessment, build national capacity for adaptation planning	20,23
Regional	Various	Multi-sectoral	Multi-donor	2004-current	Mangroves For the Future (programs in Thailand, Vietnam; Cambodia/Myanmar are 'outreach nations', little investment)	Strengthen coastal resilience to natural disasters, CC etc. Initiated by IUCN, UNDP, now with multi-partners	26
Regional	IWMI / WorldFish	Civil society	Multi-donor	2010	Review. Climate change, water and agriculture in the Greater Mekong Subregion	Assess potential impacts to water resources, identify actions to improve resilience of water sector and food production	11
Regional	IWMI / WorldFish	Civil society	Multi-donor	2010	Review. Rethinking agriculture in the GMS: how to meet food needs, enhance ecosystem services, cope with CC	Assess need for new agricultural approaches and ecosystem approaches to meet food needs under climate change	11
Regional	WWF	Multi-sectoral	Multi-donor	2009-current	Regional climate change agreement for GMS	Coordinate regional agreement on climate change approaches for natural resource management; integrate CC into existing projects	16
Regional	WWF	Biodiversity	MF	2007-2009	Assessment of vulnerability and impact of the freshwater and forest ecosystems in the Lower Mekong focal area	Identify adaptation priorities/approaches/recommendations under climate change, multi-stakeholder regional workshop	17,22

Country	Agency	Target	Donor	Year	Project title	Approach / activities	Source
Regional	In pipeline	Multi-sectoral	USAID / RDMA	2011-?	Mekong River Basin Climate Change Adaptation Project	Strengthen capacity for CC adaptation, methods for climate resiliency, scale-up model actions	25
Cambodia	BirdLife	Biodiversity	MF	2011	Avoiding deforestation and combating climate change: Western Siem Pang Forest	Pilot survey/threat assessment of forest carbon stocks, assess potential climate change impacts to threatened birds	14
Cambodia	BirdLife	Biodiversity	?	2010-2011	Biodiversity assessment of the REDD community forest project in Oddar Meanchey Province	Identify high-value conservation areas for biodiversity in support of the site's REDD project	15
Cambodia	CI	Multi-sectoral	MF	2011-2012	Developing adaptation to climate change at Tonle Sap Lake	Identify CC scenarios/impacts, sites for action, role of ecosystems in adaptation, drive policy changes	19
Cambodia	GoC	Government	GEF	1998-2004	Enabling Cambodia to Prepare its First National Communication in Response to its Commitments to FCCC	Build national capacity to implement UN FCCC, climate change planning into forest/agricultural/energy sectors	1
Cambodia	GoC	Government	GEF	2003-2007	Programme of Action for Adaptation to Climate Change	Develop NAPA, identify priority activities to enhance resilience to climate change	1
Cambodia	GoC	Civil society	GEF	2009-?	Promoting Climate-Resilient Water Management and Agricultural Practices	Reduce vulnerability of agricultural sector to climate-caused changes in water availability	1
Cambodia	GoC	Civil society	GEF	2009-?	Vulnerability Assessment and Adaptation in the Coastal Zone of Cambodia for Livelihood Improvement and Ecosystems	Reduce vulnerability of coastal communities to impacts of climate change by strengthening policy and science	1
Cambodia	MWBP	Civil society	Multi-donor	2005	Vulnerability assessment of climate risks, Stung Treng Province	Identify potential flood impacts on rural livelihoods and local coping strategies	6a
Cambodia	NCCC	Multi-sectoral	Multi-donor	2009	First National Climate Change Forum	Raise awareness among government, development partners and civil society of climate change (>300 participants)	1
Cambodia	WorldFish	Civil society	ACIAR/ JMoF	2011	Review. Fish supply and demand scenarios in Cambodia and perspectives on the future role of aquaculture	Study on future fish supply scenarios including the impacts of climate change	11
Cambodia	WorldFish	Civil society	WF	2009	Review. Climate change and fisheries: vulnerability and adaptation in Cambodia	Study on adaptation by local fisheries to combined impacts of climate change, hydropower and other threats	11

Country	Agency	Target	Donor	Year	Project title	Approach / activities	Source
Cambodia	WWF	Multi-sectoral	MF / other	current	Incorporate adaptation approaches into current natural resource management project in Kratie and Stung Provinces, Mekong River	Assist local government/communities to develop adaptation strategies, strengthen local resilience to CC	18
Lao PDR	GoL	Government	GEF	2003-2004	Prepare National Adaptation Program of Action	Develop NAPA for urgent needs in agriculture, forestry, water resources, human health	1,24
Lao PDR	GoL	Civil society	GEF	2010-2014	Improving the Resilience of the Agriculture Sector to Climate Change Impacts	Minimise food insecurity resulting from climate change and vulnerability of farmers to extreme flooding/drought	1
Lao PDR	GIZ	Biodiversity	GIZ	2010	Assessment of climate change vulnerability in Hin Namno National Protected Area	Biodiversity conservation. Assessed potential impacts of climate change to the park and a conservation project	5
Lao PDR	MWBP	Civil society	Multi-donor	2005	Vulnerability assessment of climate risks, Attapu Province	Identify potential flood impacts on rural livelihoods and local coping strategies	6b
Lao PDR	WREA	Government	ADB	2010-2012	Capacity Enhancement for Coping with Climate Change	Develop national strategy, strengthen capacity for adaptation planning, raise public awareness	7
Myanmar	MSN	Multi-sectoral	MSN	2006-2010	Ecological Mangrove Restoration Project in the Ayeyarwady Delta	Planning with government and communities, mangrove replanting, nursery establishment, land management	29
Myanmar	GoM	Government	GEF	2008	Prepare National Adaptation Program of Action	Prepare NAPA, identify priority activities that require urgent response	1
Myanmar	?	Multi-sectoral	?	1999-2000	Preliminary assessment of national capacity needs for climate change (project details unclear)	Web document outlining some natural resource management issues for Myanmar in the context of climate change; source unclear	27
Thailand	GoT	Civil society	GEF	2010-2013	Strengthening Capacity of Vulnerable Coastal Communities to the Risk of Climate Change and Extreme Weather Events	Integrate climate change vulnerabilities and adaptation into development planning in three coastal provinces	1
Thailand	IUCN	Biodiversity	MFF	2011	Management Effectiveness Evaluation for Marine and Coastal Protected Areas	Biodiversity conservation. Management Effectiveness Evaluation of Marine/Coastal Protected Areas	8
Thailand	IUCN	Biodiversity	UNDP	2011	Developing a new National Protected Areas System Master Plan	Biodiversity conservation. UNDP/CBD Programme of Works on Protected Areas	8
Thailand	MWBP	Civil society	Multi-donor	2005	Vulnerability assessment of climate risks in the Lower Songkhram River Basin	Identify potential flood impacts on rural livelihoods and local coping strategies	6c

Country	Agency	Target	Donor	Year	Project title	Approach / activities	Source
Thailand	USAID	Civil society	USAID	2008	Sustainable Livelihoods and Water Management in Shared River Basins	Case study: identify strategies for villagers relying on climate sensitive income sources to maintain livelihoods	25
Thailand	WWF	Multi-sectoral	Multi-donor	2009-2010	Assessment of climate change vulnerability for a coastal province, Krabi	Assess potential CC impacts to people, natural resource management, biodiversity, identify approaches to initiate adaptation activities	16
Vietnam	CARE	Civil society	Multi-donor	2008-current	Community-Based Mangrove Reforestation and Management Project in Thanh Hoa Province	Planting and management of mangroves to protect vulnerable communities from natural disasters	13
Vietnam	CARE	Civil society	Multi-donor	current	Integrating climate change into existing projects; responding to emergencies (floods, storms, droughts, saline intrusion)	Integrate climate change adaptation into existing CARE projects; ongoing projects to address disaster management	13
Vietnam	CARE / other	Civil society	Multi-donor	current	Co-establishment (with other agencies) of the NGO Climate Change Working Group	Provide inputs to national policy formulation, develop a capacity building program for NGO staff	13
Vietnam	ELAN	Civil society	WWF/IUCN/IIED/CARE	2011	Ecosystems and Livelihoods Adaptation Network (part of a multi-nation project)	Enhance resilience of poor and marginalized people to climate change impacts	9
Vietnam	GIZ	Multi-sectoral	GIZ	2008-2016	Conservation and Development of the Kien Giang Biosphere Reserve	Strengthen biodiversity/coastal resilience to CC, management training, improve livelihoods	21
Vietnam	GIZ	Multi-sectoral	GIZ	2007-2013	Management of Natural Resources in the Coastal Zone of Soc Trang Province	Integrated coastal area co-management, CC adaptation, mangrove rehabilitation, erosion control	21
Vietnam	GIZ	Biodiversity	GIZ	2010-2014	Adaptation to climate change through the promotion of biodiversity in Bac Lieu Province	Strengthen PA management, restore coastal forests, reduce local dependence on forest	21
Vietnam	GIZ	Multi-sectoral	GIZ	2008-2011	Sustainable Management of Coastal Forest Ecosystems in Bac Lieu Province	Implement integrated coastal zone development, improve coastal resilience, raise provincial management capacity	21
Vietnam	GIZ	Multi-sectoral	GIZ	Pipe-line	Two adaptation projects in the Mekong Delta are under preparation	No other details at this time	28
Vietnam	GIZ	Biodiversity	GIZ	current	2 biodiversity-oriented climate change projects	No other details at this time	28

Country	Agency	Target	Donor	Year	Project title	Approach / activities	Source
Vietnam	UNESCO / GoK	Multi-sectoral	Multi-donor	2006-2011	Jeju Initiative: Supporting coastal biosphere reserves in Asia-Pacific (2 sites in Vietnam: Kien Giang and Can Gio reserves)	Identify, promote and approaches to address sea-level rise; facilitate information exchange with other nations	30, 31
Vietnam	GoV	Multi-sectoral	ADB, GoA	2010-2011	Climate Change Impact and Adaptation Study in the Mekong Delta	Identify climate change impacts on natural, social, economic systems, identify adaptation measures	10
Vietnam	GoV	Multi-sectoral	GEF, ADB	2010-2014	Climate-resilient Infrastructure Planning and Coastal Zone Development	Increase resilience of communal and critical economic infrastructure in coastal areas	1
Vietnam	GoV	Civil society	GEF	2005-2007	Community-based Adaptation	Develop frameworks to respond to community adaptation needs, identify/financing diverse adaptation projects	1
Vietnam	GoV	Multi-sectoral	?	2009	Building Resilience: Adaptive strategies for coastal livelihoods (Thua Thien Hue and Ha Tinh Provinces)	Participatory study with community and local government: identify adaptation mechanisms to build resilience	32
Vietnam	WorldFish	Civil society	World Bank	2010	Review of aquaculture in the Mekong Delta under climate change	Desktop findings for a sectoral study on Economics of Adaptation to Climate Change (EACC)	11
Vietnam	WWF	Multi-sectoral	Multi-donor	2009-2010	Assessment of climate change vulnerability for a coastal province, Ca Mau	Identify CC impacts to key economic sectors, discuss strategies to improve resilience	16
Vietnam	WWF	Multi-sectoral	Multi-donor	current	Incorporate adaptation approaches into current natural resource management project in Ben Tre province	Assist local government/communities to develop adaptation strategies, strengthen local resilience to CC	18

Sources: 1 = www.gefonline.org; 2 = http://www.iucn.org/about/union/secretariat/offices/asia/regional_activities/mekong_water_dialogues__mwd;
3 = http://web.worldbank.org/external/projects/main?pagePK=64283627&piPK=73230&theSitePK=40941&menuPK=228424&Projectid=P104806;
4 = www.iucn.org/about/union/secretariat/offices/asia/asia_where_work/thailand/our_projects/building_resilience_to_climate_change_impacts__coastal_southeast_asia/; 5 = Fröde (2010); 6a = MWBP (2005a); 6b = MWBP (2005b); 6c = MWBP (2005c); 7 = ADB (2010a); 8 = R. Mather *in litt.* 2011; 9 = www.elanadapt.net;
10 = ADB (2009); 11 = http://worldfish.catalog.cgiar.org, 12 = www.iucn.org; 13 = www.care.org.au;
14 = www.birdlife.org/forests/pdfs/Cambodia_profile.pdf; 15 = Elliott *et al.* (2011); 16 = wwf.panda.org/what_we_do/where_we_work/greatermekong/challenges_in_the_greater_mekong/climate_change_in_the_greater_mekong/; 17 = Blate (2010); 18 = G. Blate *in litt*. 2011; 19 = www.conservation.org/learn/climate/strategies/field/pages/projects.aspx; 20 = www.icem.com.au; 21 = www.gtz.de/en/weltweit/asien-pazifik/vietnam;
22 = www.macfound.org/site/c.lkLXJ8MQKrH/b.1014009/k.33C0/International_Grantmaking__Conservation__Recent_Grants.htm#mekong;
23 = www.mrcmekong.org; 24 = WREA (2009); 25 = www.ngocentre.org.vn/files/docs/USAID_Songkram.pdf; 26 = www.mangrovesforthefuture.org;
27 = http://unfccc.int/files/documentation/workshops_documentation/application/pdf/cebucp.pdf; 28 = K. Schmitt *in litt*. 2011;
29 = http://mangroveactionproject.org/files/map-asia/MSNrestorationprogressreport.pdf (MSN 2006); 30 = Möller (2011); 31 = UNESCO (2006); 32 = MoNRE (2010).

Key: ACIAR = Australian Centre for International Agricultural Research; ADB = Asian Development Bank; CBD = Convention on Biological Diversity; CI = Conservation International; EU = European Union; GoA = Government of Australia; GoC = Government of Cambodia; GoD = Government of Denmark; GEF = Global Environment Facility; GoF = Government of Finland; GoK = Government of Korea; GIZ = Deutsche Gesellschaft für Internationale Zusammenarbeit (formerly GTZ); GoL = Government of Lao PDR; GoM = Government of Myanmar; GoT = Government of Thailand; GoV = Government of Vietnam; ICEM = International Centre for Environmental Management; IIED = International Institute for Environment and Development; IUCN = International Union for the Conservation of Nature; IWMI = International Water Management Institute; JICA = Japan International Cooperation Agency; JMoF = Japan Ministry of Foreign Affairs; MF = John D. and Catherine T. MacArthur Foundation; MFF = Mangroves for the Future; MWBP = Mekong Wetlands Biodiversity Conservation and Sustainable Use Programme; MRC = Mekong River Commission; NCCC = National Climate Change Committee; UNESCO = United Nations Educational, Scientific and Cultural Organisation; USAID = United States Agency for International Development; WF = WorldFish Center; WREA = Water Resources and Environment Agency.