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Global Climate Change in the Asia-Pacific Region:

An Analysis and Road Map for the USAID Regional Development Mission for Asia

Regional Development Mission for Asia
US Agency for International Development
Bangkok

July 2008

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Cover graphic: Projections of Surface Temperatures (2090-2099), in *Summary for Policymakers. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, p.15.

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ACRONYMS

ACCAF	Asia Climate Change Assistance Facility
ADB	Asian Development Bank
AECEN	Asian Environmental Compliance and Enforcement Network
APEC	Asia-Pacific Economic Cooperation
APERC	Asia-Pacific Energy Research Centre
APP	Asia-Pacific Partnership on Clean Development and Climate
ARBCP	Asia Regional Biodiversity Conservation Program
ASEAN	Association of Southeast Asian Nations
BRESL	Barrier Removal for Energy Efficiency Standards and Labeling (of GEF)
CAI-Asia	Clean Air Initiative for Asia
CCBA	Climate, Community, and Biodiversity Alliance
CDCP	Clean Development and Climate Program (of USAID/RDMA)
CDM	Clean Development Mechanism
CFL	Compact fluorescent lamp
CI	Conservation International
CIFOR	Center for International Forestry Research
CO_2	Carbon dioxide
COP	Conference of the Parties
CPO	Crude palm oil
CSR	Corporate social responsibility
CTF	Clean Technology Fund
CTI	Coral Triangle Initiative
CTO	Cognizant Technical Officer
DOCS	Documentation, Outreach, and Communications Specialist
DOE	US Department of Energy
DOI	US Department of Interior
DOS	US Department of State
ECO-Asia	Environmental Cooperation-Asia

EGAT	Economic Growth, Agriculture, and Trade Bureau (USAID)
EPA	US Environmental Protection Agency
FAF	Foreign Assistance Framework
FAO	Food and Agriculture Organization (of the United Nations)
FCPF	Forest Carbon Partnership Facility (of the World Bank)
FSM	Federated States of Micronesia
FWI	Forest Watch Indonesia
GCC	Global Climate Change
GDC	Global Development Commons
GEF	Global Environment Facility
GEOSS	Global Earth Observation System of Systems
GFW	Global Forest Watch
GHG	Greenhouse gas
GIS	Geographic information systems
IEA	International Energy Agency
ICRI	International Coral Reef Initiative
IOC	Intergovernmental Oceanographic Commission (of the United Nations)
IOM	International Maritime Organization (of the United Nations)
IOTWS	Indian Ocean Tsunami Warning System
IR	Intermediate result
IUCN	World Conservation Union
IWRM	Integrated Water Resources Management
LEED	Leadership in Energy and Environmental Design
MDG	Millennium Development Goal
MEP	Major Economies Process
MPA	Marine protected area
MRB	Mekong River Basin
MRC	Mekong River Commission
MSP	Mission Strategic Plan
Mt	million metric tons
NASA	National Air and Space Administration

NGO	Non-governmental organization
ODA	Official development assistance
OES	Bureau of Oceans and International Environmental and Scientific Affairs (US Department of State)
OMB	White House Office of Management and Budget
PDR	People's Democratic Republic
PES	Payment for ecosystem services
RAFT	Responsible Asia Forestry and Trade Program
RDMA	USAID Regional Development Mission for Asia
REDD	Reducing Emissions from Deforestation and Degradation
REO	Regional Environment Office (USAID/RDMA)
SEAWUN	South East Asia Water Utility Network
SERVIR	Spanish acronym for Regional Visualization and Monitoring System
SFM	Sustainable forest management
SIDS	Small Island Developing States
SPREP	South Pacific Regional Environment Programme
SPC	South Pacific Center
TNC	The Nature Conservancy
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNFCCC	United Nations Framework Convention on Climate Change
US	United States of America
USAID	US Agency for International Development
USFS	US Forest Service
USG	US Government
WWF	World Wildlife Fund

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PREFACE

As the world's most populous region, Asia is at the center of the global debate on how best to formulate an international response to global climate change. As Asia continues to experience unprecedented rates of economic growth, the region's energy, industrial, forestry, agricultural, and transport sectors must undergo significant transformation to reduce greenhouse gas emissions if the international community is realistically expected to reach emissions stabilization in the coming decades. By 2030, Asia is anticipated to generate as much as half of the world's predicted total carbon emissions, most of which will come from China and India. While the region is increasingly contributing to the challenge of climate change, Asia is also expected to experience among the greatest potential impacts of climate change, such as sea-level rise, severe storms, climate variability, and other risks to human environments, biodiversity, and infrastructure.

Recognizing these challenges and opportunities, USAID/RDMA intends to provide technical and strategic leadership in addressing climate change and development in Asia and anticipates a surge in funding for USAID activities in Asia that address greenhouse gas mitigation, forestry and land use, adaptation to climate change impacts, and related cross-cutting activities. In addition, RDMA anticipates increased demand from USAID Bilateral Missions in Asia for technical assistance and advisory services in mainstreaming climate change issues into their overall development activities. As a result, RDMA requested technical assistance from the EGAT Bureau to conduct an assessment and develop a road map during February-March 2008 for a future regional climate change portfolio of programs and services that RDMA will manage in close collaboration with the USAID/ASIA Bureau, EGAT, Bilateral Missions and US Embassies, US Department of State, and other USG government partners.

EXECUTIVE SUMMARY

In many ways, the countries of Asia are at the intersection of the development, energy, environment, and climate change paths. Asian economies are among the fastest growing globally, driving rapid growth in energy demand and greenhouse gas emissions. At the same time, home to nearly one-half of the world's poor, Asia is vulnerable to many expected impacts from climate change. Asian mega-cities are often situated on rivers and coasts. The Regional Development Mission for Asia (RDMA) is in an important position to address climate change and development in a key region, limiting future climate change impacts and improving livelihoods. Combined with RDMA's roles in USAID non-presence countries and relationships with other USAID missions in the region, RDMA can have direct impacts at the local, national, regional, and ultimately global level.

Climate change is a cross-cutting issue, involving nearly all sectors necessary for human development and poverty reduction. This analysis and road map focused on the existing RDMA program priorities: clean energy, water, forests, and islands and coasts. Each of these areas is important for development in a changing climate, with opportunities for influential outcomes from a regional platform. The analysis points to significant information and capacity gaps that cut across all sectors in countries across Asia. In addition, climate change policy and actions are also creating a number of emerging financial resources and potential partners as opportunities for USAID regional involvement.

In late 2007, Olivier Carduner, USAID/RDMA Mission Director, challenged the Regional Environment Office (REO) to develop a road map for RDMA to provide technical and strategic leadership in addressing climate change and development in Asia. In response to that challenge, the purpose of this analysis and road map is to identify regional climate change priorities and interventions for RDMA to support in Asia during FY2008-FY2012.

The long term success of RDMA's development programs will depend on how this changing climate is considered in planning and implementation. Will energy sector investments change from current trends to a cleaner development path? Will more sustainable forestry and agricultural practices help stem the rate of emissions from land use? Will protected areas for biodiversity be resilient to temperature and precipitation changes over the coming decades? Will water utilities be able to cope with extreme events and altered seasonal water availability? Will coastal communities and national economies reliant on coral reefs, fisheries, and tourism be resilient to increased temperatures, ocean acidification, sea level rise, and storm surge? Will people in Asia have the technical capacity to take advantage of new funding resources? Without incorporation of climate change into existing priority programs, development success becomes more uncertain when viewed in the long term.

In the analysis of existing activities and in making recommendations for new activities, the road map aims to break from traditional thought in which energy and forest activities are only seen as ways to reduce emissions and adaptation is seen as something external to development. Instead this analysis and road map describes opportunities to incorporate both mitigation and adaptation into activities that primarily serve a development purpose. The document identifies opportunities for mainstreaming climate change into existing programs, utilizing tools and

methods developed and supported by USAID's Economic Growth, Agriculture and Trade (EGAT) Bureau, and also proposes some new programs which often build off existing successes.

This analysis and road map outlines five focus areas for RDMA to support in its regional programs, and in bilateral contexts where RDMA is the responsible Mission, including: clean energy; forests and land use change; coasts and coral reef ecosystems; freshwater resources and ecosystems; and integrative climate change services initiatives. As initially developed with EGAT's assistance, this analysis and road map provides detailed discussion of each of these focus areas in Section 3, "Assessments, Opportunities, and Programming Priorities." Of these focus areas, however, RDMA has identified the first three—**clean energy, forests and land use change, and coasts and coral reef ecosystems**—as immediate programming priorities, as well as regional climate change advisory support under integrative climate change services. These priorities are based on RDMA's anticipated funding, linkages and complementarity with ongoing programs, opportunities for leveraging and partnering, and current USG policy priorities. Nevertheless, RMDA intends to consider supporting the remaining focus areas should additional program funding become available.

In the **Clean Energy** program area, the road map recommends building on and expanding RDMA's existing Environmental Cooperation-Asia Clean Development and Climate Program (ECO-Asia CDCP) and further complementing efforts under the Asia-Pacific Partnership on Clean Development and Climate (APP).

- RDMA would build on ECO-Asia CDCP and APP to expand the market for quality compact fluorescent lamps (CFLs) by promoting consumer awareness of high-quality CFL products through dissemination of the results of the current joint product benchmarking initiative between ECO-Asia CDCP and the Australian Government, and by promoting bulk procurements by utilities, governments, or the private sector, to help encourage a market shift towards high quality CFL products.

- With private sector involvement, a Cleaner Coal Competition would promote the deployment of clean coal technologies by offering significant prize money for the highest emissions reductions resulting from adoption of cleaner technologies in the rehabilitation of operating coal power plants or in new power plant designs.

- RDMA would support partnerships to increase efficiency of small coal power plants through 'twinning' arrangements between two or more small coal power plants in China and/or India with US coal power plants to facilitate information sharing on best operating practices and technologies, leading up to the identification and implementation of plant rehabilitation activities.

- A new US-China clean energy partnership would address the high priority area of end-use energy consumption through public-private alliances designed to engage the private sector in introducing energy efficiency strategies and technologies during an unprecedented construction boom in China.

- The creation of a Clean Energy Project Development Facility in the region would provide technical assistance to screen project 'ideas' and help advance them into concrete proposals for private or public funding.

For activities in **Forests and Land Use Change**, the road map recommends building on and expanding existing RDMA environment programs, and initiating an activity with new FY 2009 funding to address the contentious issue of biofuels.

- A new Asia Climate and Forests Initiative would integrate climate change objectives into RDMA's Responsible Asia Forestry and Trade (RAFT) Program by expanding current field activities, including incorporation of carbon monitoring, so that USAID assistance has a great immediate impact in measurably reducing carbon emissions. RDMA would supplement this work with new activities that can provide regional leverage to mainstream approaches for reducing emissions from deforestation across the region.

- RDMA would extend support for the Asia Regional Biodiversity Conservation Program (ARBCP) for FY 2009 and 2010 in order to incorporate carbon sequestration services into the ongoing payments for ecosystem services (PES) activity in the Dong Nai River Basin (from which Ho Chi Minh City derives its water supplies and considerable hydropower), consolidate the path-breaking new national PES policy (adopted in March 2008), and respond to requests from Cambodia and Lao PDR for similar ARBCP assistance on PES policy and practice.

- A new Biofuels Options and Standards Strategy would include a consultative and analytical study on issues and options for the biofuels sector in Asia, review and assess sustainable biofuels principles and guidelines, engage with key private sector investors and governments to develop alliances, and incorporate robust GHG accounting.

For **Coasts and Coral Reef Ecosystems**, the road map recommends an umbrella regional program to bring human development and adaptation expertise to the region's place-based Coral Triangle Initiative (CTI) and the Micronesia Challenge, and other locations.

- A regional Ridge to Reef Adaptation Initiative: Coasts, Islands, and the Coral Triangle would support climate change adaptation for Small Island Developing States (SIDS), priority coral reef ecosystems, and highly vulnerable coastal areas through a regional platform that provides the tools, techniques, and capacity-building necessary to develop and implement integrated nature-based climate change adaptation strategies. Nature-based adaptation strategies can help people and communities deal with climate change impacts by protecting natural systems and the benefits they provide—shoreline protection, erosion control, as well as food from fisheries, jobs and income.

For **Freshwater Resources and Ecosystems**, the road map recommends activities building on current partnerships and addressing rising concerns in Asia.

- RDMA would prepare and launch, through a comprehensive consultative process, a detailed policy research and action report on the likely impacts of climate change on the entire Mekong Ecosystem (Himalayas to the Delta). Based on that report, RDMA would develop a comprehensive adaptation strategy for the entire Mekong Ecosystem and build the technical and political support and partnerships to implement adaptation activities at sub-regional and national levels.

- RDMA would integrate activities to promote the improved management of water and energy resources into the current ECO-Asia Water and Sanitation program. In addition to assisting utilities to cope with climate change impacts, incorporation of water and

energy conservation and efficiency actions can help meet USAID development objectives of increasing access to service and improving service quality.

- A Water Utility Risk Assessment and Planning activity would assist selected water utilities serving large or mega-cities in Asia to investigate their vulnerability to climate change.

In response to RDMA's interest in a regional technical assistance activity for climate change, the road map recommends two **Integrative Climate Change Services Initiatives**.

- An Asia Regional Visualization and Monitoring System (ARVMS) would strengthen the regional information base for action on climate change, to promote economic development broadly while supporting both mitigation and adaptation activities. This new activity would develop and disseminate climate information and other environmental information and decision-support tools for climate resilient development, supported by new FY09 funding.

- The Asia Climate Change Assistance Facility (ACCAF) would serve as a new regional platform to provide tools, information, and technical assistance on climate change mitigation and adaptation to USAID Bilateral Missions and to USAID programs in non-presence countries. ACCAF's portfolio of services would span the various climate change-related sectors above.

1. INTRODUCTION

Climate change and the impact that it will have on key industries such as agriculture, tourism, energy, transport, and insurance, is as important as interest rate risk and exchange risk.

—Henri de Castries, Chairman of the Management Board and Chief Executive of AXA

1.1 Overview of a Changing World

We are not living in the same world as when the Brundtland Commission defined sustainable development in the early 1980s, or when the Rio Summit agreed to the United Nations Framework Convention on Climate Change (UNFCCC), the Convention on Biodiversity and the Convention to Combat Desertification in 1992. Countries that were considered "developing" now have space agencies, large middle classes, nuclear weapons, significant assistance efforts in other developing countries, and globally-significant greenhouse gas (GHG) emissions. However, continued poverty and inequity within countries drives assistance efforts from donor countries, agencies, and charitable organizations. While the US Government (USG) has doubled development assistance in this decade, American private capital flows to the developing world have tripled over the last three years, and now represent over 80% of capital funding to developing countries.

The global climate is becoming different from the conditions within which current human societies developed following the last ice age about 10,000 years ago; climate change has been particularly marked in the past century. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC 2007a, WGI) has concluded that it is "unequivocal" that Earth's climate is warming, "as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global mean sea level" and that it is "very likely (greater than 90% probability)" that emissions of heat-trapping gases from human activities have caused "most of the observed increase in globally averaged temperatures since the mid-20th century." Evidence that human activities are the major cause of recent climate change is even stronger than in prior assessments.

In many ways, the countries of Asia are at the intersection of the development, energy, environment, and climate change paths. Asian economies are among the fastest growing globally, driving energy demand growth and imports of coal and petroleum. China and India alone are home to over one-third of global population and nearly one-half of the world's poor. Asian mega-cities are often situated on rivers and coasts that are vulnerable to climate changes and impacts.

During the past two decades, greenhouse gas emissions from Asian countries have been increasing rapidly. The International Energy Agency (IEA) estimates that China has overtaken the United States as the largest carbon dioxide emitter from energy, with India (fourth), and South Korea (seventh) among the top emitters. Further, ongoing changes in land use represent significant contributions to carbon dioxide emissions in many of the larger Asian countries such as Indonesia and the Philippines. Including emissions from deforestation, Indonesia has become

the third largest greenhouse gas emitter worldwide. Growth in energy consumption is expected to lead to a 213% increase in greenhouse gas emissions in Asian countries from 2002 to 2030.

At the same time, Asia is vulnerable to many expected impacts from climate change. A rise in sea level would impact small island states such as the Maldives and Kiribati, and many of Asia's largest coastal cities, such as Jakarta, Bangkok, Manila, Shanghai, and Ho Chi Minh City. Tens of millions of people in Asia may have to be resettled. Further, the expected greater intensity of cyclones and typhoons could have a larger impact than before on Bangladesh, China, India, Vietnam, and the Philippines, whose coastal areas already encounter among the world's worst weather-related disasters year after year. Parts of many countries in Asia, including Northwestern India, Western China, and almost all of Pakistan, are already suffering from shortages of water, as well as land degradation and desertification, which will be further exacerbated by climate change.

For planning or implementing development assistance, one cannot think of how the world used to be or how it is known now. One cannot look at this dynamic problem of development in a changing climate through old lenses. Sun Tzu said, "He who can modify his tactics in relation to his opponent, and thereby succeed in winning, may be called a heaven-born captain." Given the Agency's mission of economic development and poverty reduction, USAID needs to incorporate the changing climate conditions and trends into its assistance strategies, to maximize the lasting legacy of US assistance for economic growth, human well-being, and environmental sustainability over the long term.

1.2 Climate Change and Development in Asia

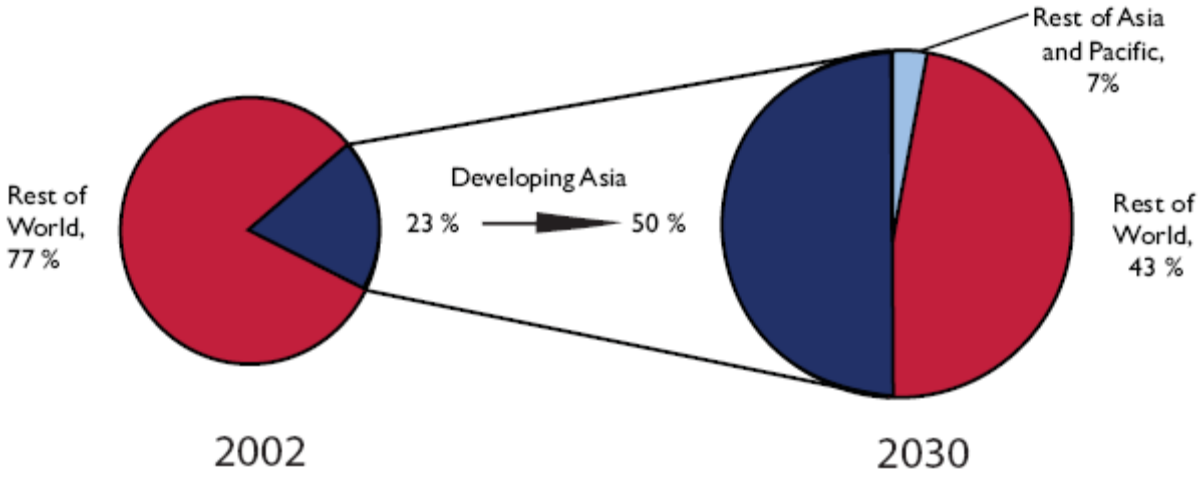
Energy Growth and Climate Change

Until now, most of the greenhouse gas emissions have come from the developed world, but in this current decade emissions from developing countries will become the majority of annual global emissions. Emissions from China, India, and Indonesia will produce a large share of this change.

Energy demands for rapidly industrializing economies are expanding at rates never before seen, as countries try to meet energy needs of billions of people. During the next 25 years, the IEA (2006) estimates that investments of more than US$6.2 trillion will be needed to build and maintain the energy supply infrastructure to satisfy projected demand in developing Asian economies (USAID/RDMA 2007). An estimated $60 billion or more is needed to provide cleaner technology rather than least-cost equipment.

Projections for energy-related emissions indicate that greenhouse gas emissions for the next 30 years will be greater than all emissions since the start of the Industrial Revolution. A majority of this emissions growth will take place in the Asia region, as China and India continue their rapid industrial growth. If the region's robust economic growth continues as expected, the energy consumption of developing Asian countries will more than double during the next 25 years, while carbon dioxide (CO_2) emissions will increase more than three-fold as energy supplies, dominated by coal, become more carbon intensive (APERC, 2006; IEA 2006).

Figure 1-1. Contribution of Asia developing countries to greenhouse gas emissions growth



Source: IEA, 2006.

Cooperation on mitigation provides opportunities for clean technology deployment and diffusion. First, it is more cost effective to deploy cleaner technology than to retrofit old technology. Second, increasing deployment will bring down unit costs. Energy efficiency investments pay off: IEA analysis has shown that demand-side investments in more efficient electrical goods are particularly cost-effective; on average, an additional US$1 invested in more efficient electrical equipment and appliances avoids more than US$2 in investment in power generation, transmission, and distribution infrastructure.

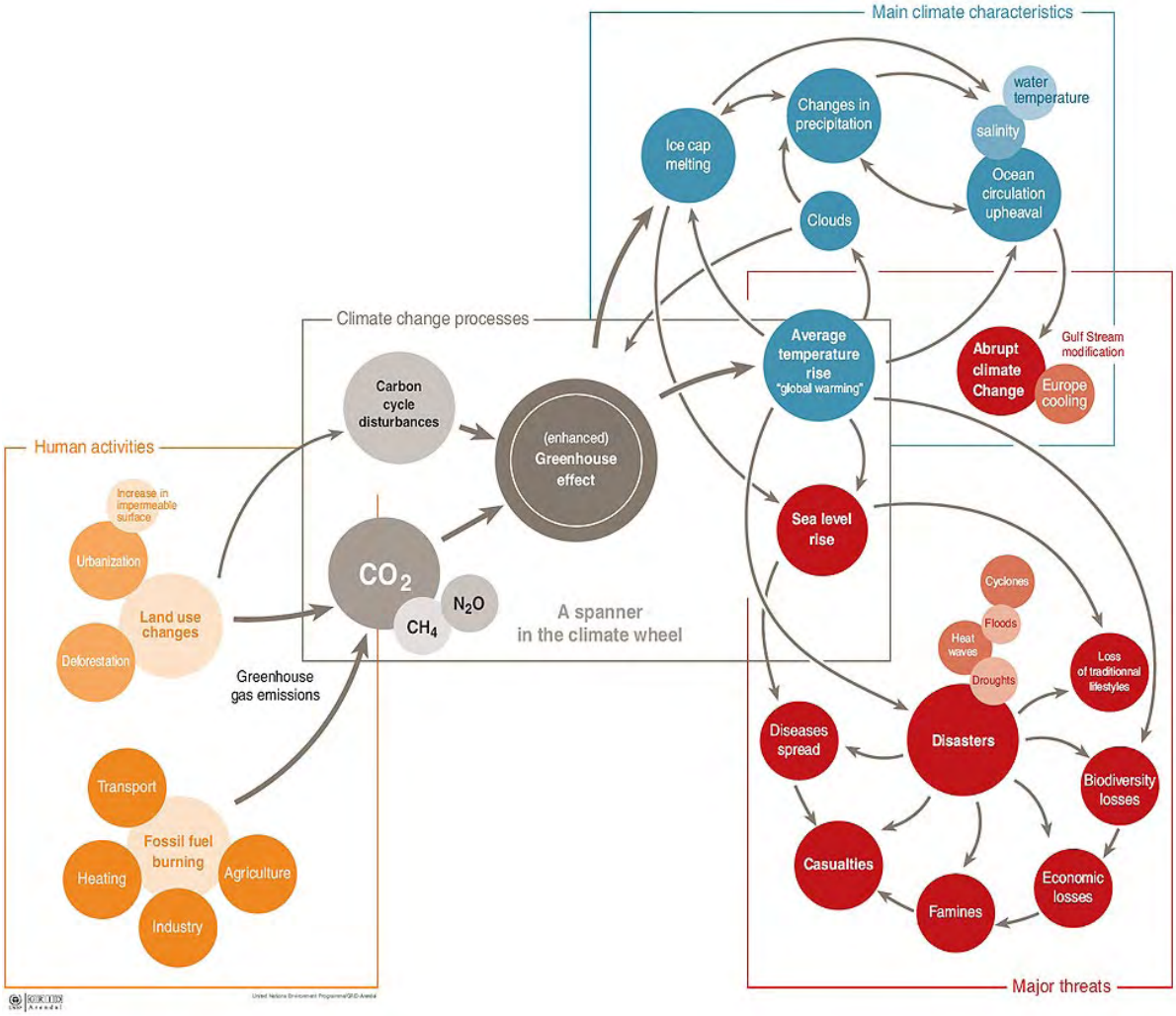
Beyond these well-studied energy and climate change concerns, there are many emerging climate-change related energy issues to address in Asia. Biofuels have been seen as a climate-neutral alternative for transportation fuels, and Asia is a major source for biofuels. Despite continued debate about the advantages and disadvantages of biofuels, new markets for biofuels will continue to grow, driving deforestation while offering a possible route for economic development. In response to market demand, government policies and new sources of funding, new technologies for more efficient, cleaner or non-fossil fuel energy services will rapidly hit the market over the next decade. Deployment of these technologies could help address development issues including air quality and balance of payments concerns. Energy and infrastructure development activities also need to consider the impacts of climate change in their design, siting, and operation. Thermal plants rely on prodigious water supply for cooling; in addition to current scarcity concerns, in the future water may be less available at certain times of year, or too warm. Coastal plants, port facilities, transmission lines, and pipelines will be vulnerable to sea level rise and increases in storm severity or storm surges.

Land Use Change as a Significant Emissions Source

Emissions from land use change and deforestation account for as much as 30% of annual global greenhouse gas emissions, with deforestation alone accounting for 20-25% of the those annual emissions. A significant proportion of global deforestation is occurring in the Asia region, with Indonesia having recently leapfrogged Brazil as the leading source of emissions resulting from deforestation. Deforestation in Papua New Guinea, Malaysia, Philippines, and Cambodia accounts for significant proportions of emissions from those countries.

The World Bank estimates that illegal logging represents a loss of $10-15 billion per year to developing countries (World Bank 2006). Loss of forest cover, riparian buffers, and mangroves also represent a significant increase in regional and local vulnerability to climate variability and climate change.

Figure 1-2. Climate change processes and linkages



Source: United Nations Environment Programme,

Impacts of Climate Change on Development Assistance

Beyond the typical understanding of increased temperatures, climate change is projected to increase the intensity of the hydrologic cycle and change seasonal precipitation patterns, leading to more intense flooding and greater incidence of drought and heat waves. Climate change has the potential to significantly disrupt food production, modify or disrupt fisheries, expand the range of human diseases and crop pests, result in population shifts in response to rising sea levels, and lead to greater conflict over natural resources, all of which will negatively impact foreign assistance efforts.

Countries in the Asia region are also among the most vulnerable to climate change impacts, with large numbers of poor people reliant on natural resources for their livelihoods. As many as

two-thirds of the world's poor live in Asia, and large numbers of people live on coasts, megadeltas, and small island states.

Climate Change and Peace and Security

The Greater Horn region of Africa, which is experiencing both extreme drought and flood cycles linked to El Niño Southern Oscillation events and chronic conflict provides a stark real-world illustration of the link between climate and conflict. The potential climate impacts in Asia may be similarly pronounced as well as diverse, and increase the potential for conflict along river systems and semi-arid areas as water supplies diminish or flow patterns change. The increasing impacts and underlying tensions caused by the many demands placed on the Mekong River, from dams, water consumption, and waste effluents, will be exacerbated by climate change. Given the Mekong's track across many countries, this could lead to tensions in the Asia region. Other vulnerable river systems including the Ganges, Indus, Brahmaputra, Salween, Huang He (Yellow), and Yangtze Rivers may face similar challenges. The potential for conflict also exists in the water-scarce semi-arid areas of West Central Asia, which includes much of Western China.

Climate Change and Investing in People

Climate change could significantly burden the already strained public health services in developing countries. Vector-borne diseases, such as malaria and dengue fever, are projected to increase as warmer temperatures facilitate vector range expansion and speed up virus replication; dengue is already reported to be spreading across South Asia. Cholera epidemics, which are occurring with greater frequency in Asia, are positively correlated to increases in sea-surface temperatures, and crop failure leads to large movements of people resulting in waterborne disease epidemics. Situations that create highly mobile populations also contribute to the spread of HIV/AIDS, according to a recent FAO report.

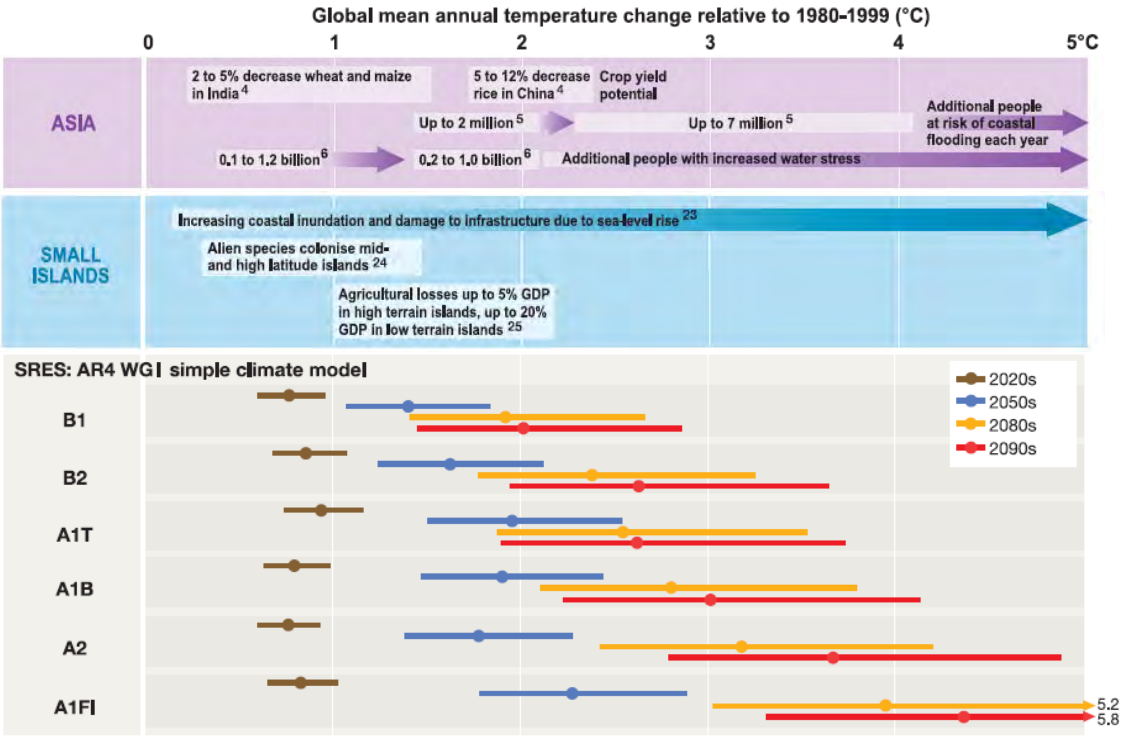
Climate Change and Economic Growth

Climate change can impact economic growth in both in the short term and over the long term: climate events can be of such extreme magnitude that they undercut an economy's foundation, or high year-to-year rainfall variability in agriculturally based economies can prevent sustained economic growth. South Asia's production of regional staples including millet, maize, and rice are projected to drop by 10% or more. Fisheries production could also drop through loss of critical habitats, such as coral reefs, and shifts in populations. Long-term economic growth could be affected as soil degradation from wind and water erosion is projected to increase substantially with climate change, natural, and managed systems could become more vulnerable to invasive species, and water resources could be compromised by shifts in rainfall patterns. As reported in the Stern Review on the Economics of Climate Change (Stern 2006), over the long term, responding to climate change impacts will cost at least 5%, and as much as 20% or more, of the world economy, and Asia's developing economies and large populations of rural and urban poor would carry a disproportionately large share of those costs.

Climate Change and Humanitarian Assistance

Environmental refugees are projected to increase from 25 million to 150-250 million annually by 2050 worldwide, with half of the refugees (75-125 million) in Asia, potentially resulting in substantial humanitarian crises. Semi-arid regions and areas with existing water scarcity are currently the regions of greatest concern for managing large refugee populations, and are likely to continue to be so in the decades ahead.

Figure 1-3. Examples of regional impacts projected with changes to average surface temperature in the 21st century



Source: IPCC 2007b.

Tipping Points

Many scientists and development experts interested in climate change have begun to discuss the need to consider "managing the unthinkable" in light of potential "tipping points", including unexpected rapid transitions in climate (as observed in the geological record) to a new stable condition or abrupt changes in the climate regime, such as disappearance of glaciers, shifts in ocean circulation, ocean acidification leading to large-scale losses of coral reef ecosystems as a result of increasing atmospheric CO_2, and rapid sea-level rise resulting from melting of terrestrial ice in polar regions.

Glaciers in the Himalayas are receding faster than in any other part of the world and, if the present rate continues, the likelihood of them disappearing by the year 2035 and perhaps sooner is very high if the Earth keeps warming at the current rate (IPCC AR4, 2007). Such a drastic and rapid change would have profound impacts in the Asia region where an estimated 0.5 billion people are reliant on the rivers for water, livelihoods, and sustenance. Potential local "tipping points" include flash floods resulting from glacial over flows (GLOFs), the result of the water build-up caused by ice melting behind a glacial ice dam that bursts without warning, and the potential disappearance of the "reverse flow" into Cambodia's Tonle Sap Lake from the Mekong system, a phenomenon upon which one of the world's largest freshwater fisheries is entirely dependent.

No other tipping points are currently mentioned in scientific literature specifically for the Asia region. Most tipping points relate to loss of glaciers and snow cover. However, development pressures in the Asia region, in particular changes to the river system due to planned dams, increased water demands and increased effluents in the rivers are likely to change the river system from historic conditions permanently. Likewise, unexpected tipping points relating to global sea-level rise would immediately threaten Asian coastal cities and communities, while sudden changes in precipitation patterns would hamper Asia's agricultural production and create new risks of flood or drought.

Figure 1-4. Glacial lake formations in the Bhutan-Himalaya

Source: NASA, 2006.

Credit: Jeffrey Kargel, USGS/NASA JPL/AGU

1.3 New Sources of Funds

There are many climate change-related funding mechanisms available to support emissions reductions and adaptation, and new significant funds are being created in response to the improved understanding of climate change and the increased political momentum of the last few years. Some funds are directly related to the UNFCCC and implemented by the Global Environment Facility (GEF), but many new funding sources are emerging as foundations and businesses address climate change and development.

As the result of an extensive interagency policy process to implement the President's new Climate Change and Energy Security Initiative, $58 million in new FY2009 climate change funding was added to the Agency's FY2009 budget. The White House Office of Management and Budget (OMB) allocated $12 million for RDMA for regional forest management, reforestation and biofuels, and adaptation activities, in addition to planned climate change-related activities. The FY2009 funding will address specific adaptation and forests activities, including support for regional geospatial information hubs, mainstreaming adaptation, forest conservation and sustainable management, reforestation, biofuels, and carbon accounting. The Administration and the State Department are certain to emphasize that the activities funded will be implemented as approved through the interagency policy process and allocated by OMB. However, until the appropriations process is complete, funding levels and activities are uncertain.

The US, United Kingdom, and Japan are leading creation of a new Clean Technology Fund (CTF) to be operated by the World Bank. The US has pledged $2 billion over 3 years to this fund, the UK has committed part of its $1.6 billion fund over 3 years, and Japan has committed part of its $10 billion commitment over 5 years. Other contributions are under negotiation with formal announcement of a broad climate change fund (including adaptation and forest funds) expected at the G8 Leader's Summit in July 2008.

The Asia-Pacific Partnership on Clean Development and Climate (APP) was initially provided $52 million in new funding for the US Department of State (DOS, $30 million), US Department of Energy (DOE, $15 million), and US Environmental Protection Agency (EPA, $5 million) in FY2007. Funding for APP was eliminated from the Foreign Affairs appropriation bill for FY2008, although DOS has received $10 million from the Office of the Director of Foreign Assistance (ODFA) and is seeking more. For FY2009, DOS requested $23 million; in the budget process DOS Bureau of Oceans and International Environmental and Scientific Affairs (OES) received $2.5 million; USAID/EGAT received $2.5 million; and the remaining $18 million was designated for USAID Missions without any detail on which missions would receive funding or how funding would be allocated. Of course, funding for APP in FY2009 is extremely uncertain given the rejected FY2008 request.

The Clean Development Mechanism (CDM) under the Kyoto Protocol to the UNFCCC is expected to provide hundreds of millions of dollars for projects to reduce emissions in developing countries to offset emissions in the developed countries. So far most of the projects are going to China, India, and Brazil. US policy does not support use of USG funds to implement projects under the Kyoto Protocol, but as projects funded through the APP, Methane-to-Markets Partnership, and other development assistance help to reduce or avoid emissions, many cooperators have been selling those reductions to international GHG markets, including the CDM.

There is a new Adaptation Fund under the UNFCCC, funded through a 2% levy on project-based emission credits under the CDM, projected to grow to over $300 million per year by 2012. This fund will support proposals from developing country governments and non-governmental entities to implement adaptation projects. Details of operation of the fund remain to be settled, but USAID's partners and cooperators may be able to access this resource.

There is growing interest from charitable foundations to support or undertake activities to address climate change in the developing world. A consortium of US-based foundations is jointly developing a funding strategy to address climate change (California Environmental Associates, 2007), the Rockefeller Foundation is interested in adaptation and livelihoods, the Clinton Foundation is providing funding for energy efficiency in cities and beginning to address forest-related aspects of climate change, and the Blackstone Ranch Foundation is interested in creating a new center for remote sensing for forest monitoring. Private sector interest in social responsibility is driving voluntary markets for carbon credits/offsets, renewable energy investments, and forest conservation. Voluntary markets have grown to $70 billion over the last two years. The growing interest of the private sector in climate and development offers many opportunities for new partnerships and GDAs.

The World Bank Forest Carbon Partnership Facility (FCPF) is in the final stages of development with a charter expected to be signed by contributors this year. The FCPF will have two funds: one fund for "readiness" to help developing countries improve their capacity to monitor and manage forests and related changes in emissions, and one fund for ex-post payments for emissions reductions in the forest sector. The UK, Germany, Australia and other donors have already pledged over $110 million for the FCPF.

RDMA is already well-connected to the Asian Development Bank's new Energy Efficiency Fund. The Energy Efficiency Fund will help small and medium sized firms in Asia invest in energy efficiency and renewable energy employing clean technologies. The fund will provide capital, project expertise, and international and emerging market experience to catalyze energy efficiency and renewable energy markets in Asia. The fund will be in a position to offer a

complete energy efficiency solution, i.e., technical expertise to develop an energy savings plan, the ability to source the best equipment and implement the plan, and provide financing to make the whole plan happen. Initially, the fund will focus on India, Malaysia, Philippines, and Thailand, whose governments are encouraging energy efficiency. As it generates momentum, the fund will evaluate opportunities in Bangladesh, China, Indonesia, Sri Lanka, and Viet Nam, where opportunities and incentives for energy efficiency are just starting to evolve.

The negotiation process initiated in late 2007 under the UNFCCC ("The Bali Roadmap") will likely lead to the eventual establishment of funds or mechanisms to assist developing countries' efforts to deploy clean technology, reduce emissions from deforestation, and adapt to climate change. Many countries, such as Indonesia, have great hopes for significant funding transfers from the negotiations on Reducing Emissions from Deforestation in Developing countries (the "REDD mechanism"), but the scope and extent of the issue will require complex negotiations during a very short time. The World Bank FCPF supports a pilot program to test and evaluate methods and procedures for a REDD mechanism.

1.4 USG Policies and Priorities Overview

The US policy on climate change emphasizes that climate change is not an isolated issue but inextricably linked with energy security, economic growth, poverty reduction, and pollution reduction.

UNFCCC and the Bali Roadmap

The US recognizes that the UNFCCC is the forum for the negotiation of climate change commitments and cooperation. Going into the Bali negotiations, the US stated that:

> A post-2012 framework for climate change must be global in nature and environmentally effective and economically sustainable. To be environmentally effective, an agreement needs action by all major economies. To attract global participation, a future framework must support broader social and economic goals. Our strategies may be differentiated based on national conditions, but we share a common responsibility to reduce greenhouse gas emissions while keeping our economies growing. (White House Fact Sheet, 2007)

The Bali negotiations resulted in a plan of action that incorporates these fundamentals, allows for the Major Economies Process (discussed below) to inform the UNFCCC process, and reached agreement on an ambitious end date for the negotiations (2009) to enable countries to progress smoothly from the end of the Kyoto Protocol's first commitment period in 2012. China, India, and Indonesia are participating in the Major Economies Process and these countries are all significant actors in the UNFCCC negotiations.

US Position on the Kyoto Protocol

The United States rejected the 1997 Kyoto Protocol as fundamentally flawed, due to the Protocol's failure to include commitments to reduce greenhouse gas emissions by major emerging developing country economies such as China, India, and Brazil. The Protocol also omits important pollutants from coverage, such a black carbon and ozone. The US concluded that the targets in the Protocol are unrealistic and not based on science, and would be both

expensive to implement and ineffective. This rejection has meant that USAID funds cannot be used to implement projects that support the Protocol, such as projects under the Clean Development Mechanism. As the negotiations on the future of the UNFCCC proceed following the Bali agreement, USG policies will change to reflect new commitments by Asian countries.

G8 and Major Economies Process

The G8 process has paid special attention to climate change in recent years, with the Gleneagles (UK-led) talks in 2005 starting a process to end this year in Toyako, Japan (2008). Along the way the G8 has endorsed the US views on the linkage between energy security, economic growth, and climate change, as well as the US-led Major Economies Process. Japan envisions several climate change deliverables for Toyako, likely to include formal announcement of a multi-billion dollar Clean Technology Fund (see above). The G8 has also included representatives from the major emerging economies (Brazil, India, China, and South Africa) in recent climate change-related processes.

In May 2007, President Bush called for a meeting of the world's major developed and developing economies to develop a new way forward in addressing climate change, energy security, and economic growth. The Major Economies Process (MEP) is intended to develop a long-term global goal for greenhouse gas reduction, consistent with economic and development objectives, supported by national mid-term goals that are environmentally effective and measurable, and identify opportunities for sectoral cooperation to meet the emissions goals. The United States is convening a number of MEP meetings during 2008, attended by representatives of leaders from 16 countries, including China, India and Indonesia, as well as the EU and the UN. The MEP will conclude its efforts at a Leader's Summit before the end of 2008, to feed into the negotiations of the Bali Roadmap.

US Commitment to Conserving Tropical Forests and Biodiversity

Slowing the lost of tropical forests and biodiversity in development countries has been a bipartisan congressional priority for at least a decade or more. As a result, USG commits at least $100 million per year in development assistance activities that address the multiple drivers of deforestation and forest biodiversity loss, and a total of $195 million per year for all biodiversity, mainly through USAID's bilateral, regional, and global programs. USAID-funded activities address a range of concerns including forest law enforcement and governance, illegal logging and wildlife trafficking, community-based forest management, sustainable management of production forests, forest and biodiversity conservation through protected areas and other means, and support for marine biodiversity and coral reef ecosystems. In Asia, Indonesia and the Philippines have been major recipients of USAID assistance in this regard, with some support for Cambodia, Bangladesh, and Nepal. USAID/RDMA supports regional-level biodiversity conservation activities in Asia, involving Vietnam, Cambodia, Indonesia, Papua New Guinea, Malaysia, and China.

Growing awareness about the role of deforestation in greenhouse gas emissions has strengthened the political support and technical rationale for an increased USAID emphasis on both forest conservation and reforestation as strategic levers for combating both climate change and biodiversity loss. Making this climate-forest linkage in USAID's programs, however, requires addressing a number of technical issues related to monitoring and measuring forest-related carbon emissions reductions and their persistence over time, the conditions under which

biofuels development will help or harm both climate change and biodiversity goals, and the relationship of forest-carbon strategies to broader development objectives.

Next Administration and Congressional Interest

To date, the US approach to climate change internationally has a foundation in the Byrd-Hagel Resolution (1997) which was passed in the Senate by a 95-0 vote just before the Kyoto climate change negotiations. The Resolution has two basic points: that any actions to address climate change cannot damage the US economy, and emissions reductions need to include all the major emitting countries, whether developed or developing. Those basic tenets will not change any time soon; no Senator will vote for a treaty deemed to damage the US economy.

Attention to climate change in Congress has greatly increased over the past few years. Literally hundreds of climate change-related bills have been introduced in the last session, addressing domestic emissions limitations, research and development, clean energy export support, and numerous focused interests such as fuels. The Global Climate Change program at USAID has enjoyed bipartisan support for over 15 years and that support will continue.

Congress is increasingly likely to enact US economy-wide greenhouse gas limits in the next several years, perhaps as early as 2009. Reflecting recent legislative trends, the legislation is likely to include carbon (allowance) trading with auctioning increasing over time, a safety valve mechanism in which industry can buy allowances if the price gets too high, incentives for international forest conservation, and significant funding for international adaptation assistance (for USAID implementation) funded from auctions and allowance purchases.

All of the leading Presidential candidates have made explicit policy statements on addressing climate change, and each has introduced legislation to reduce greenhouse gas emissions. Changes in the Administration may similarly lead to significant new climate change initiatives or programs, both domestically and internationally. Given large greenhouse gas emissions from Asia and also the large populations vulnerable to climate change impacts, RDMA and missions in the region could play a significant role in addressing climate change as part of USG development assistance efforts in Asia.

The US-UK-Japan joint Clean Technology Fund will likely continue after the change in Administration, although US funding will depend on support from both the new Administration and Congress. (Current understanding is that Treasury appropriators are supportive.) It is unclear whether other signature initiatives, such as APP, will continue in current form.

USAID can make a strong case that use of the new carbon offset markets (voluntary markets and compliance-driven) and emissions-reductions funds can provide significant leveraging for development assistance efforts. Currently, the USG is funding projects that reduce or avoid greenhouse gas emissions which are then documented as carbon credits and entered into the carbon markets (such as through the Kyoto Protocol's Clean Development Mechanism). If returned to the development assistance program, such proceeds represent an additional resource flow for economic growth. RDMA, for instance, is getting experience in these new markets through its Asia Regional Biodiversity Conservation Program work on payments for environmental services (PES) in Vietnam.

1.5 Regional Context

China and Its Relationship with the US

It is not possible to over-emphasize the importance of the US-China relationship, due to the global implications for security, trade, energy, and environment. USAID and the USG well recognize the importance, high profile, and sensitivity of this relationship, balanced between cooperation and competition. In contemplating work with China, it is important to recognize that there are enormous capital resources and cash reserves available to China for economic growth; the challenge is getting these resources to move China towards a sustainable development path. Progress on this path will improve public health, environmental protection, global emissions trends, and regional stability. Given its key role in contributing to global greenhouse gases and climate change, US engagement with China on accelerating adoption of GHG emissions mitigation options is now a high priority and will remain so for the next several decades.

As the only Mission responsible for bilateral activities there, RDMA is the USAID conduit into China and its involvement is likely to grow given the importance of US-China cooperation on clean energy, technology, and the environment. Other significant USG players include: the US Department of State for both diplomatic and strategic leadership as well as funding under the APP (and potentially the Major Economies Process); the US Department of Treasury for its leadership of the US-China Strategic Economic Dialogue (SED); US DOE which has a long history of cooperation at small funding levels; and US EPA for cooperation on environment policies and capacity. It should be noted that the fate of APP is uncertain at this time, given that Congress did not appropriate any funding for it for FY2008 and the impending transition to a new Administration in January 2009.

The World Bank, GEF, IFC, and the Asian Development Bank are significant players in China for funding and policy reform, in particular due to the global focus on energy and climate change. There are also many donor and diplomatic efforts on energy and environment involving the European Union and its member countries as well as Japan.

Association of Southeast Asian Nations (ASEAN)

The ASEAN Vision 2020 calls for "a clean and green ASEAN with fully established mechanisms for sustainable development to ensure the protection of the region's environment, the sustainability of its natural resources and the high quality of life of its peoples."

The "Singapore Declaration on Climate Change, Energy, and the Environment" (21 November 2007), agreed to at the Third East Asia Summit,[1] addresses many of the sectors and kinds of activities within RDMA's mandate and recommended in this road map, including energy efficiency and reduced emissions from power generation, reducing deforestation and increasing reforestation, innovative financing, and adaptation, including sustainable management of coasts and coral reefs.

The ASEAN Secretariat plays an important coordinating and enabling role in integrating environmental factors into other development activities of member countries, and to a

[1] The Third East Asian Summit included the Heads of State and Government of all ASEAN member nations, Australia, China, India, Japan, the Republic of Korea, and New Zealand.

significant extent, RDMA already engages ASEAN, through its Centre for Energy, on regional cleaner coal and energy efficient lighting activities. Building on its efforts to date, ASEAN could play an important regional integration role in many of the activities recommended in this road map. While ASEAN's effectiveness on environmental issues has been limited in the past, its partnership with RDMA on clean energy and climate change activities may provide an opportunity to increase ASEAN's role and impact on climate change policy and regional cooperation in the region.

Asia-Pacific Economic Cooperation (APEC)

In the "Sydney APEC Leaders' Declaration On Climate Change, Energy Security, and Clean Development" (9 September 2007), leaders underscored the need for many of the same activities supported by RDMA and activities recommended in this road map, including reducing emissions from coal power generation, energy efficiency, sustainable forest management, and support for effective adaptation strategies. APEC also agreed on aspirational goals for improved energy intensity, increased forest cover, and actions to protect marine resources. It is notable that China sponsored and the US endorsed a new Asia-Pacific Network for Sustainable Forest Management and Rehabilitation to enhance capacity building and strengthen information sharing in the forestry sector. APEC is not an implementer of activities but a forum to promote policy dialogue and cooperation. The US wields significant influence over the APEC process.

Australia Forests and Climate Initiative

Australia has committed $200 million over five years for the Australia Forests and Climate Initiative to support regional forests and climate work. Initial pledges included funding to Indonesia, a contribution to the World Bank's new Forest Carbon Partnership Fund, and funding for forest monitoring from remote sensing using tools developed by the Australia Greenhouse Gas Office. Following the election of the Rudd Administration in late 2007, there has been little news on this high-profile initiative. Given Australia's rapid ratification of the Kyoto Protocol by the new administration, however, Australian Delegates at the Bali UNFCCC negotiations in December 2007 voiced expectations that the initiative will continue under a new name.

Mekong River Commission (MRC)

Created in April 1995 through an intergovernmental treaty, the Mekong River Commission is an international river basin organization that promotes economic and social development through the sustainable use and development of the Mekong Basin's water and related resources. Its Strategic Plan 2006-2010 sets out four goals: (1) to promote and support coordinated, sustainable and pro-poor development; (2) to enhance effective regional cooperation; (3) to strengthen basin-wide environmental monitoring and impact assessment; and (4) to strengthen the Integrated Water Resources Management (IWRM) capacity and knowledge base of the MRC bodies, National Mekong Committees, Line Agencies, and other stakeholders. The MRC has a three-tiered organizational structure comprised of a ministerial council, joint committee, and Secretariat that is responsible for MRC's technical and administrative functions. It is expected that the MRC will play an increasingly important role in promoting sub-regional cooperation that includes China and in addressing serious resource management challenges related to water, energy development, biodiversity, forestry, agricultural productivity, and fisheries.

Private Sector

The private sector, besides being the major source of finance for development in the form of foreign direct investment, is increasingly becoming a force for sustainable development. Companies are spending significant funds to address corporate social responsibility (CSR), including reducing greenhouse gas emissions from their operations or suppliers, increasing energy efficiency, or purchasing emissions offsets in voluntary markets. Some companies are even altering purchasing practices. For example, Staples and Office Depot have recently severed ties with Asia Pulp & Paper Co. Ltd. due to concerns over illegal logging. Near-term decisions and investments by the private sector provide significant leverage opportunities as part of USAID's efforts to address climate change challenges in Asia.

2. STRATEGIC APPROACH

The pace of a firm's adaptation to climate change is likely to prove to be another of the forces that will influence whether, over the next several years, any given firm survives and prospers—or withers and quite possibly dies.

—Lehman Brothers, February 2007

2.1 Purpose

In late 2007, Olivier Carduner, USAID/RDMA Mission Director, challenged the Regional Environment Office (REO) to develop a road map for RDMA to provide technical and strategic leadership in addressing climate change and development in Asia. In response to that challenge, the purpose of this analysis and road map is to identify regional climate change priorities and interventions for RDMA to support in Asia during FY2008-FY2012.

Leadership Role for RDMA

RDMA plays an important role in addressing climate change and development challenges through regional and bilateral activities in locations that are not already covered through other bilateral missions. For climate change and development, leadership will involve some risk, moving out of traditional roles and methods of operation into new approaches that will face some opposition by entrenched individuals and institutions. Leadership will require anticipation of emerging issues and creating leading edge solutions, thus making mainstreaming climate change into development assistance a reality. However, opportunities abound to create new partnerships that involve emerging private and public sector interests. Addressing the magnitude of the likely climate changes will require that mitigation and adaptation actions become normal business practices.

2.2 GCC Focus Areas

This analysis and road map outlines five main focus areas for RDMA to support in its regional programs and in bilateral contexts where RDMA is the responsible Mission. As described in grater detail below, these focus areas include:

- Clean Energy;
- Forests and Land Use Change;
- Coasts and Coral Reef Ecosystems;
- Freshwater Resources and Ecosystems; and
- Integrative Climate Change Services Initiatives.

As initially developed with EGAT's assistance, this analysis and road map provides detailed discussion of each of these focus areas in Section 3, "Assessments, Opportunities, and Programming Priorities." However, of these focus areas, RDMA has identified the first three—**clean energy, forests and land use change, and coasts and coral reef ecosystems**—as immediate programming priorities, as well as regional climate change advisory support under integrative climate change services. These priorities are based on RDMA's anticipated funding, linkages and complementarity with ongoing programs, opportunities for leveraging and partnering, and current USG policy priorities. Nevertheless, RMDA intends to consider supporting the remaining focus areas should additional program funding become available.

Building on current environmental programming, implemented by the RDMA Regional Environment Office, these focus areas reflect careful analysis, based on the latest available data and current situation, of the greatest threats to development posed by climate change, and the most effective response strategies for RDMA. This set of focus areas does not, however, preclude modifications and additions to RDMA's approach in the future, as conditions change, new data become available, and new windows of opportunity arise.

While this road map involves only the environment sector, the RDMA recognizes the importance of "mainstreaming" GCC into USAID's overall development activities. Over the next two years, RDMA will also consider additional opportunities in the following areas, which potentially may be implemented through REO, or through other RDMA offices in coordination with REO:

- Agricultural development, including consideration of the mitigation of agriculture-related GHG emissions (from both livestock and crops), agricultural impacts of climate variability and change, salinization of coastal agricultural lands, water resource availability and sustainable irrigation, crop resilience, and climate-related changes in pest habitats;
- Infectious diseases, HIV/AIDS, and other health programming, including improved surveillance and health systems response to climate-related changes in disease patterns and increased access to health products and services which address climate-related changes in disease;
- Vulnerable populations, particularly with respect to how such populations are adversely affected by climate variability and change;
- Economic growth and trade, including activities that help promote adoption of mitigation and adaptation technologies and practices, as well as information products; and
- Education programs, including those that promote awareness in climate change science, emissions mitigation and sequestration, adaptation, and information sharing.

2.3 Approach and Expected Outcomes

Overall RDMA Regional and Bilateral Programming Approach

This climate change road map is designed to fit within RDMA's existing strategy and streams of work; relationships with national, regional, and global institutions; and approaches to

implementation of current development programs. To date, RDMA's Regional Environment Office has been leading targeted initiatives to demonstrate and replicate innovative policies and practices that address clean energy development, climate change, biodiversity conservation, water and sanitation, environmental compliance and enforcement, transboundary conflict, and tsunami reconstruction and early warning system development.

RDMA Functions

Generally speaking, RDMA's programming approach involves several levels of engagement that seek to promote catalytic impact and transformational development. To begin, consistent with its mandate, RDMA serves three technical functions (apart from administrative support functions) in implementing USG foreign assistance activities in the region, namely:

- **managing regional programs** to address transnational problems, strengthen regional institutions and networks, promote regional standards, and support regional learning and best practices;
- **managing bilateral programs** in countries where USAID otherwise does not have presence; and
- **providing technical services** to facilitate development activities in the region.

Catalytic Impact through Regional Environmental Cooperation

As a regional USAID Mission, RDMA seeks to promote catalytic impact through its regional activities that focus on transnational environmental challenges that are best addressed via regional cooperation and regional activities. Such efforts otherwise cannot be effectively addressed through separate bilateral programs. To be most effective, USAID's response engages key stakeholders, leveraging resources, and promoting region-wide cooperation to address technical, policy, and institutional barriers. Activities focus on promoting regional harmonization of standards, cooperation activities, replicating development successes across countries, sharing of best practices and lessons learned, and supporting knowledge-sharing, research, and information dissemination that supports common objectives in multiple countries.

By working at a regional level, RDMA can engage key Asian decision-makers and practitioners at regional, national, and local levels to strengthen governance institutions and systems, policy and financial enabling conditions, community participation, technical capacity, and regional systems for sharing and replicating best practices.

Regional Coordination, Leverage, and Leadership

RDMA also leads collaboration among key international partners such as key regional partners and economic cooperation organizations (such as ASEAN and the Asian Development Bank), regional platforms and initiatives, multilateral development banks, and UN agencies. The RDMA approach is to engage regional actors in the development and application of cutting edge solutions to Asia's challenges through pilot-scale interventions and policy reform efforts that are widely replicated with host country and other donor resources. This includes building strategic alliances with private sector and non-government organizations (NGOs) to leverage funding, experience, and ideas to increase the sustainability and impact of USG investments.

RDMA's Regional Environment Office has relied on expert assessments as well as coordination with other USAID Missions, USAID/Washington, other donors, and an extensive network of

regional and international partners in the region to catalyze effective development approaches in its priority program areas. Through its combined regional and bilateral approaches, RDMA also provides unique level of engagement for leveraging private sector resources.

Overview of RDMA's Current Regional Environmental Programs

As RDMA develops its climate change portfolio over the next few years, it can build on a strong set of existing regional environmental programs and the networks of partner organizations that have been developed through these initiatives. Current programs already encompass significant work on climate change, and also include initiatives that focus on forests and biodiversity, transboundary water resource issues, coral reef ecosystem conservation and management, and environmental governance.

With respect to addressing Asia's contributions to ***climate change***, RDMA promotes the regional exchange of information and experiences between governments in applying innovative policy, institutional, and technical solutions to problems associated with energy consumption. The Environmental Cooperation-Asia Clean Development and Climate Program (ECO-Asia CDCP) is a new initiative that promotes clean development in Asia's energy sectors, focusing on mitigating greenhouse gas emissions in combination with efforts to increase economic productivity, reduce air pollution, and improve energy security. To address these concerns, the program engages regional and national partners to catalyze policy and market transformation for greater clean technology investment in China, India, Indonesia, Philippines, Thailand, and Vietnam. Partners include the Asian Development Bank (ADB), which manages a $1 billion energy efficiency fund, ASEAN, APEC, and several United Nations agencies, as well as bilateral donors.

To support strengthened ***biodiversity conservation and sustainable forest management*** in Asia, RDMA leverages regional initiatives aimed at reducing illegal logging and wildlife trafficking, as well as promoting biodiversity corridors that protect ecologically sensitive forests, watersheds, and wildlife habitats. Major tracks of work include the Asia Regional Biodiversity Conservation Program (ARBCP) which is piloting payment for ecosystem services (PES) mechanisms to promote sustainable biodiversity and natural resources management in the Greater Mekong Sub-region, and the Responsible Asia Forestry and Trade (RAFT) program, which promotes an integrated approach to responsible timber trade and sustainable forest management to reduce the rate of forest loss and degradation in Asia. RDMA's partners in the forests and biodiversity area include the The Nature Conservancy (TNC), Winrock International, ADB's Greater Mekong Subregion Core Environmental Program (GMS-CEP), the World Bank, the World Conservation Union (IUCN), World Wildlife Fund (WWF), and the Wildlife Conservation Society (WCS).

To address ***transboundary water issues***, in support of the Mekong River Commission (MRC), RDMA works to build conflict management capacity at the MRC Secretariat and the National Mekong Committees through a program training, awareness raising and institutional strengthening. RDMA also implements the ECO-Asia Water and Sanitation Program which supports country-level demonstrations and twinning activities while sharing lessons learned and best practices in enabling water services delivery to the urban poor, demonstrating sustainable sanitation solutions, enabling access to finance for water services, and improving performance of water and sanitation services providers. Regional partners include the South East Asia Water Utility Network (SEAWUN), the South Asian Water Utilities Network (SAWUN), ADB, the World Bank, the United Nations Environment Programme (UNEP), USAID Missions, and

ASEAN, Association of Development Financing Institutions in the Asia-Pacific, and International Water Association and numerous twinning partners in Asia and the US.

With respect to ***marine management and conservation***, RDMA is launching a major program in 2008 in support of the six-country Coral Triangle Initiative (CTI), which was formally launched at the Heads of State level in late 2007 by Indonesia, Malaysia, the Papua New Guinea, Philippines, the Solomon Islands, and Timor Leste. This ambitious multi-country, multi-donor initiative aims to achieve effective conservation and sustainable use and adaptation to climate change of the "coral triangle," an area shared by these six countries and containing the most biologically diverse and valuable coral reef resources on Earth. RDMA's CTI partners include WWF, The Nature Conservancy, Conservation International, ADB, GEF, and many other national and regional institutions.

RDMA also leads a regional effort to strengthen ***environmental governance*** through a newly established regional platform, the Asian Environmental Compliance and Enforcement Network (AECEN). USAID supports AECEN in partnership with ADB, US EPA, and several other regional and international partners.

Integrating Climate Change into RDMA's Regional Development Approach

As a regional mission, RDMA is in a position to address climate change and development in ways that a bilateral mission will find beyond its scope and interests. As a crosscutting issue that is not bounded by country borders or sectoral definitions, addressing climate change will require technical expertise and regional cooperation that a bilateral mission cannot undertake. Regional programs providing for cooperation, coordination, and sharing of successes are key to RDMA's success in its development mission and in addressing climate change. However, RDMA will also be responsible for bilateral implementation in non-presence countries, currently including China, Laos, Thailand, Papua New Guinea, Burma, Fiji, the Marshall Islands, and the Federated States of Micronesia, and possibly including other locations. This provides the opportunity to take some risk and address high profile but neglected climate change needs such as adaptation in small island states. Ongoing REO activities that involve bilateral presence countries—including Indonesia, the Philippines, Vietnam, India, Sri Lanka, and Cambodia, as well as possibly new activities in countries such as Bangladesh, East Timor, Nepal, and Mongolia—will require strong, sustained engagement and coordination with USAID Missions and other USG partners operating there.

As described in the overview on climate change and development in Asia (Section 1.2) the long term success of RDMA's development programs will depend on how (or if) changing climate is considered in development planning and implementation. Will protected areas for biodiversity (and biodiversity corridors) be resilient to temperature and precipitation changes over the next decades? Will water utilities be able to cope with extreme events and changed seasonal water availability? Will coastal communities and communities reliant on coral reefs be resilient to increased temperatures, sea level rise, and storm surges? Will energy sector investments change from current trends? Will Asian governments, businesses, and communities have the technical and institutional capacity to take advantage of new funding resources and investment opportunities? If climate change considerations are not incorporated into the mainstream of development priorities and programs, the long-term impact and sustainability of development investments will be substantially diminished.

RDMA efforts will be most successful by integrating with and providing complementary linkages to other USAID and USG climate change activities in the Asia-Pacific region. Other Agencies have technical capabilities and resources that can be a cost-effective tool for implementation of USAID's and RDMA's strategic interests, in contrast to creating new capabilities. With new technical areas rising to prominence, such as adaptation along coasts and on islands, new partnerships with Agencies such as the National Air and Space Administration (NASA) and the Office of Insular Affairs in the US Department of Interior (DOI) are possible.

A significant leadership opportunity lies in RDMA's capacity to amplify the regional impact of the Agency's climate change programming across Asia, a region of key importance for USAID's global climate change priorities. Support for activities that demonstrate successful new methods or tools for addressing climate change within a development context, and their replication and dissemination across the region and to bilateral missions, can produce results far greater than the direct results of the original funding. RDMA's relationships with country governments in the region, regional organizations such as the ADB, ASEAN and the MRC, and USAID's non-governmental partners can help integrate climate change considerations and actions into development and thereby strengthen the resilience of development efforts to the effects of climate change. Working with regional organizations is another area for leadership; where others may not be able or willing to address urgent new concerns, such as the confluence of rapid and often unsustainable economic development and serious impacts of climate change on the entire Mekong River system (from Himalayan glacial headwaters to the South China Sea), RDMA is in a position to illuminate the scientific, development, and political realities, mobilize political will and public attention, and catalyze cooperation and action on the ground.

The Analytical Approach

Climate change is a cross-cutting issue, involving nearly all sectors necessary for human development. This analysis and road map focuses on the existing RDMA program priorities: Clean Energy, Water, Forests, and Islands and Coasts.

Each of these areas is important for development in a changing climate, with significant opportunities for influential outcomes from a regional platform. The analysis points to significant regional information and capacity gaps that cut across all sectors. In addition, climate change policy and actions are also creating a number of emerging financial resource flows and potential partners as opportunities for USAID regional involvement.

Integration and Mainstreaming Opportunities

In the analysis of existing activities and in making recommendations for new activities, this road map seeks to break from traditional thought in which energy and forest activities are only seen as ways to reduce emissions and adaptation is seen as something external to development. Instead this document aims to point out opportunities to incorporate both mitigation and adaptation into activities that primarily serve a development purpose. The road map identifies opportunities for mainstreaming climate change into existing programs and also proposed new programs, which often build off existing successes.

Sustainability Considerations

A sustainability road map will be important for success of the new RDMA climate change platform. This document indicates brief resource requirements and identifies possible partners for near- and long-term collaboration on program implementation. For climate change in the

development context, coordination and information exchange with key development partners will remain of critical importance, and RDMA should build off of ECO-Asia CDCP efforts and inform the Global Development Commons (GDC) initiative of the Administrator. The GDC is the space where development actors unite—physically and virtually—to gather and exchange ideas and services, communicate, and form partnerships. The GDC will unite all those with a stake in development—from end-users/beneficiaries to governments, to partners, to citizens—into a seamless and accessible network, making it easier for developing countries and their citizens to find solutions and resources that match their development needs.

2.4 Performance Management Framework

RDMA Objectives for Climate Change and Development

Three long-term objectives are proposed here to direct RDMA actions for addressing climate change in the development context in the Asia region:

1. Greenhouse gas emissions reduced or sequestered as a result of USG assistance;
2. Increased adaptive capacity to cope with impacts of climate variability and change as a result of USG assistance; and
3. Increased economic welfare, especially in poor populations.

These three program objectives would guide every activity in the program. Borrowing from the USAID Foreign Assistance Framework (FAF), proposed 2009 CBJ indicators, and REO's own common indicators, each underlying activity will have specific performance indicators tailored to the specific steps and projects undertaken. The indicators should track the progress of the activity over time, from assessment and planning, to training, to achievement of climate change and development outcomes.

Overview of Foreign Assistance Indicators, REO Common Indicators, and Relevant Custom (Program) GCC Indicators

USAID is a leader among USG Agencies in use of performance indicators. The Agency has an understandable desire to be able to measure the impacts of development assistance efforts, such as reduced greenhouse gas emissions or improved public services. Indicators should be reliable, reviewable, significant, and meaningful. However, combined with the needs for annual reporting and uncertainties in the annual appropriation process, the Agency is forced to rely on many 'output' rather than 'outcome' indicators. This short-term, one- to three-year view for program design and management detracts from the Agency's stated intent of long term economic development. As an alternative, this road map proposes that RDMA utilize outcome indicators as an overall long term guide and measure of the program, along with annual indicators for each program/activity to track progress toward overall goals.

In the Foreign Assistance Reform process, USAID has adopted a set of indicators to standardize performance monitoring for each element and sub-element in the Foreign Assistance Framework. The Agency has also implemented Program Indicators for each Area (such as Economic Growth). Specific climate change indicators are found under sub-element 4.8.2.4,

Global Climate Change, although the activities that attribute to the GCC program are found across the FAF. While custom indicators can be used, like all USAID operating units RDMA is expected to adopt as many FAF indicators as possible to assist in measuring results across the Agency. RDMA's use of a consistent set of custom indicators across all climate change-related programs may further influence Agency revisions of FAF indicators in the future.

At the same time, the Agency is increasingly moving to cost-effective opportunities 'upstream' from the outcome, such as policy reform, access to finance, and improvements to regulatory frameworks. Doing so may then lead to the desired outcome as a result of the actions of other partners or institutions, perhaps after USAID has ended its involvement. For example, emissions reductions from an energy policy reform process may only become measurable after involvement ends and continue over a 15 year period. As such, how would RDMA then measure impacts of increased access to finance, increased resilience to climate change, or policy reform?

Given the Agency's overall interest in assessing progress toward intended development outcomes, this road map proposes that RDMA develop and use program indicators that account for the net emissions reductions resulting from the long-term program impacts (i.e., the "life of the outcome") relative to the annual incremental funding. Along these lines, a performance indicator could measure, for example, "net life of program CO_2 reductions as a result of FYXX funding."

Under the Economic Growth Program Area in the Foreign Assistance Framework, the Program Elements for Clean Productive Environment (CPE, 4.8.2), Natural Resources and Biodiversity (NRB, 4.8.1), and Modern Energy Services (MES, 4.4.1) include a number of relevant common performance indicators for RDMA programs addressing climate change. Indicators that specifically or closely address climate change-related issues are provided in Table 2-1, below.

Similarly, REO's results framework also provides several relevant common "Strategic Objective-level" intermediate results (IRs) and indicators that will be considered in program management planning efforts. As needed REO programs may adopt program-level indicators to measure program impact, although to the extent possible FAF indicators will be used, as well as, to a more limited extent, REO common indicators.

USAID GCC Performance Monitoring and Reporting Requirements

Annual appropriations bills provide Congressional direction to USAID on climate change activities associated with development activities, including:

- Programs that reduce greenhouse gas emissions by promoting energy efficiency and clean energy technologies;
- Forest conservation and biodiversity programs that sequester or avoid carbon emissions;
- Activities to help developing countries assess their vulnerability and adapt to climate variability and change;

Table 2-1. Foreign Assistance Framework GCC Indicators

Indicator	Thematic Area
▪ Dollars saved from prevention, mitigation or reduction of pollution, including greenhouse gasses, as a result of USG assistance (CPE);	CE
▪ Energy and materials savings due to improved practices as a percentage of overall country's consumption (CPE);	CE
▪ Energy saved as a result of USG assistance (MES).	CE
▪ Quantity of greenhouse gas emissions, measured in metric tons CO_2 equivalent, reduced or sequestered as a result of USG assistance (CPE);	CE, FLU
▪ Quantity of greenhouse gas emissions, measured in metric tons of CO_2 equivalent, reduced or sequestered as a result of USG assistance in natural resources management, agriculture, and/or biodiversity sectors (NRB); and	CE, FLU
▪ Number of laws, policies, agreements, or regulations addressing climate change proposed, adopted, or implemented as a result of USG assistance (CPE);	CE, FLU, CCRE, FWRE, ICCS
▪ Number of people receiving USG supported training in global climate change including framework convention on climate change, greenhouse gas inventories, mitigation, and adaptation analysis (CPE);	CE, FLU, CCRE, FWRE, ICCS
▪ Number of people with increased adaptive capacity to cope with impacts of climate variability and change as a result of USG assistance (CPE);	CCRE, FWRE, ICCS

Clean Energy; FLU = Forests and Land Use Change; CCRE = Coasts and Coral Reef Ecosystems; FWRE = Freshwater Resources and Ecosystems; ICCS = Integrative Climate Change Services Initiatives

- Research to ensure that climate change science addresses information needed for global development challenges; and
- Activities to help meet countries' responsibilities under the Framework Convention on Climate Change.

During the Agency's annual reporting period, the EGAT Global Climate Change team collects information from operating units on activities that are part of the Global Climate Change program. As part of foreign assistance reform, new Technical Earmark Groups (TEG) have been formed to review activities attributed to the Agency's many earmarks, including biodiversity, clean energy, and climate change. Starting in 2008, the new Global Climate Change TEG will evaluate the activities reported, including RDMA activities, to ensure consistency and the integrity of the Agency's responsiveness to Congressional direction.

3. GCC ASSESSMENTS, OPPORTUNITIES, AND PROGRAMMING PRIORITIES

3.1 Clean Energy

Our experience shows that making buildings energy efficient requires more thinking, not more money.

—Ronald J. Balon, Senior Energy Engineer
Montgomery County, Maryland, USA

Assessment[2]

Energy Demand

Asia's energy consumption trends will generate significant contributions to global greenhouse gas emissions and have profound near-and long-term implications for global climate change trends, global and regional energy security and economic development, and US foreign assistance policy. Robust economic growth in Asia has brought unprecedented demand for energy services in the region. Energy consumption is expected to double during the next 25 years and an increasing reliance on coal to meet this demand will cause carbon dioxide emissions to more than triple in this time period (APERC, 2006; IEA 2006). Between 1992 and 2004, CO_2 emissions increased by over 82%, primarily as a result of increased fossil fuel consumption in China, where total CO_2 emissions per year nearly doubled from 2.6 billion to 5.0 billion metric tons CO_2 (MDG Indicators Database, 2007). Asia's share of global emissions will increase from the current 23% (6 million out of 26 million metric tons (Mt) to about 50% (20 Mt out of 40 Mt) by 2030 with China and India accounting for over 60% of this increase.

The price stability and availability of coal generally makes it the most attractive option for generating power to meet escalating demand for electricity. While it is the most widely available fossil fuel, current demand is even increasing the price of coal. Coal use in developing Asia is projected to increase nearly four-fold during the 2006-2030 period. Together, China and India are slated to consume 57% of the world's annual coal supply in 2030, up from 40% in 2004. Oil is the dominant fuel in ASEAN but coal is expected to play an increasing role, especially in Vietnam and Indonesia, due to rising costs of other fuels. Although wind and solar generation have been growing at around 30% a year, renewable energy supplies are expected to make a relatively small contribution (less than 10%) to the primary energy mix in the region over the next 25 years.

Power generation will make the greatest contribution to CO_2 emissions as urbanization and industrialization advance and growing incomes create demand for lighting, electrical appliances,

[2] This section draws heavily from the USAID-funded report prepared under ECO-Asia CDCP, *From Ideas to Action: Clean Energy Solutions for Asia to Address Climate Change* (2007).

air conditioners, and space heating. The residential and commercial sectors constituted 41% of final energy demand in China, India, Indonesia, Thailand, Philippines, and Vietnam. Between 2002 and 2030, commercial energy demand in the region is projected to grow 2.5% annually while residential energy demand will grow 1.6% per year (APERC, 2006). With a projected growth rate of 6% annually in household appliances, China will continue to lead in residential and commercial energy demand growth. Increased use of air conditioners and refrigerators is the largest contributing factor to increased demand for electricity in homes.

Building this energy infrastructure will attract significant investment—estimated at about $6.2 trillion over the next 25 years for developing Asia. For example, as recently reported in the Bangkok Post, Ratchaburi Electricity Generating Holding Plc aims to double its power generation capacity to 8,000 MW in the region within five years and will need to make quick decisions over the next three to four years as to which power plants it will invest in (Bangkok Post, February 9, 2008). Given the long life of energy infrastructures systems (25-30 years), it is imperative that policy frameworks, economic incentives, and financial instruments be put in place to promote the most efficient and least polluting technologies and systems.

Increased demand for transportation will lead to a 2.6-fold increase in oil demand by 2035 in developing Asia, resulting in a three-fold increase in CO_2 emissions. Demand for oil in developing Asian countries accounted for 46% of the global increase in oil demand between 2000 and 2005; nearly 30% of this increase was from China alone (IEA, 2006). Asia's dependency on oil imports is a growing energy security concern as imports are projected to rise appreciably, increasing from 10% in 2002 to nearly 70% in 2025. The Asia region will experience greater exposure to economic risks from price volatility and supply disruptions

While industrialization and growing transportation have been major reasons behind escalating energy demand, commercial and residential building development has played a growing role, particularly in China. Between 2000 and 2030, the Chinese Government plans to move 400 million people to newly-constructed urban centers, with corresponding growth expected in commercial construction. In doing so, China is expected to erect half of the total number of buildings to be constructed globally during that time. Newly urbanized Chinese consume about 3.5 times more energy than their rural counterparts, and energy consumption of heating per unit of building areas in China is two to three times higher than in more developed countries with similar climatic conditions.

Selected graphs describing energy trends and contributions to CO_2 emissions from the RDMA report *From Ideas to Action: Clean Energy Priorities for Asia to Address Climate Change* are provided in Annex 4.

Energy Efficiency

There is enormous potential in the Asia region for increased efficiency in supply- and demand-side energy investments and a subsequent, gradual de-linking of economic growth and energy demand. For example, technical improvements and structural changes helped reduce China's energy intensity until 2000 but this has since increased due to intensified industrialization. Increasing supply- and demand- side efficiency is often the most cost-effective way of meeting growing energy demand and can yield direct benefits, including increased affordability, reduced need for investment to expand energy infrastructure, and reduced emissions of greenhouse gases and local air pollutants.

In electricity generation, thermal power plants in the Asia region often have efficiencies 10-15% lower than in industrialized countries. Introduction of clean coal technologies, investments in the rehabilitation of power plants—especially small-scale coal—and improvements in operations and maintenance could lead to high reductions in carbon emissions. Cleaner technologies have been developed over the last couple of decades but their higher costs as well as poor policy frameworks, perceptions of some technologies as "unproven," and low access to financing have hindered their wide-scale uptake.

As incomes grow, demand for lighting, air conditioning, space heating, and other electricity-consuming appliances and equipment has escalated. Lighting is a major end-use in buildings and energy used in buildings accounts for 42% of total global energy consumption and 36% of energy-related CO2 emissions. In RDMA's *From Ideas to Action* report (USAID/RDMA, 2007), improving the efficiency of lighting and appliances was the highest ranked option for climate change mitigation, using criteria such as total emissions reduction potential, regional applicability, and cost of energy generated/ saved. However, energy saving potential has not been fully realized given such factors as low awareness and sometimes high up-front costs of appropriate, cost-effective technologies, low electricity prices, and inadequate access to suitable financing sources.

As described in Section 1.4, there is a plethora of planned and active clean energy funds and financing instruments intended to reduce greenhouse gas emissions, facilitate improvements in energy efficiency, and promote renewable energy. However, there are number of existing barriers to their utilization such as difficulties in navigating their associated bureaucratic processes, lack of information and awareness by policy makers and project developers, limited number of qualified projects and proposals, lack of experience by project developers and sponsors in preparing funding requests, and unsupportive policy frameworks. These need to be addressed to realize the full potential of these mechanisms.

Opportunities and Priorities

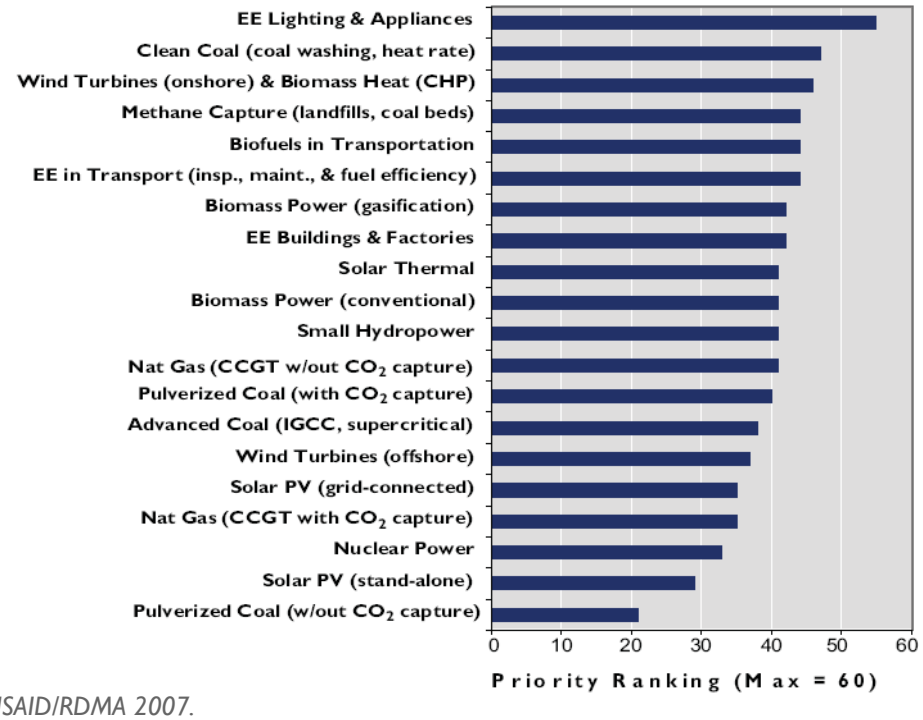
Opportunities abound in the energy sector for climate change mitigation such as cleaner fuels and vehicles, green buildings, and renewable energy supplies as well as increased efficiency in power production and use in industry and commercial and residential sectors. These have been focal areas for numerous initiatives that have been launched by donors, multilaterals, NGOs, governments and other stakeholders in the region. Section 1 outlines some of these regional energy initiatives, such as the APEC Energy Working Group, ASEAN, ADB Energy Efficiency Initiative, and APP. In addition, others with a sometimes broader focus are underway with strong US participation, such as the Clean Air Initiative for Asia (CAI-Asia), the Partnership for Clean Fuels and Vehicles, and the GEF-led Barrier Removal for Energy Efficiency Standards and Labeling (BRESL).

Within this universe of options, RDMA is most likely to achieve the greatest emissions reduction impact over the next five years by focusing its resources in targeted areas, where it can build and expand on the results of the existing ECO-Asia Clean Development and Climate Program (CDCP), leverage new funds from the private sector and clean energy/carbon funds, facilitate the transfer of US expertise and technologies, and strengthen its linkages with regional energy initiatives.

The greatest source of emissions growth in the region will be from electricity generation from fossil fuels, particularly coal. To date, ECO-Asia CDCP has supported technical workshops and study tours to promote adoption of clean coal technologies and implement efficiency

rehabilitation activities. Building on these efforts, the ECO-Asia CDCP team has proposed to RDMA a low-cost, high-profile activity that would leverage significant funds for prize money for the highest emissions reductions from the introduction and application of technologies in the rehabilitation of operating coal power plants or in new power plant designs. RDMA could also consider supporting intense 'twinning' arrangements between two or more small coal power plants in China and/or India and US coal power plants to facilitate information sharing on best operating practices and technologies, leading up to the identification and implementation of plant rehabilitation projects. Both activities are described in more detail below.

Figure 3-1: Ranking of clean energy options that can be implemented through regional cooperation programs



Source: USAID/RDMA 2007.

The most cost-effective means for emissions reduction is typically through the implementation of energy efficiency projects, which yield other direct benefits such as energy cost savings and improved management practices. There are a couple of 'low-hanging' efficiency opportunities which RDMA could immediately undertake. One, for example, is to build on the existing CDCP activities, which aim to test and collect data on CFL products, to further promote market transformation in efficient lighting. As described below, this can be undertaken by making this data available to consumers through media outlets to inform their decision-making and by utilizing it in the design and implementation of one or two bulk procurements by public sector entities, utilities, or large private retailers, which can serve as a regional model. Another 'low-hanging' opportunity is to more fully mainstream and integrate water and energy efficiency activities within the ongoing ECO-Asia Water and Sanitation program, as detailed in the section on Freshwater Resources and Ecosystems.

An important element of a global climate change road map for RDMA is the leveraging of the mushrooming number of clean energy/carbon funds that are being established in the region for the support of projects that will mitigate or avoid greenhouse gas emissions. New project pipelines will need to be developed and RDMA is in an excellent position to facilitate this and

encourage the development of new and innovative approaches to clean energy. The creation of a technical assistance facility in the region will help screen and help translate viable 'ideas' into concrete proposals for funding. This will also enable RDMA to strengthen its linkages to project developers and major funders and their initiatives in the region, such as the ADB Energy Efficiency Initiative.

With assistance from the proposed Asia Climate Change Assistance Facility (ACCAF), the implementer of the activities described below should develop the capacity of its project partners to measure, account, and record the greenhouse gas emissions reduced or avoided from project implementation. This will not only assist in the emissions reporting required by RDMA but will help establish local capacity for greenhouse accounting. By measuring its greenhouse gas emissions, local stakeholders will be in a better position to manage them and can be better prepared for future financing from carbon funds.

Climate Change Focus Areas

A wide range of actions are needed to address Asia's growing contributions to global GHG levels and the numerous related energy and environmental challenges, many of which were identified in the *From Ideas to Action* report prepared under the ECO-Asia CDCP program. Clean energy activities can span across energy efficiency improvement (demand side), fuel switching to cleaner fuels, improvements in generation, transmission, distribution (supply side), and renewable energy activities. Among its climate change focus areas, the first five below are described in greater detail as selected programming priorities in the next section.

- **Continuing support for RDMA's ECO-Asia Clean Development and Climate Program**, which focuses on helping to transform Asia's markets towards clean energy solutions through regional efforts to promote policy and financing enabling conditions.
- **Launching a Cleaner Coal Competition** with the private sector for coal-fired power plants across Asia, initially supported through ECO-Asia CDCP.
- Promoting partnerships that help increase efficiency of **small coal power plants**.
- Pursuing **high priority opportunities in end-use efficiency** through public-private partnerships, particularly in China, such as promoting energy efficient buildings and appliances.
- **Expanding the market for high-quality lighting products**, initially with support through ECO-Asia CDCP.
- **Launching a regional clean energy project development facility** that catalyzes the ability of project developers to access private financing and clean energy funds.

If additional funding becomes available, the following areas may also be supported:

- **Expanding support for clean energy programs**, either under ECO-Asia CDCP or independently, that promote regional and, where RDMA is the responsible Mission, bilateral policy transformation, increased access to finance, private sector leverage, and technology best practices in the range of areas. Activity areas would include those identified in the *From Ideas to Action* report, such as: energy efficient lighting and appliances, cleaner coal (coal washing and heat rate exchange), onshore wind power, biomass combined heat and power, methane capture from landfills and coal beds,

biofuels in transport, inspection and maintenance in transport, fuel efficiency in transport, biomass power (gasification and conventional), energy efficiency in buildings and factories, solar thermal, and others.

- **Expanding adoption and use of GHG accounting and reporting practices** in clean energy activities by program implementers as well as government, academic, and private sector partners.

- **Analyzing and addressing climate change vulnerability and adaptation of energy infrastructure** particularly with respect to energy systems serving the rural and urban poor, hydroelectric power stations, oil and gas pipelines and other distribution systems, petroleum refineries, electric power transmission lines, power generating facilities located in vulnerable coastal areas, and other critical infrastructure.

Selected Programming Priorities

ECO-Asia Clean Development and Climate Program (Existing Activity)

Activity description: The purpose of the regional ECO-Asia CDCP program is to promote policy and market transformation in Asia that promotes increased investment in clean energy technologies while addressing Asia's contribution to global climate change, significant air pollution problems, rapidly increasing energy demand, and worldwide energy security concerns. The program takes a fundamentally *regional approach*, bringing together stakeholders both virtually and physically in order to address and solve common problems related to clean energy, climate change, and energy security. Program activities will be built around three inter-related pillars: (1) enhancing policy and market incentives, (2) mobilizing and facilitating clean energy finance, and (3) accelerating deployment through regional knowledge sharing. The China and India sub-programs are designed, to the extent possible, to operate in an integrated manner with the regional activities that bring together the four ASEAN focus countries: Indonesia, Philippines, Thailand, and Vietnam. Tasks outlined in the current ECO-Asia CDCP work plan include:

Component 1. Improve Policy and Market Incentives for Clean Energy

- CFL Policy and Market Incentives: Promote CFL Harmonization and Quality in Asia, Improve Governance Capacity for CFL Testing, Monitoring, and Compliance in China, Quality Assurance Program and Harmonization of CFLs in India (APP)

- Cleaner Coal Policy and Market Incentives: Promote a Regional Dialogue on Cleaner Coal Deployment in Asia, Support a National Dialogue on Policies and Regulations Related to Coal Power Plants in China

Component 2. Promote Financing and Deployment of Clean Energy

- Cleaner Coal Financing: Financing and Technology Best Practices for Cleaner Coal Power Plants in ASEAN, Promoting the Rehabilitation of Inefficient Coal-Fired Power Plants in India (APP)

- Clean Energy Financing: Promote Improved Legal and Regulatory Framework for Financing Energy-Efficiency Projects in China, Establishment and Replication of State Energy Conservation Funds in India (APP), Mobilizing Commercial Finance for Clean Energy Deployment in India (APP)

Component 3. Regional Information Sharing to Accelerate Clean Energy Deployment

- On-line Knowledge-Sharing Portal on Clean Energy Development in Asia
- Asia Clean Energy Forum

Rationale: As summarized in the ECO-Asia CDCP Scope of Work, Asia's industrialization and urbanization will have lasting consequences unless there are significant and lasting changes to how Asia's growing economies choose to develop. Clean development remains the central challenge to ensuring that Asia can reverse the alarming trends in its growing GHG emissions, air pollution and resultant health care costs, and energy consumption and inefficiency. One of the most immediate needs is to establish the enabling conditions that promote investment in cleaner technologies and practices. Policy reforms, increased access to finance, market-based incentives, and increased government capacity to facilitate such change are all essential steps for displacing near-term capital investments in out-dated, polluting technologies with cleaner and more efficient alternatives. Governments and businesses also require significant knowledge transfer in how clean technologies can be adopted and maintained. In addition, much more regional cooperation is needed to help catalyze the technical and financial resources that exist within Asia itself to make such reforms a long-term reality.

Roadmap:

Years 1-3: Initial ECO-Asia CDCP program period. Conduct a comprehensive regional analysis of clean energy priorities for Asia (completed; report titled *From Ideas to Action: Clean Energy Solutions for Asia to Address Climate Change*). Launch and implement selected activities addressing priority clean energy areas (ongoing). Conduct a mid-term and end-of-task order internal evaluation on program progress, and

Years 4-7: Based on outcomes of evaluation at the end of the current task order, initiate new procurement for continuation and/or possible expansion of activities into one or more additional priority areas identified in the *From Ideas to Action* report, including, but not limited to: energy efficient appliances, onshore wind, biomass heat, methane capture, biofuels in transportation, and energy efficiency in transport.

Performance indicators: See ECO-Asia CDCP Performance Management Plan (March 2008).

Partners: ADB, World Bank, Global Environment Facility, Government of Australia, numerous national government, private sector, and NGO partners.

Funding Resources: RDMA core program funding.

US-China Clean Energy Partnership (New Activity)

Activity description: This activity will support public-private partnership activities to assist China in achieving its goal of reducing energy consumption per unit of GDP by 20 percent, as mandated in its 11th Five Year Plan (2006-2010), and reduce its growing contributions to greenhouse gas emissions. To reduce energy consumption by end-users, US partner organizations, such as universities and NGOs, will share information with their Chinese counterparts on best energy management practices and technologies, leading up to the identification and implementation of efficiency interventions. While this activity may encompass a broad array of demand-side efficiency measures, it will likely focus on energy efficiency in buildings and their lighting, appliances, and heating and cooling systems given the high potential

for efficiency improvements and the immediate opportunity to influence the ongoing construction boom in China.

The activity will raise awareness on the potential for improved energy performance in planned building construction and existing buildings or through other, related, end-use efficiency areas. The US implementing partner will utilize case studies, technical manuals and guides, toolkits (such as the US EPA Benchmarking Tool), or other information to raise awareness of energy and cost savings potential. Support may be provided for the design and implementation of energy audits to identify specific opportunities for efficiency interventions. Potential building improvements may include the installation of energy efficient windows and doors, replacement of lighting with CFLs, optimization of ventilation, heating and cooling systems, pump replacement or optimization, and installation of other efficient technologies. Furthermore, the activity will consider emphasizing improved energy management practices and building maintenance to maximize and maintain efficiency gains. Tools for monitoring and evaluating changes in energy consumption will be applied.

Given the large number of potential partners that are currently activity in the Chinese building sector – national and local government bodies, multi-nationals, NGOs, private sector companies in the building and/or energy technology industries, donors and multi-lateral development banks, it is expected that strong partnerships will be established and significant resources leveraged. Specifically, the activity will pursue a Global Development Alliance (GDA) model in which an alliance is created that combines the assets and experience of strategic partners and leverages their capital and investments, creativity and access to markets. The consortium of partners will seek an innovative, sustainable approach to increasing demand-side efficiency that can be widely replicated.

Rationale: Energy efficiency is the most cost-effective means for reducing energy consumption and greenhouse gas emissions and can yield additional benefits such as cost savings, reduction in local air pollutants, and reduced need for the expansion of energy infrastructure. The impact of energy efficiency can be enormous: the International Energy Agency (IEA) estimates that about 65% of global GHG emissions reductions through 2030 could come from energy efficiency measures in developing and transitional countries. The potential is especially high in China where energy intensity (the amount of energy required for every dollar produced in the economy) is considerably higher than other countries in the region such as India and Japan. For example, energy consumption of heating per unit of building area in China is two to three times higher than in developed countries with similar climatic conditions.

Tremendous growth in the Chinese building and construction sectors makes this activity especially timely. Between 2000 and 2030, the Chinese Government plans to move 400 million people to newly-constructed urban centers, with corresponding growth expected in commercial construction. In doing so, China is expected to erect half of the total number of buildings to be constructed globally during that time. Sharing of US expertise and experience can help promote the uptake of clean energy technologies, tools and management practices and have a lasting impact on the sector. US partner organizations are well-positioned to undertake this activity, given that US-based utilities, government agencies, and others have been leaders in developing programs and policies to improve energy efficiency and to provide incentives to end-users to minimize energy consumption.

Roadmap:

Year 1: Stakeholder consultation; selection of project partners; signed MOU with GDA partners; development of work plan; training; energy audits.

Year 2: Identification of efficiency opportunities; implementation of efficiency measures; monitoring and measuring of efficiency gains.

Year 3: Evaluation of project results; case studies; outreach and dissemination of results; identification of local partner(s) and funding sources to continue program implementation.

Performance indicators: (1) Estimated greenhouse gases reduced; (2) Funds leveraged; (3) Energy savings.

Partners: US EPA eeBuildings, APP Buildings and Appliances Task Force, Clinton Climate Change Initiative, ADB Energy Efficiency Initiative, Leadership in Energy and Environmental Design (LEED), local building managers, owners, and developers.

Funding resources: RDMA China earmark

Cleaner Coal Competition (Extension of Existing Activity)

Activity description: A Cleaner Coal Competition would promote the deployment of clean coal technologies by offering significant prize money for the highest emissions reductions from the introduction and application of technologies in the rehabilitation of operating coal power plants or in new power plant designs. The prize funds would be used to cost-share the purchase of the clean coal technologies. Prize funds of $3-5 million will be raised from coal industry associations, technology providers, private foundations, governments, and bilateral and multilateral development banks. The competition for prize money and recognition as industry leaders is expected to stimulate investment in cleaner coal technologies, plant rehabilitation, and improved operations and maintenance. Furthermore, the activity will promote policies that could lead to the improvement of minimum standards for coal-power plant efficiencies and emissions performance across the region.

The competition would be designed and judged by a panel of international experts in clean coal technologies and plant operations, drawn from coal industry associations, academic institutions, multilateral development organizations, and technology providers. The prize funds should comprise less than half the total project costs. Panel experts should define competition criteria such as emissions reductions per investment dollar, co-environmental benefits (reduction in SO_X and NO_X), cost-effectiveness, and sustainability of benefits.

The high-profile nature of the competition will raise overall awareness about clean coal technologies across the region, enhance the image of the US Government as a promoter of clean coal technologies and best practices in plant operations and management, and recognize and reward plant owners and managers as leaders in the development of 'clean' power plant designs, improved plant efficiencies through rehabilitation, and implementation of best management practices. Award of the prize funds will be made at a high-profile event and will attract significant media attention. The Cleaner Coal competition could be repeated approximately every two-three years to continue to spotlight and encourage the adoption of clean coal technologies in plant design and operation.

Rationale: A Cleaner Coal competition would be timely in Asia given the estimated increase in coal power generation from the current 460 gigawatts (GWs) to 1,600 GWs in 2030 in six Asian countries (China, India, Indonesia, Philippines, Thailand and Vietnam). Coal already makes the highest contribution to the power generation mix in the region (especially in China and India) and is expected to grow. A competition would encourage 'leapfrogging' in clean coal technology adoption in new plant design and rehabilitation. Traditionally, awards and competitions, such as those in ASEAN for renewable energy and energy efficiency, have attracted a great deal of attention and response from participants.

This activity is an excellent candidate for a GDA with the private and public sector organizations that contribute the prize funds and with the winning power plant, which will pay for the majority of the project. A small amount of RDMA funds can leverage much larger sums from these potential partners.

Roadmap:

Year 1: Identify a panel of clean coal experts to consider alternative competition designs that would catalyze the maximum emissions reductions; Develop competition criteria; Approach private and public sector donors for prize funds.

Year 2: Collect $3-5 million in prize funds; Advertise competition in regional media; Solicit proposals; Review proposals and select winners; Award prizes at high-profile event; Issue press releases to media.

Years 3-4: Review and assess competition program; Redesign as necessary; Attract any new funding partners and commence with Year 2 activities as redesigned.

Suggested performance indicators: (1) Funds leveraged for prize money; (2) Dollars leveraged from plants in adapting plant design and adopting best management practices and (3) Emissions reductions from changes to plant designs or operations as a result of the competition.

Potential partners: Asia Development Bank, World Coal Institute, coal mining companies, International Energy Association, US Department of Energy, World Bank, APEC, ASEAN Forum on Coal, national electricity utilities, Coal Producers Association.

Funding Resources: RDMA core program funding.

Partnerships to Increase Efficiency of Small Coal Power Plants (100-300 MWs) (Extension of Existing Activity)

Activity description: This activity will provide intense 'twinning' arrangements between two or more small coal power plants (100-300 MW) in China and/or India and US coal power plants to facilitate sharing of information and knowledge on best operating practices and maintenance specific to the targeted plants, leading up to the identification and implementation of cost-effective opportunities for rehabilitation. This activity will build off of the existing ECO-Asia CDCP activities that aim to transfer knowledge about more efficient plant technologies and utilize the CDCP network of plant managers and experts to help identify suitable candidate plants for the 'twinning' program. This activity will also complement and closely coordinate with the APP project, Best Practice for Power Generation, which consists of approximately 18 site visits (within six countries), workshops and capacity building, to assist power generators to improve their overall coal-fired power plant thermal efficiency.

The activity will review a select list of small coal power plants in Asia (including those being assisted by CDCP and APP) and prioritize those according to their potential for emissions reductions, expected future operational life, and commitment by plant management to enhance operational efficiency and undertake rehabilitation investments. Collaborative partnerships will be established with clearly defined roles and responsibilities, agreed workplan of activities, and expected outcomes. This 'twinning' between Asia and US small coal power plants will encompass internships, study tours, site visits, transfer of materials, manuals, and other resources as well as management tools.

It is expected that through this partnership, plant management in Asia will identify and take advantage of immediate, no- or low-cost opportunities for efficiency improvements. Further assistance will be provided in the implementation of audits and assessments to define the scope of potential rehabilitation works, prepare project proposals for outside financing and, as appropriate, facilitate access to financing. As described below, there are a number of new financing opportunities, including recent GEF initiatives and the potential sale of certified CO_2 emissions reductions (the relevant methodology is pending approval by the UNFCCC). A regional workshop will be conducted at the end of the partnership to disseminate the results of the exchange, highlighting efficiency improvements, financing instruments utilized, new management tools and O&M procedures.

Rationale: There are significant numbers of existing coal power plants, particularly in China and India, that are old but still far from retirement (e.g., 539 units in China and 216 units in India are 10-30 years old). The majority of these are small (between 100-300 MWs) and by virtue of their smaller size, less efficient than larger power plants over 300 MW. Without investment in rehabilitation and effective operating and maintenance practices in place, plant aging will often cause their operating efficiencies to decline by 2-4% below the 'design efficiency.' In addition to improved operating and maintenance practices, rehabilitation projects can be a cost-effective way to reduce CO_2 emissions, while increasing plant efficiency and availability.

Roadmap:

Year 1: Consult with stakeholders, including relevant global institutions, other program partners and donors, on feasibility, design, and complementarities with existing efforts; Develop short-list of small coal power plants in Asia meeting such criteria as potential for emissions reductions, future operational life, management commitment; Select two-three plants to participate in the program; Identify US Coal Power Plants to act as 'sister' institutions; Develop and sign MOUs; Develop workplans; Conduct site visits, training workshops.

Year 2: Identify priority areas for improvements in operations and maintenance and rehabilitation; work with plants and transfer knowledge, tools and other resources for improvements; define scope of any rehabilitation works and work with plants to define technical and engineering designs; Connect power plants with sources of grants, carbon funds or financing; Facilitate the development of project proposals that meet the requirements of the funding source(s); One or more regional workshops held to disseminate lessons learned to date.

Year 3: Assist, as appropriate, with bringing project to financial closure; monitor project implementation; apply carbon accounting to assess emissions reductions; host regional workshop to disseminate project results; review and assess program and re-design/ expand/ transfer to other institution as necessary.

Performance indicators: (1) Reductions in energy consumption; (2) Greenhouse gases reduced; and (3) Number of people trained.

Potential partners: This activity can leverage the GTZ Environmental Protection in the Energy Industry program (http://www.gtz-powerandcoal.com), which supports technical cooperation between the People's Republic of China and the Federal Republic of Germany to improve the environmental situation in the Chinese coal and power sectors through increasing the efficiency and environment-friendly use of the resources coal and water in China's coal-fired power plants. The GEF also recently initiated projects in India and China, focused on rehabilitation and removal of barriers to improving plant efficiency. Other partners may include the ASEAN Forum on Coal, World Coal Institute, and Unites States Energy Association.

Funding resources: RDMA China earmark.

Expanding the Market for High-Quality Lighting Products (Extension of Existing Activity)

Activity description: Building on existing ECO-Asia CDCP and APP efforts, this activity is envisioned to have two parts: (1) to promote consumer awareness of high-quality CFL products through dissemination of the results of the current ECO-Asia CDCP/ Australia Greenhouse CFL product benchmarking initiative and (2) to support bulk procurements by utilities, Government, or the private sector to help encourage a market shift towards high quality CFL products. Under the first activity, test data being produced by the benchmarking CFL test initiative of about 2000 lamps will be compiled into a CFL registry or information database that will be made available on-line to consumers and through media outlets, similar to Consumer Reports. Additional test data will be sought directly from CFL manufacturers. In coordination with on-going standards and labeling programs (e.g., GEF—BRESL, ELI, APP, International CFL Harmonization Initiative) and lighting manufacturers and associations, this information will be use to further the development of a regional consumer awareness program about CFL product quality.

To promote a buyer-led shift in the market towards high quality lighting products, this activity will seek opportunities to work with the public sector, large private retailers and/or utilities on bulk procurements of products that meet ELI and minimum quality standards. This activity may encompass working with existing procurement efforts to advise utilities on product quality, such as PLN—Indonesia's purchase and dissemination of CFLs for its rural customers; providing support for purchasing policies and practices by national or municipal government bodies; creating awareness about lighting product options; and dissemination of technical information and product specification. Although lighting will remain the pre-dominant focus of the procurement, the implementer may consider adding other efficient equipment to the procurement, where savings may be high and significant improvements could be made to the overall energy management of the facility. Given the mercury content of CFLs, this activity would ensure that its partners put in place adequate procedures for the proper disposal of CFLs—either to a modern landfill or to a hazardous waste collection facility.

Rationale: ECO-Asia CDCP efforts to date have focused upstream on the harmonization of CFL test procedures in Asia and regional benchmark testing of CFL products. This activity will complement current efforts by seeking to influence consumer decisions through disseminating test results to-date and generating demand for high quality CFL products through bulk procurements. This type of assistance is made urgent by the high penetration of sub-standard CFLs in the Asia market. To prevent a consumer 'backlash' to the CFL product, continue the

expansion of the CFL market, and ensure that energy savings and emissions reductions targets are met, action must be taken to promote the uptake of high quality CFLs and raise awareness amongst consumers about product quality.

This activity is especially timely given the growing momentum across the region towards a phase-out of incandescent bulbs. For example, the Philippines recently announced a national deadline of 2010, which is estimated to result in a reduction in the Philippines' annual greenhouse gas emissions by 2 million metric tons. China plans to transition away from incandescent bulbs over the next ten years, which could lead to a reduction of 500 million tonnes of CO_2 annually, equal to about half the greenhouse gas emissions of Germany.

RDMA will utilize its regional partnerships (e.g., APEC, ASEAN, APP) to ensure that CFL test data and the results of the bulk procurement(s) will be widely disseminated to stakeholders throughout the region. The CFL test data will be of regional interest given the testing of CFL products that are available for purchase throughout the region. Although the bulk procurement will be specific to a country, the energy equipment specs and case study, outlining the procurement process, results and lessons learned, will be circulated to all stakeholders in the region including bilateral missions, donors, government bodies, multilateral development banks, and other lighting initiatives (e.g., the Efficient Lighting Initiative, Vietnam Energy Efficiency Public Lighting program, GEF—Barrier Removal to the Cost-Effective Development and Implementation of Energy Efficiency Standards and Labeling). This information will be particularly timely given the upcoming phase-out of incandescent bulbs in the Philippines and China and the likelihood that other countries in the region will follow suit.

Roadmap:

Year 1: (a) CFL database/ registry: Consultation with CFL manufacturers, lighting associations, donors, and other stakeholders; Solicitation of test data from CFL manufacturers; Compilation of ECO-Asia CDCP/ Australia Greenhouse data; Design of on-line database. (b) Bulk procurement: Outreach to private sector retailers, Government bodies, and utilities to identify opportunities to initiate and influence bulk procurements.

Year 2: (a) Launch of on-line database; development of press releases and articles for dissemination; integration of database into complementary standards and labeling programs' efforts to raise consumer awareness about CFL product quality. (b) Introduction or changes to procurement policies, as required; development of product specifications for procurements; development of procurement mechanisms (such as tendering, performance contracting, etc); evaluation of tenders, proposals, etc; monitoring of procurement process, implementation and results.

Year 3: Program review; recommendations for program redesign, expansion, or transfer to other institution. (a) Identify third party to continue product testing and maintain CFL registry. (b) Disseminate lessons learned through preparation of case study and regional workshop.

Year 4: Implement program assessment recommendations.

Performance Indicators: (1) Energy savings; (2) Greenhouse gases reduced or avoided; (3) Number of procurement policies enacted; (4) Funds leveraged.

Partners: CFL manufacturers, lighting associations, utilities, large private retailers, government bodies, ASEAN, GEF—BRESL, ELI, APP, International CFL Harmonization Initiative.

Funding: RDMA core program funding

Clean Energy Project Development Facility (New Activity)

Activity description: This activity will assist project developers across the region to gain access to private finance and mushrooming clean energy funds, both existing and soon to be announced (see Section 1.4). It will support the upstream development of clean energy concept proposals that could be submitted for either further development under technical assistance facilities such as the Private Financing Advisory Network (PFAN) or for financing through carbon funds or clean energy financing facilities. It will support the earliest stages of program or project identification. The activity will focus on small- and medium- sized projects given the existing focus by governments and multilateral development banks on large-scale projects. The activity will explore opportunities to bundle smaller projects to enhance access to financing facilities. The activity is expected to build the project pipeline for such facilities as the ADB Energy Efficiency Initiative, Asia-Pacific Carbon Fund, Clean Development Mechanism, as well as clean energy funding windows in development banks and commercial banks and the upcoming Clean Technology Fund.

Specifically, the facility will screen project ideas with respect to estimated emissions reductions, viability of their technical and engineering aspects, prospects for financing and future scale-up, and project sustainability. Small grants will be offered for pre-feasibility and feasibility studies for the more promising project concepts. The facility will connect developers with a list of consultants who may be able to undertake the work at preferred rates, oversee the design and implementation of these studies and then, as appropriate, assist developers with elaborating the project concept in more detailed proposals for submittal to PFAN, financing sources or carbon funds. In addition, the facility will hold workshops and other convening events to connect project developers with potential investors, multilateral development programs, and private and public financing sources.

To facilitate project financing, technical assistance may be provided to financiers to help them better understand the technical and financial aspects of the proposals. The activity implementer will likely act as a liaison between the financial institution and developers, and help bridge any gaps in understanding as well as ensure that the proposals meet the financial institutions' requirements. As appropriate, the implementer may provide training to the financier on specific issues that would help bring the deal to closure. It is most likely that this type of assistance will be provided to banks and other sources of commercial finance, which have less experience with financing small- to medium- sized clean energy projects. Larger projects will be submitted to institutions managing clean energy initiatives in the region, such as the ADB Clean Energy Initiative and the Asia-Pacific Carbon Fund. As appropriate, the implementer should consider alternative financing and implementation schemes, such as performance contracting by energy service providers and suppliers.

Rationale: Although a number of clean energy financing facilities, credit guarantees and carbon funds have been launched (and more with significant funding are on the way), there is a dearth of financially-viable project proposals and subsequent under-utilization of these instruments. A mechanism is needed to translate project ideas into high-quality project concept notes or proposals which have passed a certain level of scrutiny and are ready for review by project development or finance facilities. Furthermore, project developers require assistance in navigating the plethora of available grants, guarantees, and facilities and identifying the most appropriate resource source.

This activity will leverage significant resources as it will work with project developers to connect them with grant funds and financing, and help them bring the projects to financial closure. It will complement and expand on the APP—Project Preparation Facility in India which aims to identify and prepare projects that can have increased potential to qualify for loans and investments. The PPF aims to match project sponsors with investment sources by convening periodic investment forums and bringing together developers and investors.

This facility will provide a one-stop shop for developers across the region that require assistance with conceptualizing their project ideas, ascertaining their proposals' financial and technical feasibility, and accessing financing. As appropriate, the facility may consider bundling smaller projects across the region to access funding from large clean energy/ carbon funds. The facility will also serve as an important mechanism for sharing innovative approaches to designing and financing clean energy projects among developers, financiers, and other stakeholders in the region.

Roadmap:

Year 1: Stakeholder consultation; development of expert network to be tapped by project developers; Solicitation of project ideas through dialogue with Missions, APP Task Forces, Individual developers, Call for initial concept notes, and Outreach; Screening of project concepts, Development of workplan.

Year 2: Selection of first tranche of project concepts; Design and implementation of pre-feasibility and feasibility studies; Development of more detailed project proposals, as appropriate; Submission of project proposals for PFAN technical assistance or financing.

Year 3: Assistance, as required, to bring projects to financial closure; Monitoring of project implementation; Program review; Recommendations for program redesign, expansion, or transfer to other institution; Design of funding mechanism for facility sustainability.

Year 4: Implement program assessment recommendations; implementation of sustainability mechanism.

Performance indicators: (1) Number of project proposals developed; (2) Funds leveraged; (3) Estimated greenhouse gases reduced.

Partners: PFAN, APP—Project Preparation Facility, India—New Venture, ADB Energy Efficiency Initiative, Asia-Pacific Carbon Fund, State Conservation Funds in India.

Funding resources: RDMA core program funding

3.2 Forests and Land Use Change

The creation of a thousand forests is in one acorn.

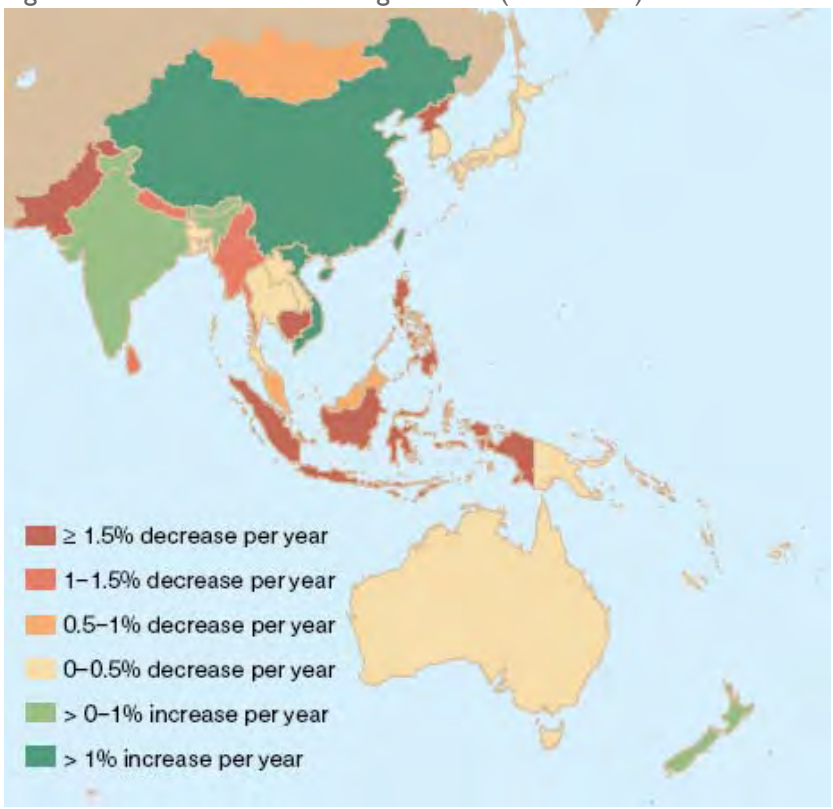
—Ralph Waldo Emerson

Assessment

Forests in Asia—Conditions and Trends

Forests in Asia play a critical role in providing a variety of ecosystem services that millions of people depend upon. They provide food, building materials, medicinal plants and fuel wood. They supply timber for domestic and export markets, protect soils from erosion, play an important role in recycling and distributing freshwater. Asia's forests also contain the great majority of the region's terrestrial biodiversity (Barber et al. 2005) Asia's forests are crucially important as reservoirs of CO_2, holding 11.5% of the global stock of carbon in living forest biomass (Nabhurs et al. 2007). In addition, some 10% of Southeast Asia's land area consists of carbon-rich peatlands, mostly in Indonesia. Current draining and burning of these peatlands in Indonesia alone are producing some 516 megatons of CO_2 emissions per year—almost twice the emissions from fossil fuel burning in that country (Hooijer et al. 2006). Deforestation and destruction of peatlands in Asia have thus been increasingly acknowledged to be a major global source of GHG emissions (Nabhurs et al. 2007). When emissions from land use change and deforestation are calculated, Indonesia ranks as the third-largest emitter of GHGs globally (PEACE 2007). According to World Wildlife Fund, deforestation in Indonesia's Riau Province alone releases more greenhouse gases per year than the Netherlands, or 58% of the total emissions of Australia. Covering one fifth of Sumatra Island, the province has lost 65% of its forests in the past 25 years, as well as large peat swamp areas (Reuters 2008).

Figure 3-2: Rates of forest change in Asia (2000-2005)



Source: State of the World's Forests 2007 (FAO).

Despite their intrinsic and societal values, natural forests in Asia continue to disappear at alarmingly high rates (Figure 3.1). Forests are under constant threat from conversion to agriculture, illegal logging, unsustainable extraction of timber and other forest resources, changing

climate conditions, pollution, and policies that subsidize forest conversion to other uses. Slowing deforestation and securing the sustainable management of forests in the region is one of the most urgent tasks for climate change policy, investment, and action.

The picture is not entirely grim: the region as a whole experienced net forest increase during 2000-2005, due mainly to afforestation programs in China, although planted forests cannot be considered a substitute for natural forests from biodiversity and ecosystem services perspectives. India's forest cover was generally stable during this period.

Many areas in the region, however, face serious rates of forest loss and in some Asian countries deforestation rates are amongst the planet's highest, exceeding 1.5% per annum. According to FAO (2007), Southeast Asia experienced an annual net forest loss of more than 2.8 million hectares per year during 2000-2005, and a total loss of primary forest of 1.5 million hectares (more than five times the rate of loss of the rest of the Asia-Pacific region), similar to the rate it experienced in the 1990s. Deforestation rates were highest in Indonesia, where 1.9 million hectares disappeared on average each year, followed by Burma, Cambodia, the Philippines, Malaysia, and the Democratic People's Republic of Korea. Accessible lowland tropical forests have been hardest hit, largely disappearing on the Indonesian islands of Sumatra and Sulawesi, and rapidly disappearing elsewhere. Overall, seven countries in Southeast Asia lost nearly 15,000 km^2 of forest cover from 2000 to 2005—an area greater than Bangladesh or Nepal, equivalent to 40% of Japan's land area—and the Asia-Pacific region as a whole lost over 27.4 million hectares of primary forest land between 1990 and 2005 (FAO 2006).

Forests and Climate Change in Asia

GHG emissions from forests and land use change account for as much as 25% of the global total, with the majority of those emissions coming from deforestation in tropical and sub-tropical developing countries (IPCC 2007c). In Southeast Asia, the percentage is much greater, topping 80% in Indonesia, where the deforestation rate is high, and the destruction of peat forests contributes disproportionately to emissions (PEACE 2007; Hooijer et al. 2006). Southeast Asia's current total peatland CO_2 emissions of 2,000 Mt/year—nearly 90% from Indonesia—equals almost 8% of global emissions from fossil fuel burning (Hooijer et al. 2006).

In other countries of the region where forest cover is still extensive, such as Papua New Guinea and the Solomon Islands, there are opportunities to prevent the rapid deforestation experienced by Southeast Asian countries, and thereby avoid significant future emissions. Addressing both types of situations requires the same three-pronged approach: (1) mobilizing political will and momentum, (2) establishing an enabling policy and institutional environment for reducing or preventing deforestation, and (3) creating mechanisms that provide concrete financial rewards for reducing or avoiding deforestation.

In addition to human activities a number of forest areas and biodiversity resources are also threatened by climate change impacts resulting from shifts in precipitation patterns and climate variability. USAID has conducted an initial study on such climate vulnerabilities in Thailand, which reported tangible risks to natural resources and the communities that depend on them, although further study is required to consider risks to other sensitive areas.

Biofuels—A Key Emerging Issue

Biofuel development—primarily ethanol and biodiesel—is a rapidly growing sector globally, and, while Asia's share is still small, it is booming, stimulating sizeable new investments in production

of ethanol from sugar and grain crops and biodiesel from palm oil and jatropha (Bio-era 2006). Oil palm is the major biofuels crop in Asia, and as demand has grown, global palm oil prices have climbed by more than 30% during 2006 and an additional 68% during 2007. In January 2008, the price of crude palm oil (CPO) rose above $1000/ton for the first time. Indonesia and Malaysia are, respectively, the first and second largest producers in the world. Discussion of biofuels, at least in Southeast Asia, is therefore dominated by the oil palm boom and its negative impacts.

Biofuels are attractive to Asian countries as a locally feasible means to diversify energy resources and bolster energy security in a world of declining domestic petroleum supplies and high prices for imports. Biofuels development—especially oil palm—however, is also controversial for several reasons.

First, biofuels are often promoted as part of the solution to climate change, but it is unclear whether the production of oil palm and its use in biodiesel actually reduces net CO_2 emissions (Reijnders and Huijbregts 2006; Fargione et al. 2008). In Indonesia, oil palm plantations have been a key driver of natural forest destruction and catastrophic forest and land fires, with particularly serious CO_2 emissions impacts from the degradation, burning, and conversion of carbon-rich peatlands and forests (Hooijer 2006; Barber and Schweithelm 2000). The loss of peat and other forests to oil palm plantations is a major contribution to Indonesia's position as the third-largest emitter of GHGs globally, as noted above. The clearing of tropical forest for oil palm plantations is also a major driver for biodiversity loss (Friends of the Earth et al. 2005), and often leads to serious conflict with local and indigenous communities (Friends of the Earth et al. 2008; GFW and FWI 2002).

In addition to these environmental impacts, conversion of land formerly used for food production to energy production, combined with the rapid rise in palm oil prices, has contributed to the dramatic rise in food prices during 2008 that has caused severe hardship for the world's poor, led to riots, and dominated headlines and international policy discussions. While the relative contribution of the biofuels boom to rising food prices is contested, in Asia it is clear that the skyrocketing price of CPO over the past few years has been a key driver of increases in the price of cooking oil, a key staple for the region's poor (Naylor et al. 2007; Doornbosch and Steenblik 2007).

Despite these current controversies and problems, biofuels are very likely here to stay in Asia in one form or another. The booming market for biofuels, especially palm oil, has outrun efforts to better understand the options, costs, and benefits of various approaches to the sector, to develop best practices and standards, and put in place the enabling policy environments to allow for their implementation. This is a gap that RDMA can help to fill as part of its regional climate change portfolio, but with important benefits for biodiversity conservation and sustainable livelihoods as well.

Opportunities and Priorities

Political momentum for addressing deforestation within the climate change context grew dramatically during 2007, culminating in the December UNFCCC Conference of the Parties (COP) in Bali, which firmly placed REDD on the international political agenda. National political commitment in the Asian region to reducing deforestation is stronger than it has ever been, due largely to the impetus of the climate change issue. International institutions ranging from the World Bank and the Center for International Forestry Research (CIFOR) to the major international conservation NGOs are all focusing on the REDD issue with increasing intensity.

US philanthropic foundations are also focusing on the REDD issue, and one group of foundations is planning to invest $15-30 million per year in this area over the next five years or so, representing a significant new potential for GDA partnerships (Packard Foundation, 2008).

With this political wind at the region's back, the major challenges over the next few years lie in helping countries to establish enabling policy and governance environments for reducing deforestation and sustainable forest management, and helping governments and the private sector to establish REDD-specific mechanisms, as well as broader payments for ecosystem services (PES) systems.

Enabling and promotion of PES—including REDD mechanisms—is consonant with broader US objectives in the international forest policy arena. The longstanding US view, shared by other donor countries, is that official development assistance (ODA) cannot and will not meet the needs in developing countries for financing sustainable forest management (SFM). ODA plays an important catalytic role, but can only be part of a broader "portfolio approach" including private sector investment, increased domestic budget allocations through "mainstreaming" of forest management into broader development policy and financing, and, importantly, the development of PES systems under which the costs of maintaining forest ecosystem services (including carbon) are internalized by users of those services, with concrete financial and livelihood benefits flowing to those who maintain and enhance those ecosystem services (Richards and Jenkins 2007; Daily and Ellison 2002; Pagiola et al. 2002). Mobilizing PES systems, private sector investment and other components of a "portfolio approach" requires, in turn, a strong focus on governance, understood as creating or strengthening the requisite enabling policy, legal, and institutional conditions in developing countries.

The growing focus on the role of forests in mitigating climate change through REDD and other PES mechanisms is a welcome development. It must be remembered, however, that a "carbon" forest project is still just a forest project, with some additional site-selection criteria (e.g., targeting carbon-rich peat forests) and carbon measurement and monitoring methodologies. The fundamental problems that have bedeviled the forest management in much of Asia—indeterminate and chaotic spatial planning and land tenure, perverse economic incentives, weak governance and law enforcement, lack of community participation (Chomitz 2007; Barber et al. 2005), and the difficulty of bringing good management models "to scale"—have not changed, and the ultimate success of REDD and PES initiatives will depend on finding effective and sustainable responses to these challenges.

Climate Change Focus Areas

A wide range of actions are needed to address the current and ongoing threats to Asia's forest and land use resources, and their contribution to the climate change challenge, including those listed here. Among these priority focus areas, the first three below are described in greater detail as selected programming priorities in the next section.

- **Ending illegal logging and timber trade** through RDMA's Responsible Asia Forestry and Trade (RAFT) Program, including expanded activities that incorporate carbon monitoring and adaptation to ensure success over the long term.

- **Promoting innovative forest and natural resource conservation practices**, such as through payment for environmental services (PES) schemes, incorporating carbon accounting and adaptation to changing climate.

- **Promoting sustainable biofuels production** through regional activities focused on standards and best practices, partnerships, community and economic development, trade, and cooperation.

If additional funding becomes available, the following areas may also be supported:

- **Promoting carbon sequestration and GHG emissions mitigation** through regional cooperation activities and sharing of best practices supporting afforestation/reforestation, agroforestry, conservation of natural ecosystems, fire management, sustainable agriculture, sustainable forest management, protection of high priority peat lands, or related activities; all of which increase resilience to climate change.

- **Expanding adoption and use of GHG accounting and reporting practices** in forestry and land use by government, academic, and private sector partners through regional platforms.

- **Improving adaptation and resilience** of forest, biodiversity, land use resources to ongoing and long-term climate risks through regional or, where RDMA has responsibility, bilateral activities that promote, for example: habitat conservation through biological corridors, community based natural resource management, and protected area management; integrated landscape protection using forest resources, restoration of degraded lands, and erosion control; research, policy, or regulatory reform in support of sustainable forest resource management; improved ecosystem resiliency to climatic variability; crop diversification (drought-tolerant and disease-tolerant crops); famine early warning systems; rehabilitation of coastal mangroves and riparian forests that increase resilience and protect coral reefs from sediment; modeling of climate impacts on agriculture production; and improved market and trading systems to increase access to food.

Selected Programming Priorities

Responsible Asia Forestry and Trade (RAFT) Program – Incorporating the Climate Change Dimension (Expansion and Extension of Existing Activity)

Background: RDMA's Responsible Asia Forestry and Trade (RAFT) program, a three-year activity (FY07-09) implemented by The Nature Conservancy and a consortium of NGO and private sector partners, works with forest producers and other stakeholders across the region to: (a) increase regional timber trade from legal sources; (b) measurably improve sustainability of forest management on the ground; and (c) strengthen regional cooperation on forest management and trade. By reducing illegal logging and promoting sustainable management of forest production, RAFT is therefore already making a contribution to mitigating climate change in the region, since deforestation and forest degradation are important sources of GHG emissions, as previously noted. It is proposed that RDMA launch complementary activities that explicitly measure and report the climate change mitigation impacts of ongoing RAFT activities at its field sites, and build on the RAFT consortium to provide RDMA, USAID Missions, and countries in the region with an enhanced set of tools, methods and activities for mitigating forest-based GHG emissions and incorporating climate change adaptation into forest management and conservation strategies. This activity would be funded in part under the President's Climate Change and Energy Security Initiative.

Activity Description: The general approach to integrating climate change objectives into RAFT will involve (i) expanding current field activities with private sector timber enterprises, including incorporation of carbon monitoring, so that USAID assistance has a great immediate impact in measurably reducing carbon emissions; and (ii) supplementing this work with new activities that can promote regional sharing of best practices to mainstream climate and forest approaches across the region.

Specific proposed activities are as follows:

(a) Expansion of existing sites and incorporation of carbon accounting: Bring the 20 timber concessionaires who are currently working with RAFT through the complete "step-wise" approach to certification, including priority attention to High Conservation Value Forest (HCVF) elements (where the greatest carbon gains can be made), and monitoring of carbon emissions avoided due to project interventions and identify an additional 10 concessions. Significant funding is envisioned for this activity over three years.

(b) Support for the Balikpapan (East Kalimantan, Indonesia) Sustainable Forest Management Resource Center: This Center is developing as a key center of excellence for forest spatial planning and related geographic information system (GIS)/remote sensing technical assistance and capacity building for Indonesia, and Malaysian Borneo (Sabah and Sarawak). Developing GIS/remote sensing capacities and, crucially, applying them to forest planning and monitoring, are cornerstones of any workable approach to measuring the carbon impacts of forest interventions and obtaining compensation for them, whether on voluntary carbon markets or under the evolving international "REDD" mechanism. To this end, The Nature Conservancy has been in discussions with the USDA Forest Service (USFS) to provide technical assistance support to the Center's staff and partner organizations (e.g. national and provincial forest agencies), through long- or short-term secondment of USFS technical staff to the Center. The possibility of linking this USFS role with technical assistance to ASEAN's forest management program is also being explored. In addition, initial discussions with Forest Service have indicated a number of GIS/planning hardware and software development needs that are required to better support partners with improved forest management planning in forest concession areas and with forest cover monitoring to fully assess the results of interventions. Over the period FY2009-FY2011, this activity will therefore comprise two sub-components: (a) A modest injection of funding for equipment, training, and access to imagery; and (b) provision of the equivalent of 2-3 years FTE of technical assistance from USFS or USFS-recommended staff to assist the Center in strengthening its contributions to improved forest management and reduced emissions from deforestation. As noted, the details for this component (e.g. long-term staff placement versus a number of shorter-term missions, possibility of combining with a USFS secondment to the ASEAN Secretariat in Jakarta) are still under discussion. Modest funding is envisioned for this activity over three years.

(c) Incorporation of Carbon Exposure Analyses into Forest Investment Screening: RAFT currently involves WWF to refine sustainable forest management investment screening instruments and disseminate these materials to Banks that provide investment support to forest enterprises in the Region, starting with Indonesia, Malaysia and Singapore. None of these instruments currently include any carbon risk exposure, though a number of financial institutions in Australia and elsewhere are starting to develop such instruments for their portfolio screening for major clients. It is proposed to hire a financial screening specialist for a fixed period of 3-4 months to synthesize best practice on approaches to carbon exposure analysis and then to hold a series of workshops to ensure that these practices are incorporated in the WWF forest investment screening guidelines and extended to potential clients through a series of review

workshops. This modest investment could provide considerable leverage in terms of improved future practices. Modest funding is envisioned for this activity in the first year.

(d) Creation of a Regional REDD Learning Network: The RAFT program includes support for the development of a pilot forest conservation and management learning network on the theme of participatory planning and conflict management using the Regional Community Forestry Training Centre (RECOFTC) at Kasetsart University, Bangkok as an anchor institution. TNC's approach has been to use this network as a pilot for a number of other key thematic learning networks in areas such as protected area management, reduced impact logging, and HCVF analysis and management. TNC has made support for these networks a key element of its US Capital Campaign fundraising priority for the Forests of the Southeast Asia Archipelago and, based on the experience of developing the RECOFTC work, believes that significant funding would be required for a gestation period of 3-5 years to effectively kick start and maintain a network. To be successful, this kind of effort requires regular training sessions backed by a full-time point person in an appropriate anchor institution within the region. The latter person could be a skilled, but relatively junior professional (e.g., a post-Doctoral Fellow or Professional Intern) who would act as a knowledge manager for the particular network, facilitating communications, synthesizing best practice and experience, and disseminating lessons learned to network participants and regional training institutions.

With the emergence of GHG emissions reductions as a major forest policy and practice driver over the last year, there is a clear need to establish a learning network to document and share experiences in key forest and climate change areas such as: enabling policy frameworks; incentives to reduce forest loss and degradation; and cost effective monitoring, linking project-level and sub-national monitoring to national and potentially multinational monitoring frameworks (e.g., for tracking progress against, for example, the APEC aspirational forest cover goals and developing confidence about extra-national leakage of destructive forest exploitation and conversion). Moderate funding is envisioned for this activity over three years

Roadmap:

Year 1: Agree on and formalize terms of RAFT expansion/extension; expand step-wise certification approach at existing 20 sites to incorporate systematic monitoring of reductions in carbon emissions arising from RAFT interventions and develop business plans for taking these sites through the full 3-5 year stepwise certification process; identify and carry out negotiations with 10 additional sites; contract and carry out work with Balikpapan Center; contract and carry out work on carbon investment screening; and conduct consultations and develop strategy and business plan for forests and climate change learning network.

Year 2: Launch activities at 10 additional RAFT sites; continue work at 20 existing sites; and launch the Forests and Climate Change Learning Network.

Year 3: Complete certification process with all RAFT site partners; and continue to implement and strengthen the Forests and Climate Change Learning Network.

Suggested Performance Indicators: quantity of greenhouse gas emissions, measured in metric tons CO_2 equivalent, reduced or sequestered as a result of USG assistance (CPE); number of clients (missions, projects, governments, etc.) served with information and technical assistance on Forests and Climate Change.

Potential Partners: Current RAFT partners; Winrock; Forest Trends; World Bank; ADB.

Funding Resources: RDMA core program funding, as well as FY2009 proposed passback funding. There are significant leverage opportunities from World Bank FCPF and other funds as described in Section 1.3, as well as from existing and potential new RAFT GDA partners.

Payment for Forest Carbon Ecosystem Services in Vietnam (Extension of Existing Activity)

Activity Description: Maintain RDMA support for the Asia Regional Biodiversity Conservation Program (ARBCP) for two years (FY2009-FY2010) with the following scope of work: (a) consolidate policy and field activities in Vietnam, in anticipation of scaling up new national payment for ecosystem services (PES) pilot policy (2008-2010) across the nation, and the establishment of a final PES policy for the post-2010 period; (b) Incorporate climate change mitigation and adaptation activities into the ongoing field activities, including development of a forest carbon income stream in ongoing PES activities in south-central Vietnam; (c) Support requests from the governments of Cambodia and Lao PDR for technical assistance and policy advice to develop their own national PES policies, and work with partners to initiate pilot activities on the ground in those countries; and (d) strengthen cooperation and exchange of lessons learned with key regional platforms, including the Asian Development Bank's Biodiversity Corridors Initiative (BCI), ASEAN, the proposed REDD learning network under the RDMA-supported RAFT program (discussed above), and the Indo-Burma Hotspot Program financed by the Critical Ecosystems Partnership Fund (CEPF). This activity would be funded in part under the President's Climate Change and Energy Security Initiative.

Rationale: The ongoing ARBCP program is in a critical phase, having gained strong support from national and local government and local stakeholders in the project area. GoV, through the Prime Minister's Office, has just set in place its national pilot PES policy, to run for two years, and has specifically invited ARBCP to be a key partner in its implementation. Indeed, RDMA's lead implementing partner is specifically mentioned in the PES policy, the first time that the role of an NGO has been formally institutionalized in this manner.

Developing and implementing practical systems for measuring, monitoring and reducing greenhouse gas emissions from forests is a policy priority for USG, GoV, and the international community. Integrating carbon values into PES systems can potentially provide an additional conservation incentive and income stream for forest owners and managers, and GoV is very interested in moving in this direction with their PES policy and program. The impressive progress of GoV and ARBCP (despite a late start of activities, due to GoV approval process delays) in establishing the policy basis and on-the-ground institutions and mechanisms for PES mean that Vietnam will be able to develop a carbon payments system much more easily than a country that was starting from scratch. In addition, carbon PES will reinforce the incentives for forest conservation, since it will provide an additional income stream for forest owners and managers and thereby provide for a diversified PES portfolio.

Development of a working forest carbon PES pilot, and associated climate change adaptation monitoring capacities, will also support and contribute to further development and implementation of GoV's new national climate change strategy and action plan: GoV released its draft "National Target Program to Respond to Climate Change", due to be finalized sometime during 2008. Climate change is a very high priority for GoV, especially since the Intergovernmental Panel on Climate Change Fourth Assessment Report (November 2007) identified Vietnam as one of the countries most vulnerable to climate change impacts.

Beyond this pioneering and strategic work in Vietnam, a specific objective of ARBCP is to work at the sub-regional scale of the Great Mekong Sub-Region (GMS). Considerable new opportunities have recently arisen for GMS-level work by ARBCP on PES over the coming two years. At the national level, relevant agencies in Cambodia and Lao PDR have approached ARBCP indicating their interest in ARBCP support for development of national PES policies and initiation of pilot activities on the ground. Several potential partner organizations have also indicated their interest in collaborating with ARBCP in these countries.

Sub-regionally, the initial successes on PES in Vietnam have attracted increasing attention from key regional initiatives, including the ADB's Biodiversity Corridors Initiative (one of three programs under ADB's Core Environmental Program for the GMS), and the Indo-Burma Hotspot Program of the Critical Ecosystems Partnership Fund (CEPF). ARBCP's work under this activity will also make a considerable contribution to the REDD Learning Network under the expansion of the RAFT program (discussed above).

As ARBCP activities in Vietnam begin to bear fruit, and new activities start up in neighboring countries, the program should begin to play a stronger role in linking to other relevant regional processes and platforms in order to share experiences and best practices and leverage additional financial and technical resources.

Roadmap: One-year FY09 activity with two components: (a) integrate the "carbon layer" into the Dong Nai watershed PES initiative ("from methods to market"); and (b) produce a summary report on progress and lessons learned with PES in Vietnam, at both the watershed (Dong Nai) and national policy levels.

Suggested Performance Indicators: quantity of greenhouse gas emissions, measured in metric tons CO_2 equivalent, reduced or sequestered as a result of USG assistance (CPE); incremental increase in income/family/year as a result of the additional forest carbon component.

Potential partners: Same as current program, plus Birdlife International (Critical Ecosystems Partnership Fund), and partners in Cambodia and Lao PDR TBD (for implementation of PES pilot field sites.)

Funding Resources: RDMA core program funding, as well as FY2009 funding in the proposed climate change passback.

Biofuels Options and Standards Strategy (New Activity)

Activity Description: Develop and implement a Biofuels Options and Standards Strategy ("BOSS") including the following components:

(a) A consultative process and analytical study on issues and options for the biofuels sector in Asia, modeled on the ECO-Asia CDCP *From Ideas to Action* report (USAID/RDMA 2007). This effort should of course provide a careful analysis of net GHG emissions impacts arising from various kinds of biofuels development—and the availability, cost and practicality of existing methods for measuring biofuels-related GHG emissions—but it should also take into account corollary issues such as land use and land use conflict, food security and livelihood impacts, and biodiversity. While much of the report will inevitably focus on oil palm it should also consider the current and potential role of jatropha, ethanol crops, and new "second generation" biofuels;

(b) Review and assessment of the Roundtable for Sustainable Palm Oil (RSPO) process, principles and guidelines, and development of a strategy for implementing these principles and guidelines on the ground and developing a certification system to verify compliance with them;

(c) Engagement with key private sector investors to develop GDA activities in the oil palm sector to pilot implementation of the RSPO standards (or other, stronger standards, if the RSPO review concludes that the RSPO system is not sufficiently robust) on the ground at specific sites;

(d) Engagement with key governments, through regional platforms (e.g., ASEAN, APEC, Asia Forest Partnership), to develop and agree on common objectives or standards for enabling policy and legislation to support sustainable biofuels development; and

(e) Incorporation of robust GHG accounting methods and capacities into industry standards, projects on the ground, and national and regional policies.

This activity would be funded in part under the President's Climate Change and Energy Security Initiative.

Rationale: RDMA is well-situated to address biofuels and their role in both development and climate change for several reasons. First, it is an emerging sector that strongly needs the development of regional standards and criteria for sustainability, and the adoption of a credible certification system to verify adherence to standards. Second, it is an issue that crosses the sectoral boundaries of both RDMA and bilateral mission objectives and programs including climate change, energy, biodiversity, and livelihood enhancement. The ECO-Asia CDCP *From Ideas to Action* report provides a well-tested, ready-to-go method for jumpstarting the initiative. Finally, the proposed initiative fits closely with the climate change and forests priorities outlined in the FY09 USAID budget, and can meet both climate change and biodiversity earmark criteria.

Roadmap:

The Biofuels Options and Standards Strategy activity is envisioned over a three-year period as follows:

> **Year 1:** Design and implement a *From Ideas to Action*-style consultation process and report providing options and strategies for the sustainable development of biofuels in Asia, incorporating climate change, biodiversity, food security and local livelihoods perspectives. The consultation process and resulting report should: (a) assess current biofuels trends and issues in the region; (b) review and assess current best practices and standards and available tools for implementing them; (c) specifically assess the Roundtable on Sustainable Palm Oil (RSPO) process and the guidelines it has produced; and (d) assess the potential for the work of RSPO (or of others, if indicated) to form the basis for both regional standards that might be agreed by governments (e.g., through ASEAN or APEC), and a voluntary, third-party certification system for adoption by the private sector. An opportunity exists to assign some or all of this proposed initial work using FY2008 funding.
>
> **Years 2-4:** (a) Based on the Year 1 consultation process and report, develop and implement a GDA with one or more major private sector investors who are committed to implementing best practices in oil palm development, and NGOs with expertise and

credibility in the sector,[3] to pilot implementation of the RSPO (or other) best practices in siting and developing oil palm plantations in selected locations; (b) engage with government policymakers, through regional organizations (e.g., ASEAN, APEC, Asia Forest Partnership) and relevant bilateral USAID programs (e.g., Indonesia and the Philippines) to catalyze development and implementation of standards and best practices for enabling policy and legislative environments and incentives for sustainable biofuels development; and (c) support development of a credible certification system to verify compliance with RSPO principles and guidelines (or other such standards, depending on the assessment of RSPO during Year 1).

Suggested Performance Indicators: completion of broadly agreed standards and verification (certification) system or systems; area of oil palm established and managed according to sustainability standards/certification; quantity of greenhouse gas emissions, measured in metric tons CO_2 equivalent, reduced or sequestered as a result of USG assistance (CPE).

Potential Partners: RSPO members; international conservation NGOs; private sector investors and financing institutions; ASEAN Secretariat; Asia Forest Partnership

Funding Resources: RDMA core funding as well as additional FY2009 funding in the proposed climate change passback. Significant leverage opportunities exist for subsequent years through proposed GDA with key private sector biofuels firms and international NGOs.

3.3 Coasts and Coral Reef Ecosystems

On the island where I live, it is possible to throw a stone from one side to the other. Our fears about sea level rise are very real. Our Cabinet has been exploring the possibility of buying land in a nearby country in case we become refugees of climate change.

—Teleke Lauti, Minister for the Environment, Tuvalu

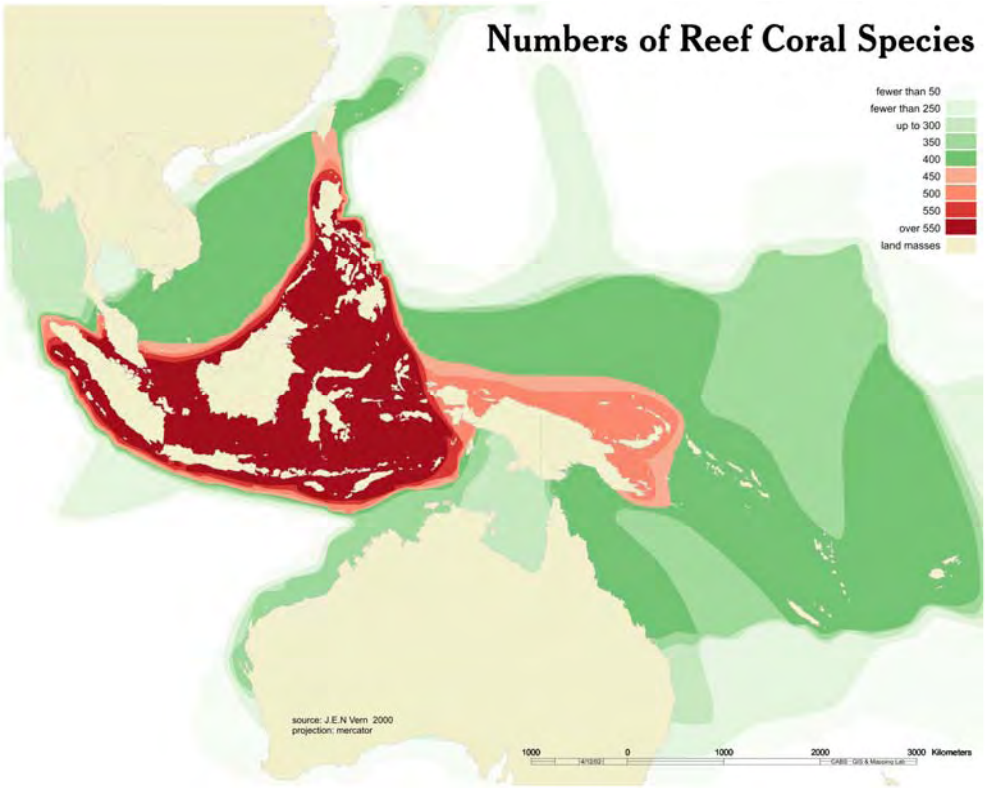
Assessment

Coasts, small islands, and coral reefs in the Asia-Pacific region are among the ecosystems most vulnerable to the impacts of climate change. Populations living on coasts, and particularly on small islands, are highly dependent on the resources provided by the sea, and highly vulnerable to coastal/marine ecosystem disturbance and degradation. Whether one looks to Vietnam's vast coastline, the nearly 25,000 islands in the Indonesian and Philippine archipelagos, or the myriad small islands strung across the western tropical Pacific, strengthening adaptation capacities and resilience to climate change is a very high priority for regional development, poverty alleviation, and security. From a global environmental perspective, the coral reef ecosystems of the Asia-Pacific region constitute the center of global marine biodiversity, particularly in the "coral triangle" region and adjacent areas of the western Pacific (see Map 3.1). The impacts of climate change on coral reefs—mainly coral bleaching due to rising sea temperatures and ocean acidification—are already manifest throughout the region, and the future of the region's reefs is greatly dependent on adopting marine protected area (MPA) and

[3] These would likely include major conservation NGOs as well as development NGOs focusing on the equity and livelihood aspects of biofuels development, such as the Community Carbon Fund initiative launched by RARE in early 2008.

other strategies to strengthen resilience to climate-changed induced stresses. Also, development pressures and impacts from land-based sources of pollution in this region are significant.

Figure 3-3. Species Diversity in the Coral Triangle



Source: World Wildlife Fund 2003.

Coastal areas and small islands throughout the region face increasing risk from climate change impacts including saltwater intrusion, sea-level rise, and increases in the frequency and intensity of storm surges. Areas of particular vulnerability include the small islands of the Pacific and the Philippine and Indonesian archipelagos, and the extensive, low-lying, and densely-populated coasts and deltas of countries such as Bangladesh, Indonesia, and Vietnam (Nicholls et al. 2007; Mimura 2007). The accuracy of research in potential sea-level rise resulting from climate change continues to improve. New findings from the United Kingdom and Finland suggest sea-level rise would be between 0.8 m and 1.5 m by 2100, significantly higher than previous estimates by the IPCC (BBC News 2008).

Robust tools and adaptation techniques are therefore needed for both the small islands of the region and the coral reef ecosystems which surround them. These tools need to encompass the design and management of marine protected areas (MPAs), management of forests and watersheds (i.e. a "ridge to reef" approach), freshwater management and conservation, fisheries management, coastal spatial planning and protection, and marine tenure reform. All of these tools need to explicitly incorporate enhanced livelihoods as a key consideration. In order to facilitate effective use of these tools, adaptation efforts need to also focus on building local and regional institutional and human capacity to apply them, and sustainable financing strategies and institutions.

Figure 3-4. Coastal Inundation Resulting from One-Meter Sea Level Rise

Source: Weiss and Overpeck 2007.

A number of tools and techniques for small island and coral reef adaptation have been developed in recent years (Marshall and Schuttenberg 2006; Grimsditch and Salm 2006), and others are under development. One valuable assessment document prepared by the World Resources Institute, *Reefs at Risk in Southeast Asia* (Burke 2002), provides an assessment of the threats to regional coral reefs based on coastal development, marine-based pollution, sedimentation and land-based sources of pollution, overfishing, destructive fishing, climate change and coral bleaching, and is provided in GIS format. Other important work on coastal community resilience evaluation and planning has been conducted in the context of the RDMA-funded US Indian Ocean Tsunami Warning System (IOTWS) Program, including a recently completed guide for assessing community resilience to natural hazards (USAID 2007). While not specifically focused on resilience to climate change impacts on coastal communities, the required tools are similar, and this work provides a key basis for developing and applying coastal resilience adaptation tools and methodologies.

Nature-based adaptation strategies can help people and communities deal with climate change impacts by protecting natural systems and the benefits they provide—shoreline protection and erosion control, as well as food from fisheries, jobs and income. Such nature-based solutions include the design of marine protected networks specifically for resilience to climate change, defined as the ability to resist shock or recover quickly from stress. Building resilience in coastal and marine ecosystem depends upon: (1) spreading risk to manage for uncertainty by protecting replicates of critical habitats (i.e., mangrove forests, coral reefs) over a large geographic range; (2) identifying and securing sources of "seed" or marine larvae which are critical for maintaining and restoring healthy populations—oftentimes, the most resistant corals to bleaching reside in "marginal" habitats, such as turbid environments; (3) maintaining connectivity between habitats by creating refuges from other stresses, such as overfishing; and (4) managing resources effectively by controlling other threats and pressures (i.e. sedimentation from land-based sources).

At the political level, the small island developing states (SIDS) and archipelagic countries of the region (including Indonesia and the Philippines) have prioritized coastal/marine adaptation through summits and policy documents such as the Pacific Islands Framework for Action on

Climate Change, the Micronesia Challenge, the outcomes of the First Coral Triangle Initiative Senior Officials Meeting (Bali, December 2007), and numerous other initiatives.

Effectively applying these tools as an integrated package to address the multi-dimensional nature of adaptation for small islands and coral reefs, however, will require development of three interrelated components:

- Bringing these tools together and making them accessible in forms useful to decision-makers, resource managers, communities and donors;
- Building the capacity to utilize the tools at sub-regional, national, and local levels; and
- Catalyzing and strengthening sustainable financing mechanisms to support direct adaptation action and corollary capacity building and institutional strengthening.

An initial focus on CTI countries is recommended because the CTI contains the vast majority of the regions coral reefs, small islands, and marine resource-dependent communities. In addition, CTI has strong political support both within the region and in USG.

A secondary focus on the cluster of Pacific Islands comprising "Micronesia"[4] is also recommended. The Micronesian Heads of State have launched the ambitious "Micronesia Challenge" to conserve at least 30% of the nearshore marine resources and 20% of the terrestrial resources across Micronesia by 2020. Longtime USAID partners The Nature Conservancy (TNC) and Conservation International (CI) have together pledged $6 million to leverage an additional $12 million (likely forthcoming from GEF and other sources) for the first phase of the challenge, with an ultimate goal of establishing a $100 million endowment. Adaptation, both on land and sea, will clearly be a major component of the Challenge.

Opportunities and Priorities

The launching of both the Coral Triangle Initiative and the Micronesia Challenge provide important regional political platforms for action on conservation and sustainable management of coral reefs, small islands, and coasts. Both initiatives are sub-regional in scope, and include a considerable number of USAID non-presence countries, making them especially suited for engagement by RDMA. RDMA's experience implementing the US Indian Ocean Tsunami Warning System (IOTWS) Program provides RDMA with both technical and institutional experience with these kinds of regional initiatives. Both the CTI and the Micronesia Challenge have identified adaptation to climate changes as one of their key priorities for action and international cooperation. Ongoing and growing USAID bilateral initiatives on the CTI in Indonesia and the Philippines will benefit from the climate change adaptation tools and assistance that RDMA could contribute to bilateral programs. Finally, RDMA has recently been given new responsibilities for assistance in natural disaster preparation and response in the Federated States of Micronesia (FSM) and the Republic of the Marshall Islands.

Given all of these circumstances, there are considerable opportunities for RDMA to develop an initiative focusing on climate change adaptation in the countries of the Coral Triangle and Micronesia, as proposed below.

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[4] Micronesia, for purposes of this report, includes the Federated States of Micronesia (FSM), Kiribati, Palau, and the Republic of the Marshall Islands. Geographically, Micronesia also includes the US territories of Guam and the Commonwealth of the Northern Mariana Islands.

Climate Change Focus Areas

A wide range of actions are needed to address the current and ongoing threats to Asia's coasts and coral reef ecosystems, including those listed here. Among these priority focus areas, RDMA has identified the following item as a programming priority, described in greater detail in the next section.

- Launching the **Coasts, Islands, and Coral Reefs Adaptation (CICRA) Initiative** implemented in connection with RDMA's support under the Coral Triangle Initiative (CTI).

If additional funding becomes available, the following areas may also be supported:

- **Supporting additional activities to build coastal and coral reef resilience to climate variability**, such as through support for marine protected areas and fisheries reserves, improved capacity for coastal management (zoning schemes, coastal set-backs, coastal watershed management), and greater protection of critical habitats (e.g. coral reefs, mangroves, estuaries, sand dunes) that function as buffers to sea-level rise and storm-surge.

Selected Programming Priorities

Coasts, Islands, and Coral Reefs Adaptation (CICRA) Initiative (New Activity)

Activity Description: Develop and implement a regional initiative to support adaptation to climate change for priority small islands, coastal areas and coral reef ecosystems. The CICRA Initiative will develop a regional platform to provide the tools, techniques and capacity-building necessary to develop and implement integrated climate change adaptation strategies for small island developing states (SIDS), priority coral reef ecosystems, and highly vulnerable coastal areas. This activity was conceived, and would be funded, under the President's Climate Change and Energy Security Initiative.

Key CICRA products and services will be: (a) an integrated "one-stop shop" for technical adaptation tools and techniques; (b) a "matchmaking function" to help countries assess and prioritize capacity-building needs and then match those needs with appropriate sources of technical capacity-building support; (c) education and outreach to local populations within the CTI in local languages to improve local understanding about the value of coral reefs and associated coastal habitats; and (d) a clearinghouse for information and guidance on accessing financial resources for implementing adaptation strategies, and developing sustainable financing "business plans" for the long-term financial sustainability of adaptation efforts.

This integrated suite of products and services might best be managed by one or more NGOs operating under a cooperative agreement, and tasked, inter alia, with serving a catalytic and "integrator" function to draw in and coordinate technical and other inputs from a range of USG agencies.

While the tools and services under CICRA will be made available across the entire region, the main geographic focus of the Initiative will be the CTI countries and the countries that are part of the Micronesia Challenge, for the reasons noted above. In countries where USAID has a mission and ongoing coastal/marine programs (i.e. Indonesia and the Philippines), the CICRA role would be to provide value-added adaptation tools and services for existing programs. In

non-presence countries (e.g., the Federated States of Micronesia, the Republic of the Marshall Islands, Palau, Papua New Guinea, Solomon Islands), the Initiative might play a more direct role in initiating and financing stand-alone activities on the ground, depending on the level of available resources.

Rationale: Coastal, small island, and coral reef adaptation are truly regional issues in the sense that that these communities and ecosystems face common risks and require common tools and capacity-building to mitigate and adapt to those risks. USAID has growing bilateral CTI activities in both Indonesia and the Philippines which will need specific assistance with the kind of tools and support that CICRA can provide. At the same time, RDMA has the mandate and flexibility to work with non-presence CTI countries, most significantly Papua New Guinea and the Solomon Islands.

RDMA is also well-situated to lead in providing adaptation assistance to the Micronesia Challenge effort, especially with the recent handover of USG disaster preparation and response duties in the Federated States of Micronesia and the Republic of the Marshall Islands to RDMA. In addition, the US has strong historical and ongoing ties with Micronesia (Palau, FSM and the Marshall Islands are all "Independent in Free Association with the United States"), and there is significant potential for RDMA to leverage funding from DOI's Insular Affairs Department and other agencies within USG.

From an international climate change policy perspective, CICRA will make an important contribution to the UNFCCC process. SIDS are a strong voice in UNFCCC negotiations, face unique vulnerabilities to climate change, and require a tailored assistance response. The archipelagic nations of Southeast Asia, particularly Indonesia, also play an important role in the negotiating process. CICRA will send a strong signal to the SIDS that the United States understands their unique vulnerabilities to climate change and stands ready to assist their adaptation efforts. More broadly, the Initiative will support the UNFCCC "Nairobi Work Program" on adaptation, and can provide support for UNFCCC National Adaptation Plans of Action (NAPAs) for Least Developed Countries (LDCs), and help those countries to integrate adaptation efforts into broader development strategies, mainstreaming climate issues into the priorities and strategies of ministries of finance and planning.

Roadmap:

> **Year 1:** Feasibility and design; consultation with target countries, potential partners, key donors (e.g., ADB/GEF CTI and Micronesia programs[5]) and stakeholders (including traditional knowledge-holders and practitioners, particularly in Pacific Island countries); institutional establishment and detailed workplan development; inventory of technical resources in the region; and establishment of information management and delivery systems.[6]

[5] For Micronesia, RDMA and EGAT should consult with the US Department of Interior (Office of Insular Affairs), which has a specific interest in, and funding for, climate change adaptation in Micronesia.

[6] In developing the CICRA platform, RDMA should draw on, inter alia, lessons learned and contacts/resources from the IOWTS coastal livelihoods work, and build on EGAT/GCC and EGAT/NRM tools, expertise, and ongoing work, as well as work underway in bilateral programs (especially Indonesia and the Philippines.) The effort should also draw on country adaptation action plans, national communications and technology needs assessments, where available.

Year 2: Official "launch" of CICRA; participatory needs assessments with target countries (and projects within countries); development and start of initial set of specific activities with countries and partners.

Years 3-4: Expansion of activities to a full portfolio of targeted activities.

Year 5: Final year of Phase I activities implementation; assessment; design, if indicated, of Phase II continuation (which might be a hand-off to another institution in the region.)

The first phase should focus on pulling together all relevant tools (and information on where they have been applied) as well as on the capacities and institutions in the target countries, and liaison and cooperation with key players in the countries and internationally (GEF, ADB, TNC, CI, the South Pacific Regional Environment Programme (SPREP), etc.) Then the program can move to: (a) applying these tools in selected sites as part of larger donor efforts; and (b) building capacity in national institutions and regional institutions.

Suggested Performance Indicators: number of people/communities with improved resilience to climate change in target countries and areas; number of kilometers of coastal areas with increased protection; number of hectares of coral reefs and fishing areas conserved; number of people with increased adaptive capacity to cope with impacts of climate variability and change as a result of USG assistance (CPE); number of client institutions served with tools and technical assistance for improving resilience to climate change.

Potential Partners: DOI, the National Oceanic and Atmospheric Administration (NOAA), GEF, ADB, key NGO partners, SPREP, the South Pacific Center (SPC), UNEP, the International Maritime Organization (IMO), the International Coral Reef Initiative (ICRI), and the Intergovernmental Oceanographic Commission (IOC), U.S. Coral Reef Task Force, USEPA's Pacific Islands Office, relevant government agencies.

Funding Resources: RDMA core program funding for CTI, as well as additional FY09 climate change funding included in President's budget for SIDS adaptation; significant leverage potential for Micronesia with DOI; GDA potential with NGO donors to Micronesia Challenge (TNC and Conservation International); foundations such as the UN Foundation; significant co-financing opportunities exist with Global Environment Facility (GEF) programs for the Coral Triangle Initiative (and RDMA and other USG parallel funding for the US CTI program) and the Micronesia Challenge (both of which were approved by GEF Council in March 2008 and under development for final program approvals in April 2009).

3.4 Freshwater Resources and Ecosystems

Assessment

Freshwater and Climate Change in Asia

Water is fundamental for both human survival and the natural and cultivated ecosystems upon which life depends. Climate change is already affecting the spatial and temporal distribution of freshwater in complex ways that vary from region to region. Taken together, IPCC (2007) concludes with high confidence that the overall impact of climate change in all regions on water resources and freshwater ecosystems is negative. With respect to Asia, IPCC concludes that:

> Water and agricultural sectors are likely to be most sensitive to climate change-induced impacts in Asia. Agricultural productivity in Asia is likely to suffer severe losses because of high temperature, severe drought, flood conditions, and soil degradation.

As a result, IPCC concludes that:

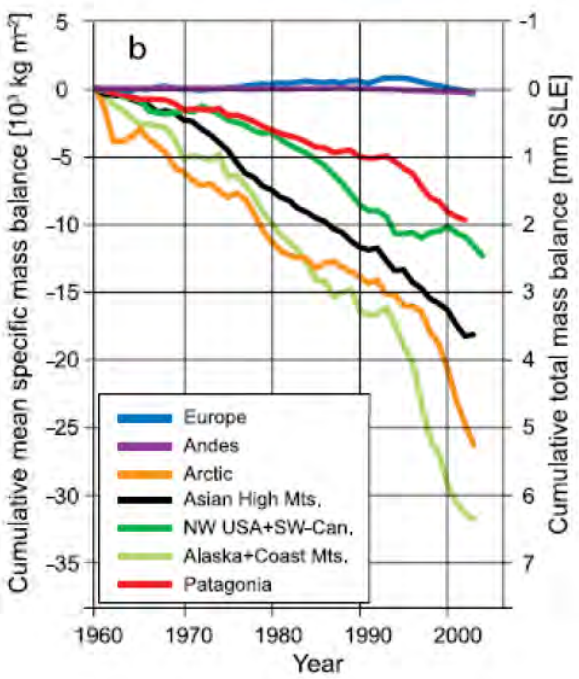
> Expansion of areas under severe water stress will be one of the most pressing environmental problems in South and South-East Asia in the foreseeable future as the number of people living under severe water stress is likely to increase substantially in absolute terms.

Nine major Asian rivers originate in the Himalayas, supporting some 1.3 billion people who live within these river basins, and a total 3 billion who depend on the water resources generated overall. Because temperatures in the Nepalese and Tibetan Plateau are increasing faster than at lower elevations, glaciers in the Himalaya, as mentioned above, are disappearing at a faster pace than anywhere else in the world, and may disappear altogether by 2035. Selected maps of eastern and southern Asia's main watersheds, and environmental and developmental stresses affecting them, are provided in Annex 5.

Rapid industrialization and urbanization in many Asia countries has already strained freshwater resources, and increased climate change and variability will further reduce water availability in the coming decades. According to the Food and Agriculture Organization (FAO) of the United Nations, per capita water availability is declining across Asia at an alarming rate, with most countries showing decreases of between 10% and 40% in water availability between 1988 and 2007. Water availability levels in China rank among the lowest in the entire Asia-Pacific region. China's total internal renewable water resources per capita averaged 2,115 cubic meters per capita in the 2002-2007 period, a decline of 10.5% since 1988. (FAO Aquastats 2008.)

Overall, key climate change-induced stressors in Asia include changes in streamflow due to: receding glaciers and reduced snow water storage; changes in the volume, frequency, and distribution of precipitation; and saline intrusion into freshwater systems in coastal areas and deltas. These climate-related stressors compound growing pressures from human activities on the quantity and quality of water resources including deforestation, pollution, poorly planned water impoundments (i.e. dams), excessive groundwater abstraction, and chaotic urbanization and urban sprawl, particularly in coastal areas.

Figure 3-5. Cumulative total mass balances of glaciers and ice caps, reflecting rapid retreat of Himalayan glaciers



Source: IPCC 2008. The mass balance of a glacier is the sum of all mass gains and losses during a hydrological year.

The growing impacts of climate change will combine with these existing challenges in severe, complex and in some cases unpredictable ways. In some areas, changes in temperature and precipitation will lead to prolonged droughts and water scarcity. For example, while significantly increased precipitation is expected across northern and central Asia, more intense and longer droughts have been observed and are likely to continue across parts of southern Asia (UNEP Global Environment Outlook 2004). Northern China has been particularly hard hit, particularly the Yellow River Basin, the Huaihe River Basin, the Haihe River Basin and the Luan River Basin, where surface water resources have recently declined by 17% and total water resources by 12%. In Western China, annual water shortages will have reached 20 billion cubic meters by the years 2010-2030 (Working Group on Climate Change and Development, 2007, Up in Smoke, Asia and the Pacific). Even in areas that are likely to receive increased precipitation, the complex interaction of precipitation and temperature changes could actually result in less runoff to streams and subsequent water shortages in some areas of Asia (World Bank, 2007, Adapting to Climate Change).

Reduced river flows and groundwater recharge will lead to water stress in cities and towns. During the past century, freshwater withdrawal from rivers, aquifers, lakes and other sources have increased more in Asia than other parts of the world. Expanding economies, increasing populations, and continuing rural to urban migration will exacerbate water shortages in many cities in the coming years. In coastal areas, seawater intrusion will significantly impact the availability of fresh water supplies, such as in Ho Chi Minh City. Nowhere will water-related impacts of climate change be greater, or reap a greater human toll, than in Asia's eleven densely-populated "megadeltas" (greater than 10,000 km^2) that are continuously fed and formed by rivers—the great ones being the Ganges, Indus, Brahmaputra, Salween, Mekong, Yangtze, and Huang He (Yellow)—originating on the Tibetan plateau, and include megacities such as Bangkok, Dhaka and Shanghai.

Climate Change and Water Supply—The Fate of the Mekong

The Mekong river ecosystem provides an extremely important and illustrative example of how the confluence of human- and climate change-induced stressors will fundamentally and negatively impact a vast swathe of humanity and irreversibly degrade a globally-important ecosystem by century's end.

From its source at some 4,500 meters above sea level on the Tibetan plateau, the Mekong flows 4,800 km south through mainland Southeast Asia to the South China Sea, draining a total catchment area of 795,000 km^2 within the six countries of China, Burma, Lao

Figure 3-6. Relative vulnerability of coastal deltas as shown by the indicative population potentially displaced by current sea-level trends to 2050

Source: IPCC 2007b. (Extreme ≥ 1 million; High = 1 million to 50,000; Medium = 50,000 to 5,000)

People's Democratic Republic (PDR), Thailand, Cambodia, and Vietnam. The eleventh longest river in the world and the twelfth largest in terms of discharge, the Mekong is the essential lifeline for the approximately 60 million people living in the basin, some 90% of whom are subsistence farmers and fishermen who depend directly on the Mekong to water their fields and provide fish and other livelihood resources. Due to the large elevation difference between headwaters and delta, the Mekong has immense hydropower potential (39,000 megawatts), only 13% of which has been developed to date. The Mekong Ecosystem is also extremely rich in biodiversity. The world's largest freshwater fishery, there are more than 1,500 species of fish in the ecosystem and a great diversity of terrestrial species and habitats.

Already under threat from numerous stresses—hydropower development, deforestation and erosion, pollution, over-exploitation of fish and terrestrial species, canal-building in the lower delta—the Mekong faces potentially disastrous impacts arising from climate change. According to the IPCC's 2007 Assessment Report, direct effects of climate change will occur "due to changing patterns of precipitation, snow melt, and rising sea level, which will affect hydrology and water quality. Indirect effects will result from changing vegetation patterns that may alter the food chain and increase soil erosion."

In plain language, the Mekong will soon very likely experience sudden, unprecedented increases in volume due to snow and glacier melt, new and more severe episodes of low volume and drought, rapid increases in the ongoing salinization of the Delta, and severe negative impacts on the farming systems and fisheries upon which some 60 million people depend. As recently summarized in an article published in the Bangkok Post:

> By the end of this century, there is a reasonable likelihood that levels in the South China Sea will have risen half a metre. A 30-centimetre rise in sea levels would contaminate lower Mekong river tributaries up to 10 km inland, devastating some of the region's most fertile agricultural land, and leaving millions of farming families without a viable means of support… Were water levels to rise a full metre, the Mekong delta would be swamped, one in 10 families would be displaced, and 7% of Vietnam's agricultural land would be submerged.
>
> In addition to rising sea levels, [a] mere 1°C increase in minimum growing season temperatures would diminish crop yields by 10% or more… [Diminished] crop yields and large swaths of land lost to saline intrusion would decrease the affordability of food staples, diminish farming families' incomes, create a significant drag on economic growth, and cast millions of Mekong families back into poverty. (Bangkok Post, March 31, 2008.)

Climate Change and Water Systems

Threats to water supply in Asia are intensifying concurrently with growing demand for water to meet the needs of increasing populations and expanding economies. Yet service coverage remains low in Asia as the sector is beset with a number of difficult challenges, such as highly inadequate infrastructure, poor system maintenance and operations, financially strapped utilities, low cost recovery, increasing pollution and a host of environment problems such as unsustainable groundwater extraction and watershed degradation.

Despite the fact that Asia's water supply is likely to decline, sharply in some Asian locations, as a result of climate changes, water utilities have done little to assess and adjust their planning and operations to take the impacts of climate change into account, or to strengthen their potentially important role in both mitigating and adapting to climate change. USAID's ECO-Asia Water and Sanitation program, and similar donor efforts, have made helpful advances in recent years, but

much more in needed. To start with, utilities in the region have been slow to take immediate advantage of existing no- and low-cost measures to simultaneously improve the water and energy conservation and efficiency ("watergy") of their systems, which can at once reduce their vulnerability to water shortages, cut operating costs, and reduce GHG emissions. About one-third to one-half of water pumped into the systems in developing countries is lost before it reaches the consumer due to leaks and system inefficiencies. In India, losses in large metropolitan cities average around 40% but this figure grows to 50-60% in smaller cities and towns (Alliance to Save Energy, 2007, Watergy: Energy and Water Efficiency in Water Supply and Wastewater Treatment). Given the threat to water security posed by climate change, it is even more critical for cities to adopt best practices and technologies to significantly reduce water waste and reap associated reductions in energy consumption, costs, and carbon emissions.

Opportunities and Priorities

Given RDMA's regional mandate, the Mekong River Basin (MRB) should be of highest priority given its reach across six countries and the strong need to promote a regional approach in addressing transboundary conflict issues arising from climate change. As detailed below, there is no comprehensive assessment of the major impacts of climate change and human intervention to the entire length and breadth of this important river system. RDMA can help fill this gap and, in doing so, provide a framework for the development of appropriate policies and actions for adaptation to climate change. Such actions will benefit the tens of millions of people whose livelihoods depend on the availability of water from the Mekong.

Building on this effort, with additional funding RDMA would be able to initiate pilot adaptation activities all along the watershed that explored options for reducing vulnerability and strengthening adaptation and resilience to climate change—with respect to water supply and water resources management, infrastructure development, agriculture, biodiversity conservation, livelihoods and community development, and protection against climate variability, salt water intrusion and inundation, increased risk from storm surges, and other threats.

Water delivery systems also provide an excellent opportunity for RDMA to work on multiple fronts: reducing water waste, increasing energy efficiency with associated reductions in greenhouse gas emissions, and utilizing the water and energy savings to expand access to water services in towns and cities. Water and energy efficiency gains can be made in the short-term by integrating 'watergy' activities in RDMA's existing ECO-Asia Water and Sanitation Program. To assist utilities with their longer-term planning, RDMA should consider providing additional technical assistance to 1-2 utilities that will be most impacted by climate change to assist them with demand and supply forecasting and planning for anticipated climate change impacts. This assistance will be focused on planning of new infrastructure or large-scale rehabilitation of systems while 'watergy' activities will primarily focus on optimizing existing systems and their management, thereby improving the utilities' day-to-day operations.

As a regional body, RDMA can facilitate the transfer of knowledge, information and lessons learned from the adaptation assessment of the Mekong River Basin to other critical river basins in South Asia and China, as well as promote regional sharing and cooperation from 'watergy' and utility planning activities.

Climate Change Focus Areas

A wide range of actions are needed to address the current and ongoing threats to Asia's freshwater systems and ecosystems, including those listed here. Among these priority focus areas, the first three bullets are described in greater detail as selected programming priorities in the next section.

- **Promoting Sustainable Water Services in Asia** to promote more effective water and energy (watergy) usage in water delivery systems.
- **Supporting Water Utility Risk Assessment and Planning** to assist one to two selected water utilities serving large or mega- cities in Asia to investigate their vulnerability to climate change, and to share efforts in other locations in the region.

If additional funding becomes available, the following areas may also be supported:

- Supporting a new initiative, **the Mekong Climate Initiative**, to conduct policy research and adaptation action planning for the entire Mekong watershed ecosystem, and sharing key outcomes with neighboring countries facing similar challenges in major watershed.
- Promoting a range of **other potential areas involving water systems and ecosystems**, including, for example, improved management of water demand and/or water use efficiency, and improved management of water supply (groundwater aquifers, reservoirs, and hydropower).

Selected Programming Priorities

Promoting Sustainable Water Services in Asia (Expansion of Existing Activity)

Activity Description: There are strong opportunities within the current ECO-Asia Promoting Sustainable Water Service in Asia program to integrate activities to promote the improved management of water and energy resources. In addition to assisting utilities to cope with climate change impacts, incorporation of 'watergy' (water and energy conservation and efficiency) can help meet USAID development objectives of increasing access to service and improving existing service quality. Utilities can realize significant energy, water, and monetary savings through technical and managerial changes, capacity building, improved policy frameworks, and access to new financing sources for investments in energy efficient equipment and system upgrades. This activity was conceived, and would be funded, under the President's Climate Change and Energy Security Initiative.

These project activities can be woven into each of the five focal areas of the existing program, described below:

- Improved Corporate Governance and Management by Water Service Providers;
- Innovative Models for Expanding Water Supply to Poor Communities;
- Sustainable Sanitation Solutions;

- Improving Enabling Conditions for Water and Sanitation Services; and
- Increasing Access to Innovative Financing.

Through initial energy assessments and audits of facilities, the program can raise awareness and identify no- and low- cost watergy opportunities for more immediate implementation as well as provide municipalities with a basis for medium- and long-term management of their energy and water resources. Watergy projects could encompass a range of interventions, such as capacity building on improved operation and maintenance procedures, leak management, optimization of pumping systems, automation of system operations, monitoring (including end-use metering), pressure management, and installation of energy efficient pumps and motors. Under this activity, recent experience with performance contracting in India and South Africa will be disseminated and efforts made to encourage private sector participation in infrastructure upgrades. As appropriate, technical advisory services will be provided for drafting the technical scope of work for incorporation into Expressions of Interest, drafting Request for Proposals, setting evaluation criteria for selecting energy audit firms and ESCOs, and providing technical supervision during project implementation.

It is envisioned that in addition to training courses and workshops, the Watergy program would build water and energy management capacity through 'twinning' arrangements between water utilities in Asia and water utilities in developing countries from other regions that have successfully implemented watergy activities. For example, in Mexico, in FY07, watergy activities resulted in annual energy savings of 13 million kWh, cost savings of $1.6 million, and expanded service to 887,000 customers with little additional energy and water resources utilized. Under this program, 'twinned' utilities will develop a collaborative partnership and clearly define roles and responsibilities, expected outcomes and resource requirements. Over the course of the partnership, the utilities will identify priority areas for action and work together to share information, tools, and resources to achieve improvements in their management capacity and system efficiencies.

With assistance from the ACCAF, the implementer of this activity should develop the capacity of its project partners to measure, account and record the greenhouse gas emissions reduced or avoided from project implementation. This will not only assist in the emissions reporting required by RDMA but will help establish local capacity for greenhouse accounting. By measuring its greenhouse gas emissions, local stakeholders will be in a better position to manage them and can be better prepared for future financing from CDM and carbon funds.

Rationale: This activity builds on a global USAID program that has been effectively implemented in South Africa, India, Sri Lanka, Mexico, and Brazil, with co-funding from partner utilities, the private sector, and other donors, such as the International Finance Corporation, Coca Cola Company, and the Renewable Energy and Energy Efficiency Partnership (REEP). The RDMA activity can leverage the experience gained by this network of utilities, as well as the plethora of global tools and resources developed to date. Watergy activities would be highly synergistic with the existing 'Promoting Sustainable Water Services' program and there are ample entry points in the five focal areas for the integration of Watergy activities. Dissemination of best practices and experiences, particularly from India, can be undertaken at a regional level through platforms such as the Southeast Asian Water Utilities Network (SEAWUN), the South Asia Water Utilities Network (SAWUN) and the Sustainable Water Services Leadership Forum Asia.

Roadmap:

Year 1: Identify entry points within the 'Promoting Sustainable Water Services in Asia' program to integrate watergy activities; Consult with program partner institutions and other stakeholders; Identify technical expertise on watergy; Identify water utilities in Asia and developing countries for 'twinning activities'; Develop MOUs and workplan of activities.

Year 2: Conduct first phase of Watergy activities, including identification of priority areas in O&M and system upgrades, targeted energy audits, site visits, and training, exchanges and transfer of Watergy resources and expertise; Training in greenhouse gas accounting.

Year 3: Facilitate implementation of improved O&M and, as appropriate, initiate processes for performance contracting and preparation of proposals for project financing. Connect with sources of grants, carbon funds or financing. Assist, as appropriate, with bringing projects to financial closure; Monitor project implementation. Apply carbon accounting to assess emissions reductions. Prepare case study and host regional workshop to disseminate project results.

Year 4: Review and assess Watergy technical assistance and twinning program and re-design/ expand/ transfer to other institution as necessary.

Performance indicators: (1) Greenhouse gases reduced or avoided; (2) reduction in energy consumption; (3) cost savings; (4) water savings; (5) number of people with improved or new service; (6) number of people trained; (7) funds leveraged.

Partners: Alliance to Save Energy, ADB, SEAWUN, SAWUN, Sustainable Water Services Leadership Forum Asia.

Funding resources: RDMA core program funds, potential future clean energy funds and financing.

Water Utility Risk Assessment and Planning (Expansion of Existing Activity)

Activity Description: This activity will assist one to two selected water utilities serving large or mega- cities in Asia to investigate their vulnerability to climate change. Climate change will likely bring increased variability in the quantity and quality of water that might be available at any given time. This analytical assessment will help utilities better understand the risks to their facility operations and planning from the likely impacts of climate change over the near- and mid-term (10-50 years). It will establish priority issues for the utility and lay the groundwork for follow-up actions in facility planning.

The assessment will focus on analyzing the vulnerability of the utilities' 10-50 year supply plans to climate change. The utility's water resource modeling tools will be applied to examine alternative scenarios, such as altered demand patterns, decreased inflow from runoff, decreased recharge, increased evaporative losses, salinization and seasonal shifts. This 'bottom-up' approach is considered more effective than using climate change modeling to build climate change forecasting into the front end of water supply planning (AMWA, 2007). This activity will assist the utilities to test the robustness of current plans to upsets from changes in key climate-related variables. Thresholds or tipping points will be identified using the planning models already being utilized by the utilities and then shared with climate experts to better understand the probability of these 'breaking point' scenarios.

Technical assistance will then be provided to the utilities to help them adapt their facility planning to any likely impacts identified in the assessment. This assistance will emphasize increased resilience and flexibility in maintaining water supplies and the importance of taking an integrated approach to resource management, accounting for the environmental, socio-economic, and engineering aspects of future plans. The assistance will consider broader regional collaboration for the selected utilities, given any hydrologic changes that can upset resource allocation and capital investments. As appropriate, the activity will advise and facilitate access to financing sources for implementation of recommended actions from the assessment.

Rationale: Reliability of future fresh water supplies in the region has critical links to USAID development objectives in health, economic growth, conflict mitigation and poverty alleviation. On-going assistance by RDMA to water utilities can be leveraged to identify those utilities in critical need of improved water supply planning and forecasting, in view of expected climate impacts as well as growing urban population demands. The RDMA platform provides an excellent venue for disseminating the lessons learned to other water utilities in the region, either through the networks established under Promoting Sustainable Water Services in Asia, as well as forums that RDMA is currently active in, such as the SEAWUN, SAWUN, and Sustainable Water Services Leadership Forum Asia.

Roadmap:

Year 1: Consult with potential partners, stakeholders, and technical experts; Identify needed technical expertise for program implementation; prepare a short-list of water utilities in the Asia region serving large urban populations, which are expected to be most vulnerable to climate change; reach out to targeted utilities and develop MOUs with interested partner utilities; prepare workplan of activities.

Year 2: Review water utility planning and forecasts for the next 50 years; Identify key climate factors that may impact water supply along with other water availability stresses (e.g., lower water tables/aquifers); test robustness of current plans to changes in key variables; work with climate change experts on probability of extreme changes to these variables; assist utilities to adopt their planning and forecasting to these probabilities.

Year 3: As appropriate reach out to other utilities, networks, donors, and MDBs in the region to discuss highlighted water management issues. Hold regional workshop highlighting program results.

Year 4: Review and assess program and re-design/expand/transfer to other institution as necessary.

Performance indicators: (1) Number of people trained; (2) number of institutions with 'climate proofed' planning and forecasting.

Partners: Association of Metropolitan Water Agencies (AMWA), ADB, SEAWUN, SAWUN, Sustainable Water Services Leadership Forum Asia.

Funding Resources: Current and ongoing RDMA core water program funding.

The Mekong Ecosystem and Climate Change: Preparing for an Uncertain Future (Mekong Climate Initiative) (New Activity)

Activity Description: Proposed activities for the Mekong Climate Initiative include the following: (a) prepare and launch, through a comprehensive consultative process, a comprehensive policy research and action report on the likely impacts of climate change on the entire Mekong Ecosystem (Himalayas to the Delta); (b) based on the consultative process and resulting report, develop a comprehensive adaptation strategy for the entire Mekong Ecosystem; and (c) build, through this process, the technical and political support and partnerships to implement adaptation action at sub-regional and national levels.

Rationale: Considerable analytical work has focused on climate change impacts in the upper and lower Mekong basin, including the impacts of Himalayan glacier retreat on the one hand, and impacts on the fishing and farming system of the lower basin on the other. With numerous plans to develop hydropower all along the river gathering momentum in 2008 (14 dams currently under construction and 37 more actively being planned), attention to the cumulative impacts of these impoundments is also growing. Other work has focused on the threats to biodiversity in the Mekong Basin's ecosystems. MCI does not intend to replicate this work.

What is missing, however, is a comprehensive, policy-relevant assessment that elaborates, in one place: the current status, trends and threats in the entire Mekong Basin—from the headwaters to the delta; scenarios for expected impacts of climate change; and how riparian countries and other stakeholders can both mitigate climate change impacts and adapt to those impacts where necessary.

Carrying out this comprehensive assessment is the centerpiece of the MCI, but the Initiative encompasses much more than a report. Rather, MCI will use the process of preparing, launching and publicizing the report to catalyze political and technical awareness, dialogue and collaborative action across the sub-region to prepare for the Mekong's increasingly uncertain future.

To that end, the project structure is envisioned to include: (a) a prime contractor with responsibility to undertake and deliver the report and manage the consultative process for preparing it; (b) enlistment and modest funding for country-level technical working groups (e.g., in China, Vietnam, Cambodia and Lao PDR) led by an institution with relevant technical expertise, ongoing work on the topic, and political influence (e.g., the Chinese Academy of Sciences); (c) close liaison with relevant regional bodies (e.g., MRC and ADB); (d) establishment of a senior International Advisory Panel (approximately 10-12 people) including high-level representatives from the riparian countries, regional and sub-regional organizations, and recognized and respected international experts. This Panel would meet once during the inception phase of the report, and a second time at its launch. Both of these meetings would also include representatives of the institutions leading the national-level technical working groups.

MCI is proposed here as a two-year activity. Depending on its outcomes, however, it may lay the groundwork for follow-on activities on the ground in one or more riparian countries and/or through relevant regional platforms and partners (e.g., Mekong River Commission, ADB).

RDMA's mandate to tackle regional challenges, its capacity to work bilaterally in China and other non-presence countries, and its strong network of contacts and working relationships with key national and regional organizations makes this an especially appropriate activity for the Mission.

The design and structuring of MCI will build on lessons learned in similar assessment exercises, particularly the relevant working groups and outputs of the IPCC and the Millennium Ecosystem Assessment (MA), particularly the MA's Sub-Global Assessment working groups and processes. Its design and process will also draw on lessons learned from relevant international dialogue and consensus-building models such as the World Commission on Dams, Global Biodiversity Forum, The Forest Dialogue, and Asia Forest Partnership.

Roadmap:

Year 1: Retain contractor; develop inception report (i.e., desk literature review complemented by selected interviews in key countries and institutions); identify technical working group leads and members; establish advisory group; hold initial inception meeting; begin preparing report draft.

Year 2: Review and completion of report; launch workshop with Senior Advisory Committee and Technical Working Group leads; preparation (if indicated) of terms of reference for "Phase II" activity or activities.

Suggested Performance Indicators: number of people receiving training in GCC adaptation analysis; number of people with increased adaptive capacity to cope with impacts o climate variability and change.

Potential Partners: Research institutions in riparian countries (TBD); MRC; AusAID/CSIRO; ADB; ICIMOD; WWF (Himalaya in particular); TNC (Great Rivers work in Yunnan); relevant working groups and lead staff from IPCC and Millennium Ecosystem Assessment.

Funding Resources: Future RDMA water program funding; leverage potential with NGOs, ADB, US private foundations.

3.5 Integrative Climate Change Services Initiatives

In the future I expect a company's carbon statement to be as prominent as its financial statement. That's because investors are demanding reliable information about a company's global carbon footprint, as well what it's doing to reduce its CO_2 emissions. Proper financial reporting is a no-brainer. Carbon reporting must be the same.

—Ian Pearson, former Minister of State for Climate Change and Environment at the Department for Environment, Food and Rural Affairs (UK)

Assessment, Opportunities, and Priorities

Developing countries present significant hurdles for climate change mitigation and adaptation efforts, some of which stem from basic information and institutional issues that deter economic growth. Developing countries typically lack readily useable environmental information, including economic data on natural resources and climate-sensitive activities such as agriculture and fishing. Unlike developed countries, most developing countries do not have their own satellites or space agencies. They have traditionally had to make important decisions affecting their populations and diverse natural resources in absence of the significant information that Earth observation can provide. As a result of these gaps, developing countries lack quality emissions

inventories, forest monitoring data, and environmental information needed to plan mitigation activities, get access to emerging carbon markets, and respond to climate change. Examples abound in Asia: Indonesia lacks the ability to monitor land conversion and illegal logging. Pacific small islands states lack maps to monitor land changes due to sea level rise.

Information and capacity needs have been identified through multiple UNFCCC workshops and negotiations, technical assessments, and national reports. The UNFCCC Secretariat and the United Nations Development Programme (UNDP) provide some funds to developing countries to prepare and improve their emissions inventories. Improved emissions inventories would also provide the US better information to identify opportunities for cooperation to reduce emissions in partner countries. An Asia regional emissions inventory improvement network functions on minor funding from UNFCCC resources (a State Department voluntary contribution) and represents a cost-effective means for inventory improvement.

The United States is playing a lead role in international efforts such as the Global Earth Observation System of Systems (GEOSS), which gives communities early warning of natural disasters, and improves decision-making for agriculture, coastal development, and other economic sectors that are affected by climate variability and change. Earth observation information can provide fundamental information on forests and land use change, the main emissions source in many developing countries. Recently, the countries of the Central America region have been able to leverage the satellite resources of other countries, such as the US, to implement a unique system which makes available Earth observation data, monitoring tools and the capability to visualize Earth information in three dimensions through a system known as SERVIR, the Spanish acronym for Regional Visualization and Monitoring System. SERVIR operates like the hub and spokes of a wheel; with the SERVIR center at the hub and cooperating meteorological organization as the spokes, exchanging information and needs. SERVIR supports the UNFCCC Nairobi Work Program with respect to methods and tools, socio-economic information, adaptation planning and practices, technologies for adaptation, and provides capacity building for developing country meteorologists, climatologists, and development specialists.

SERVIR was first established with USAID ($1.8 million) and NASA ($4.5 million) support over FY2003-2006 in Central America and is fully operational (www.SERVIR.net; http://servir.nsstc.nasa.gov/). USAID and NASA are planning the expansion of SERVIR into Africa, and are working to identify African organizations to host the three regional hubs. Current EGAT investments include: adaptation tools and pilots (<$1 million (FY06); $0.6 million (FY07); and investment (with NASA) to begin to expand SERVIR ($1 million in FY06, $0.5 million in FY07).

Climate Change Focus Areas

A wide range of actions are needed to promote potential areas in need of support relating to integrative climate change services, including those listed here. The first two bullets below are identified as programming priorities, and described in greater detail in the next section.

- Launching an **Asia Regional Visualization and Monitoring System (ARVMS)** to support the regional information base and knowledge-sharing platforms for action on climate change, supporting both mitigation and adaptation activities.

- Establishing an **Asia Climate Change Assistance Facility** to provide tools, information, and technical assistance on climate change mitigation and adaptation to bilateral missions and programs in non-presence countries.

- Supporting the creation of **regional seasonal climate forecasting and early warning systems capabilities**, building off of information sharing systems developed under AVRMS, and based on increased understanding of climate risks and challenges to the Asia region.

Selected Programming Priorities

Asia Regional Visualization and Monitoring System (ARVMS) (New Activity)

Activity description: ARVMS will strengthen the regional information base for action on climate change, supporting both mitigation and adaptation activities. Information from the ARVMS will support economic development broadly, as experienced in the Central America SERVIR project. This new activity will develop and disseminate climate information and other environmental information and decision-support tools for climate resilient development. ARVMS would be operated by regional and/or developing country institutions and provide information and tools for mainstreaming adaptation into development; a "one stop shop" for environmental, climate, and development data and information to support adaptation. This activity was conceived, and would be funded, under the President's Climate Change and Energy Security Initiative.

Rationale: ARVMS will build off success of SERVIR in Central America and EGAT/NASA enhancement efforts over the last two years. In Central America, USAID and partners support SERVIR, a hub to collect and process climate information, test new and innovative tools, and then apply that information to development problems such as weather prediction, fire monitoring, red tides and disaster response. ARVMS will support many activities of RDMA and bilateral Missions in the Asia region, including: forests and anti-deforestation efforts; regional integration; adaptation analysis and implementation; and efforts to improve transparency.

Roadmap:

Year 1: RDMA and EGAT will work to identify a local host institution and establish an MOU, similar to the MOU EGAT and NASA concluded with the Regional Center for Mapping Resource Development (RCMRD) in Nairobi, signed in November 2007. Possible partners include the Manila Observatory or the Singapore National University Center for Remote Imaging Sensing and Processing (CRISP).

RDMA and EGAT will work to identify donor partners while providing an anchor of committed funding donors who have expressed interest to date and can be expected to partner with USAID. A critical effort for the first year is to develop a network of meteorological or environmental agencies or institutions across the region and then to develop agreements among those participating governments/agencies. The initial staffing team will receive training at the SERVIR hub in Panama and then return to provide training in the Asia region.

Year 2: Once a host institution has been identified and an MOU signed, the ARVMS will begin efforts to install hardware at site, including computers, receivers, and installing the training center.

Working with EGAT and NASA, ARVMS will carry out activities to create region-specific tools and decision support tools. A significant regional priority will be to apply the FOMAS (WRI) technique displaying forest concession boundaries on maps to the rest of the Asia region.

As the projects progresses towards operation, ARVMS should identify industry partners in the region; potential new partners include IT companies, broadband providers, airlines and tourism industries.

Year 3: As the ARVMS goes live and starts providing information services to governments, Missions, cooperators and the general public, ARVMS will need to address sustainability. In year three, ARVMS will develop and implement a sustainability plan, including possible user fees for industry users, new partnerships or emerging financial resources.

Suggested Performance Indicators: number of people with improved resilience to climate change; number of paying users; funding leveraged; improved economic growth

Funding resources: The Agency has received funding in President's budget for FY09 for a series of regional visualization and monitoring system hubs in Africa (3) and Asia (1); with EGAT receiving funding to continue tool development. The ARVMS would need funding for FY09 and FY10. An integral part of the EGAT/NASA development plan is to develop means to sustainability; in addition many other donors are interested and would likely contribute once USAID sets a financial anchor.

There is interest among other donors and developing country organizations in supporting SERVIR expansion into Africa and beyond, including the UK Meteorological Office, DFID, DEFRA, GTZ, World Bank, ENDA, IISD and others.

Asia Climate Change Assistance Facility (New Activity)

Activity Description: Develop and establish a new regional platform—the Asia Climate Change Assistance Facility (ACCAF)—to provide tools, information, and technical assistance on climate change mitigation and adaptation to bilateral missions and programs in non-presence countries. ACCAF's portfolio of services would span the various climate change-related sectors previously discussed (clean energy, forests and land use, coastal and marine adaptation, and water). Where appropriate, ACCAF would draw on the services developed under ongoing or proposed sectoral platforms, such as the ECO-Asia CDCP, RAFT, and the proposed Ridge to Reef Adaptation Initiative (RRAI). ACCAF would also draw on the cross-sectoral products and services to be provided by the proposed ARVMS.

In addition to becoming a "one-stop shop" for services available through these other ongoing and proposed initiatives, ACCAF would also directly develop information, tools and technical assistance in two key cross-cutting areas: (a) carbon markets and financing; and (b) greenhouse gas accounting, monitoring and reporting.

Taken together, ACCAF would then be able to provide missions and non-presence country programs with information, tools and technical assistance to meet a wide variety of climate change program and policy needs, including:

- Greenhouse gas accounting, monitoring and reporting;
- Accessing carbon markets and financing;
- Developing payment for ecosystem services (PES) systems;
- Promoting clean energy policies and strategies and adopting clean technologies;
- Reducing emissions from deforestation and forest degradation (REDD);
- Strengthening coastal, marine, and small island adaptation and resilience;
- Managing water resources for development in the context of climate change.

ACCAF would provide these services in the following ways:

- Providing information, tools and technical assistance to USAID bilateral missions in developing their climate change strategies and activities, and to inform their policy dialogues with host governments and other donors;
- Giving direct technical support for designing and implementing climate change activities in non-presence countries (e.g., China and the Pacific Islands);

ACCAF is envisioned as a flexible mechanism with a small core staff and a database, network and roster of technical experts comprised of USAID/EGAT staff, staff from other USG agencies with relevant expertise (e.g., USFS, EPA, NOAA, NASA), and external individuals and institutions who could be enlisted for short-term contracts for particular support tasks. Institutionally, ACCAF could be managed through an IQC or other contracting mechanism, and/or through addition of one or more dedicated new staff within RDMA.

Rationale: The focus on climate change as a core development issue for USAID will grow dramatically over the coming five years, particularly in Asia. USAID bilateral missions in the region will be expanding their climate change programs and seeking efficient ways to obtain the information, tools and technical assistance that they will need to do so. RDMA's climate change programs in non-presence countries—particularly in China and the Pacific Islands—are also likely to grow and thus require the same kinds of information, tools and assistance. Currently, USAID lacks the capacity—whether globally or in the region—to meet this growing demand in an efficient manner. Developing these stand-alone capacities country-by-country will be inefficient and beyond the resources available in missions. RDMA is therefore in a position to take advantage of the economies of scale and broader perspectives and networks inherent in a regional mission to take a leadership role in providing these services throughout the region.

Roadmap:

Year 1: Feasibility and design study, including a "user-survey" to gauge mission and non-presence demand for assistance and services; procurement and/or RDMA staffing; development of roster and network of expertise; identification of initial missions and/or non-presence country programs for ACCAF assistance; formal launching of ACCAF.

Years 2: Implement assistance to initial portfolio of missions/non-presence programs; expand services to additional mission/program clients.

Years 3-5: Evaluate and fine-tune ACCAF mechanism as necessary; continue to expand ACCAF's services and clients.

Suggested Performance Indicators: Number of clients served (quantitative); client feedback on quality and utility of ACCAF services.

Potential Partners: RDMA GCC-related programs (EOH, RAFT, RAII, ECO-Asia CDCP, etc.); Numerous centers of excellence on GCC tools within USG (e.g., EPA, USFS, NASA, NOAA); NGOs and research institutions.

Funding Resources: Start-up funding TBD. Once ACCAF is up and running, it is assumed that mission and program buy-ins would fund some requested support activities. Continued core support from RDMA will be necessary, however, since (a) there will be ongoing overhead costs; and (b) missions are likely to have climate change-related mandates (e.g., reporting on GHG impacts of their programs) which will not be funded with new, dedicated funds.

4. RDMA MANAGEMENT, COMMUNICATIONS, AND OUTREACH ISSUES

4.1 Management Approach

This analysis and road map has been developed along the lines of the RDMA Mission Strategic Plan (MSP), and priority RDMA activities and mechanisms with the intention of maximizing utilization of the knowledge and relationships represented in those streams of development work. Activities in this road map will enhance the long term success of the development priorities of the Agency and RDMA by reducing greenhouse gas emissions from the fastest growing region, and increasing the resilience of climate-reliant development activities in the face of future conditions. The regional platform provides an opportunity for greater impact due to existing networks with significant organizations, and activities ranging from engagement on the ground to regional intergovernmental coordination.

Management Responsibility

RDMA's Regional Environment Office will have lead responsibility for implementing this road map and any related or unanticipated additional activities.

Internal and External Coordination

As with other RDMA programs, the global climate change activities envisioned in this road map will be implemented within RDMA's mandate to support regional programs across Asia, bilateral programs in non-presence countries, and provide technical expertise to partner Missions. To a large extent, this road map may also form the basis of coordinated activities that are simultaneously implemented by RDMA, bilateral Missions, and USAID/Washington, as well as other USG and donor partners. As appropriate, RDMA will seek to serve as a central coordinating body when RDMA and bilateral Missions or other USG partners are engaged in joint or otherwise closely related activities.

To the extent that other RDMA Offices initiate activities that also address climate change (e.g., such as relate to economic growth, health, or vulnerable populations), REO will seek to serve as a central coordinator and information clearinghouse to ensure the appropriateness of proposed activities and consistency with the objectives in this road map.

Implementing Mechanisms

The road map is designed to be largely executed by building on a number of RDMA/REO's existing implementing mechanisms and programs. Many of RDMA's existing partners have experience and capabilities in climate change and development to bring to these activities, such as IRG, Winrock, WWF, TNC, the development banks, and UN agencies. Most of these partners can be expected to be enthusiastic participants in greater attention to climate change in their work. Some of the RDMA mechanisms may require slight changes that can be

incorporated with incremental funding modifications as the climate change considerations do not fundamentally change the nature or intent of the development program. Other mechanisms and programs are coming to a close and new agreements will be necessary in any case. RDMA and its partners can likewise use mechanisms and tools developed by EGAT's Global Climate Change team, such as carbon calculators, adaptation methodologies, and interagency agreements.

Technical experts in EGAT are also available to provide technical input to evaluations, review of project proposals, statements of work, and project design.

4.2 Outreach and Communications

Outreach and communication is already a priority activity for RDMA, sharing lessons learned across the region and linking relevant actors to address common concerns across the region. Communication will continue to be a critical element for the success of these activities to integrate climate change into development programs. USAID as an Agency is re-awakening to the need for communication of successes, innovation, and demand for services and hopefully needed funding will follow the recent push for a Global Development Commons.

The new ACCAF would provide a platform for regional outreach, in particular for dissemination of technical capabilities but also for sharing experiences. A state-of-the-art Knowledge Management facility using both virtual and live elements could be a significant contribution to addressing climate change and development across the region.

All RDMA climate change activities will seek to adopt common messages and themes relating to communicating the overarching objectives described in Section 2. In the absence of the ACCAF, REO staff will work with RDMA implementing partners in developing consistent communications information and approaches in coordination with RDMA's Documentation, Outreach, and Communications Specialist (DOCS).

4.3 Staffing

A Regional Climate Change Advisor will oversee implementation of this strategy, in coordination with Cognizant Technical Officers (CTOs) at RDMA or other Missions who have responsibility for activities that are wholly or partly related to global climate change. Depending on the demand from the Missions, there may be a need for additional technical experts in climate change, with capabilities to support Mission efforts on, for example, carbon accounting, adaptation assessment and planning, and application of innovative finance to support development efforts.

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ANNEX 1: SUMMARY OF STRATEGY TEAM'S MEETINGS AT RDMA

Monday, Feb 4:

USAID/RDMA:

- Olivier Carduner (DIR), +66-2-263-7479, ocarduner@usaid.gov
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Tuesday, Feb 5:

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Wednesday, Feb 6:

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- Masakazu Ichimura (Chief, Environment Section), +66-2-288-1455, ichimura@un.org
- Hongpeng Liu (Econ officer), +66-2-288-1543, liu4@un.org

UNEP Regional Office for Asia/Pacific:

- Wei Zhao (Env. officer), +66-2-288-1133, zhaow@un.org

UNDP Regional Centre in Bangkok Serving Asia and the Pacific:

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Friday, Feb 8:

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- Aurelia Micko, +632-552-9822, aumicko@usaid.gov
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- Allan Joseph Mesina, +632-552-9827, amesina@usaid.gov

ANNEX 2: IPCC WORKING GROUP 2 CLIMATE CHANGE IMPACTS IN ASIA

Executive Summary

New evidences show that climate change has affected many sectors in Asia (medium confidence).

- The crop yield in many countries of Asia has declined, partly due to rising temperatures and extreme weather events.
- The retreat of glaciers and permafrost in Asia in recent years is unprecedented as a consequence of warming.
- The frequency of occurrence of climate-induced diseases and heat stress in Central, East, South and South-East Asia has increased with rising temperatures and rainfall variability.
- Observed changes in terrestrial and marine ecosystems have become more pronounced (medium confidence).

Future climate change is likely to affect agriculture, risk of hunger and water resource scarcity with enhanced climate variability and more rapid melting of glaciers (medium confidence).

- About 2.5 to 10% decrease in crop yield is projected for parts of Asia in 2020s and 5 to 30% decrease in 2050s compared with 1990 levels without CO_2 effects (medium confidence).
- Freshwater availability in Central, South, East and South-East Asia, particularly in large river basins such as Changjiang, is likely to decrease due to climate change, along with population growth and rising standard of living that could adversely affect more than a billion people in Asia by the 2050s (high confidence).
- It is estimated that under the full range of Special Report on Emission Scenarios (SRES) scenarios, 120 million to 1.2 billion will experience increased water stress by the 2020s, and by the 2050s the number will range from 185 to 981 million people (high confidence).
- Accelerated glacier melt is likely to cause increase in the number and severity of glacial melt-related floods, slope destabilization and a decrease in river flows as glaciers recede (medium confidence).

- An additional 49 million, 132 million and 266 million people of Asia, projected underA2 scenario without carbon fertilization, could be at risk of hunger by 2020, 2050 and 2080, respectively (medium confidence).

Marine and coastal ecosystems in Asia are likely to be affected by sea-level rise and temperature increases (high confidence).

- Projected sea-level rise is very likely to result in significant losses of coastal ecosystems and a million or so people along the coasts of South and South-East Asia will likely be at risk from flooding (high confidence).

- Sea-water intrusion due to sea-level rise and declining river runoff is likely to increase the habitat of brackish water fisheries but coastal inundation is likely to seriously affect the aquaculture industry and infrastructure particularly in heavily-populated megadeltas (high confidence).

- Stability of wetlands, mangroves and coral reefs around Asia is likely to be increasingly threatened (high confidence).

- Recent risk analysis of coral reef suggests that between 24%and 30% of the reefs in Asia are likely to be lost during the next 10 years and 30 years, respectively (medium confidence).

Climate change is likely to affect forest expansion and migration, and exacerbate threats to biodiversity resulting from land use/cover change and population pressure in most of Asia (medium confidence).

- Increased risk of extinction for many flora and fauna species in Asia is likely as a result of the synergistic effects of climate change and habitat fragmentation (medium confidence).

- In North Asia, forest growth and northward shift in the extent of boreal forest is likely (medium confidence). The frequency and extent of forest fires in North Asia is likely to increase in the future due to climate change that could likely limit forest expansion (medium confidence).

Future climate change is likely to continue to adversely affect human health in Asia (high confidence).

- Increases in endemic morbidity and mortality due to diarrhoeal disease primarily associated with climate change are expected in South and South-East Asia (high confidence).

- Increases in coastal water temperature would exacerbate the abundance and/or toxicity of cholera in south Asia (high confidence).

- Natural habitats of vector-borne and water-borne diseases in north Asia are likely to expand in the future (medium confidence).

Multiple stresses in Asia will be compounded further due to climate change (high confidence).

- It is likely that climate change will impinge on sustainable development of most developing countries of Asia as it compounds the pressures on natural resources and the environment associated with rapid urbanisation, industrialization and economic development. Mainstreaming sustainable development policies and the inclusion of climate-proofing concepts in national development initiatives are likely to reduce pressure on natural resources and improve management of environmental risks (high confidence)

ANNEX 3: ENERGY CONSUMPTION AND EMISSION TRENDS

USAID/RDMA 2007. *From Ideas to Action: Clean Energy Solutions for Asia to Address Climate Change*. Bangkok. http://usaid.eco-asia.org/programs/cdcp/

Figure A4-1. Total electricity generation 1980-2030

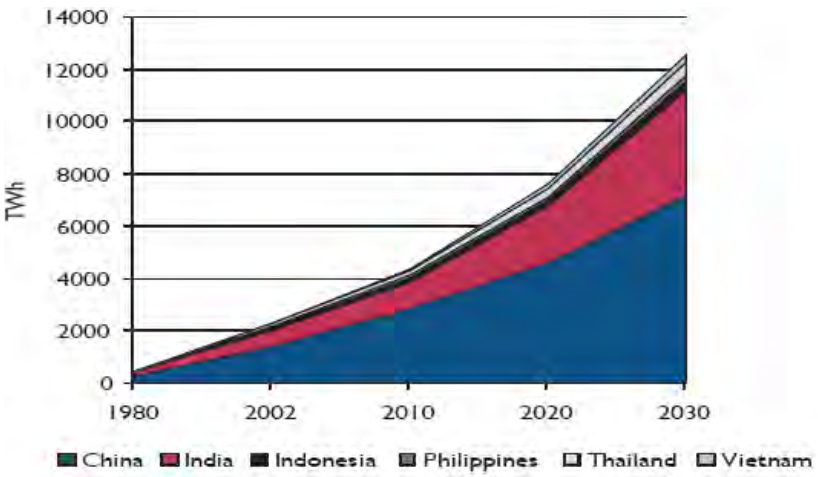

Figure A4-2. CO_2 emission by sector in selected countries (1980-2030)

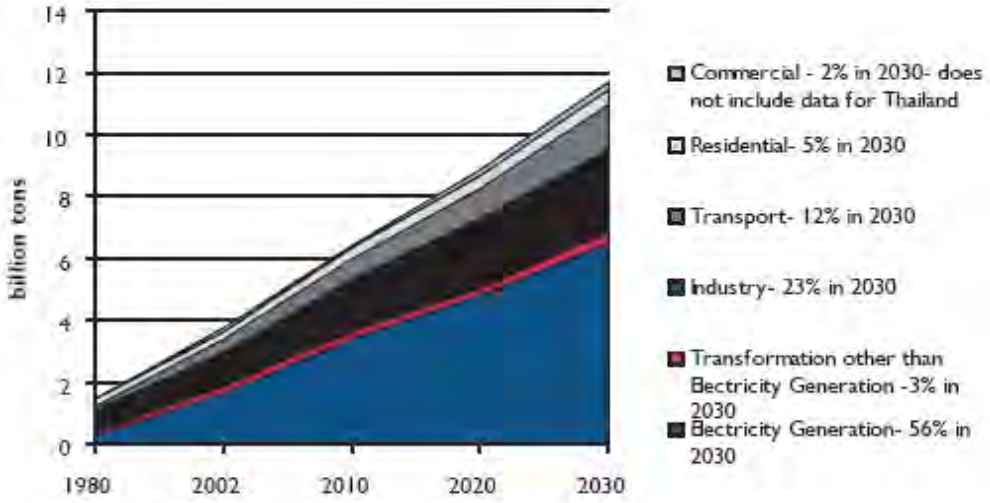

Figure A4-3. Contribution of coal to the total primary energy mix in selected Asian countries

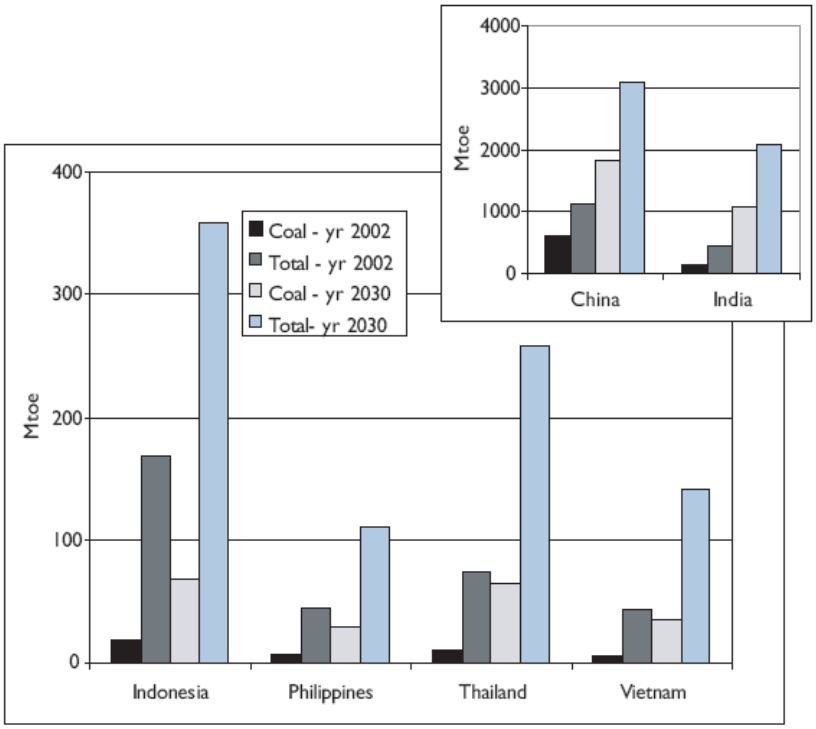

Figure A4-4. Contribution of coal to the total CO_2 emissions in selected Asian countries

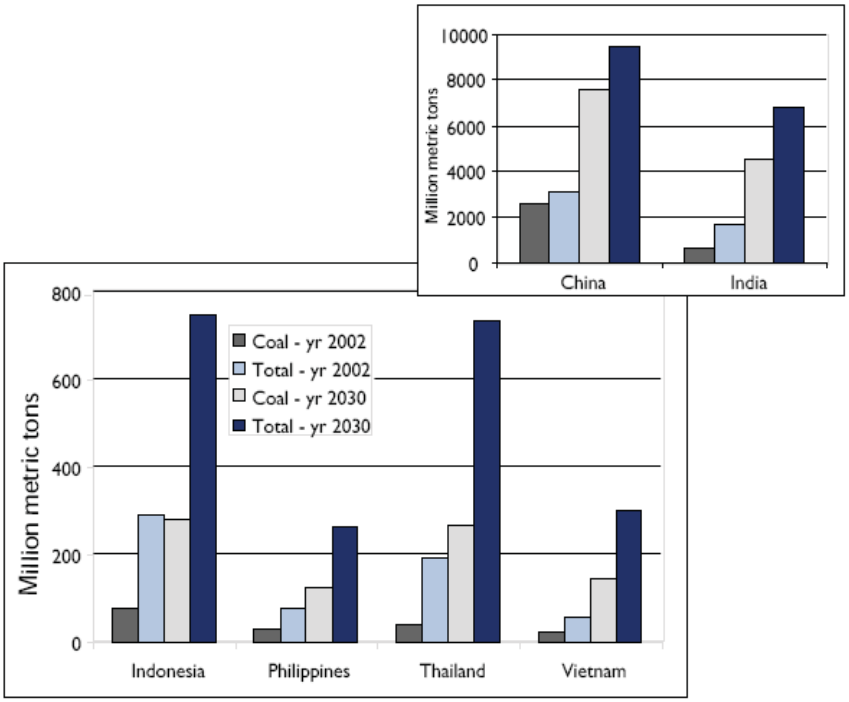

Figure A4-5. Contribution of oil to the total primary energy mix in selected Asian countries

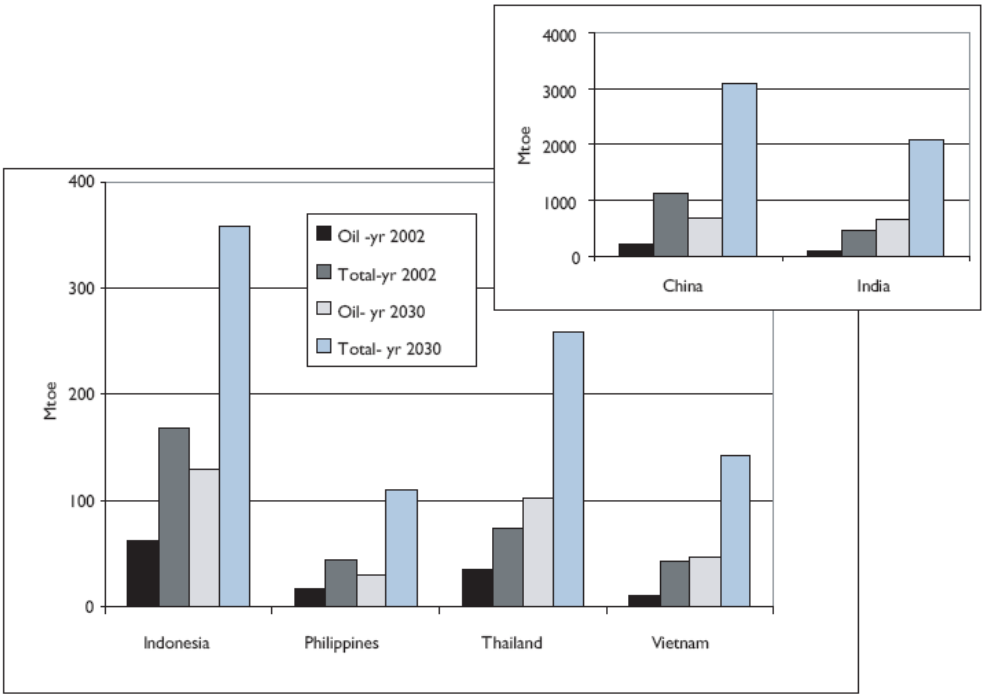

Figure A4-6. Contribution of oil to total CO_2 emissions in selected Asian countries

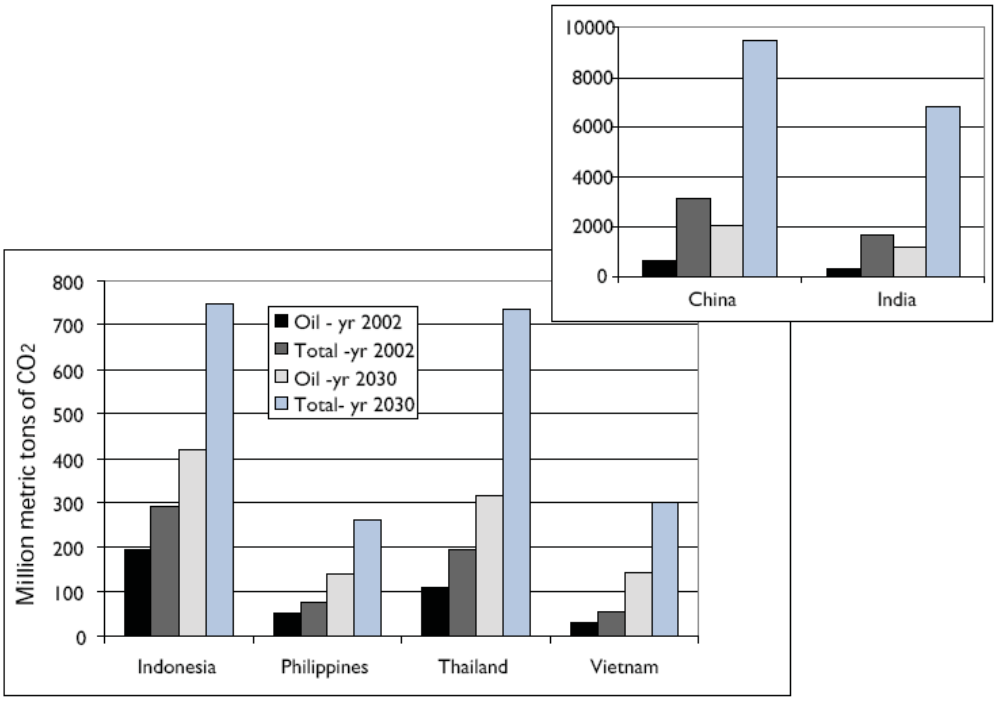

Figure A4-7. Contribution of natural gas to the total primary energy mix in selected Asian countries

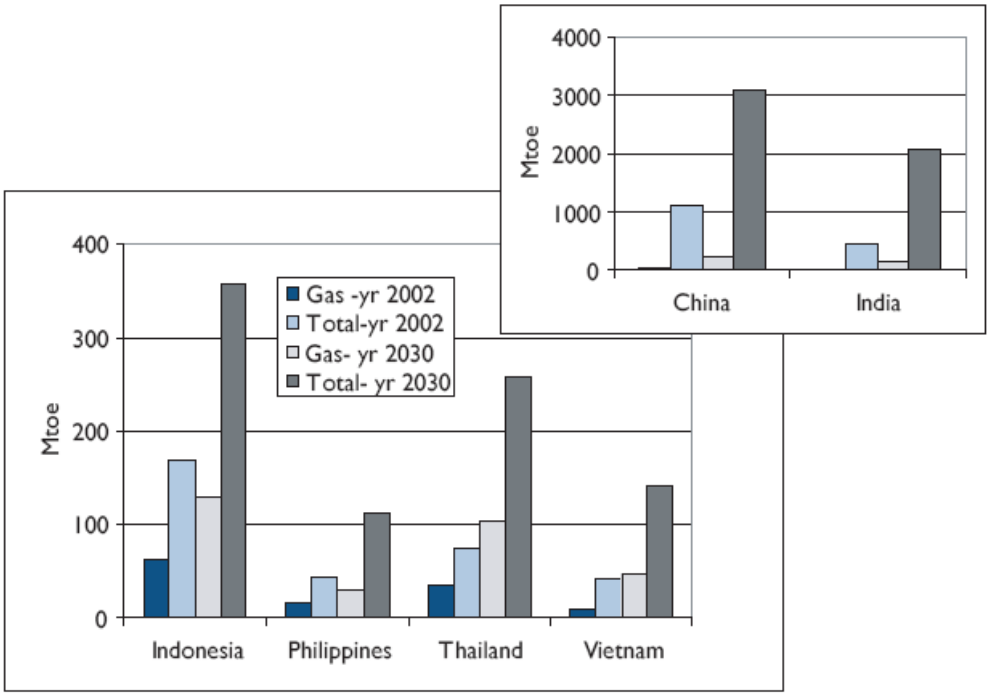

Figure A4-8. Contribution of natural gas to total CO_2 emissions in selected Asian countries

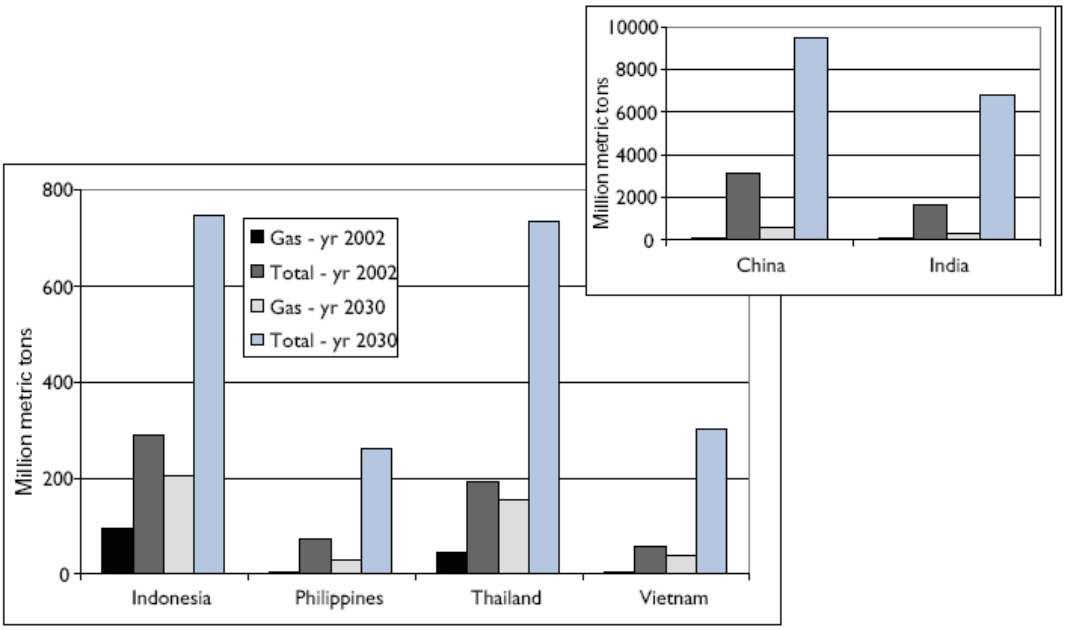

Figure A4-9. Regional installation and technical potential for wind, PV, and biomass in 2000 and 2050 (TWh/yr)

	Wind 2000	Wind 2050	Solar PV 2000	Solar PV 2050	Biomass 2000	Biomass 2050
South Asia (incl. India)	1,000	1,000	54,000	192,000	0	2,000
East Asia (incl. China)	1,000	2,000	58,000	640,000	0	11,000
Southeast Asia	0	0	17,000	25,000	0	1,000

ANNEX 4: REGIONAL SUSCEPTIBILITY TO SEA-LEVEL RISE

Graphics provided in Annex 4 originate from research conducted by Jeremy Weiss and Jonathan Overpeck at the University of Arizona, and illustrate the coastal areas in Asia with the greatest potential risk from sea-level rise. Graphics of small island states in the Indian Ocean and the Pacific, which also face significant risks, are not provided here as the image resolution and contrast is not sufficient to clearly show impacts. (Locations of major cities have been added to the original graphics.)

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http://www.geo.arizona.edu/dgesl/research/other/climate_change_and_sea_level/sea_level_rise/sea_level_rise_old.htm

Susceptibility to Sea Level Rise
Weiss & Overpeck
The University of Arizona
0 220 440 660 880
Kilometers
Legend
1-meter rise
rivers
lakes
international borders
intranational borders
High : 146668
Low : 0
Afghanistan
Pakistan
China
Nepal
Bhutan
Bangladesh
India
Myanmar
Thailand
Sri Lanka
Maldives
Delhi
Karachi
Mumbai
Kolkata
Dhaka
Yangon
Chennai
Jaffna
Colombo

Susceptibility to Sea Level Rise
Weiss & Overpeck
The University of Arizona
0 220 440 660 880
Kilometers
Legend
1-meter rise
rivers
lakes
international borders
intranational borders
High : 146668
Low : 0
India
China
Myanmar
Vietnam
Hanoi
Laos
Cambodia
Phnom Penh
Ho Chi Minh City
Guangzhou
Hong Kong
Nanjing
Shanghai
Taipei
Japan
Philippines
Manila
Malaysia

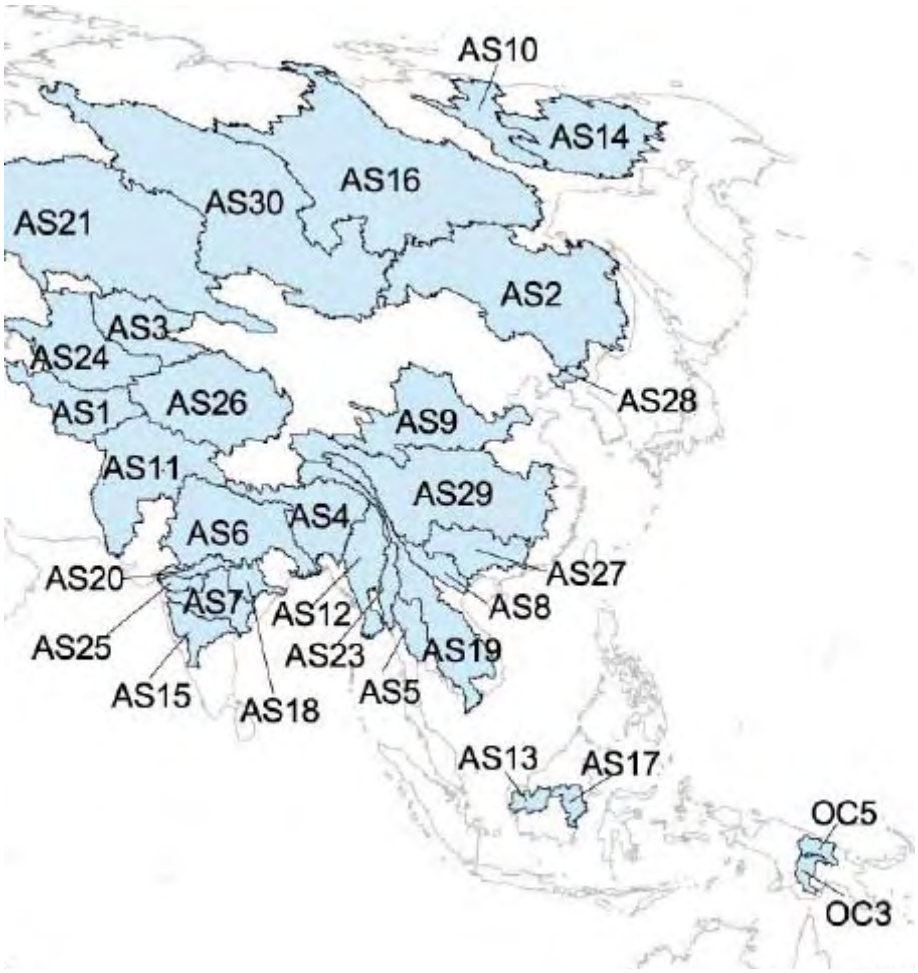
Thailand
Philippines
Brunei
Malaysia
Singapore
Indonesia
Jakarta
Timor Leste
Christmas I.
Legend
1-meter rise
rivers
lakes
international borders
intranational borders
High : 146668
Low : 0
Susceptibility to Sea Level Rise
Weiss & Overpeck
The University of Arizona
0 210 420 630 840
Kilometers
Australia

Philippines
N
Indonesia
Papua New Guinea
Solomon Is.
Port Moresby
Darwin
Australia
Legend
1-meter rise
rivers
lakes
international borders
intranational borders
High : 146668
Low : 0
Susceptibility to Sea Level Rise
Weiss & Overpeck
The University of Arizona
0 220 440 660 880
Kilometers

ANNEX 5: ASIA'S WATERSHEDS: ENVIRONMENTAL STRESSES AND FUTURE RISKS

Maps provided in Annex 5 are derived from World Resources Institute. 2003. *Watersheds of the World Online*, available at http://earthtrends.wri.org/maps_spatial/watersheds/index.php.

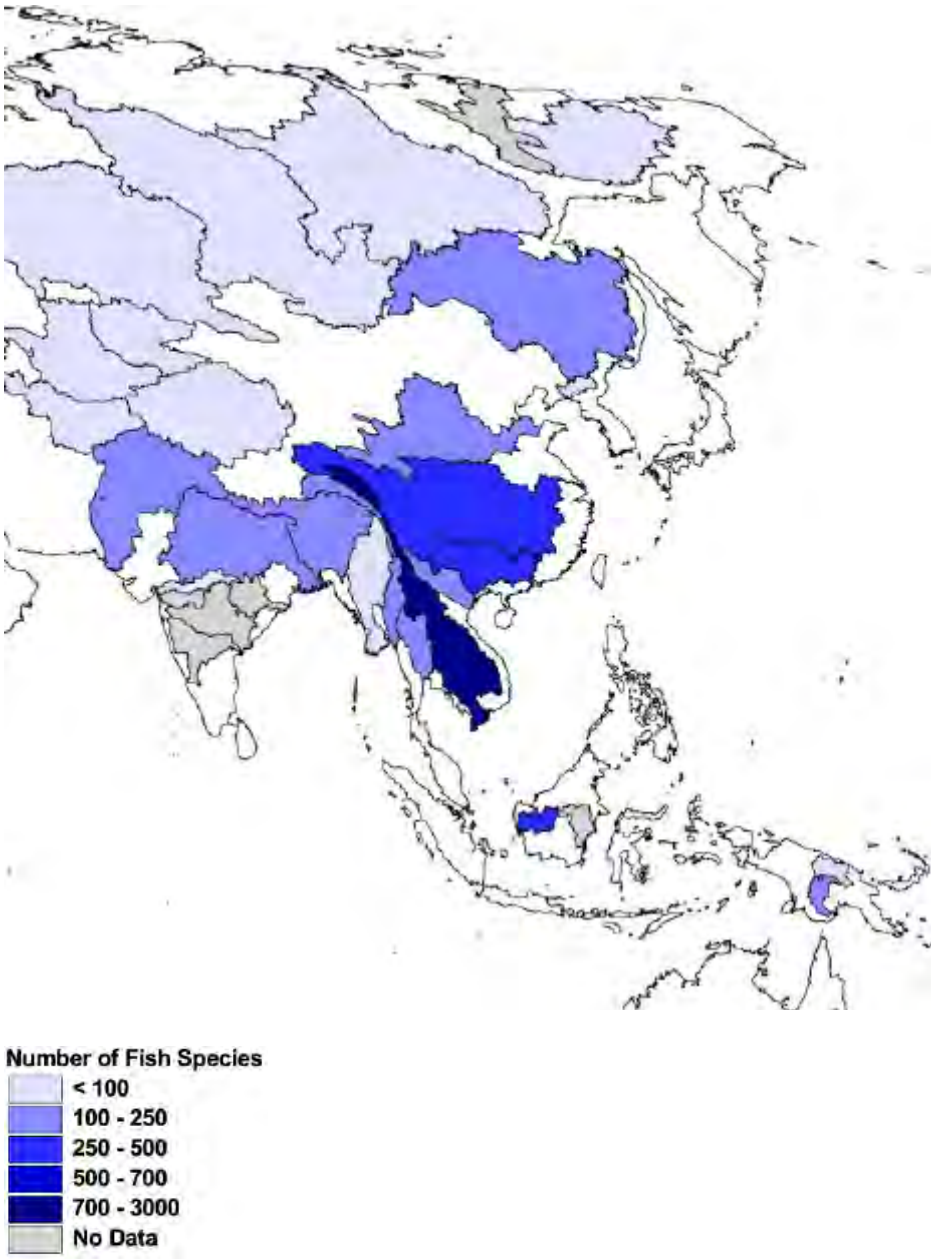
Map 01. Primary Watersheds



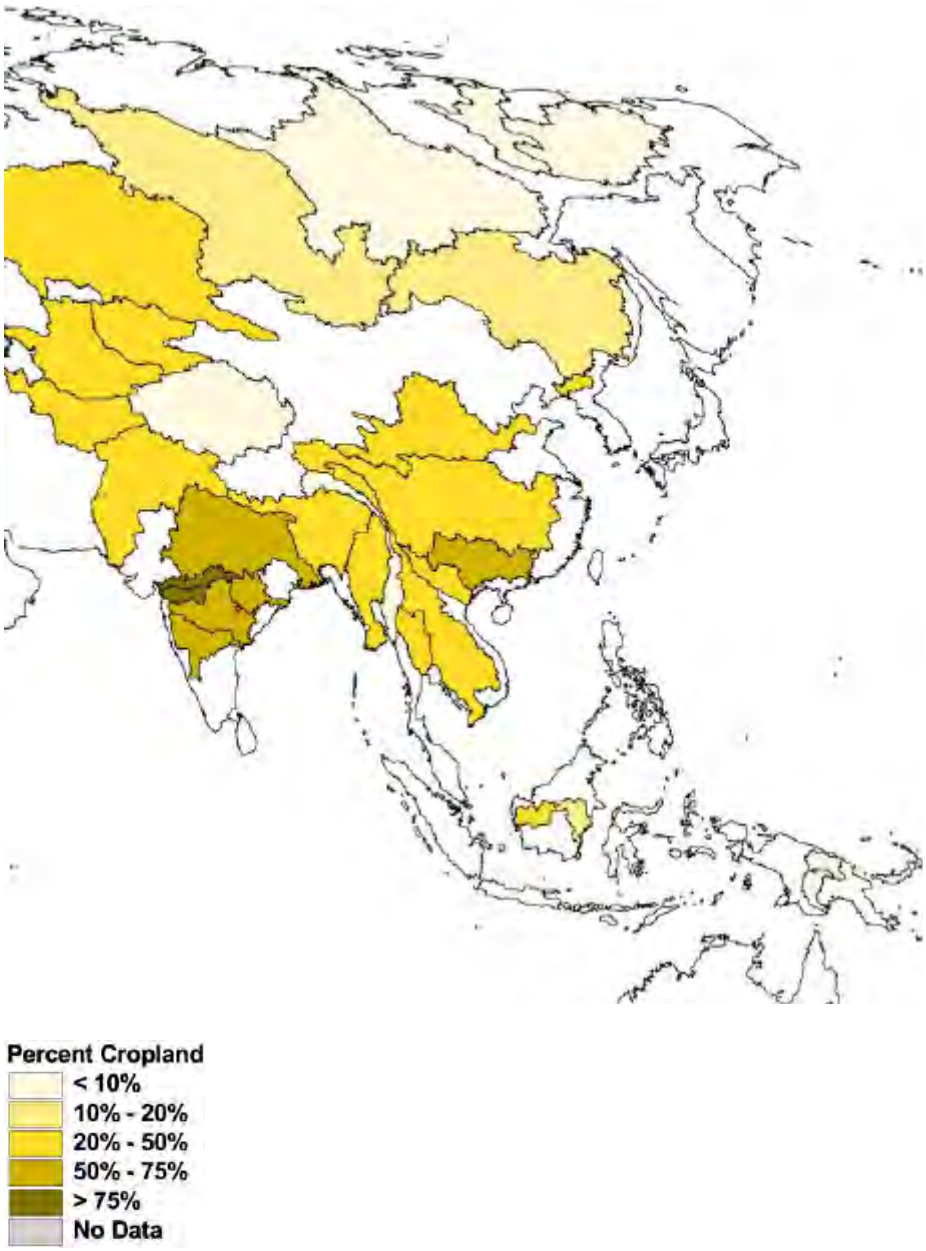
AS01 Amu Darya
AS02 Amur
AS03 Lake Balkhash
AS04 Brahmaputra
AS05 Chao Phraya
AS06 Ganges
AS07 Godavari
AS08 Hong (Red River)
AS09 Huang He (Yellow River)
AS10 Indigirka
AS11 Indus
AS12 Irrawaddy
AS13 Kapuas
AS14 Kolyma
AS15 Krishna
AS16 Lena
AS17 Mahakam
AS18 Mahanadi
AS19 Mekong
AS20 Narmada
AS21 Ob
AS22 Pechora
AS23 Salween
AS24 Syr Darya
AS25 Tapti
AS26 Tarim
AS27 Xun Jiang
AS28 Yalu Jiang
AS29 Yangtze
AS30 Yenisey

OC03 Fly
OC05 Sepik

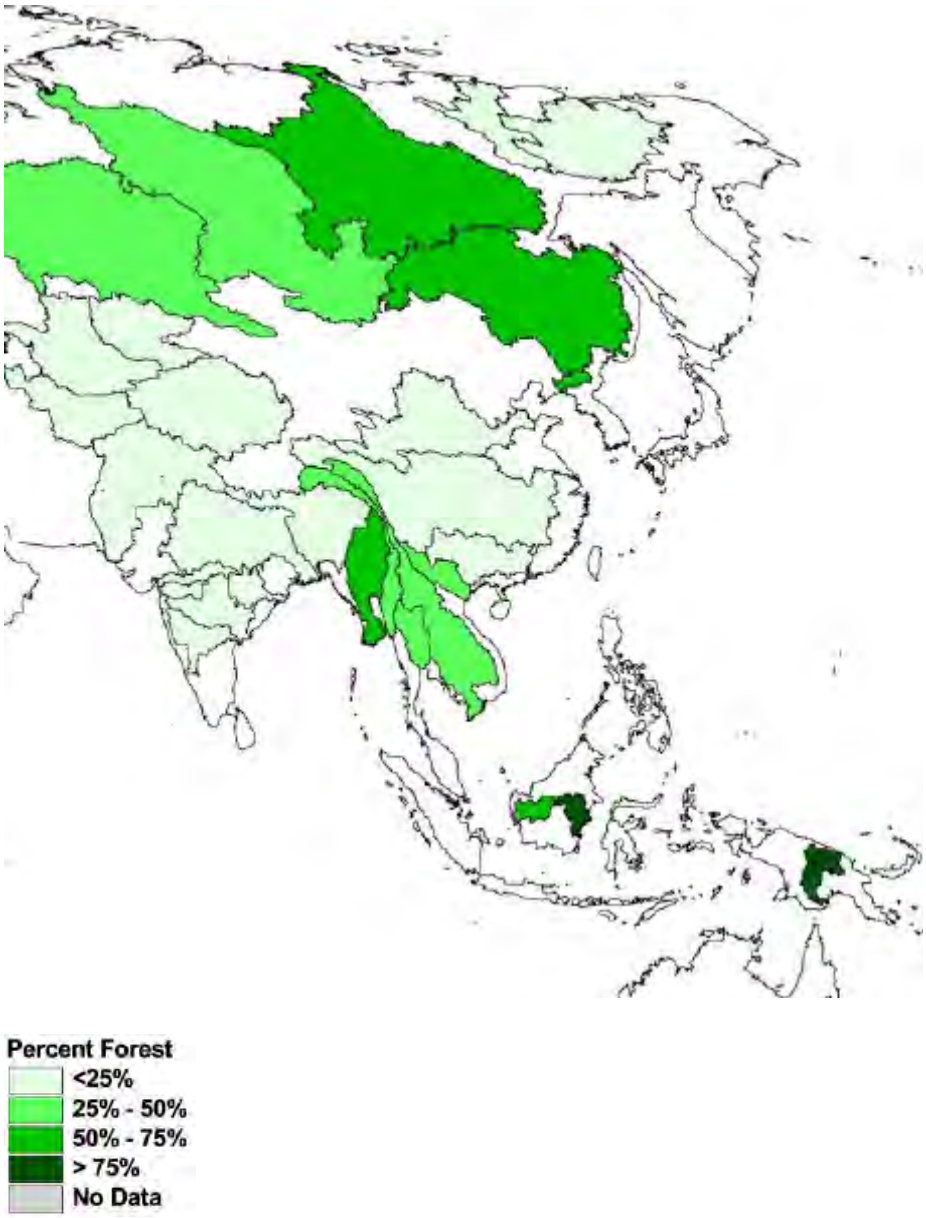
Map 02. Freshwater Fish Species Richness by Basin



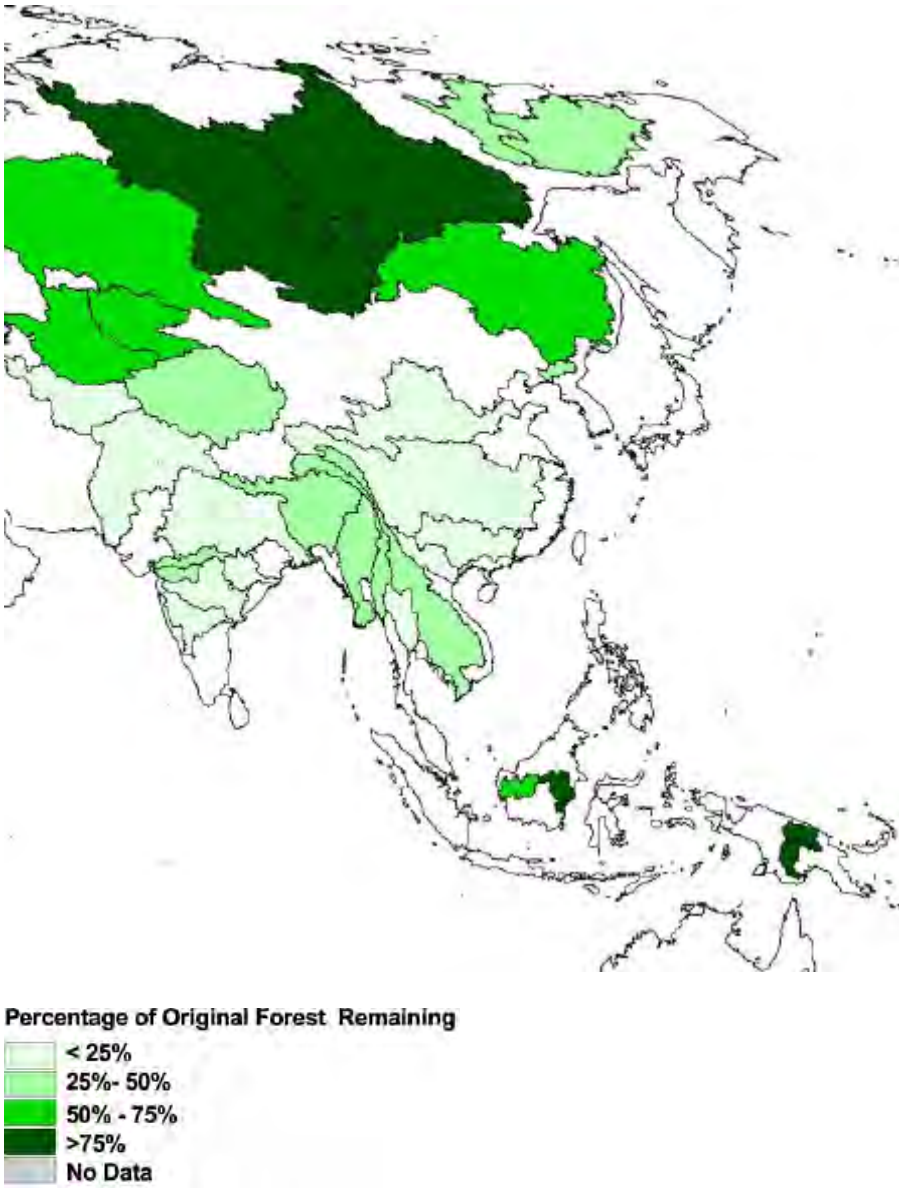
Map 06. Cropland Area by Basin



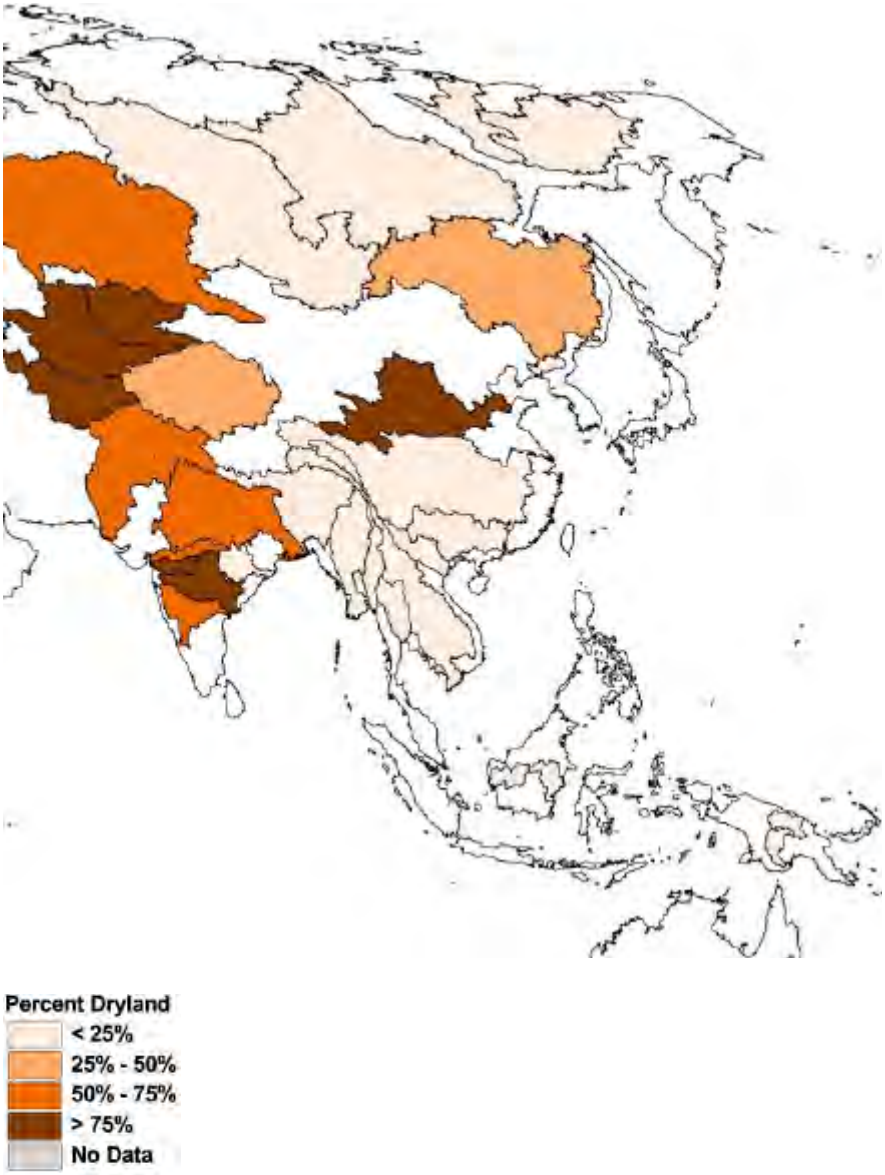
Map 08. Forest Cover by Basin



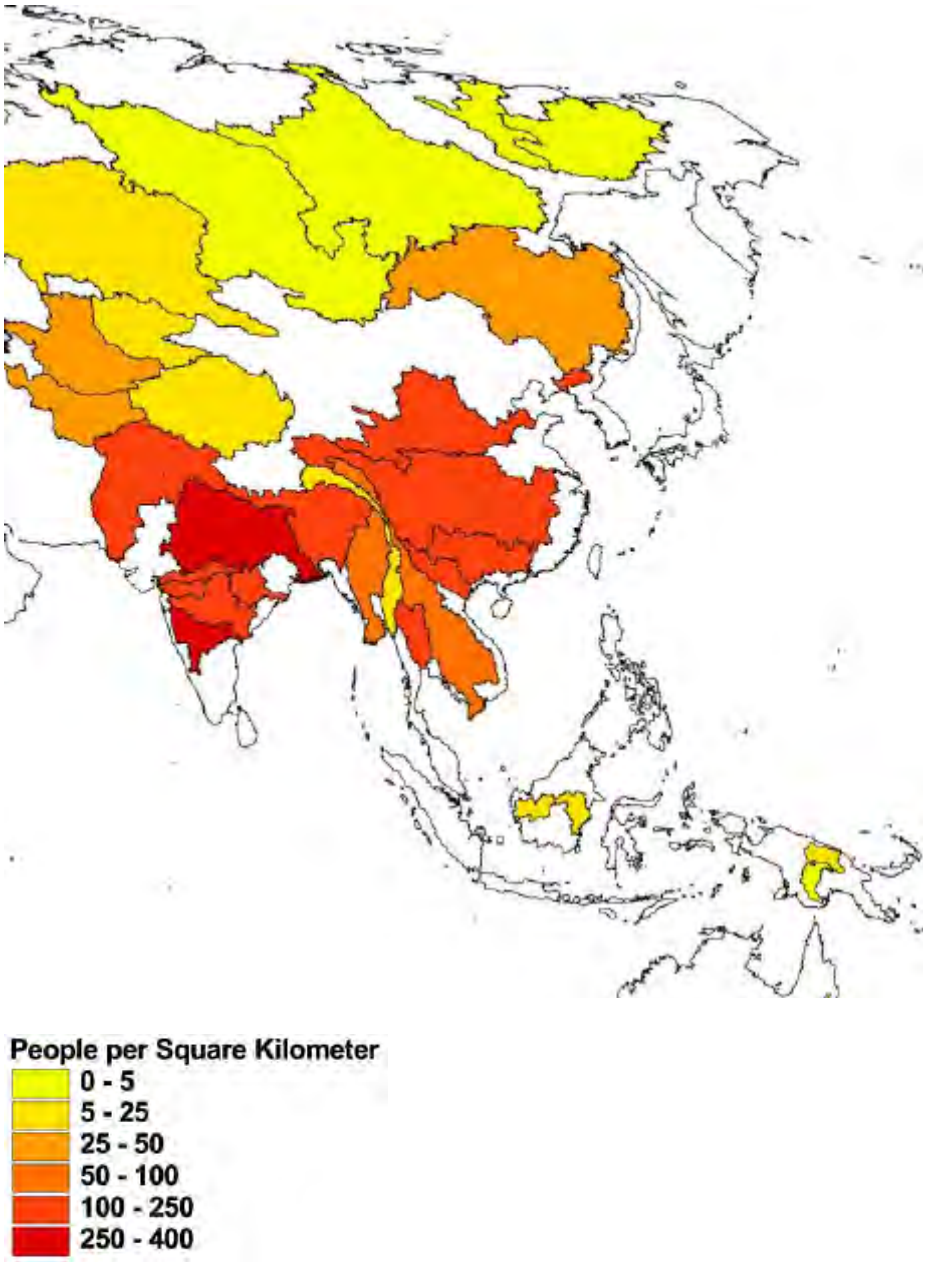
Map 09. Remaining Original Forest Cover by Basin



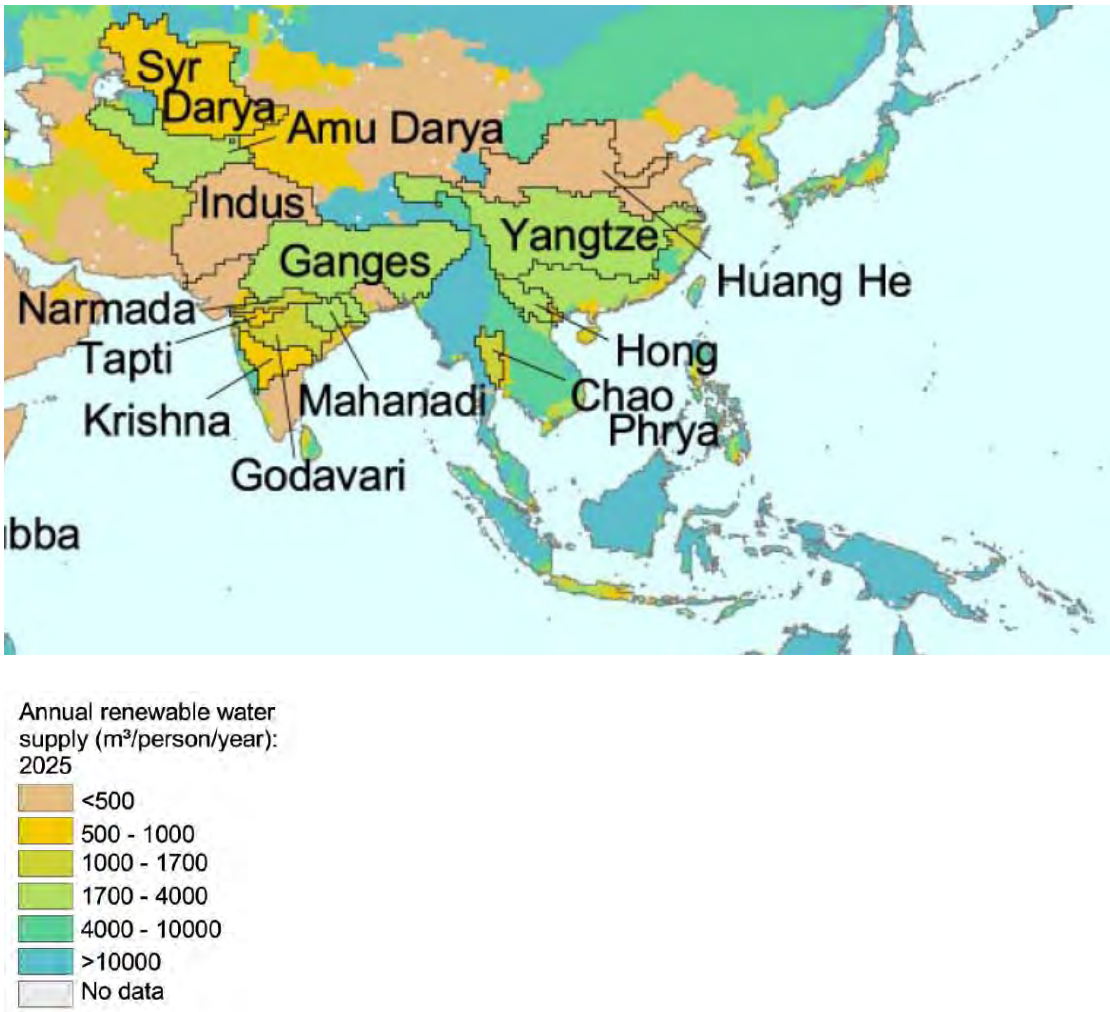
Map 10. Dryland Area by Basin



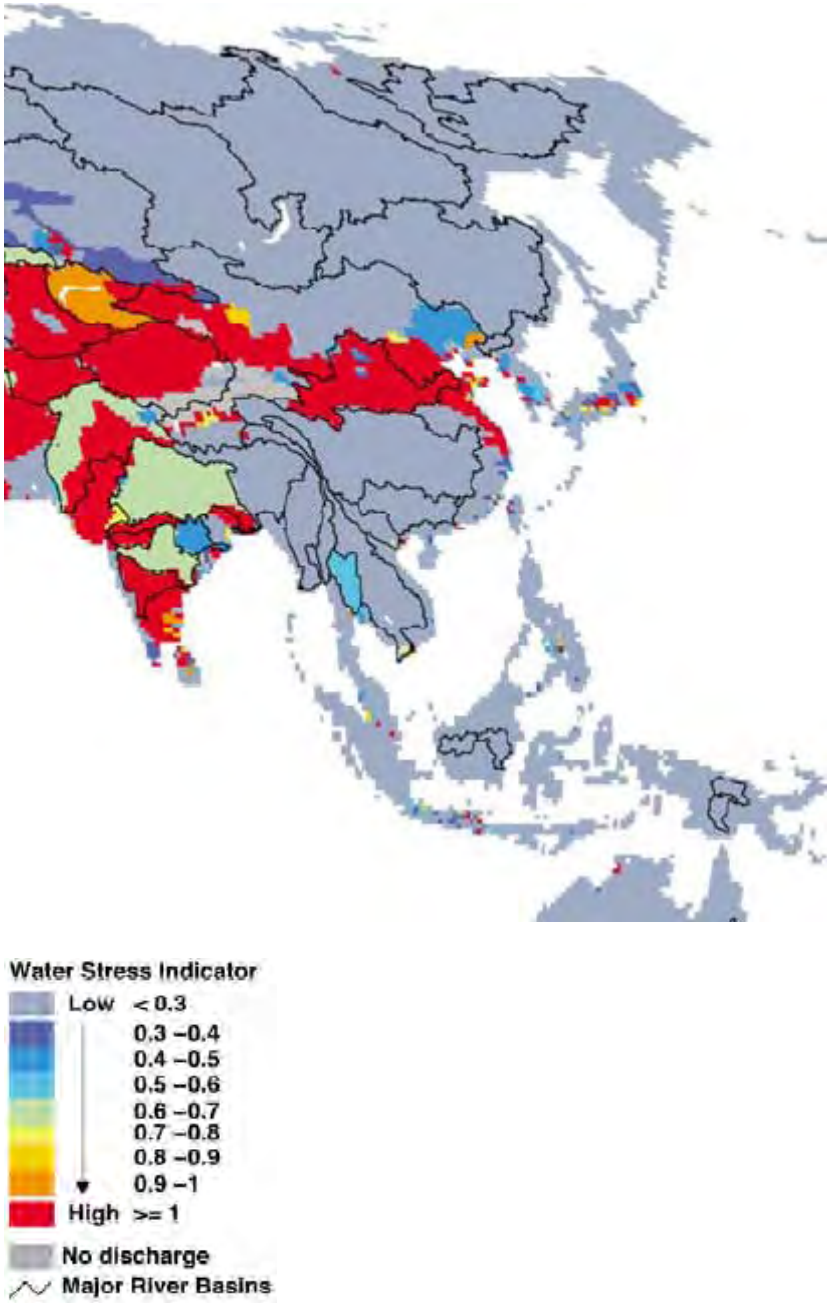
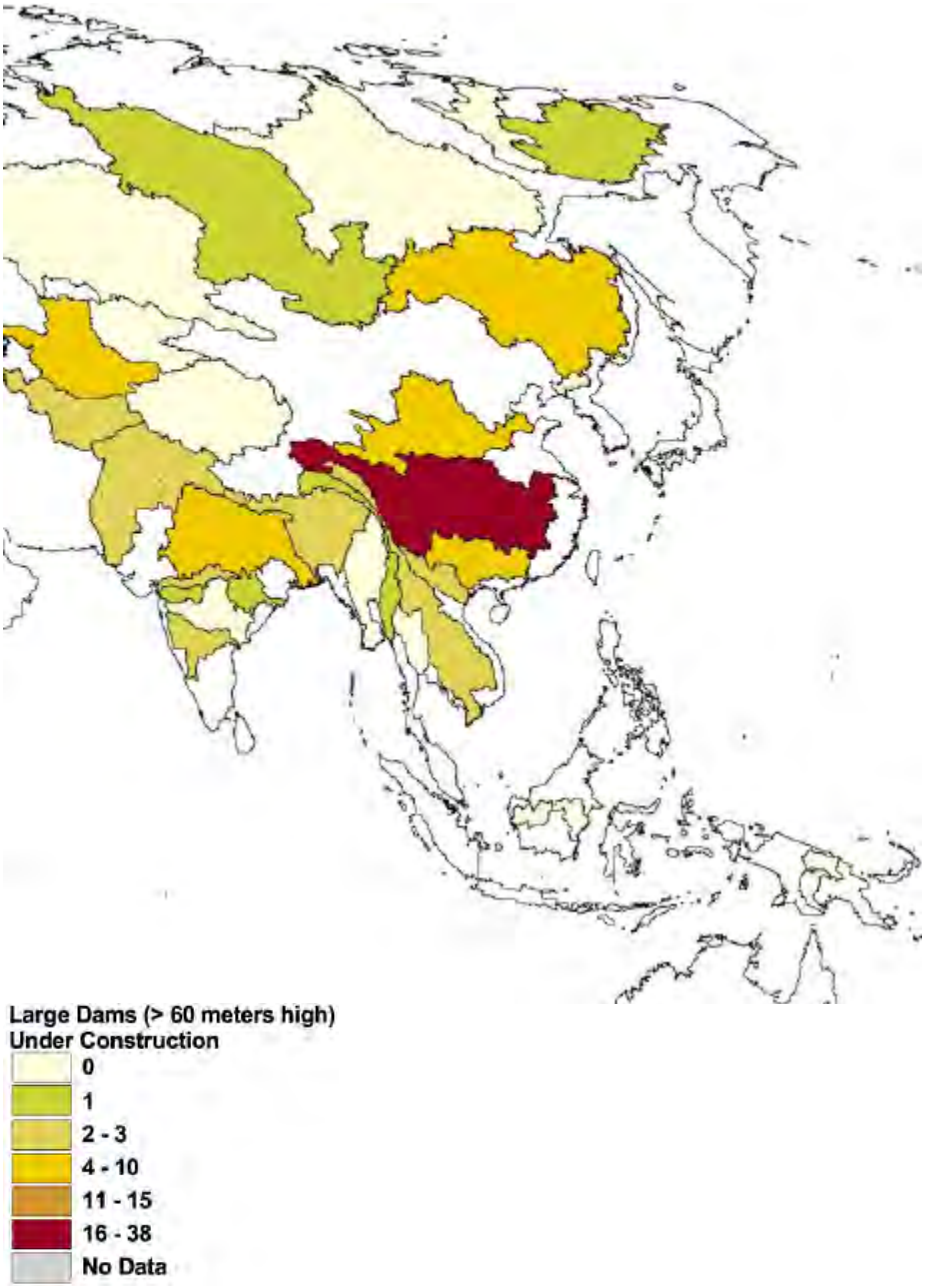
Map 13. Average Population Density by Basin



Map 15. Annual Renewable Water Supply per Person by Basin—Projections for 2025



Map 16. Environmental Water Scarcity Index by Basin



Map 17. Large Dams under Construction by Basin