

SEPTEMBER 2009



ASIA'S FUTURE

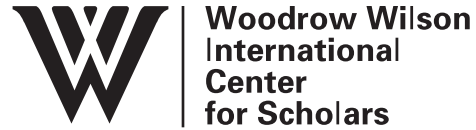
Critical Thinking for a Changing Environment

By Dorothy C. Zbicz, Ph.D.

With input from Jennifer Turner, Ph.D., and
Linden Ellis, China Environment Forum

Funded by and prepared for USAID Asia Bureau through
an agreement with the USAID Global Health Bureau by:

The Woodrow Wilson International Center for Scholars
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The author and the Woodrow Wilson Center wish to thank the dozens of experts who participated in our brainstorming meetings and the many dedicated USAID mission staff who enthusiastically participated in the training workshop in Bangkok. Throughout the process we greatly benefitted from insights and help from a troika of experts—Howard Shapiro (Mars, Inc.); Patrick Alley (Global Witness); and Jim Jarvie (Mercy Corps). Last but not least, we wish to express gratitude to Heather D'Agnes (USAID Global Health Bureau) and Mary Melnyk (USAID Asia Bureau) for not only their vision to support this project, but also for their invaluable participation in the various meetings and workshops and their input into this report.

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1 Section One

Introduction and Summary

1.1 Long-Term Effects of Short-Term Thinking

In the digital, fiber-optic-driven twenty-first century, results are measured in quarterly reports, and long-term planning is generally considered to be anything longer than six months in advance. Rarely does an industry or a government have the luxury of stepping away from urgent crises and current bottom lines to look at longer-term trends affecting their business. As a result, necessary expenditures are too often deferred, and capital is drawn down at unsustainable rates until suddenly disaster emerges, sending everything into crisis mode and further curtailing wise, long-term planning.

This may be one of the many factors at the root of the global economic crisis of 2009, but it also has parallels in biodiversity and the environment. Here too, natural capital is being expended faster than it can be replenished, and the mounds of waste pile ever higher, leaving future generations more environmentally impoverished.

While Europe and the U.S. accomplished their own levels of environmental degradation over centuries, already densely populated Asia, with its lightning-speed economic development, natural resource-dependent economies, and globalization of trade, is currently playing out this environmental version of unsustainable growth in fast forward, and its rich biodiversity is paying the price. With change now occurring so rapidly, both globally and in Asia, some trends now appearing in the distance may all too soon become serious environmental threats. Identifying these trends and the broader, longer-term drivers giving rise to them is key to protecting Asia's environment and its future.

1.2 Looking Ahead in Asia

In 2008, as USAID's Asia Bureau embarked on its program planning, it was faced with rapidly increasing breadth and complexity of environmental threats in the region and the growing challenge of addressing threats to the environment and biodiversity on multiple fronts simultaneously. During the past year, alongside the more traditional issues of economic development, population and corruption, the Asia Bureau had to incorporate speculation in biofuels and demands for food and energy security into their planning. The year was also pivotal in the increasing global awareness of the climate crisis. Rising fuel and food prices led to widespread food insecurity, only to be followed by a global financial crisis late in 2008. More than ever, programs and solutions were required that could address not only longer-term threats, but also their multiplicative interactions. The situation called for stepping back and scanning the horizon in many different fields to gather a new view of these approaching trends, some of which may not even be patently obvious yet, in order to begin to estimate what tomorrow's greatest environmental threats might be and what hope some emerging technologies and approaches might offer for ameliorating them.

Given these challenges, the Asia Bureau sought to consider how these trends might come together and affect efforts and investments in conservation, especially important at a time when the agency was embarking on new program designs under a new administration. By identifying these emerging trends and the broader drivers behind them, the intent was to incorporate this



information into current programming to forestall the potential negative impacts, hopefully eliminating or diminishing their damage more effectively and at lower cost. Strategic investments could then be tailored towards those crucial junctures where pressure might be applied at lower cost today, in hopes of deflecting more serious negative impacts tomorrow.

To this end, USAID provided a grant to the *Environmental Change and Security Program* and the *China Environment Forum* at the Woodrow Wilson International Center for Scholars to coordinate the Asia's Future project and conduct a series of expert roundtables to elicit from numerous visionary thinkers and experts what significant trends they see in their own fields, and how these might affect Asia's environment in the future. The countries initially included in this analysis were those in Asia with current USAID biodiversity activities: **Bangladesh, Cambodia, China, Indonesia, Laos, Burma, Nepal, the Philippines, Papua New Guinea, the Solomon Islands, Thailand, and Vietnam.** The substantial influences of both China and India on this region were also taken into account, as were the needs of the Central Asian Republics, which were newly added to the Asia Bureau's portfolio.

Over ninety experts participated in these roundtables from a variety of fields. [See *Appendix A on website for a List of Experts*]. These included (but were not limited to): industry, finance, information technology, human rights, health, government, biotechnology, nanotechnology and the environment. The roundtables were intentionally composed with a view to generating fruitful discussion and creative problem-solving to address Asia's environmental challenges. The participants in each roundtable were asked to consider three questions:

1. What do you see as a major emerging trend in your field of expertise?

2. What are likely cumulative impacts of these multiple trends that might be overlooked?

3. How might these trends be addressed to better protect Asia's future environment and biodiversity from their impacts?

The results of these expert roundtables were collated, along with a substantial review of relevant trends literature, into a draft of this trends analysis report. This combined expert information provided the background for an applied training workshop held in Bangkok, Thailand on March 30–April 1, 2009 for USAID environmental and program officers working in USAID field Missions across the Asia region [see *Appendix B on website for a List of Workshop Participants*]. At the workshop, expert presentations were provided and discussions centered on both identifying the interactive and cumulative impacts of the drivers and trends, as well as possible actions to strengthen environmental conservation in the region.

Highlights from the expert presentations and discussions at the workshop have been incorporated into this final report, which includes economic, political, social, technological and demographic trends affecting Asia. The goal of the report is to provide a background analysis of trends influencing Asia's environment in order to assist USAID in considering their cumulative impact and potential points of intervention for future program design. As an accumulation of the results of research, expert roundtables and a USAID training workshop, this final document is not a strict biodiversity threats analysis. Rather, the trends and drivers identified are a step back from a threats analysis. While all the trends are likely to have an impact on Asia's environment; unlike threats, they are not all negative. Some of the trends identified may actually have positive impacts, or a combination of positive and negative.



1.3 Major Trends and Drivers

This process has identified trends most likely to shape Asia's environment and biodiversity in the immediate future and over the next 10–20 years. Even though USAID's programming requirements are in the shorter term, the experts were asked to consider a longer time-frame in to order to produce a more comprehensive vision of the direction that the drivers and trends can be expected to take in coming decades. This enables USAID to consider the longer term in its current programming. In the ten months since this project began, a financial crisis has engulfed the world, slowing some, if not most, of these drivers for an unspecified period of time. However, due to the conditions in Asia, whenever the region and global economies do begin to emerge from the crisis, these trends are likely to rise quickly to the top once again.

Out of the Asia's Future process, six broad trends rose to the top as the most significant and influential drivers of future environmental conditions in the region. While all of these six are undoubtedly trends, they differ both quantitatively and qualitatively from the scores of others that were identified. These six drivers actually underlie and even cause the numerous sub-trends listed under them. None of these six are necessarily good or bad in themselves, but all drive trends with both positive and negative environmental consequences. Due to their overwhelming influence, for the purpose of this document, these six will be referred to as *drivers* to distinguish them from the many other trends identified during the project. Discussed in greater detail later in this report, these six primary drivers identified as most affecting Asia's future environment are:

1. **Rapid Economic Development and Rising Living Standards in Asia**
2. **Globalization of Trade and Demand for Asian Natural Resources**
3. **Rise of Asian Science and Technology**

4. **Exploding Energy Demand in Asia and Globally**

5. **Projected Effects of Climate Change and Post-Kyoto Mitigation Approaches**

6. **Continued Population Growth and Urbanization**

Each of these drivers is leading to multiple sub-trends that will directly affect Asia's environment and biodiversity. The identified sub-trends could obviously have been arranged in multiple ways. For this report, they are not clustered around USAID's current priorities and categories, because the purpose of this project was to go beyond sectoral thinking and view Asia's future in all its complex realities. Nor are they grouped by habitat or resource type, such as water, land, atmosphere, energy, agriculture, because so many of the sub-trends cross resources and habitats, impacting biodiversity in different ways and places. Instead, classifying the sub-trends by the forces that are driving them helps both to predict what unexpected consequences might arise from specific actions, such as substituting products or shifting environmentally damaging activities elsewhere, and to identify those points of intervention likely to be most effective. [*For a list of the six key drivers and their related sub-trends, see Box 1.*]

For example, the melting of glaciers is a very important trend affecting Asia's environment and biodiversity. However, if taken as the starting point, then the only intervention possibilities would be adaptation—finding other water sources, building reservoirs, etc. By stepping back and viewing the trend in the context of climate change and air pollution, we recognize that investments in climate change mitigation or pollution reduction may actually slow the rate of melt. By recognizing that the rapid increase in mining in Southeast Asia is being driven by global demand and trade, we can identify those pressure points in the



international supply chain where interventions could contribute to improving the environmental criteria for mining concessions. If we ban oil palm plantations in one country, we might simply drive them to neighboring countries, in the way that banning logging in China and Thailand exported the activity to its neighbors. However, if we acknowledge those broader factors driving their expansion, then we can identify several different opportunities at multiple levels to slow it and reduce the environmental impacts.

Many of the sub-trends identified in this project are interrelated and actually result from multiple drivers, with combined, synergistic effects on the environment. Some of them are obviously more urgent in the near term than others and may therefore become higher priorities for immediate programming. However, it is nevertheless important to see them all together in their relation to one another and the broader drivers, so all have been included. Taken together, the six drivers provide a useful picture of Asia's future. The list of trends that they are driving provides a detailed view of what activities are actually shaping its future environment. The table below lists the six primary drivers, with the related sub-trends that derive from each. These are discussed in greater detail later in the report.

The most important conclusion to be drawn from the Wilson Center's analysis on these trends for the Asia's Future project is the urgent need for *environmental sustainability*—for sustainable use, sustainable consumption, sustainable development—in ways that do not enrich current generations at the expense of future ones. At least five of these six drivers and many of the related trends reflect unsustainable demand and use of Asia's natural resources and environment, some of it originating from within the region and much from outside. Most of the drivers are related to economics, as human economic activity, especially the pursuit of financial gain, is what is most significantly affecting Asia's environment, both directly and indirectly. Most of these trends also demand ever-increasing amounts of freshwater, a recurring theme. While these drivers are all connected, any single one alone, if allowed to proceed out of control, could potentially negate USAID's environmental investments, seriously damaging Asia's environment. Therefore, all six must ultimately be brought within limits of environmental sustainability to protect Asia's (and the world's) environment and biodiversity over the long term. This is the real challenge ahead for USAID and its partners in Asia.



Box 1: Drivers and Trends Shaping Asia's Future Environment

1. Rapid Economic Development and Rising Living Standards in Asia

- Increased demand for meat, dairy, fruits, and vegetables in Asian diets.
- China's growing global resource draw
- Increasing degradation of coastal and marine environments
- Increasing demand for environmental protection and environmental health
- Asia's growing economic and political power relative to the U.S. and the EU

2. Globalization of Trade and Demand for Asian Natural Resources

- Asia rapidly becoming the "producer for the world"
- Transportation infrastructure as a weak link for trade and an environmental threat
- Increasing Asian agricultural industrialization and cash crops for export
- Acquisition and leasing of land in Asian countries by foreign entities
- Increasing investment in mining in Asia
- Regional economic cooperation in Asia and trade agreements
- Increased involvement of organized crime in illegal natural resource trade
- Greening of supply chains and corporate social and environmental responsibility
- Depletion of marine resources and fisheries
- Growth in aquaculture production, freshwater and marine

3. Rise of Asian Science and Technology

- Large investment in Research and Development (R&D) in Asia, especially China
- Asian investment in biotechnologies
- Asia's growth in nanotechnology (both in manufacturing and R&D)
- High-value science capacity (and education) in Asia
- Access to international communication via cell phones, internet, mobile devices
- Pollution threats from new technologies (nano, biotech, information technology)

4. Exploding Energy Demand in Asia and Globally

- Increased exploration for fossil fuels and alternative hydrocarbon sources
- Increase in alternative energy sources and biofuel production, especially palm oil
- Planned growth in hydropower, particularly in dams
- Increasing atmospheric pollution in Asia
- Increasing Asian greenhouse gas (GHG) emissions

5. Projected Effects of Climate Change (CC) and Post-Kyoto Mitigation Approaches

- Rising sea level, increased flooding and storms, changes in rainfall and temperature
- Melting glaciers and snowpack, especially in the Himalayas and Tibetan Plateau
- Increased competition for freshwater as threat to development and security
- Ocean acidification threatening corals, shellfish, and calciferous zooplankton
- Declining quality and quantity of groundwater; aquifer depletion and salinization
- Emphasis on renewable energy sources – hydro, wind, solar, and geothermal
- Energy and economic gains from energy efficiency measures
- Adoption of "Avoided Deforestation" and biochar as CC mitigation strategies
- Growth in green technologies and jobs

6. Continued Population Growth and Urbanization

- Aging populations and declining labor forces
- Growing access to education for females
- Asian urban areas to increase in population by 50% (100 million) by 2020
- Growing disparity between urban and rural living standards

2 Section Two

Unsustainability for the Twenty-first Century

2.1 The Environmental Cost of Human Success

In 1798, Thomas Malthus predicted dire consequences and starvation as the human population grew beyond the capacity of the earth to produce food. Since that time, as his predictions did not materialize within the timeframe he predicted, his critics have sought to explain why and where his reasoning failed. Among their explanations have been observations such as:

- a) He underestimated the influence of *technological developments and industrialization* (especially the “green revolution” in agriculture);
- b) He did not envision the role of *international trade* in moving food commodities around the planet so that every country or region did not need to be self-sufficient in every commodity, or the economies to be gained from focusing on comparative advantages; and
- c) It was yet to be understood that as societies develop economically, health care and survival rates improve, and family planning technologies and use become more widespread, *fertility rates naturally begin to decline*.

Malthus could not have known these developments would occur after he was gone, or the dramatic impact they have had on the ability of the earth to produce and to sustain human life. He would have been stunned to imagine that the population on earth of some 900 million during his lifetime could grow to 6.7 billion people in 2008 or a projected 8.3 billion by 2030, or more than an estimated 9 billion by 2050. The Club of Rome

and others have followed up on Malthus’s predictions with more detailed analysis and computer simulations (Meadows, 1972, 1992; Ehrlich, 1968, 1990; Hardin, 1968; Turner, 2008). While criticisms have been plentiful and the predictive value of specific dates of overshoot and collapse are still impractical, Thomas Malthus and his followers were not completely wrong. Although he might have missed some of the technological and social advances that have allowed us to compensate for predicted shortages, Malthus nevertheless did recognize an incontrovertible truth. The earth *does* at some point have limits to its ability to sustain both humans and the diversity of other species it contains.

The World Bank currently predicts that food demand will increase by 50% by 2040, due to increasing population, affluence, and a shift to Western dietary preferences by a growing middle class in other parts of the world. Lack of access to fresh water, particularly for agriculture will worsen due to urbanization and population growth, and in some places climate change. Today, 21 countries with a combined population of 600 million are estimated to be either cropland- or freshwater-scarce. By 2025, 36 countries with a combined population of 1.4 billion will fall into these categories. Although we are not yet facing worldwide starvation, things are still not moving in the right direction around the globe. Today, these old shortages simply have a new name: food and water insecurity. The challenge to overcome them is constantly at odds with the very environment that provides them and the many other species that require food, water, and habitat.



In the twenty-first century, while still approaching the much-expanded global limits to food production capacity, the planet is being stressed by those very advances that allowed humans to avoid Malthus's dire predictions. The earth's environment is now being taxed to its limits, both as source of natural resources upon which production depends, and as *sink* for the waste products of that production. In one sense, humankind has thus far survived the disease, only to be threatened by the cure. Asia is a perfect example of this.

2.2 Asia as Microcosm of the World

With its dramatic economic growth, Asia is the poster child for economic development success. In only a few decades this region has achieved what it took centuries for the West to accomplish. The Association of Southeast Asian Nations (ASEAN) economies, including Indonesia, Malaysia, Philippines, Singapore, Thailand, Brunei Darussalam, Vietnam, Laos, Burma, and Cambodia, now account for some 57% of global GDP, and this does not even include China or India. Asia is fast becoming the "producer for the world," and its economic and financial powers are rapidly increasing relative to that of the U.S. and the EU. However, because this economic growth has occurred so rapidly in places where populations are already high and the resource base is already strained, this region is also becoming a microcosm for testing the limits of resource carrying capacity. Its youthful, and still expanding, populations are combining with burgeoning manufacturing, urbanization, international trade, and rising living standards to create dramatic environmental pressures in a region with some of the highest terrestrial and marine biodiversity in the world.

In spite of the fact that Asia is home to some four billion of the world's 6.7 billion people, tropical Asia is still holds much of the world's biological wealth. Southeast Asia alone contains over 64,800 terrestrial species

(some 20% of the world's known terrestrial species) in only 3% of the world's total land area, including some 27,000 endemic species (ASEAN, 2006). Despite an alarming rate of deforestation, Southeast Asia still has some of the largest remaining stands of primary forest. The Mekong River houses the world's largest inland fisheries with more than 1,500 freshwater species of fish living within the basin. The region's marine biodiversity is equally as rich, with some 75% of the world's known coral species, 577 species in the Philippines alone, and the highest marine fish diversity on the planet. The region also contains three of the world's 17 "megadiverse" countries and 7 of the world's 34 "biodiversity hotspots" (Conservation International, 2009). Yet this rich resource base is being seriously threatened by exactly those remarkable human advances that have enabled the planet's human population to avoid Malthus's dire predictions thus far. The advances mentioned above are particularly evident in Asia:

Technological development and industrialization

Asian advances in science and technology have been remarkable, and Asia is rapidly becoming a powerhouse for nano-, bio-, and information technologies, both in research and development, as well as manufacturing. Technological development, including that of the agricultural "green revolution," have not only enabled greater production of food and other goods, but have also raised many in Asia from poverty in only a few decades. These technological advances, however, come at a cost to the environment, in terms of both natural resource use and waste products. They also demand increasing inputs of energy and water, while also contributing to the global technological influence on the planet, or the "elephant in the room" — global climate change.



Globalization of trade and natural resource demand

In recent decades, Asia has embraced global trade with an energy and success unmatched anywhere else in the world. As global markets have opened, it is now producing goods consumed around the world. In fact, few societies or individuals on the planet go through a day without using some product produced in Asia. However, producing for this global market is taking a tremendous toll on the natural resources of the region, as well as in resulting in pollution with both local and global effects. The demand is insatiable. The natural resources and the capacity to absorb waste are not.

Declining fertility rates, but expanding populations and rising living standards

Demographers have been generally correct to predict that as living standards rise and family planning becomes available, fertility rates naturally tend to decline. This effect is proving true for most

uneven, with access to family planning information and services still lacking in many rural, remote areas of Asia that coincidentally are also frequently areas of high biodiversity.

China, Vietnam, and other countries have capitalized on their abundant and youthful labor markets to catapult their economic development and raise living standards for many. The rise of manufacturing in Asia has spurred substantial migration from rural to urban areas, resulting in an expansion of cities and rising living standards among workers and associated local enterprises. In some places this is contributing to increasing disparities between rural and urban living standards. Increased incomes also contribute to rapidly rising demand and consumption, with all their attendant environmental impacts.

Asian countries, with their rapid technological, economic, and social development, are in some ways an abridged version of the post-industrial world's history, and its future. While the most dire predictions of global famine have been averted, the underlying assumption that the earth does indeed have a basic carrying capacity, whatever it may be, is still sound. Although hopefully technology, creativity, and trade will continue to increase that capacity and buy more time, limits do ultimately exist, for both the region and the planet. Those limits become more obvious when considering not only the capacity of earth simply to sustain human life at a minimal existence, but also what the desired human living standard should be. Even less examined is whether allowances must also be made to ensure the survival of other species and ecosystems on which human production and existence depend. As a region, Asia appears to be playing out this scenario in fast forward.

USAID has recognized this challenge and has stepped up to the task by attempting to

While the most dire predictions of global famine have been averted, the underlying assumption that the earth does indeed have a basic carrying capacity...is still sound.

countries in Asia (although exceptions do remain, such as in the Philippines, Timor-Leste, and Papua New Guinea.) However, as people live longer with better health, and large percentages of the population remain below or in their child-bearing years, populations will continue to increase for some years due to population momentum. Additionally, access to family planning throughout the region is



gaze five, ten, and even twenty years into the future as it strategically plans its investments for the region. Crucial in determining the best investments is to gain an understanding of what trends, current and future, will be shaping the environment of this region and will affect Asia's ability to continue to develop economically and improve and maintain living standards for its people. Some of these trends will come from within the region, but with increased globalization, many of them will come from elsewhere. Ideally, USAID will be able to plan its work to capitalize on these positive trends and to ameliorate the effects of the negative ones in order to sustain the environment and biodiversity on which Asian livelihoods and welfare ultimately depend.

2.3 Asia: A Study in Contrasts and Linkages

Asia is not a homogenous region, but in many ways a study in contrasts—rich and poor, rural and urban, coastal and inland, agrarian and industrialized, developed and developing. Sometimes the differences are between countries; while in other cases opposite conditions exist within the same country. This project has not included all of Asia, but specifically those countries that are current priority biodiversity countries for USAID. These include: *Bangladesh, Cambodia, China, Indonesia, Laos, Burma, Nepal, the Philippines, Papua New Guinea, the Solomon Islands, Thailand, and Vietnam*. The project was begun before Central Asia was incorporated into USAID's Asia Bureau, so those countries, while also high priorities are not specifically a part of this report, although many of its conclusions will still be relevant. Obviously, a study of Asia without India is problematic. Although India is not specifically included as one of the target countries in this analysis, its influence on the region as an actor has been considered. While most of the Asia's Future countries tend to share

characteristics of being the less developed countries in Asia, they all do not share the same situations and needs. Even the trends shaping their future environmental conditions vary from country to country.

Likewise, the trends themselves may have both negative and positive influences on development and on the environment. For example, production of biofuels may create rural jobs and products for export, while reducing dependence on fossil fuels. However, at the same time, it can compete with domestic agriculture, threaten local food security, and increase deforestation and loss of biodiversity. Science and technology can bring opportunities for new green industries and jobs, cleaner energy sources, and more environmentally-friendly products, while simultaneously creating new hazardous or biological wastes that bring environmental and human health risks. Expanding mobile communications technologies can be used to facilitate the international illegal trade in natural resources, but also as an enforcement tools to stem it. Urbanization brings economies of scale to bear in delivering social services, water, sanitation and energy; but, if too rapid, it can overwhelm governments, leading to inequities of access, a proliferation of slums, and political instability.

Because ecosystems and resources are interconnected, policies and interventions can often have unintended consequences. For example, dykes may hold back sea level rise and slow salinization, but they result in a loss of brackish habitats and ecosystems. Dams provide hydropower, water for agriculture, and flooding regulation, but lead to reduced flow and siltation and a loss of fisheries downstream. Often policies aimed at reducing unsustainable resource extraction simply shift the demand either to other resources or other locations. For example, bans on logging in China and Thailand led to increased deforestation in Laos, Burma, Cambodia, and Africa, as the continued



demand for timber simply shifted unsustainable logging practices elsewhere. Wise resource management policies will recognize linkages across resources and regions to address potential effects on the environment and livelihoods. Often, however, different government agencies are responsible for different resources, with little authority or responsibility to look broader than their own responsibilities. Data on cross-sectoral or transboundary impacts is insufficient. Few governments have the capacity to manage holistically across resources or to stop the development of one to protect the others (Kobayashi, 2009).

At times, the interactions among individual trends combine in a synergistic fashion to greatly multiply the impacts. Asia's future is unfolding in a complex web of interrelated trends with the potential to greatly affect the environment and biodiversity. For example, economic development is a continuation of the human pursuit of food, water, and energy. As development occurs and populations grow, so does demand for resources. Instead of reaching satiation, rising incomes lead to changes in the types and quality of food demanded, such as meats, fruits, and exotic foods. Increasing consumption places demand on the environment as both source for natural resources and sink for disposal of waste products.

Changing demand for more Western-style diets leads to more intensive and industrialized agriculture, with its greater use of water and energy, increased fertilizer inputs leading to run-off and ocean dead zones, degradation and loss of soils, and threats to food security for the rural poor who are displaced by commercial agriculture. Rising incomes and changing diets are also depleting marine fisheries, especially exotic reef species and highly migratory species, such as tunas. This, in turn, drives an increase in aquaculture, which leads

to competition for water use, water and marine pollution, and threats to wild fish stocks. Increased energy requirements lead to greater fossil fuel use and exploration, more greenhouse gas emissions and climate change impacts, air pollution, and melting glaciers, which may lead ultimately to less water or changed rainfall patterns that in turn affect agriculture and biodiversity.

All of these trends are compounded by globalized trade and international demand for Asian resources and products. This demand is causing shifts in agricultural production to export crops, which are more water and energy intensive. Commercialization of agriculture and this shift away from production for domestic consumption further jeopardizes local food security and livelihoods. Western targets to increase the use of biofuels led to the clearing of forests in Asia to intensify its production.

The growing disparity between rural and urban incomes along with global trade, especially in manufactured goods, creates a trend of migration to urban areas, creating its own drain on local resources and services and affecting public health, both rural and urban. All of this takes place within a global situation of climate change, which is both a product of global economic development and an agent of biodiversity loss itself. Changes in climate cause natural environments to shift and biofuel production to increase, which increases the pace of deforestation and conversion of carbon-rich peatlands—destruction that further contributes to climate change in a downward spiral. The compounded effects are indeed often circular in their influences with exponential impacts. Understanding the linkages among trends is critical for deciding where interventions can make the greatest difference.

3 Section Three

Future Trends Affecting Asia's Environment

This report synthesizes information from a review of literature and the discussions from a series of roundtables drawing on the expertise and knowledge of over 90 experts to gather input from different sectors and viewpoints. (See *Appendix A*). These roundtables revealed more than 70 sub-trends that can be expected to affect Asia's environment in the next ten to twenty years. These sub-trends were clustered and pared down to six broad trends or drivers most likely to have significant impacts on the biodiversity and environment of the region. Each of these drivers is contributing to a set of sub-trends, each with their own environmental impacts. For this reason, the six are referred to as drivers rather than trends. As listed in Box 1, the six broad drivers likely to have the most far-reaching environmental consequences in the region are:

- 1. Rapid Economic Development and Rising Living Standards in Asia**
- 2. Globalization of Trade and Demand for Asian Natural Resources**
- 3. Rise of Asian Science and Technology**
- 4. Exploding Energy Demand in Asia and Globally**
- 5. Projected Effects of Climate Change and Post-Kyoto Mitigation Approaches**
- 6. Continued Population Growth and Urbanization**

While each of the sub-trends is influential in its own right, identifying the drivers behind them is important for understanding their causes and the potential points of intervention. The drivers are so large that USAID investments alone would be unlikely to change them significantly. The sub-trends, however, are more amenable to influence.

Identifying them in the context of their drivers helps to suggest what unexpected consequences might arise from specific restrictions or interventions, such as how demand might shift elsewhere or what substitutions might arise if certain activities are banned.

3.1 Rapid Economic Development and Rising Living Standards in Asia

In recent years, the growth rate for ASEAN countries has averaged 5–6% per year, with China pushing 7–10% per year for the past 30 years. While economic development is a positive goal, as history has repeatedly shown, it does not come without environmental costs, fueling environmental degradation by increasing both pollution and consumption. The rapid rate at which Asian societies have been developing has revealed this in a compressed time-frame, increasing the difficulty of mitigating the environmental effects. The rapid rise of much of Asian society from poverty to middle class increases demand for both greater quantity and quality of goods, fueling much more energy and resource-intensive growth. While the global economic crisis is already seriously slowing this rapid growth, some experts are predicting that several Asian economies are likely to be able to recover from the financial shocks relatively quickly. The economic downturn may provide a short hiatus, but it is unlikely to derail this driver over the longer term. Some of the sub-trends resulting from this driver include:

Rising incomes leading to increased demand for meat, dairy, fruits, and vegetables in Asian diets

The shift from vegetable- and grain-based diets changes the type of agricultural



production from subsistence to commercial. Meat and dairy products are more energy-intensive, requiring more land, water, and feed to produce equal amounts of food. This expansion leads to deforestation, soil degradation and loss, run-off, water depletion and pollution, and marine degradation. Some have even suggested that increasing meat in diets will be the primary driver of deforestation in future years.

China's growing global resource draw

As incomes rise in China, with more than 1.3 billion people, the domestic demand for resources and energy is exploding. Many of these resources are being drawn from China's neighbors, often via unsustainable rates and means. Trade in wildlife and exotic species, both legal and illegal, is rapidly increasing with devastating effects. Shark populations are being decimated globally for shark fin soup. Recently two shipments of pangolins were seized en route to China to be used in soup—14 tons from Indonesia and 23 tons from Vietnam, for a to-

Marine pollution and dead zones are also a serious threat to the marine environment of Southeast Asia, which contains...75% of the world's coral species and 25% of its reefs.

tal of 7,000 animals (China Roundtable). China's preparations for the Olympics in 2008 drove up prices for construction-related materials, especially in Southeast Asia. The value of Chinese imports of rough wood increased from US\$1.69 billion in 2001 to US\$3.93 billion in 2006, and copper imports grew from US\$4.89 billion to US\$17.19 billion during the same period (Hamlin, 2009). [For more on the role of China, see Section 4, page 31.]

Increasing degradation of coastal and marine environments

Most agricultural run-off and pollution from industrialization and urbanization ultimately ends up in the ocean. Marine pollution greatly threatens public health in Asia, especially in urban areas. This run-off, coupled with overfishing, is also resulting in oxygen-starved "dead zones" in coastal and marine areas, where fish and other valuable marine species cannot live. Huge swarms of jellyfish move into the vacuum caused by the loss of other fish and predators, overwhelming ecosystems, clogging industrial operations, and becoming a danger for swimmers and divers. This degradation is a particularly serious threat in Asia, where half a billion people depend on fish for food.

Mercury pollution has been found to be quite high in the Gulf of Thailand, home to many of the region's fisheries and source of the much of the world's canned tuna. Marine pollution and dead zones are also a serious threat to the marine environment of Southeast Asia, which contains the greatest marine biodiversity in the world, including 75% of the world's coral species and 25% of its reefs, a growing source of tourism revenue. UNEP has reported that every square kilometer of healthy coral reefs can be valued at \$100,000 to \$600,000 every year (ASEAN, 2006).

Mangrove forests, important spawning and nursery areas for many marine fish species and protection against the impacts of storm surges from cyclones so prevalent in the region, are increasingly threatened by pollution, increased salinity, over-extraction and coastal development. Indonesia, Malaysia, Bangladesh and India, where the majority of the world's mangroves are found, have lost 25% of their mangrove coverage since 1980 due to logging, clearing for



shrimp aquaculture and rice paddies and urban development. Several countries have passed legislation to protect their mangroves, but enforcement is often weak. The Philippines and Vietnam are planting mangrove greenbelts as protection against increasing storms.

Increasing awareness and demand for environmental protection and environmental health resulting from rising living standards

Similar to the historical trends in the world's developed countries, rising incomes in Asia are also bringing growing environmental awareness and demand for cleaner and healthier environments. Like labor standards, environmental standards can be expensive at times, and thus will not always be driven by companies pursuing the bottom line. Sometimes they come only from social demand, and rising living standards are increasing this demand. In the decade leading up to the 2008 Olympics in Beijing, Chinese citizens became more aware of the possibilities of cleaner air and water that they might expect. Environmental health crises such as tainted food products and industrial wastes are beginning to bring pressure for greater environmental regulation and enforcement and threaten to stir social unrest. China's newly amended water pollution control law now allows civil lawsuits for environmental damage and requires public participation for issuing permits. Youth in China and elsewhere are growing very interested in the environment. Establishment of local Asian environmental NGOs can be expected to continue and grow, with more groups forming networks regionally.

Asia's growing economic and political power relative to United States and the European Union

Even with the impacts of the current global economic downturn on Asian countries, the economic and political

influence of the region has been and is continuing to grow vis-à-vis the West. Some are suggesting that many Asian economies may even be able to bounce back more quickly from the global recession than Europe or the U.S. Many experts predict the world is moving more into a multi-polar scenario, with Asia becoming a 3rd major economic and even political/military center to compete with the U.S. and Europe and exert its influence on the developing world. The ASEAN countries (which do not include China) already have a combined GDP of US\$2 trillion and a population of 570 million, both greater than either the GDP or the population of the EU or the combined NAFTA member countries. The National Intelligence Council (NIC) predicts a historic transfer of relative wealth and economic power from West to East based on increases in oil and commodity prices and shifting loci of manufacturing and some service industries to Asia (NIC, 2008).

3.2 Globalization of Trade and Demand for Asian Natural Resources

Asia's growing domestic demand for resources is being compounded by the region's increasing integration into international trade and the voracious appetites of global markets for Asian raw materials and manufactured goods. This demand, both domestic and international, reflects the increasing commodification of Asia's natural resources. For example, Indonesia, Malaysia, and Burma have now all become major timber exporters supplying global markets. Over the past decade, prices of natural-resource-based commodities such as minerals and energy have increased significantly. The global financial crisis is reversing this trend for the time being, although these countries are continuing to move ahead with regional economic cooperation. Over the longer term, no doubt global demand will rebound and expand,



increasingly affecting Asian resources and biodiversity through both extraction and pollution. As political boundaries become increasingly permeable with globalized trade, the power of non-state actors such as multinational corporations, business associations, non-governmental organizations (NGOs), religious organizations, and even criminal networks is increasing relative to that of governments. Notably, of the sub-trends identified in this report, more arise from this globalization driver than from any other.

Asia rapidly becoming the “producer for the world”

Already few persons on the planet go through a day without using some product produced in Asia. By 2015, Asia is expected to be responsible for some 42% of global GDP, increasing in years thereafter, and reflecting a shift of wealth from West to East. Asian manufacturing and its sourcing are becoming more and more globalized. Along with Asian consumption of end-products, Asian factories are drawing ever-larger quantities of raw materials from within the region. International trade can often distort resource

Already few persons on the planet go through a day without using some product produced in Asia.

prices and encourage corruption, leading to over-extraction, and Asia is proving to be no exception.

Transportation infrastructure as a weak link for trade and an environmental threat

Countries with the lowest transport costs usually benefit most from increased trade, as greater than 50% of international trade is “intra-industry” (components) and highly

sensitive to transport costs. Increased trade places greater demands on transportation infrastructures: highway systems, ports and railroads. Throughout Asia, rapidly rising numbers of automobiles are clogging already crowded roads, at times bringing commerce to a halt. For example, Bangkok is estimated to lose some 6% of its GDP to traffic each year (Dhakal, 2008). Expansion of the transportation infrastructure, while essential for economic development, can be extremely destructive to biodiversity through clearing forests for road-building. Roads in pristine areas have also been shown to open these areas up to human migration and settlements, bringing further deforestation, invasive species and disease. Improved transportation and roads also make illegal trade easier and more profitable.

Increasing Asian agricultural industrialization and intensification of cash crops for export

Asian agriculture is rapidly shifting from traditional subsistence farming to industrial agriculture for export. The value of cash crops such as rubber and crude palm oil for exports has doubled in the past decade, with Indonesia, Malaysia and Thailand now major global agricultural exporters. In the last 30 years, some 40% of Bangladesh’s wetlands have been converted to agriculture. Southeast Asian wood pulp exports quadrupled from 1992–2002, primarily from Indonesia, Malaysia, Burma, and Vietnam. Rising energy prices and demand for biofuels are driving deforestation to clear land for oil palm plantations. Increasing demand for non-fossil fuel energy sources will likely feed this trend, affecting both biodiversity as well as food security and increasing topsoil loss and degradation across the region, and when forests are cleared, increasing greenhouse gas emissions. With



increased global demand for food, especially for export, unless hydrological or environmental values are incorporated in values, the agricultural productivity of the land must keep rising or the value of land for industrial agriculture is likely to out-compete all other uses of land, particularly forests or conservation,

At present, the demand for crude palm oil as an edible oil is even greater than that for biofuels or other sources of edible oil. Oil palm plantations can yield over five times the oil output than any of the other edible oil crops such as soybean, rapeseed, or sunflower. Demand for edible oils is projected to double by 2050 to 240 million tons per year (Tharakan, 2009). The land required to meet this increase in demand would require more than twice the agricultural land currently devoted to edible oil production (*ibid.*). Much of the world is eyeing the forests and peatlands of Southeast Asia as a predominant source. Additionally, large-scale agricultural production is too often detrimental for livelihoods as mechanization replaces workers.

Acquisition and leasing of land in Asian countries by foreign entities

Countries rich in cash (such as the petroleum exporters), but poorer in agricultural resources are acquiring land in Asian countries to increase their own food (and biofuel) security. Kuwait, Saudi Arabia, Qatar and the United Arab Emirates have leased land in Cambodia. In 2008, Kuwait agreed to provide technical assistance and \$546 million in soft loans for infrastructure projects in Cambodia in exchange for leasing land for crops for export to Kuwait (Mackenzie, 2008). China contains 20% of the world's population but only 9% of its farmland, and since 2007 the Chinese government and companies have leased or purchased 2 million hectares of farmland outside the country, most

of it in Southeast Asia. Already as much as 15% of Laos's territory has been leased to foreign entities, some for as long as 70 years, for some 150 international agricultural projects (MacKinnon, 2008; Mackenzie, 2008). Foreign land acquisition drives up prices, contributing to deforestation, loss of biodiversity and decreased food production for local consumption, as well as often displacing the poor from agricultural land and opportunities. The displacement of the poor from their traditional fields and forests sets the stage for political and social unrest, only to be exacerbated by water and land shortages arising from climate change.

Increasing investment in mining in Asia

This region holds some of the world's largest deposits of coal, tin, nickel, copper, and gold, and foreign mining companies, from within the region as well as from outside it, are increasingly investing in the extraction of these and other minerals. From 2000 to 2007, Indonesia's exports of coal and metal ores grew by 18% per year, accounting for almost 8% of government revenues and 4% of GDP. West Papua (formerly Irian Jaya) has the world's largest gold mine and third largest copper mine (Cronin, 2009). At present, mining operations in Cambodia for iron and gold by Chinese and Korean companies are threatening lowland dry evergreen forests that provide water to for the main rice-producing areas. Mining not only damages biodiversity, but also generates water pollution and hazardous wastes and often uses vast quantities of water and energy.

In Cambodia, Burma, and the Philippines, toxic cyanide and mercury are used for processing gold, resulting in deaths of fish, animals, and people. Strong opposition to small-scale gold mining in the Philippines has appeared due to the use



of mercury. Since 2007, the Cambodian government granted mining concessions on nearly 70% of Virachey National Park. In Asia, extraction methods are crude, and reclamation is uneconomical, and therefore rarely undertaken. Mining also leads to the building of infrastructure—dams for hydro-power and roads for transportation—often in rich, biodiverse areas. As elsewhere, the profitability of mining concessions can lead both industry and government to overlook environmental considerations.

Regional economic cooperation in Asia and free trade agreements, with China as a dominant player

While few are predicting an Asia-wide trading bloc or substantial economic integration in the next few years, some bilateral or multilateral free trade agreements may develop. China is increasingly engaging in trade with its neighbors such as Vietnam, Laos, Cambodia, Malaysia, and Thailand, both for raw material and components. ASEAN is continuing to tighten its cooperation on many issues. In February 2009, ASEAN signed a free trade agreement with Australia and New Zealand and committed to working together even in tight economic times to avoid trade barriers among member countries.

Increased involvement of organized crime in illegal natural resource trade

Expanding trade markets create incentives for illegal fishing, logging, and trade in wildlife, lowering costs, increasing profits, and attracting the involvement of organized crime in these activities. Trade leads to improved roads and transport infrastructure, which also make illegal trade easier and cheaper. Improved international communications technology allows international rings to operate all the way through supply chains from forests to consumers. Well-funded and effective

syndicates rely on and contribute to government corruption and make enforcement increasingly difficult.

Much of the illegal trade in endangered species is linked to rising incomes in China and elsewhere in the region that fuel a demand for the exotic, including rare and expensive products. Voracious demand and black markets can quickly push threatened species to extinction. China has improved its enforcement against illegal live animal smuggling, but in its place facilities are springing up in Southeast Asia to process and freeze the meat from wild animals, making detection difficult at borders. Some Southeast Asian countries, such as Indonesia and Malaysia, are also home to a different type of environmentally damaging trade, the import and transshipment of hazardous wastes, including significant electronic waste. Much of this is also illegal.

Greening of supply chains and corporate social and environmental responsibility

A positive trend affecting the Asian environment is increasing international demand for sustainably-sourced products, from roundwood to paper to coffee and cocoa to fish. Industry standards and certification schemes help consumers to identify products that are environmentally sustainable and fair to laborers and producers. This trend will likely continue to expand into other resource sectors. Recently, Cambodia voluntarily adopted labor standards and has seen buyers automatically migrate there from other countries. The same could be expected with the adoption of environmental standards.

Also related to sustainability is the rise of *corporate social and environmental responsibility*, resulting in private sector investment beyond simply supplying their markets. The world's 150 largest companies all have sustainability



directors. Business is naturally drawn to the concept of sustainability, not necessarily as philanthropy, but to provide a source of sustained supply and return on investment. International companies are engaging in communities, building schools and hospitals, improving labor standards, and investing in environmental protections to guarantee not only sustainable sourcing of materials, but also future labor supplies. Large corporations recognize that being seen as responsible citizens and beneficial to their supply countries (environmentally and socially) is good for both their corporate image and their bottom-line over the long term.

Depletion of marine resources and fisheries

Rising global demand for fish products is rapidly depleting marine resources around the world, particularly in Asia. Industrial and illegal fishing are stripping the resources, threatening some fisheries with collapse. Thirteen of the top twenty fishing countries are in Southeast Asia. Declining catches are a serious threat to both livelihoods and food security in the region, where as many as half a billion people depend on fish for income and food and more than 200 million people depend on it as their primary source of protein. Already a staple in the Chinese diet, seafood consumption is projected to increase by 40% by 2020 (Ellis & Turner, 2007). Rising incomes in China and elsewhere are also increasing demand for reef fishes and exotic species, as well as shark fin, rapidly decimating threatened populations and species. The expanding aquarium trade is another threat to reef species, especially when harvested by use of dynamite or cyanide that damage the reefs.

Growth in aquaculture production, freshwater and marine

Asia is already one of the world's largest producers and exporters of aquaculture

products. Globally, the aquaculture industry now accounts for over 43% of fish consumed by people, with annual consumption topping 45 million tons and valued at over \$63 billion (FAO, 2007). China, the largest source, produces over 75% of global output and half the global value (ibid.). Aquaculture and mariculture are rapidly expanding, both as an income stream and as a means to satisfy increasing food demand, especially as marine fisheries are becoming depleted and more expensive. While a positive source of livelihoods and food supply, aquaculture can also have negative environmental impacts as natural ecosystems are converted to production.

Asian mangrove forests are increasingly being cleared for shrimp aquaculture. Concentrated aquaculture enterprises generate waste and can spread disease to native species. Aquaculture also requires feed, which is often grain-based, thus competing with local diets, or fishmeal, which further depletes ocean resources. Aquaculture also requires space and water, either fresh or ma-

[In Southeast Asia] as many as half a billion people depend on fish for income and food and more than 200 million people depend on it as their primary source of protein.

rine, which can lead to disputes over water usage as well as river, lake, or "sea rights." While some positive trends in making aquaculture more environmentally friendly are being developed, the potential for environmental degradation remains high.

3.3 Rise of Asian Science and Technology

Many Asian countries are investing heavily in science and technology, both in education and in research and development.



China especially is leading this trend, from information technology to nanotech to biotech [see Section 4 on China below]. These investments will have widespread implications across the region as new jobs and industries are created to spur economic development, in some cases leapfrogging to cleaner technologies, such as those with increased energy efficiency, less waste, or a higher percentage of recycled materials.

This investment is important both regionally and globally as the world faces a rapidly increasing need for more water, food, and energy. The National Intelligence Council estimates that all current technologies are inadequate for replacing the traditional energy architecture on the scale required to meet supply and slow climate change. Not only are new energy sources required, but “smart grid” technologies must be developed to increase efficiency. The pace of technological innovation will be key, and Asia’s investment is sorely needed. However, the developments are occurring so rapidly, with so little oversight, that the potential for yet unknown environmental damage is significant.

Large investment in Research and Development (R&D) in Asia, especially China

Over the past 15 years, China has attracted much foreign-funded, high-tech R&D investment. The Chinese government has encouraged this foreign investment through favorable incentives, especially for the computer and IT-related sectors, with the goal of increasing the country’s capacity to develop its own industry. As a result, between 1990 and 2002, foreign investors established more than 200 computer and telecommunications R&D centers or labs in China, and now most of the world’s leading computer and telecommunications companies have R&D investments in China (Walsh, 2003). China continues

to absorb this knowledge and invest in its own R&D at a rate that has been increasing by more than 20% each year since 1999. The size of its R&D investment is now second only to that of the U.S., leading to high-tech products accounting for an ever-increasing percentage of its total exports (Mackenzie, 2009). Much of its sourcing of raw material and components come from Vietnam and other countries in the region. This modern, technological China will greatly shape the future of Asia and its environment. Part of China’s \$584 billion stimulus package announced in November 2008 includes investment in R&D, with an additional \$88 billion for scientific and technological projects.

Asian investment in biotechnologies

Asian countries are embracing biotechnology widely, especially in agriculture, as a means to expand production, increase food security, and overcome depleted soils. China may already be the world’s agricultural superpower, with some 140 genetically engineered crops available. Between 2001 and 2005, the Chinese government invested almost \$1.45 billion in the development of its biotechnology industry, especially in pharmaceutical applications (Borton, 2005). To date, possible negative environmental and health consequences have not been fully examined, and the potential exists for a growing middle class to push back against genetically modified organisms (GMOs) and biotechnology.

Asia’s growth in nanotechnology, manufacturing, and R&D

Growth in nanotech is providing a new set of technological fixes for environmental problems, from cheap desalinization to lithium batteries, as well as new economic opportunities. The total value of all nano products in circulation globally by 2014



is predicted to approach \$3 trillion, with an annual market around \$2.6 trillion, or 15% of the value of all manufacturing output (Mackenzie, 2009). Governments also see this as a source of economic stimulus. China has already become the third largest investor in nanotechnology research and development, surpassing Japan and leading in Asia.

China now produces more publications on nanotech than any other country, and is close on the heels of developed countries in its number of scientists in the field and in its patents (ibid.). Vietnam and Thailand are also investing significantly

60% of nanotechnology products are being manufactured in Asia

in nanotech R&D. While nanotech in the U.S. tends toward basic science or medical applications, China is taking a different approach and seeking to apply existing technologies in new ways. Asian investment is focusing more on energy applications as well as environmental applications to reduce the footprint of production, mitigate environmental pollution, and develop environmentally safe materials. Already approximately 60% of nanotechnology products are being manufactured in Asia. While the possibilities for environmental solutions encourage high hopes, the implications of nanowaste and potential risks of nano-particles disrupting biological systems must also be carefully examined and tested.

High value science capacity (and education) in Asia

Asia has heavily invested in science education and training, in many ways already surpassing the West. China now has as many scientists and engineers as the U.S., and other Asian countries are close

behind. In recent decades, the difficulty has been that wages in Asia and China were too low to hold highly trained scientists and engineers. As global demand for their services increases and supply from the West diminishes, this is beginning to change, with expatriates trained in science and technology moving back to Asia from the U.S. and Japan. Multinational firms doing business in China are already finding it necessary to pay salaries rivaling those in the West for this expertise, which is a dramatic pull considering differences in the cost of living. While this may slow in the wake of the economic recession, it will likely continue in the longer term, unless the West significantly invests in science education. In Southeast Asia, only Thailand, Malaysia, and Singapore have made the transition to middle-income status. Only Singapore has made the necessary investments in human capital to sustain its gains in the face of rising competition from China. While natural resources are important for development, human capacity-building, education and technical training are even more important.

Access to international communication via cell phones, internet, and mobile devices

Increased access to mobile cellular technologies and the internet has been perhaps one of the most rapid, dramatic, and horizon-changing developments in Asia of the last decade. For example, every new apartment building in Beijing now has broadband internet access. As more people gain access to mobile communications, in many places this technology is leapfrogging over telecommunication via landlines. It is rapidly bringing the most remote communities into contact with the rest of the world, furthering globalization of culture and communication. It is also feeding demand for democratization, environmental protection and human rights.



The internet has exponentially increased the ease of knowledge-sharing and access to information, with the number of internet devices globally in 2008 exceeding 1 billion and 2.7 billion Google searches conducted in 2006 (Club of Rome, 2008). For many countries, access to bandwidth will be crucial for economic growth.

Pollution threats from new technologies (nano, biotech, information technology)

While these new technologies offer much for economic development of the region, they also bring their own threats from hazardous waste and pollution. By 2020, the global greenhouse emissions from IT are expected to equal those from aviation, with a substantial portion of that growth in Asia. Biotech brings risks of out-competing native species or threats to human health, and disposing of wastes can be a serious problem. The threats from breathing nanotech particles or absorbing them through the skin are still largely unknown, as they have barely begun to be tested.

3.4 Exploding Energy Demand in Asia and Globally

By 2030, global energy demand is predicted to grow by as much as 55%, with China and India accounting for 45% of the increase (UNESCO, 2009). With economic development, energy demand is exploding in Asia, especially in China and the Philippines. Energy demand in Asia is expected to increase by nearly 50% over the next 15 years, at a rate of more than 4% per year until at least 2020; with the fastest growth expected in the Philippines. Electricity demand alone is expected to quadruple from 2000 to 2020 (UNESCAP, 2006). Over 40% of this growth in energy use is expected to come from residential use. From 1985 to 2000, China tripled its electricity capacity and will triple it again soon. While China's energy intensity had been falling, the trend

has flattened since China joined the WTO, as growing exports have increased energy demand by 30%. Even Indonesia, the region's largest energy producer, finds its economic growth increasingly constrained by availability of energy supplies.

Global rise in energy prices, driving fossil fuel exploration and development of alternative hydrocarbon sources

High energy prices are driving the exploration and extraction of fossil fuels in the region—petroleum, natural gas, and coal. Indonesia still has significant oil reserves (although some report they are less than previously thought), while others, such as Burma, Timor-Leste, and Vietnam, potentially have reserves. Off-shore extraction, primarily for export, is increasing in Indonesia and beginning in Papua New Guinea, threatening fragile marine ecosystems. Despite its heavy reliance on coal, China is also the world's second largest importer of petroleum. The increase in China's coal demand each year is greater than the increases in all OECD countries together from now until 2030. China's economy is now much more energy intensive than it has ever been, and energy needs are viewed as central to development. China is looking at all alternative energy sources, but all will be in addition to increases in coal production, with significant environmental impacts. In future years, Asian fossil fuel sources are expected to be explored and exploited, with the risks of spills and damage to terrestrial and marine environments and to biodiversity that accompany weak governance. Globally, over the next few years, energy demand and security concerns will likely cause a shift from traditional oil and gas production to alternative hydrocarbons (oil sands, coal, methane, etc.)



Increase in alternative energy sources and biofuel production, especially palm oil

High fuel prices and the need for climate change mitigation will also spawn the development of alternative energy sources, such as wind, geothermal, solar, hydro-power, micro-nuclear, and biofuels. This volcanically active region holds much geothermal potential, and PNG is already looking into exploiting it. Even renewable fuel sources can have environmental effects and should always require environmental impact assessments. Research is needed on the most efficient use of biofuels, as some studies show that using biomass to generate electricity for hybrid vehicles may be more energy efficient than converting the biomass to biofuels for transport vehicles.

In recent years, with the incentives and targets for biofuel production and use introduced in the U.S. and the EU, biofuel production for export has increased significantly in Southeast Asia. Malaysia and Indonesia are already primary producers of biofuels, utilizing primarily palm oil. Global biofuel demand has spawned significant deforestation and conversion of peatlands and forests to oil palm plantations, with crude palm oil able to be easily switched for biofuel or edible oil markets, depending on demand. Indonesia's own figures reveal that 9.4 million acres of forest have been planted with oil palm since 1996, or some 2,000 acres a day. With the economic downturn, the Indonesian Ministry of Agriculture has recently revoked the ban on converting peatlands for oil palm production. Some segments of the Indonesian government and civil society are trying to reduce plantation expansion and promote sustainability. However, this is a politically difficult task, with many benefiting financially from oil palm cultivation. Many Asian countries

are also setting ambitious targets for biofuel production and use.

With the recent drop in oil prices and the sudden drying up of the export markets for crude palm oil for biofuel, the governments have turned to boosting domestic demand. The Malaysian government is stimulating the biofuel industry with laws making biofuel use in diesel vehicles compulsory, beginning with government diesel vehicles in February 2009 and then privately-owned diesel vehicles in 2010. In September 2008, Indonesia passed laws mandating biofuel use by manufacturers, businesses, and power plant operators, and the state oil company required by law to sell fuel with at least 1% biofuel content. The biofuel boom has triggered vast new plantings of oil

Global biofuel demand has spawned significant deforestation and conversion of peatlands and forests to oil palm plantations [in Southeast Asia]. ... the conversion of lands from food production to biofuels can be blamed for driving up food prices [globally].

palm throughout Indonesia and Malaysia, converting former habitats for threatened orangutans, tigers, and other species. In addition to environmental threats, the production of biofuels from agricultural commodities and the conversion of lands from food production to biofuels can be blamed for driving up food prices, according to the UN Food and Agriculture Organization. The spread of plantations causes conflicts between those clearing the forests and local communities or indigenous peoples who are dependent on the forest resources and at times even



being displaced from their homes. Forest clearing and burning for biofuel production, especially on carbon-rich peat soils, is also shown to result in net emissions of greenhouse gases, taking hundreds or thousands of years to recover the carbon lost to the atmosphere (Tharakan, 2009). Additionally, while biofuels are cleaner in terms of particulates emitted, they produce greater emissions of ozone and NO_x than fossil fuels.

Planned growth in hydropower, dams

The surging demand for energy in Asia is also leading to scores of new dams being built to provide hydroelectric power along almost every river in the region. Some 5–7 new facilities are planned on the upper reaches of the Mekong alone in China, Laos, and Burma, affecting millions of people and countless industries downstream. China already has 3 dams in operation and 1 under construction on the river, with 14 more proposed. More than 100 hydropower projects are planned in the greater Mekong basin for the river and its tributaries (Johnston, 2008). Both Laos and Cambodia are already positioning themselves as the “battery for South-east Asia,” having signed agreements with Thailand and Vietnam and thus intensifying the rate of hydropower development. Laos currently has 75 projects in planning, with eight dams proposed for the Mekong mainstream. Vietnam has a plan for 73 hydropower projects in 10 river basins, including the Mekong. Indonesia is also examining its own hydropower potential.

The rapid rate of hydropower development is creating the emergence of power “speculators,” private investors looking for projects without considering energy demand or potential environmental and social impacts (Cronin, 2009). Several of the hydropower facilities in the Mekong basin

are located near mining sites, which suggests that they are not intended for rural electrification. Hydropower planning and the sequencing of projects for construction in each country appear to be based primarily on the interests of private and public financiers and only secondarily on the appropriateness of the site. As a result, the planning process is ad hoc, uncoordinated, and lacking transparency.

The potential effects of uncoordinated and uninformed hydropower development range from increased food insecurity due to the loss of fisheries and riverbank agriculture, to the loss of livelihoods and property due to physical and economic displacement. The value of Mekong fisheries is estimated at US\$2–3 billion a year. Fisheries provide the main source of animal protein and micronutrients for the 60 million people living in the Mekong Basin. In addition to hydropower development, much biodiversity and rich farmland is lost through the flooding of rivers to create reservoirs. Water diversion projects also contribute to and compound these impacts. Although Thailand has limited hydropower potential in its portion of the basin, it is reportedly planning for major water diversion activities, especially for agriculture.

The World Bank and the Asian Development Bank are also back in the hydropower business in Asia after a hiatus. Power generation facilities and dams are being financed primarily by China, Vietnam, Thailand, and Malaysia, while the banks are financing transmission lines and distribution facilities. Some have speculated that the banks have taken this approach because the environmental and social issues are less complicated and controversial than dams. Aside from the fact that they make the hydropower possible and economically viable, transmission lines, with their accompanying roads and development, also bring their own threats to biodiversity in that they often



traverse pristine forest regions of high biodiversity value, opening them to settlement and exploitation. Several transmission lines have even been planned through national parks and protected areas.

The current economic downturn could cause a temporary slowing in the construction of large-scale hydropower projects, if only for a few months or years until energy demand surges again. This could provide a window of opportunity to encourage governments and industry to focus on more sustainable development alternatives and to call for fuller environmental and social impact assessments of projects. Burma has experimented with levees with three-foot dams and small turbines that can generate power for two to three households, with little negative impact on the environment or fisheries. With financing and micro credit, this model could be further examined and expanded upon in many places throughout Asia. The slowdown could also be an opportunity to incorporate the analysis of melting Himalayan glaciers for water supply (*see below*) in hydropower planning. Hydropower must be approached holistically, with a multi-objective approach, as it affects not only power supply but also water, fisheries, livelihoods, environmental habitats, and downstream users.

Increasing atmospheric pollution in Asia

Parts of Asia are being choked by Atmospheric Brown Clouds (ABCs) and deteriorating air quality in both rural and urban areas. Air pollution levels in the largest Asian cities are among the highest in the world, contributing to an estimated 1.5 million deaths per year (USAID, 2009). No large Asian cities meet the World Health Organization guidelines for particulates (Dhakal, 2009). Currently, most urban air pollution comes from transportation and the ever-increasing numbers of automobiles. Elsewhere, the air pollution

comes primarily from incomplete combustion of fossil fuels, primarily coal. Mercury from power plants finds its way into the air, water, and oceans. In addition to the significant public health effects of air pollution, the ABCs have been shown to be exacerbating climate change effects and even changing rainfall and monsoon patterns throughout Asia. They are also depositing soot and contributing to climate change's impact on melting glaciers in the Himalayas, which are the headwaters for major rivers and the primary water supply for some 60 million people downstream. When the entire Tibetan plateau is considered, the number could approach two billion.

In addition to visible particulates and heavy metal pollution, other air emissions pose an increasing threat to human health and to increasing climate change. China was one of the first countries in Asia to ban lead in gasoline, thus eclipsing that crisis in its atmospheric concentrations. However, China and other Asian countries, with increased fuel use and combustion, are still encountering growing methane, SO_x, NO_x and tropospheric ozone (O₃) concentrations. High levels of tropospheric ozone are associated with respiratory illness, premature death, declining agricultural yields, and loss of biodiversity. If unabated, they are predicted to increase by as much as 30% across much of China and Asia from 1990 to 2020, with the potential for serious decline in agricultural production and food security (Wang and Mauzerall, 2004).

Increasing Asian greenhouse gas (GHG) emissions

Rising energy production and usage in the region are increasing Asia's greenhouse gas (GHG) emissions and contribution to climate change significantly. China is now the world's number one GHG emitter,



with its emissions projected to double by 2030. Indonesia is number three, after the U.S., with emissions mostly from deforestation. From 2006–2030, 89% of the cumulative increase in CO₂ emissions will come from non-OECD countries, primarily in Asia. While China and other Asian countries are taking significant steps toward development of renewable energy sources, GHGs are still projected to continue to grow for some time. The direction of the Post-Kyoto Climate Change negotiations and what forms mitigation will take (especially the obligations of developing countries) will greatly influence the pace at which GHGs increase in Asia.

3.5 Projected Effects of Climate Change and Post-Kyoto Mitigation Approaches

Projections of the effect of climate change are growing constantly more reliable. Many of the most significant impacts will be felt in Asia, with its already dense populations con-

From 2006–2030, 89% of the cumulative increase in CO₂ emissions will come from non-OECD countries, primarily in Asia.

centrated in low-lying coastal areas. Changes in rainfall patterns, temperatures, and sea level cannot help but affect biodiversity and ecosystems, for the most part negatively. The region is particularly vulnerable to impacts since it is already environmentally degraded, with little adaptive capacity. Climate change will exacerbate existing environmental problems in the region, while creating new ones, such as the massive displacement of people from their homes. The Mekong delta, Asia's food basket, is already beginning to recede, forcing people inland, but Vietnam's hills are too degraded to be able to support them.

Climate change is likely to exacerbate existing resource scarcities, especially water scarcity, and could very likely increase instability. This will simply compound the already present biodiversity crisis in the region.

As the pace of climate change appears to be accelerating, the post-Kyoto climate change negotiations intended to lead to a new agreement in Copenhagen in late 2009 will shape the future direction of international mitigation efforts. What obligations these Asian developing countries assume under any new agreement will also affect economic and energy development in the region, whether by slowing the rate of increase in demand or by promoting specific sources of alternative energy. With China in the position of the world's number one GHG emitter and Indonesia at number three, many of the governments in the region are still maintaining their official positions of not accepting caps on emissions. However, China and others are beginning to take actions independent of their official positions in the direction of reducing their emissions. Currently, Asia faces a serious and growing over-reliance on coal. If international agreements push toward reductions in the use of coal, the economic implications for Asia could be enormous. For the next two decades, the most important global issue will most likely be climate change mitigation—both slowing and stopping it. Asia will play a very significant role in whether or not this can be achieved. After that time, all climate change efforts will consist of adaptation and, if that scenario plays out, the impacts will be severe if not devastating, for Asia and its biodiversity.

Rising sea levels, increased flooding and storms, changes in monsoons, rainfall, and temperatures

Rising sea levels threaten not only coastal populations, but also lowland agriculture, especially in Bangladesh and Vietnam.



Bangladesh is increasingly faced with flooding and salinization of its agricultural land and drinking water, and this country, once known as the “rice bowl of the world,” was forced to import the crop in 2008 due to heavy flooding from cyclones. Changes in the monsoons can affect the types and locations of crops and, in turn, food security. Even slight temperature increases can affect species and biodiversity that are constrained to certain localities. A one-meter rise in sea level would cause Vietnam to lose 12% of its most fertile land where half of its 17 million population lives, as well as one-third of its natural reserves and a quarter of the known biodiversity they contain. Climate change is also expected to increase the incidence of El Niño events, which cause drought in Southeast Asia and have led to forest fires in Indonesia.

In Asia, the distinction between man-made and natural disasters is already becoming blurred, and climate change can only exacerbate it. Changes in rainfall and climate can alter patterns of disease as flooding and insect vectors increase, greatly affecting human health. Areas of high population densities in low-lying coastal zones are particularly vulnerable to increases in frequencies and intensities of storms and flooding,

By 2050, much of Asia is expected to be under water stress, with demand exceeding available supply, not even accounting for the impact of melting glaciers.

especially in a volatile region already known for natural disasters. In 2007, floods inundated most of Jakarta, killing more than 50 people and displacing 340,000 residents into temporary shelters. Some estimates project

that as many as 10–20 million people in the region could be displaced by rising sea levels. If sea level rises by one-half meter by 2025, as predicted, salt water would intrude into the groundwater some 15 km inland in low-lying areas (Jarvie, 2009). These countries in Asia have little margin of safety to enable them to adapt to sudden system shocks arising from climate change.

Melting glaciers and snowpack, especially in the Himalayas and Tibetan Plateau

The nine largest rivers in Asia all originate on the Tibetan plateau, in the snowpack and glaciers of the Himalayas. Some 60% of the Brahmaputra River flows through this region, although most of the users are downstream in India, Nepal, and Bangladesh. Due both to climate change and to brown soot raising the temperatures on their surfaces, at the current rate of melting, these glaciers are predicted to retreat by 75% by 2050. This is occurring in a region that already deals with a per capita annual water supply that is less than 1/3 of the global average. By 2050, much of Asia is expected to be under water stress, with demand exceeding available supply, not even accounting for the impact of melting glaciers. Its impacts will not only be felt severely in already parched China, but also downstream in other countries, such as Cambodia, currently home to the world's largest freshwater fisheries. Plans for dam construction on the Mekong and other rivers have not yet even taken into account the fact that its flow is already decreasing from its source. As glaciers melt, storing water may become a necessary climate change adaptation strategy.

Increased competition for freshwater as a threat to development and security

Climate change will undoubtedly alter patterns of freshwater resource availability;



for some regions increasing it and for others seriously limiting it. Water supply is not equally distributed in these countries and some countries, especially China, face severe water scarcity. Currently, only 6% of water usage in Asia is for domestic use, with the remainder going to industry or irrigation. However, in China, per capita urban water use is three times that in rural areas. Urbanization and the growing need for water in the cities have already caused millions of dollars of cotton agricultural investments in Western China to be abandoned. Already, Asia is home to almost two-thirds of the world's population lacking safe drinking water. In some countries, population migration toward water supplies may be expected. Rapid urbanization, so prevalent in Asia, brings particular difficulties in providing safe water supplies and sanitation, while almost none is provided in the region's rural areas. Changes in the distribution of water also affect agricultural output, as well as biodiversity. Where water supplies are transboundary, such as rivers, access and supply are always a potential source of conflict.

Ocean Acidification leading to loss of corals, shellfish, and calciferous zooplankton

As the oceans store more CO₂, they are growing more acidic, slowly dissolving calciferous species. Some predictions suggest that biological tipping points may be reached in colder regions by 2030. Not only is this likely to affect marine food webs, but even more relevant for Southeast Asian countries is the threat to coral reefs. Reefs in this region house the richest marine biodiversity on the planet and provide spawning and nursery areas for fish, making the region home to the greatest diversity of fish species anywhere (over 3,000 species). Reef diving and tourism is also a growing industry in the region, generating millions of dollars in revenue per year.

Declining quality and quantity of groundwater; aquifer depletion and saltwater intrusion

Rising demand for freshwater from growing populations and urban migration and increased irrigation is being compounded by the effects of climate change and rising sea levels. Aquifers are being depleted by increased use, especially in Bangladesh, China, and Indonesia. Increased flooding is contributing to saltwater intrusion of aquifers, surface waters, and agricultural land, as evidenced in Bangladesh and Vietnam and the 2004 tsunami in Indonesia. This compounds the problem of pollution and contamination of groundwater and surface water from residential, industrial, agricultural, and natural sources. Examples include heavy metals, such as high levels of arsenic in Bangladesh waters. Almost all economic development both depends on and affects water sources and quality. Climate change impacts can only exacerbate these.

Emphasis on renewable energy sources—hydropower, wind, solar, and geothermal

Increasing energy demand and climate change mitigation will also drive the development of alternative energy sources, such as wind, geothermal, solar, and biofuels. Papua New Guinea, with the lowest per capita energy use of these Asian countries, is currently exploring technologies related to geothermal energy for domestic use. The Philippines already generates 27% of its energy from geothermal sources. While positive examples exist, most alternative energy sources, even though greatly limiting GHGs, can also have negative environmental impacts, such as threats to birds and marine species, and pollution in manufacturing. All risks need to be addressed carefully with full environmental impact assessments.



Energy and economic gains from energy efficiency measures

Both growing energy demand and the need for climate change mitigation will globally drive the pursuit of energy efficiency toward lower carbon intensity. Asian countries, with current high levels of energy waste, have much to gain from increased efficiency, both in terms of energy supply and economically. ASEAN estimates that if its member states were to meet the ASEAN Vision 2020 clean energy goals, the energy savings would total some \$87 billion or \$2 for every dollar invested (UNESCAP, 2005). Already countries are recognizing that proactive climate change, clean energy, and environmental policies will drive long-term economic growth. Post-Kyoto agreements may help to provide some needed incentives.

Adoption of biodiversity-relevant mitigation measures such as "Avoided Deforestation" and biochar

The types of mitigation agreed upon in Copenhagen will also have the ability to contribute to biodiversity protection or to harm it. Deforestation comprises some 25–30% of all carbon emissions. Even if all fossil fuel use is stopped, deforestation is still a sizeable component of climate change. One component of climate change mitigation must be to address deforestation. REDD (Reduced Emissions from Deforestation and Degradation in Developing Countries) is important for a successful climate change agreement, for if done correctly, it could financially out-compete logging, with the possibility of providing up to \$30 billion for "avoided deforestation."

Primary forest is by far the best forest-related carbon sink, with 60% of the stored carbon lost in the first logging. Therefore, appropriate definitions of "forests" and of "sustainable forest management" are

essential to getting the requirements right in order to protect the climate, biodiversity, and local communities. The peatlands, on which much of the forest in Indonesia grows, are also significant carbon stores, so removing the forests and the peat multiplies the greenhouse gas emissions. Vital to any REDD agreement will be the clarification of rights to forests and who receives the financial benefits for carbon credits. Most forest areas, although remote, are not uninhabited, and have people depending upon them for their livelihoods. The "degradation" component of REDD means that it will also apply to all carbon sinks and sources, such as peatlands, rangelands, etc., and not only forests. The vast quantity of the possible revenues from REDD will also open the door to corruption and mismanagement deriving from weak governance. Not only must REDD be carefully designed for conservation and climate change benefits, but it must also taking into account economic incentives and political realities, in order to minimize misuse.

Another mitigation option that has been included in the draft text for Copenhagen is the incorporation of *biochar* into agricultural land. Biochar is produced by gasifying agricultural and woody waste products under low oxygen conditions. When plowed into croplands, it can serve as a stable, long-term (up to a century) carbon sink. It also greatly improves the condition of some soils, increasing their retention capacity for holding water and nutrients and thereby reducing the need for added fertilizers. The production of biochar also results in small amounts of clean-burning, liquid biofuel with a low carbon content that could be used to run generators or vehicles, continue the production process, or provide household energy.

A coalition of Belize and 13 African countries has submitted proposals for the



inclusion of biochar provisions into a Copenhagen agreement, and others have voiced support. However, biochar as a mitigation strategy is not without environmental risks. It could lead to cutting forests to produce it or removing agricultural wastes from cropland that would be more appropriately tilled into agricultural soil directly as opposed to being converted to biochar that ends up being sold or used elsewhere. Thus far, no Asian countries, where the risk of deforestation might be significant, have spoken in support. If it is promoted in the Copenhagen agreement as a mitigation strategy, especially if incentives or credits are included, care must be taken to ensure that it does not lead to environmentally unsustainable practices.

Growth in green technologies and jobs

The pursuit of renewable energy and energy efficiency and the direction of the post-Kyoto climate change mitigation strategies hold the potential for significant development of new “green” technologies and the creation of new “green” jobs. Some, including the U.S., are holding out hope that this green stimulus will help to pull the global economy out of its recession. Regardless, Asia, with its large investment in science and technology R & D and its growing manufacturing prowess, is likely to be affected by these new developments. For example, China already produces the overwhelming majority of compact fluorescent light bulbs and, as these are phased out in favor of LEDs, it can be expected to shift its manufacturing in that direction. China is also a major producer of solar panels. New green technologies being driven by climate change should open up a myriad of new manufacturing possibilities, some of them based on nanotechnologies.

3.6 Continued Population Growth and Urbanization

The UN predicts that by mid-century global population is expected to reach 9 billion, with 1.4 billion of that growth in Asia. For many countries in Asia, such as Thailand, Indonesia and China, fertility rates have declined, slowing the rate of population growth. Other countries such as Laos, Cambodia, the Philippines and Timor-Leste, with high fertility rates and relatively lower access to family planning will continue to see increases in population in coming decades. In spite of declining fertility rates, though, significant percentages of Asia’s population are currently below, entering, or in their child-bearing years. As a result, even if the region’s fertility rates decline to replacement level in the near future, this population momentum will cause the population to continue to expand for some years in most of Asia.

ASEAN countries already hold 45% of the global population, with some of the highest population densities in the world; they contain 125 persons per sq km, compared to the world average of 43 persons (ASEAN, 2006). The total population of ASEAN countries (which does not include China or India) is projected to be 651 million by 2050 (ibid.). Growth in Indonesia and the Philippines will be particularly significant, with Indonesia, already the fourth most populous country in the world, doubling its population in the next decade. Bangladesh, with a current population of 150 million, still has a growth rate of 2.8% and is expected to increase to 150 million by 2035—in an area the size of Iowa. Rapid population growth and rising densities also have implications for food security, as well as regional migration. This trend has already begun, as the Philippine Migration and Development Statistical Almanac, launched in 2009, states that some 8.7 million Filipinos already live in 239 different host countries and territories (Nieva, 2009).



Historically, rapid population expansion has led to over-extraction of natural resources and environmental stress and has been shown to correlate with loss of biodiversity (D'Agnes, 2009). It has also traditionally fueled a migration, especially of youth, from rural to urban areas. The UN estimates that the world's urban population will increase by 3.2 billion by 2050, with 60% of this increase (1.9 billion) in Asia (Dhakal, 2008). Both environmental stress and urban migration are occurring in Asia, and will continue to do so while populations are still expanding.

In recent months, with the current global economic downturn, millions of urban factory workers, especially in China, have lost their jobs and returned to their families in rural areas. The Chinese government has begun to encourage college graduates to take jobs in rural areas, to reduce the rising urban unemployment rate and its potential instability. While urban to rural migration will pose a great short-term strain on already stressed natural resources and economies, it is likely to be only a few-year blip in a longer-term trend of urbanization. If recent trends continue globally, virtually all the world's population growth will be in urban areas, and in developing countries mostly in Asia.

Aging populations and declining labor forces in the next 20 years

While population momentum will continue in most of these countries for the next 20 years, after that, for many the youth bulges will begin to age and if family planning is available and living standards rise, then fertility rates are likely to decrease. This trend will combine with longer lifespans, which will result in aging populations, as is currently occurring in Europe and Japan. Western-style diets and longer life expectancies are already leading to an explosion of chronic diseases in Asia, such as cancers, diabetes, and heart disease. The Asian economies such

as China and Vietnam have based much of their economic development on an ever-expanding labor market as their comparative advantage to boost trade. As this labor pool begins to decline, these countries are not prepared to be able to support a high percentage of elderly or retirees. Not only will it greatly strain already inadequate social services and food supply, but declining labor could reduce this comparative advantage. With its significant reduction in fertility rates, China is likely to begin to see this aging of its population even sooner than other Asian countries. Countries experiencing declining labor forces are likely to experience inward migration of labor from neighboring countries where the population is still growing.

Growing access to education for females

A positive trend across many of these Asian countries is the increased access to education for women and girls. While two-thirds of the world's illiterate are still women, the gap is narrowing in many countries in Asia. Not only is this opening up job opportunities and expanding the labor markets and household incomes, but when combined with access to family planning, it also slows fertility. Education also often brings with it greater environmental awareness.

Asian urban areas to increase in population by 50%, or 100 million people, by 2020

Currently, half of the world's urban population is in Asia. Some 42% of the population in Southeast Asia is already urban. Most of the world's future growth in urban population will occur in Asia, with Asian cities expected to grow by 1.1 billion by 2030 (Dhakal, 2009). In the next decade, Jakarta is expected to increase by five million people and Manila by two million. Part of this



is simply from growing populations, while much of it is the pull of jobs in the cities. Rapid urbanization places tremendous pressure on cities for social services, water, energy, and other needs.

Water and energy are actually easier and more efficient to supply in densely populated areas, but unequal access can become a problem. Urbanization often leads to snarled traffic and air pollution, as already experienced in many Asia cities. One estimate has shown that Bangkok loses 6% of its economic productivity each year due to traffic congestion (*ibid.*). Urban areas contribute 75% of global energy-related CO₂ emissions. Large Chinese cities currently account for 24% of the global urban CO₂ emissions, or 4.8 GT, which is more than all European emissions combined (Dhakal, 2009). Thirty-five cities account for 18% of China's population, but consume 40% of its energy and emit 41% of the country's energy-related CO₂ emissions (*ibid.*).

Rapid urbanization compounds the difficulty of sanitation and waste disposal, a serious problem for Asia, which already contains 80% of the world's population lacking adequate sanitation. Migrants without family in the cities can settle in growing slums, which increase the risk of spreading disease and public health crises. One of the most damaging impacts of urbanization is the dumping of untreated garbage and sewage into rivers and the sea, leading to marine degradation, dead

zones, and disease outbreaks. While clustering much of the population in cities may be beneficial for rural biodiversity, its attendant rising incomes and consumption patterns places a drain on natural resources and habitats.

Growing disparity between urban and rural living standards

Better job opportunities in the cities, coupled with a lack of services in rural areas, lead to a greater disparity in living standards. Those living in rural areas are already less likely to receive medical care, education, piped water, or electricity, and with government attention focused on urbanization, this disparity is likely to increase. Most of the benefits of natural-resource-dependent economies accrue to the urban middle class, while the rural poor are further disadvantaged as they are moved to less productive lands or separated from their source of livelihoods. Around the world, the 60–80% of population in developing countries in poor rural areas is effectively subsidizing the lifestyles of the 20–40% that live in cities (Bayes, 2008). Asia is currently home to 87% of the world's 400 million small farms, half of them in China. By 2015, half of the world's poor (living on less than \$1 per day) will still be in Asia, and 75% of them will be in rural areas, eking out their subsistence livings from the increasingly stressed lands and soils (*ibid.*, 2008).

4 Section Four

China as Asian Trendsetter

4.1 The China Effect

In many ways, China can be considered a trend in itself, or a set of trends, shaping the future of Southeast Asia. China has already affected the region in many profound ways. Its economic growth has helped generate regional prosperity, and its potential resiliency in the current financial crisis could play a crucial role in the region's recovery. China's economic influence and role as a donor nation are rapidly eclipsing those of the United States and Japan in the region. Another potentially positive force is China's prioritization of investments in R&D, especially in green technologies. The government has already committed \$88 billion on top of its \$586 billion stimulus package for science and technology. This will build on its existing commitment to green technologies to help to catalyze development of significantly cleaner automobiles and energy sources, and promote smart grid development. China is already the lead producer of solar water heaters globally and is expanding into exporting small wind turbines.

These positive developments are important, as China's influence on the other Asian countries is of significant and growing concern. Its various regional impacts range from transboundary air pollution to extraction of natural resources, to encroachment into fisheries and dam construction in the Mekong River Basin. China is now the leading emitter of GHG emissions globally, and how climate change impacts China could have far-reaching overflow effects on the rest of Asia. One serious aspect of this is the increasing speed of glacier melt in the Tibetan Plateau, which supplies water for well over a billion people in the region. Chinese mining and oil companies are

also often viewed as an environmental threat, as their extractive activities too often ignore pollution control and land use laws in other countries. Moreover, China is a major consumer of timber and endangered wildlife from Southeast Asia—the former often exported to the West in the form of furniture or paper and the latter consumed domestically in medicines or as exotic dishes. The consequences are not only felt outside its borders, though. The Chinese government is fully aware that environmental degradation within its borders and across the region also poses serious domestic threats to public health, national productivity, and economic and political stability.

4.2 Chinese Trade and Demand for Natural Resources

Although China's population is growing at only 0.6% annually, the sheer scale of the country's population still results in an increase of some 240 million new people each year. Combined with rapid urbanization and breakneck economic development, this population growth places a major strain on regional resources, especially on high-value resources. With rising incomes, meat consumption in China is increasing approximately 15% per year, raising demand for water-intensive agriculture in an already water-stressed country. China's meat production is also highly polluting, with 90% of animal waste still flowing untreated into waterways. China also has the world's largest aquaculture industry, which, like other countries in Asia, is increasingly focusing on carnivorous species, such as grouper. Demand for feed-fish for this mariculture is placing an additional strain on already overfished oceans, pulling feed fish imports from across the Pacific.



Wildlife

In the words of Crawford Allan at WWF, “China is the trend that has been driving the wildlife trade.” This threat results from a sad combination of demand for the exotic with rising incomes in China and weak governance and enforcement in neighboring countries. As a result, Southeast Asia has served as China’s supermarket, supplying turtles, large cats, and pangolins, to name a few. As supplies are declining, however, the trade is even being forced into other regions such as Africa and the Americas. This trade is industrial in its scale of extraction and processing. It is increasingly difficult to monitor as smugglers utilize new technologies and techniques, including freeze-drying and packaging illegal animal meat to better evade detection. China’s rigorous enforcement and partnerships with international organizations such as TRAFFIC and WWF, and the Chinese traditional medicine community’s rejection of using endangered animals have been helping to stem the trade, as has USAID’s partnership with ASEAN countries in the formation of a transboundary Wildlife Enforcement Network to strengthen enforcement capacity. Too often, however, improved enforcement encourages the smugglers to take ever more extensive measures, making it a constant challenge to keep up.

China, as a party to CITES, does officially have bans on trade in endangered species. The government has been permitting captive farming of some endangered species to meet local demand, but such farming is not without critics, as it can generate pressure to lift the trade bans to permit export of farmed species. Tigers, used for medicine, meat, and fur, are central to this debate. China has had a ban on international trade in tigers since 2003, but with supplies doing well, the government is currently considering lifting it. Many think that lifting

the ban will lead to the disappearance of tigers in the wild, as inspectors are unable to differentiate between farmed and wild tiger bones and parts.

Timber

Since massive flooding in the Yangtze River in 1998 was attributed to excessive deforestation in the upper basin, China has made considerable strides in protecting its forests. The subsequent timber ban and reforestation campaigns led to a drastic drop in timber harvests from China’s natural forests, from 32 million cubic meters in 1997 to 14 million cubic meters in 2000, with drops continuing until 2002 (Tianjie, 2008). China’s demand for timber has increased considerably over this same time period, both to supply China’s rapid urbanization, as well as for exported products. China is the world’s second largest consumer of wood products, the largest exporter of plywood, and the second-largest exporter of furniture.

To supply this production, China’s raw timber imports tripled between 1993 and 2005. Construction for the Beijing Olympics contributed to this, with the value of China’s import of round wood doubling between 2001 and 2006 (Hamlin, 2009). Approximately half of China’s current timber imports are thought to have been illegally logged. Greenpeace estimates that 80% of logging by Chinese companies in Indonesia and over 90% of that in Papua New Guinea are illegal. One report estimates that 98% of the timber exports from Burma to China are illegal. As with wildlife, this arises from combined problems of lack of governance and enforcement in source countries and a weak sense of social and environmental responsibility among Chinese companies.

4.3 China’s Energy Challenge

With its still-growing population and meteoric economic development, one of China’s



greatest challenges is developing and maintaining adequate energy supplies while responding to both domestic and international calls for reducing pollution and greenhouse gas (GHG) emissions. Coal currently drives China. Although China is already the world's second-largest importer of petroleum, at present 70% percent of its energy comes from coal. Until the recent financial crisis, a new 1,000-megawatt coal-fired power plant was being brought online in the country every week. Globally, coal's share of power generation has risen from 42% to 46% in recent years, with China accounting for two-thirds of that increase. The increase in demand for coal in China each year has been greater than the increase. Yet, despite this rapid growth, energy shortages—and even coal shortages—remain chronic in the country.

China's heavy reliance on coal power has also recently led the country to overtake the U.S. as the number one global emitter of carbon dioxide. This jump in GHG emissions is due not only to its growth in coal-fired power plants, but also to the fact that the country consumes 50% of the world's cement, 25% of all steel, and 20% of all copper. Cement production alone is responsible for 14% of all of China's GHG emissions. According to several studies, the manufacturing of export products accounts for 23% of China's GHG emissions.

Much of rural China still remains completely off the energy grid. To avoid pollution in mountainous rural areas, hydropower has to date been the power option of choice. The Chinese government plans to triple its hydropower production by 2020. Although hydropower supplies only 2% of China's energy, the country is still home to approximately 86,000 dams, 22,000 of which are large dams, accounting for 45% of large dams in the world (World Commission on Dams, 2000). This ongoing dam-building boom has caused concerns among some Chinese scientists and the environmental community over ill-conceived

projects such as building dams to tap melting glaciers; dams constructed on earthquake fault lines; and dams that threaten important aquatic species. Many projects are also criticized for not taking into account the social and financial costs of relocating citizens from dam sites. Domestic pressure against hydropower is increasing in the country, including a vibrant debate over the operating and planned dams on the Mekong River and other rivers in southwest China. Dam-building also requires vast quantities of cement production, a significant source of China's GHG emissions.

In recent years, the Chinese government has begun to adopt stricter energy conservation legislation and to explore cleaner uses of hydrocarbons. With only 7% of its energy today coming from renewable energy and another 2% from hydropower, coal still accounts for 70% the country's energy production and 80% of electricity generation. It is also increasing its use of non-coal hydrocarbons, having signed 20-year contracts with Russia, Brazil, and Canada for petroleum. To clean the air in advance of the Olympics, the government closed many small-scale coal mines, further contributing to the growing energy shortfall.

China has moved ahead with an integrated gasification combined cycle plant and has signed agreements to build 2 more (Fairley, 2008). An additional 26 are planned by 2010. The technology converts coal into synthesis gas (syngas), a blend of carbon monoxide and hydrogen that can be used to feed catalysts that synthesize chemicals and fuels, drive turbines, and generate electricity with less pollution and pure CO₂ that is easier to capture and sequester. In 2008, BP in collaboration with the Chinese Academy of Sciences established a \$73 million research center in Shanghai to commercialize technologies such as carbon capture and storage, and gasification (*ibid.*).

As China is rapidly developing and diversifying its energy-generation capacity, it is expanding its renewable energy sector and incorporating more modern, efficient, green



technologies in newer facilities. Over the longer term, in new power facilities, China is looking to shift from its dependency on coal to renewable sources such as wind and solar photovoltaic farms and micro-nuclear plants. Wind farms in the northwestern part of the country are supplying electricity through new, robust, ultra-high voltage transmission grid infrastructures capable of bundling thermal and renewable energy and transmitting it to the cities in the East. Some 9000 MW of wind energy was supplied in 2008, a 50% increase over 2007, with exponential growth expected in the future (Chan, 2009). Smart grids are being installed in each rural village as part of rural electrification. Generating power in the western part of the country is part of a strategy to improve development there and slow urban migration to the East.

As economic development has increased the energy intensity of China's economy, energy efficiency is also gaining popularity. Building efficiency has become increasingly popular since the government set energy reduction goals in the last Five-Year Plan. The Five-Year Plans also include significant targets for renewable energy, including 20% of its energy from renewable sources by 2020 (Balfour, 2009a). Solar water heaters, biogas digesters, and other household-scale renewable energy technologies have become more accepted and in demand. Last year, China's battery giant BYD launched the world's first mass-produced plug-in hybrid vehicle (Fairley, 2008). Balancing China's exploding need for energy over the next decades with pollution concerns will require every avenue possible, involving massive investment in all energy technologies, from cleaner hydrocarbon processes to renewable energy sources, as well as a focus on efficiency and conservation.

4.4 Transboundary Pollution

Increasing energy production and consumption in China is also fueling air pollution and Atmospheric Brown Clouds (ABCs). Most

of China's coal is high-sulfur, "dirty" coal that generates significant particulate emissions when burned. China has regulations in place for scrubber technology to be installed at all new facilities, but compliance is not always 100% in the provinces and most of the older plants have not been retrofitted. Prevailing winds carry pollutants such as ozone, fine particulate matter, and mercury from power plants from continent to continent, even from Asia to North America. Spring sand storms originating in northern China close airports and shut down schools in Japan, Korea, and Taiwan and distribute particulates as far away as the Grand Canyon. Mercury pollution is already a serious problem in the Gulf of Thailand and other seas in the region. Sulfur particles contribute to acid rain and ocean acidification, threatening marine species. Atmospheric brown clouds contribute significantly to air pollution and public health effects both domestically and regionally. They are also compounding the effects of climate change by changing regional rainfall and monsoon patterns and by depositing soot that contributes to glacier melt.

Pollution from industry, agriculture, energy, and human sources runs into China's rivers, one-third of which are now unfit for industry and even less for drinking. Some flow through other countries, such as in the Mekong Basin, carrying silt and pollution. Much of the water pollution flows into the South China Sea or other coastal areas, resulting in vast dead zones offshore. These dead zones, combined with increasing red algal tides, send China's fisherman further from the coast and into internationally disputed waters, leading to conflicts with its neighbors, including Vietnam and Indonesia.

4.5 Environmental Governance

China's decentralized structure of governance is perhaps one of the greatest challenges to effective domestic environmental action. Although the central government shows considerable commitment for environmental



governance, it rarely backs this support with financing for local governments to implement national laws and plans. With strong requirements to maintain economic growth, powerful local governments thus continue to prioritize jobs and GDP growth over environmental protection. China briefly experimented with Green GDP, which was intended to rank local government leaders on their environmental achievements. However, the pilot program was abandoned in 2007 due to objections by local leaders that the process was not scientific, although this was likely an excuse to cover the fact that performance was discovered to be substandard in most participating provinces.

Another major obstacle to environmental action within China is corruption. As China gradually transitions from a planned to a privatized economy, many of the local government leaders continue to have a hand in local business. This inevitably leads to significant conflicts of interest, compounded by low wages and incomes of local government authorities. One example of this conflict of interest is revealed in the fact that the State Forestry Administration, heavily invested in tiger farms, has been behind the push to lift the ban on selling tiger parts.

The central government recognizes that it has little leverage over local government leaders, and also realizes the importance of environmental protection for social stability and sustainable development. As such, Chinese policymakers and environmental regulators cooperate extensively with international environmental NGOs, bilateral agencies, and multilateral agencies to craft environmental legislation, carry out pilot projects, and research activities. The Chinese government has notably opened up more political space domestically for NGOs and citizens to be involved in environmental decision-making and enforcement. The most notable examples are new “green” freedom-of-information measures; required public participation in

environmental impact assessments; and expanded provisions granting pollution victims more power to sue polluters. Although China’s environmental laws often lack clear regulations and provisions for enforcement, national Five-Year Plans are often backed with funding and more concrete targets and strategies. Most notable are the ambitious goals to increase energy efficiency by 20% between 2006 and 2010, which have catalyzed massive investments by Chinese industry.

China’s laws and enforcement profoundly affect the environment of the region, both positively and negatively. For example, in 1998 China instituted a timber ban, which resulted in a flood of illegal timber from Burma, Indonesia, PNG, and Russia. On the other hand, successful enforcement of the tiger ban has stalled the decline of the species regionally. This demonstrates that any measures to alter Chinese patterns of consumption or demand are likely to have significant implications outside the country, as extraction and/or supply are simply shifted elsewhere.

Civil Society

Regulations for registering civil society groups began in 1994. The first environmental NGO to be established was Friends of Nature, a group that promoted environmental education and acted as an incubator for new grassroots groups. Today, China’s “green” NGOs make up the country’s largest civil society sector. While most of them undertake activities that are relatively politically “safe,” such as environmental education or activities that support government policy and emphasize local problems, a growing number of groups have delved into sensitive issues of pushing transparency, empowering pollution victims, or halting dam building. While still small, some groups are even emerging that are focusing on climate change. Since registration and fundraising are difficult for Chinese environmental groups, almost all are dependent



on foreign funding. However, this sector seems poised to grow larger and more influential due to some key domestic trends. These include:

- A growing middle class willing to volunteer their time to environmental causes
- Active and growing professional groups, stemming from the student environmental movement, many of whom are increasingly interested in global affairs
- An emphasis on science and education as a tool for influencing policy
- Increasing attention to the law as a tool for preventing and mitigating pollution
- Raising public awareness of public environmental health issues and their connections to pollution

International Lending and Business Practices

China is rapidly replacing Japan as the major investor in the region. As it competes with India to fund projects, it has developed a reputation for often under-bidding more socially conscious investors, though notable progress is being made in this area. Recently, both China Ex-Im and the China Development Bank have agreed to adopt international environmental standards for lending. China Industrial Bank has become the first of China's banks to adopt the Equator Principles to consider environmental and social consequences in project financing. In 2007, the China Development Bank formed a meaningful contract with an international NGO to clean up Lake Tai. Domestically, green lending is becoming a reality, although it is not yet widespread. These banks have vast resources, but they are still developing standardized practices to guide environmentally and socially sustainable investment.

Business practices in China have been simplistically summarized as "greening within, while browning without." Corporate social responsibility has been slow to

win support in China, although it is gaining some ground in recent years. Notably, few incentives exist to encourage business donations or green initiatives by corporations, whether from governments pursuing economic growth or manufacturers producing goods for domestic and export markets. One central government initiative has been to green the 1000 most polluting industries in China, although results are so far inconclusive. Overseas investments by Chinese companies in the region are often in extractive industries and are usually poorly regulated by either the Chinese government or the host governments eager for the foreign revenue. Public environmental awareness, while slowly emerging, has not yet developed enough to begin to pressure Chinese industry to develop environmentally sustainable business practices at home and in countries where it does business.

4.6 Chinese Economic Outlook

For the past several decades, China has posted an annual GDP growth of 7–10%. During that time, its industry has become increasingly energy intensive as cheap prices, lax enforcement, and booming development attracted dirty industry to the country, especially cement and steel. More recently, China is emphasizing energy efficiency and raising taxes on heavy industry exports to reduce domestic production relying on heavy industry. Chinese exports are now primarily light industry, such as clothing and small electronics, both drawing natural resources and components from the rest of Asia and placing China in direct competition with similar enterprises all over the region.

Predictions of the economic impact of today's recession on China vary. The export industry, recent source of much of the country's rapid economic expansion, has been severely curtailed in recent months, resulting in as many as 20 million unemployed and many urban migrants returning to the

**Box 2: Chinese Mining and Petroleum Extraction**

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From a presentation by Jill Shankleman at the Woodrow Wilson Center

The drop in overall resource investment from European and U.S. companies due to the current global financial crisis has opened up more opportunities for Chinese companies to invest in extractive mining and petroleum projects globally. Initially, Chinese oil and mining companies invested overseas with little knowledge of the countries or their laws. Chinese companies today have learned lessons from past missteps and are working to acquire better information, support local philanthropic projects, and attempt to comply with local labor standards. China Ex-Im Bank, which funds many global resource extraction projects, has notably begun to adopt international environmental and social standards, due both to global pressure and to conflicts in various countries.

OECD countries have promoted the Extractive Industries Transparency Initiative (EITI) to encourage governments to publish audited accounts of the monies received from foreign extractive companies. Chinese oil and gas companies have shown little interest to date in international initiatives related to the management and transparency of oil and mining concessions to the governments of resource-rich countries. Absent from a change in the regulatory framework, Chinese companies are unlikely to support the EITI or similar voluntary initiatives in the near future. China might be more likely to pay attention to global initiatives such as the EITI if they were better linked to established international institutions such as the United Nations.

Nevertheless, China's increasing influence on international development aid thinking, and its emergence as a development donor that focuses on infrastructure rather than capacity-building and governance, has had an impact on aid in resource-rich countries. The fact that China will often grant concessional loans to resource-rich countries for projects undertaken by Chinese construction firms has meant that while some resource revenue will be used for infrastructure projects, it does not help create jobs for locals. Western companies should work together with their Chinese partnering companies on the impacts that international investment and extraction have on local communities and environments and on issues such as revenue transparency that affect local resources.

countryside. Manufacturing and foreign direct investment is certainly being reduced, at least in the short term. However, several experts believe that China may not be hit as hard as others because of the potential of its large domestic market. Although this potential domestic market is vast in scope and ultimately potentially able to absorb some of the impact of reduced export demand, it is not yet well-developed and doing so will take some time. If that shift is ultimately made, then domestic companies will begin to displace the foreign companies that have been, until now, the primary source of many manufactured goods for Chinese consumers.

Even with rising incomes, Chinese patterns of consumption have not been as unsustainable as that of much of the developed world. If advertising should convince them to adopt such Western habits, the environmental implications for Asia and the world could be enormous. Chinese decision-makers recognize that they cannot replicate the Western model of development. For example, Shanghai and Beijing have banned the sale of land for single-family dwellings, forestalling further suburbanization toward more densely populated urbanization, and reducing commuting distances and vehicles. Some



70,000 of China's dirtiest factories have closed down in recent months. While some have moved to the interior or to neighboring countries, others will re-emerge as cleaner and more energy efficient or even evolve into more service-oriented enterprises (Balfour, 2009a). China is the world's largest producer of steel, but the industry is now shifting toward the use of the most advanced clean and energy-efficient technologies, as opposed to the older models.

Since China's economic development is coming at such a rapid pace in an already densely populated, resource-constrained environment, the potential exists for it to become a newer, greener model for global development in upcoming decades. The challenges are enormous, but the Chinese appetite and enthusiasm for it are strong.

The National Intelligence Council reports that China is poised to have greater impacts on the world over the next twenty years than any other country (NIC, 2008). If current trends persist, by 2025, China will have the world's second-largest economy and will be a leading military power, becoming an important third pole in a multi-polar world. It could also be the world's largest importer of natural resources and, barring significant changes, the world's greatest polluter. Even the current financial crisis, while in the short run contributing to massive unemployment and raising the specter of political instability, may over the longer term serve to shift the balance. China's enormous potential domestic market and its sound financial footing, including large reserves of U.S. bonds, place it in a position of

possibly being able to recover from the global recession more quickly than some developed economies. China cannot be ignored as one of the most significant trends, both positive and negative, shaping Asia's future environment. Influencing that impact for environmental sustainability will be essential.

How drivers and trends affect a place obviously depends in many ways upon its current state. Differing starting conditions will influence how these trends impact different countries and populations. Some of these pre-existing conditions vary greatly across the region, while others are shared. The fact that Asia is already the most densely populated region on the planet and that as a result, much of its environment is already seriously degraded, provides it less cushion for new environmental shocks and further degradation. The fact that it is still so rich in biodiversity means that it still has much to lose. Other current situations in the region might not really be considered trends because they are not necessarily undergoing significant change, but are more static conditions. Some of these are shared by other developing countries such as high rates of poverty, lack of strong governance, or corruption. These are also likely to greatly influence and even magnify how the drivers and trends will affect Asia's environment. The global financial crisis is hopefully not a 20-year trend, but it cannot help but affect the drivers and trends over both the shorter and the longer term. Recognizing some of these pre-existing conditions helps to understand how the drivers and trends might shape Asia's future.

5 Section Five

Asia Today — The Foundation for Future Trends

5.1 Democratization and Governance

Strong *governance* is crucial to the security of the environment and natural resources. Although good governance and environmental protection are not always synonymous, the environment is almost never secure where governance is weak. Demand for natural resources is too strong and growing, and extraction is too profitable. Poor governance, corruption, and lack of enforcement are behind many biodiversity threats. Often environmentally and socially damaging practices migrate to where governance is weak and corruption is high.

In Southeast Asia, as some countries have implemented policies against damaging practices, the business has simply moved to their weaker neighbors. Laws against timber cutting passed in China, Thailand and Malaysia have simply exported the practice. Chinese logging companies now operate in Cambodia, Laos, and Burma, and Malaysian companies in Myanmar and Indonesia. The island of New Guinea (Indonesia and Papua New Guinea) has now become a “new frontier” for extractives. In many cases, globalization and regionalism have outpaced domestic governance capacity as countries have opened themselves to the free flow of capital and trade before they have in place adequate financial, regulatory, and enforcement capacity (Cronin, 2009). Roads grew faster than the ability to monitor and manage forests or land. Weak governance and inadequate planning often lead to decisions favoring short-term returns at the environment’s expense.

Natural-resource-dependent economies are particularly vulnerable to *corruption* as governments mete out highly profitable

concessions for timber, plantations or mining. In Asia, as elsewhere, where governments or militaries are financed by concession fees from resource extraction, too often the tendency is to over-extraction. Some countries whose natural resources have historically suffered greatly from corruption are making efforts to change. In Indonesia, some recent high-profile convictions are demonstrating the current government’s commitment to reducing it. In countries that base their economies on resource extraction, weak governance and corruption allow the revenues to enrich the elites rather than actually contributing to economic and social development. Corrupt governments, in seeking to preserve their position, can foster oppression and censorship, subverting democracy and leading to social and political instability and conflict. Furthermore, as resources become depleted the country is at risk for economic and political destabilization. [*For more on corruption’s link to forest conflict, see Section 5.3.*]

The best antidotes to corruption are transparency and participatory democratic processes. One movement in this direction has been the development of the ***Extractive Industry Transparency Initiative (EITI)***, a coalition of governments, industry, civil society, and international organizations that sets a global standard for companies to publish what they pay and for governments to disclose what they receive. EITI thus far has the support of more than 80 global investment institutions. More than 40 oil, gas, and mineral companies are participating, and 25 countries have candidate status, with 11 having published audited EITI reports (EITI, 2009). Although this is a strong beginning,



participation by more of the growing import countries is needed, as well as expansion into other sectors such as timber and agricultural products. The extent of the challenges facing Asia's future environment means that governments and aid agencies alone cannot solve them. The private sector must be engaged as well. Strong governance and regulation, and transparency help to provide the assurances and protections required for industry to act in socially and environmentally responsible ways and to invest for the long term.

Trends towards *democratization* can strengthen environmental management. Often these trends are linked with rising living standards, increased globalization, and access to international communications. As basic human needs are met, people have more time and resources to devote to improving their quality of life. This is often reflected in demand for better health care and services, such as safe drinking water and sanitation. Where medical services are insufficient or still unaffordable, rising incomes can increase demand for exotic species. This direct threat to biodiversity must be addressed through improved medical care as well as education. Improved living standards and international communication work together to increase awareness of the health effects of pollution and toxins in the environment, a precursor to demand for change.

China's highly publicized efforts to clear Beijing's skies for the Olympic Games in 2008 raised the expectations of millions of Chinese that clearer air and less pollution could actually be possible for them, creating new demands on government. Over the past decade, pollution problems in China have notably become a source of growing civil unrest. Democratization can also increase the role of civil society in demanding and working for environmental protection. With the exception of Thailand and the Philippines, with their vibrant civil societies, most of the Southeast Asian countries

have limited public participation by civil society. Environmental legislation should also be accompanied by legal protections for whistle-blowers and civil suits for environmental crimes in order to work against entrenched forces of corruption and weak government enforcement.

One noticeable trend in some countries in Asia has been attempts at *decentralization* of responsibility for management of natural resources to provincial and community levels. The argument in favor of this has been that those closest to the resources and most dependent on them will be likely to provide the best long-term stewardship. Indonesia, the Philippines, and more recently China, have all begun to pursue this for both forests and fisheries, with some success. In some cases, this can provide a protection against cronyism and corruption in the central government regarding natural resource exploitation, although the risk still exists of simply dividing the problem into myriad fiefdoms of corruption. Public participation in resource management is crucial to ameliorating this threat. Difficulties also arise when responsibility is devolved by financially strapped central governments eager to shed some financial burdens of management, but the necessary financial resources and technical capacity for sound management are not provided.

Local communities may have the best intentions, but lack the resources they need for adequate enforcement or even the legal authority for apprehension and prosecution. Often indigenous or local communities can be intimidated by their governments (whether central or provincial) or concession-holders and do not recognize or know how to protect their user rights over their land and resources. Decentralization has created bureaucratic hurdles and new opportunities for corruption, making it difficult for foreign companies to start new projects. For example, no new metal



mining projects have been begun in Indonesia in 12 years, although recently revised mining legislation is likely to change that. Decentralization can prove helpful for improving environmental management, but it must be implemented with caution.

Regionalization is another trend that could shape the future of environmental management and conservation in Asia. Economic cooperation and trade agreements among countries within Asia are increasing, and ASEAN is ever increasing its web of regional economic activities. To date, historic and ethnic disputes and differences have prevented rapid movement toward an economically and politically integrated “Asian Union” comparable to the EU. Nevertheless, intra-regional and particularly intra-industry trade within the region are growing rapidly, with China serving as an integrator and a catalyst in many cases. Much of the success of this increased trade will depend on strengthening the transportation infrastructures in the participating countries, which in turn can have both positive and negative impacts on habitats and biodiversity. It can increase the free trade of illegal products such as wildlife, but also increase opportunities for transboundary cooperation on enforcement as goods cross borders.

ASEAN, first established in 1967, was formally chartered as a legal entity in December 2008, further strengthening its ties. At its 2009 February meeting, ASEAN signed a free trade agreement with Australia and New Zealand to take effect in December, intended to increase the flow of goods and services by US\$48 billion over the next decade (ICTSD, 2009). It also announced plans to accelerate progress toward an EU-style trading bloc, committing to keep trade lines open during the economic crisis and avoid protectionism within the region. ASEAN already has free trade agreements with China, Japan, and South Korea, with one for India expected soon and one with the EU under

discussion. At their recent meeting, they also created a roadmap for the creation of an integrated economic community (minus a common currency) by 2015. While analysts still question how much issues of national sovereignty will impede unity, its economic potential is significant. ASEAN economies (which does not include China) already possess a combined GDP of U.S. \$2 trillion and a population of 570 million, more than the population of either the EU or the NAFTA countries combined.

Regional environmental cooperation is also growing around shared environmental resources, strengthening both environmental management and political security. Not all environmental issues can be managed from the national level. The Mekong River Commission of Cambodia, Laos, Thailand, and Vietnam, with China and Burma as cooperative Dialogue Partners, is one example, although upstream/ downstream issues and the prospect of dams for hydropower that would reduce downstream flow have kept tensions high. The ASEAN *Agreement on Transboundary Haze Pollution* of 2002 addresses problems of Southeast Asian transboundary air pollution arising from forest fires, although some have criticized its effectiveness, and Indonesia has not yet joined. Transboundary conservation and adjoining protected areas between many of these Asian countries (Laos and Vietnam; Cambodia and Laos; China and Vietnam; Malaysia, Indonesia and the Philippines; Indonesia and Timor L'este; Indonesia and Papua New Guinea, to name a few) increase the opportunities for coordinating management of adjoining conservation areas, especially important where species migrate or the threats (fire, disease, poaching, etc.) cross international boundaries. Some predict that the most effective regional environmental cooperation may still be at the bilateral or trilateral level (Cronin, 2009).

A recent example of regional environmental cooperation set to test this notion



has been the development of the *Coral Triangle Initiative* (CTI) of six coastal countries of Southeast Asia to collaborate on sustainable management and conservation of marine resources and biodiversity of the region. The CTI builds on previous collaborations among Indonesia, Malaysia, and the Philippines to manage resources of the Sulu-Sulawesi Seas and Papua New Guinea and the Solomon Islands in the Bismarck and Solomon Seas. These five countries, along with Timor-Leste, now make up the CTI membership, with other entities as partners. USAID has already committed over \$40 million to the CT Partnership.

The CTI is also indicative of a global trend for conservation, that of *international environmental cooperation*, as it is attracting significant funding from the U.S. (especially USAID), Europe, Australia, and other developed countries, as well as from international organizations such as the World Bank, the Asian Development Bank, the Global Environmental Facility, and numerous environmental non-governmental organizations. This reflects the concern that the global community holds for the rich biodiversity of this region and the shared responsibility for helping to protect it. It builds on similar consortiums formed in support of the Heart of Borneo and the Greater Mekong. Global conservation-related treaties, such as the Convention on Biological Diversity, CITES, and the Ramsar Convention are also increasingly relevant for this region, and most of the countries in the region are Parties to all three. Many are also Party to other global conventions of regional importance, such as those addressing air pollution, shipments of hazardous wastes, migratory species, management of regional fisheries, and other transnational issues.

The international convention likely to have the greatest impact on Asia's future will be the next-generation *climate change agreement*, scheduled to be concluded by the end of 2009 in Copenhagen. The shape that this next-generation agreement takes—whether

specific targets of reductions in emissions are agreed; whether specific technologies are mandated or phased out; what forms of mitigation will be promoted; how offsets such as for avoided deforestation or conservation of peatlands are handled—will all have an enormous effect on Asia's future environment. For example, promotion of biofuels could increase land-clearing and deforestation, while offsets can help pay countries to protect their forests and wetlands. Incentives for renewable energy can drive green technology development, but also increase other biodiversity risks (such as to birds and migratory species or from new pollution) from these technologies. Most significant for Asia's economy and its environment will be the degree to which developing countries are expected to share in the obligations to slow their rate of growth in carbon emissions and adopt new technologies.

One aspect of governance critical to environmental protection at all levels is the economic valuation of environmental resources and services. Too often the development framework is based on economic indicators valuing economic growth over the environment. Water is viewed as an economic commodity for agriculture, consumption, or industry. Forests are seen as timber, a product. Environmental externalities and the value of natural capital are not included in prices, so resource decisions tend to overestimate financial benefits and underestimate costs, especially those to society at large. Costs of mitigation or reclamation are rarely incorporated. A large part of sustainable environmental governance is relying on sound environmental economics. The current global financial crisis is both revealing where all economies have missed the mark here and to what extent earth's human economy relies on its environmental economy.

5.2 Global Recession – Crisis or Opportunity

Since this project began in October 2008, the world has slipped into a global economic crisis unseen in many decades, perturbing



some of the trends outlined earlier in this document. Globally, industrial production declined by 20% in the 4th quarter of 2008, and global GDP will decline in 2009 for the first time since World War II. With demand in developed countries plummeting, world trade is showing its largest declines in 80 years. From July to December 2008, non-energy commodity prices plunged 38% (World Bank, 2009a). Initially, the developed world was hit hardest with the contraction of credit and loss in wealth, but the impacts have trickled down to less developed countries, especially those with export-based economies or those that are heavily dependent upon remittances that have been rising rapidly for several years.

In the long term, increases in debt issued by developed countries are likely to begin to squeeze out the market for debt from developing countries, forcing them to face higher spreads, lower capital flows, investment, and slower growth (ibid.). Donor countries,

under their own financial stress, are also likely to have to cut back on total Overseas Development Assistance (ODA). Many developing countries also face greater vulnerability due to higher poverty levels preceding the crisis and continued weaker capacity.

Many of the Asia's Future countries are already reporting the impacts of the crisis. As demand for Chinese exports diminished, the Ministry of Labor reported in early 2009 that some 20 million of China's estimated 130 million migrant workers are now unemployed, mainly in the exporting, manufacturing, construction, and mining industries. China's growth is expected to drop from the double digits of recent decades to between 6% and 8% in 2009. Experts say that an 8% growth rate is needed to generate enough jobs to accommodate entrants into the workforce, a factor important for maintaining political stability.

Malaysia and Thailand, also dependent on exports, have also been hit hard. The garment industry in Cambodia has laid off 30,000

Table 1: Vulnerability of the Poor in Asia's Future Countries to Global Financial Crisis

AF Countries	Exposure		Government Response Capacity	
	Impacts of Financial Crisis on GDP	Poverty Levels before Financial Crisis	Fiscal Capacity to Finance Larger Deficits	Institutional Capacity to Manage Poverty Reduction
Bangladesh	High	High	Med	Med
Cambodia	High	High	Med	Low
China	High	Med	Med	Med
Indonesia	High	High	Med	Med
Laos	High	High	Low	Low
Nepal	Low	High	Med	Med
The Philippines	High	High	Med	Med
Papua New Guinea	Low	High	High	Low
Thailand	High	Med	High	High
Vietnam	High	High	Med	Med

Excerpted from World Bank Policy Brief. "The Global Economic Crisis." March 2009. (Myanmar and the Solomon Islands were not included in the World Bank Study.)



workers, or 10% of the country's workforce. The fact that this is Cambodia's only export industry has somewhat limited the country's exposure. The Philippines is projecting that 800,000 workers there are vulnerable to layoffs, especially in export industries, semiconductors, and electronics. The Philippines government reports that 2.53 million are currently unemployed and 6 million are underemployed, but private sources suggest the numbers are much higher.

The global recession is also likely to reduce dramatically the \$120 billion a year in remittances that Filipinos living abroad send back to the country each year (Nieva, 2009). In a country where one in three persons lives below the Asia Poverty line of \$1.35/day, this crisis will make it much harder to reach the Millennium Development Goal of halving it by 2015, and this is a difficulty likely to be shared by many. Indonesia, less dependent on trade than its neighbors, may weather the crisis a bit better, although the collapse of metal prices has hurt them, and mining output has slumped. Its GDP is expected to slow to 3.7% in 2009, down from 6.2% in 2008 (Balfour, 2009a).

While all countries will be affected, the impacts will differ from country to country. As a region, East and Southeast Asia may come out with less damage than many places in the world. For some economies, the drop in prices of commodities is somewhat ameliorating the decline in exports. The Asia's Future countries, as oil importers, have for the most part actually even benefited from the dramatic fall in oil prices; in some cases, receiving an average income boost of some 2% GDP (World Bank, 2009a). Many low-income countries have been somewhat shielded from the sudden cessation of private capital market flows because they had lower access to such flows originally. As a result of these and other factors, some experts are even predicting that Asia may actually be in a position to recover more quickly from the crisis than the West.

Aside from dependence on exports, housecleaning after the Asian financial crisis of 1997 has placed several Asian economies on fiscally stronger footing than their Western counterparts. For example, China holds much of the U.S. debt. Indonesian banks are in good shape with a strong capital cushion and the lowest loan-to-GDP ratios in the region (Balfour, 2009a). For the millions of Asians already living in poverty, the basic needs for food, water, and energy are constant and somewhat resistant to global economic declines. The challenge will be ensuring that more do not join their ranks. In relation to this report, while the global recession may have some serious repercussions in the short-term, it may not actually be as significant a trend for Asia in the longer term (10 years or more).

The countries of Asia are also taking action against the downturn. China, Japan, and South Korea (all non-ASEAN countries) have contributed to the ASEAN regional emergency fund, increasing it from US\$80 billion to US\$120 billion. The Philippines has announced a \$6 billion economic recovery package, of which \$2 billion is devoted to infrastructure. China's \$586 billion stimulus package also includes much for infrastructure, which will help more domestically than regionally, since 70% of China's imports from its neighbors are components used as inputs for export manufacturing, and exports are down. This policy is designed to wean China's dependence on exports by shifting to a focus on domestic consumption. By substituting government spending to replace foreign demand, the government hopes to buy China a couple more years of growth. Part of the stimulus package includes a 13% subsidy on appliance purchases by rural customers. An additional \$88 billion is being invested in science and technological projects. The Premier's goal is for China to be the first country to recover from the financial crisis. Although Asia is likely to recover



sooner than the West, it cannot reinvent its domestic markets overnight and much will still depend on recovery in the U.S., still the greatest consumer of Asian exports.

Some of the effects of the economic downturn may negatively affect Asia's environment. Millions of urban migrant workers returning to the countryside could severely strain already stressed resource bases and push rural dwellers even further into forests or degraded lands. Another risk is the fact that so much of the government stimulus investment is directed towards building infrastructure. Infrastructure, whether it be dams, roads, railroads, power generators, or transmission lines, all uses land and can threaten vulnerable biodiversity. While maintaining and rehabilitating public infrastructure is critical to economic development, careful planning and detailed environmental impact assessments will be essential to ensure that the environment does not suffer from a sudden spurt in investment.

In other ways, the sudden drop in global demand for Asian resources, while decreasing Asian incomes, may actually be beneficial for biodiversity. The global financial "bubble" helped to drive up demand for Asian raw materials, industrial inputs, and energy, leading to a resource development frenzy that has proven devastating for biodiversity. For example, with global drops in fuel prices, palm oil prices have fallen from \$1,245 to around \$526, causing a significant slowdown in palm oil production in Indonesia and Malaysia. The Malaysian government is now reviewing 91 biofuel plant licenses, as most are currently not operating (AFP, 2009). Foreign direct investment declined in late 2008, particularly in the natural resource sectors such as mining and timber, as financing has become scarcer and declining commodity prices have led to project delays and cancellations (World Bank, 2009a). For now, with the exception of climate change, the financial downturn is actually slowing all

of the primary drivers identified in this Asia's Future project. That could be a benefit for Asia's environment.

If there is any bright spot in this recession, in Asia, it may actually provide a breathing space to allow governance and sustainable management to catch up. It could provide the opportunity to develop and implement environmental legislation, strengthen management and enforcement capacity, collect baseline data, and put robust environmental impact assessment requirements in place. The lull in extraction could be used to look across sectors and regions, as well as ecosystems, toward more region-wide ecosystem-based planning and management, as well as the social and human security impacts. It could especially provide an opportunity to get the environmental accounting right, by incorporating environmental costs and benefits into pricing, so that Asia's future economy is more sustainable and based on what its environment can actually sustain. If the recession does prove to be shorter in Asia than elsewhere, then the window of opportunity may be brief, perhaps only 3–5 years, and the need to use it wisely is critical.

5.3 Environmental Conflict and Security

Globally, environmental security is becoming of greater concern as more people compete for fewer resources. These countries of Asia are no exception, with their long histories of ethnic, cultural, and religious tensions exacerbating the potential for conflicts over scarce resources and environmental degradation. Food, water, and energy are not only basic human needs, but also required for industrialization, manufacturing, agricultural crops, export products, and effectively most of the components of economic development. Competition for land, water, energy, and other resources puts the most economically vulnerable at risk and contributes to social and political instability, both domestically



and internationally. All of these effects stand to be further threatened in the short term by the global financial crisis and in the longer term by the impacts of climate change.

One serious example is the violent *conflicts over forest resources* that are prevalent in several Asian countries. Forest conflict results from weak governance, a lack of accountability, and corruption, as well as failure to establish or enforce resource-access laws that are seen as transparent and legitimate by all stakeholders. Governments and rebel groups in several countries use timber to finance armed conflict, or to buy political support or fund operations, often using tactics of intimidation and violence to overcome resistance from local forest users. In other cases, conflict arises between forest users over rights and access to timber. Forest conflict not only further impoverishes local communities and hinders economic development, but also seriously threatens the forest ecosystems and biodiversity. USAID, with ARD, Inc., has analyzed the causes of forest conflict and identified approaches to reducing it and communicating the seriousness of the threat to governments and civil society in the region and in the U.S. This builds on an earlier USAID project identifying the extent to which timber is used to finance armed conflict in Asia and Africa (see www.forestconflict.com).

Increasingly, food security, water security, energy security, and *environmental security* are attracting the attention of the global community interested in maintaining peace and stability. Food scarcity can lead to riots, and some Asian countries are already witnessing sabotage of oil palm and biofuel plantations that compete with local agriculture. Conflicts over access to land and land use destabilize communities, and in many places around the world contribute to terrorism and insurrection. Valuable natural resources such as minerals can be targets for international organized crime, with local operators often supplying them. Some 75% of the

population in the coastal communities of Southeast Asia lives in subsistence economies that are particularly sensitive to resource degradation and depletion. Lack of water leads to migration of populations and increased urbanization.

Energy sources determine where economic infrastructure is located. Weak governance, inadequate enforcement, and corruption open the door for illegal activities and trade, and even organized crime. From a military security standpoint, many already view Asia, with its large and still growing populations and ethnic and religious conflicts, as of major importance globally for maintaining peace. Work has been done on identifying the security “tipping points” in Africa, and some have suggested that similar work in Asia could be beneficial. The current economic crisis, with its rising unemployment, only intensifies the potential instability and can run the risk of a return to mercantilism. From a global perspective, the National Intelligence Council 2025 report concludes that descending into a world of resource nationalism (mercantilism) due to population growth, loss of resources, and climate change increases the risk of great power confrontations (NIC, 2008). For all its potential threat to biodiversity, globalization is probably still more conducive to a peaceful and stable human world. The challenge is to build it on a foundation of ecological sustainability.

5.4 Water and Food Security

Water security could easily be identified as its own category, but water is actually affected by all of the six drivers. For that reason, different water-related sub-trends show up under multiple drivers. The 2009 edition of the “Water in a Changing World” reports that by 2030, nearly half of the world’s people will be living in areas of acute water shortage (Worsnip, 2009). Water scarcity is already known to be a cause of conflict in some regions. One expert has observed



that the exportation of rice from South-east Asia or Bangladesh to the Middle East is actually a net transfer of water (Cronin, 2009). Competing requirements for water for human, agricultural, and industrial uses strain water management frameworks and political systems.

With continually growing populations, expanding need for agriculture, rising incomes, and increasing international trade, compounded by climate change, availability of freshwater will be perhaps the number one determinant of Asia's future. For example, the fact that Chinese consumption of meat has risen on average from 44 pounds per person in 1985 to over 110 in 2009 means that an additional 94 cubic miles of water is now required for meat production. The needs will also vary in different places from arid upland China with its melting glaciers, to reduced flows in large river basins, to urbanization polluting water supplies, to climate change's increased storms and sea level rise increasing salinization. Some will be related to quantity, while others will be related to quality and sanitation. Availability of clean water has a direct effect on human health, with water-related disease in developing countries causing 3 million early deaths; a child dies from diarrhea every 17 seconds (UNESCO, 2009).

A particularly critical result of changing water supplies is its impacts on agricultural production and food security. Improving food security, currently a high priority for USAID, is intricately connected with *water availability for agriculture*. Under current projections of demand for food and water, supplies may still be adequate to avert future food crises, but not without careful planning and management (Samad, 2009). Ensuring an adequate supply of water for agriculture will require major increases in efficient use and productivity per unit of water—"more crop per drop" (ibid.). The distinction between rain-fed and irrigated agriculture is

no longer clear. Agricultural water management should reflect this and incorporate all sources, including reclamation and conservation. Under a scenario of climate change, water storage will become an important investment for water scarce areas. This can and should involve a creative range of solutions from small village ponds to larger reservoirs, to water harvesting and methods for conserving soil moisture.

Water availability is not the only factor affecting agriculture and food security in the region. Climate change will also bring increases in maximum temperatures, as well as increased nighttime temperatures, both of which can reduce yields. Increased tropospheric ozone levels, which are rising in much of Asia, are also shown to decrease yield. In the Mekong Delta, the source of 50% of Asia's rice production, cropland is increasingly subject to flooding and salinization. While research has begun on using "marker assisted selection and backcrossing" to develop rice strains better able to cope with these stresses, more work is needed on merging qualities of high yield with resilience (Wassman, 2009). Other gains are possible from reducing post-harvest loss and storage or better utilizing crop residues. The combined effects of climate change on Asia's water and agriculture will take place in the context of a still expanding population and rising living standards. Research, improved management, and conservation will all be needed to address this scenario.

Adequate water resources development and investment will be critical to the economic and social development of these Asian countries, but this also an investment with strong return. The UN Report estimates that each dollar invested in improved access to safe water and sanitation will produce an estimated return of US\$3–\$34, but that the failure to adequately invest may constrain GDP by as much as 10% (ibid.). Overseas development assistance to the water sector



has been decreasing and now represents only some 5% of total aid. The current regulatory framework, based on a water surplus, is inadequate for an era of water scarcity. Management reform is necessary that will provide users with clear, enforceable entitlements to water, full cost pricing, functioning water markets, and incentive-based, participatory management (Samad, 2009).

As vital as water supply is for human sustenance, it is equally as critical for biodiversity. One of the most critical impacts of climate change for biodiversity will be its disruption on water supplies. The effects of changes in

temperature on species and ecosystems will be compounded by water scarcity or floods. These shifting supplies, coupled with ever-growing human competition, mean that water availability will be one of the most significant factors affecting Asia's future biodiversity. Water sector investments such as dams and infrastructure can have serious repercussions for biodiversity, and diligent environmental impact assessments are only the first step towards limiting the damage. Investments in the water sector will need to take into account the needs of other species as well as those of humans.

6 Section Six

USAID and the Asian Environment

6.1 USAID in Asia

USAID works in 22 countries across Asia, as well as regionally. The Regional Development Mission for Asia (USAID RDMA) was established in 2003 to manage regional development assistance programs in Asia and those countries without USAID offices such as Burma, China, Laos, and Thailand. USAID's work in environmental protection includes fresh water supply, pollution, forests, natural resources management, and biodiversity conservation. These are closely integrated with programs on health, agriculture, climate change, energy, and governance.

USAID pioneers conservation activities that address economic growth, governance, and security challenges. Its activities currently conserve over six million hectares of biologically significant areas throughout Asia, using innovative approaches such as linking conservation with income generation and public-private sector alliances. In fiscal year 2008, USAID's support for biodiversity in Asia totaled over \$40 million, with similar amounts targeted for 2009.

USAID actively engages in partnerships with other organizations, both public and private, to pursue its objectives more efficiently. Some current USAID conservation-related programs in Asia include:

- **Combating the illegal wildlife trade** – Working in collaboration with ASEAN and the regional Wildlife Enforcement Network, USAID is assisting government agencies in countering the illegal wildlife trade through intelligence exchange and joint cross-border operations.
- **Building alliances to reduce illegal logging** – Through memoranda of understanding

with 29 forest enterprises, USAID partners have formed public-private alliances to reduce illegal logging by shifting global trade towards legally harvested and conflict-free sources and to improve forest management in approximately 2.5 million hectares of tropical forest.

- **Safeguarding marine and coastal resources** – USAID supports the Coral Triangle Initiative (CTI), a multilateral partnership based on a commitment by the governments of Indonesia, Malaysia, Papua New Guinea, the Philippines, Timor-Leste, and the Solomon Islands to safeguard marine resources and coastal biological resources by promoting sustainable fisheries, sustainable livelihoods, and climate change resilience and adaptation in this 5.7 million square kilometer region known for its extraordinary marine biodiversity.
- **Resolving resource conflict** – USAID operates projects throughout Asia to reduce conflict through clarifying forest ownership, facilitating community forest mapping, establishing standards for removing conflict timber from markets, and easing transitions in countries undertaking co-management of forest lands with local communities.
- **Engaging stakeholders to protect orangutans** – Support of a multi-stakeholder process has resulted in a national plan for long-term survival of the orangutan in Indonesia. USAID is working with partners to conserve 3.3 million hectares of its habitat.
- **Increasing biodiversity through co-management** – Work with the government of Bangladesh to establish 80 wetland sanctuaries co-managed by local communities and the government and to train managers



has created a model for co-management of all critical ecosystems in the country, including the world's largest mangrove ecosystem, The Sundarbans.

- **Maintaining biodiversity corridors** – USAID is working with partners to create and maintain a biodiversity corridor in the Greater Mekong Region, connecting important habitat areas for rare and endangered species and beginning with a pilot corridor in Vietnam that utilizes payment for environmental services.

6.2 USAID and ASIA'S FUTURE: Roundtables

The expert roundtables held as part of this Asia's Future project produced valuable insights into the trends expected to influence Asia's environment over the next two decades. While this report was not intended to be a strategy document, suggestions did emerge from the roundtables on possible USAID engagement and activities to address these trends. In no particular order or priority, and not necessarily intended as recommendations from this project as a whole, some of these suggestions for USAID that emerged from the roundtables' participants included:

- Help to pay the **differential costs** between the fastest path to economic development and environmentally sustainable paths.
- Examine the possible **unintended consequences of investments** (such as aquaculture that depends on wild fish for feed further contributing to the over-exploitation of marine fisheries).
- Work to develop **longer time horizons** for projects to allow for capacity-building, which takes time. Build monitoring, enforcement and follow-up into all projects and study ways to credit qualitative improvements such as good governance rather than only quantitative results.
- **Restructure financing** to provide incentives for environmentally sustainable practices.
- **Take advantage of the economic downturn** and temporary slowdown of large-scale economic development investments to influence governments and industry towards smarter, more sustainable development, including in their economic stimulus policies.
- Examine and encourage more **localized, decentralized investments** with more livelihoods benefits and fewer environmental costs, such as small levees with turbines to generate micro power, or small-scale biofuel production at the local farm level rather than in plantations.
- Assist governments to require substantive **Environmental and Social Impact Assessments (ESIA)** for all large-scale infrastructure or extraction projects, through a transparent and participatory process. Include food security, climate change implications, and cumulative and transboundary impacts.
- Work across government ministries and agencies in planning projects to encourage **cross-sectoral planning** and coordination and to avoid resource damage by activities in one sector on the resources of another.
- Work to get the economics right and **incorporate environmental costs** into prices to set correct incentives. Fines must be set higher than fixing the damage, with strong enforcement.
- **Integrate environmental protection** throughout all sectors in the development portfolio and have **dedicated staff** to work on this integration.
- Ensure that **environmental conservation is mainstreamed** into development, both in Asia and elsewhere.
- Assist in **capacity-building for international negotiations**, especially in trade and environmental fora.
- Improve and expand **labeling systems** to help consumers identify sustainable products, such as those already being undertaken in places for forests, aquarium trade, paper products, sustainable seafood, and even the mining industry in South Africa.



- Support the principles and criteria of the ***Extractive Industries Transparency Initiative*** to strengthen governance by improving transparency and accountability in the extractives sectors, including participation by key governments and companies and expansion to other industries.
- Many environmental benefits can improve economic efficiency and help the bottom line. Support new ***businesses*** that utilize environmental protection to create jobs and stimulate economic growth.
- Partner with others to leverage large ***private sector investment***, especially for medium-sized projects that the multilateral development banks do not address.
- Assist governments and industry to establish independent, public ***third-party auditing facilities*** to monitor and audit supply chains and processes for environmental sustainability and safety.
- Partner with ***CSR committee of the U.S. Chamber of Commerce*** on a workshop on the subject of supplier codes, standards, and transparency.
- Work closely with the new administration to negotiate enforceable environmental standards into ***international trade agreements***, both bilateral and multilateral, with enforceability clauses such as support for watchdog groups.
- Since environmental standards can be expensive and will thus not always be driven by economic incentives, but sometimes by social pressure, assist in building the local capacity for communities and ***civil society to demand*** environmentally sustainable practices.
- Work to strengthen representative ***civil society*** with a real voice in project planning and approval, to improve transparency and counter corruption.
- Support NGOs working in ***local communities***; the places where private sector cannot or does not go.
- ***Finance incentives*** for local farmers and communities to develop new, more sustainable technologies that are locally and culturally appropriate and therefore more likely to be adopted.
- Strengthen ***environmental education*** for young people; create youth leadership; and build transnational environmental networks across borders to help engage new actors and leaders over the long term.
- Greater investment in ***science education*** and ***scientific exchange programs*** related to environmental issues, biodiversity, and climate change.
- USAID, long seen as a conduit for ***technology transfer***, should now apply this expertise to ***industrial waste and clean energy***.
- Cooperate with the World Bank Forest Law Enforcement and Governance networks to assist with capacity-building for ***enforcement***.
- Capitalize on ***communications and IT technology*** (cell phones, satellite tracking, GPS, mega-computer capacity) for monitoring on-the-ground activities, land use, and supply chains affecting biodiversity.

7 Section Seven

Conclusion: Development, Sustainability and Asia's Future

7.1 Economic Development and Asian Resources

Humans are ultimately dependent on nature for their basic needs of food, water, and energy. Even industrialization does not free humanity from this dependence, and economic development. Rather than lessening the demand, industrialization increases it as rising incomes afford both increased quantities as well as improved quality of goods. As people live longer and multiply, the demand on earth's resources continues to increase, and the burden of waste products increases. With its rapid industrialization in an already densely populated region of islands and mountains, Asia's pursuit of food, water, and energy continue to pose serious threats to its biodiversity. Economic development and globalization are also leading to urbanization, with its increased drain on resources and impacts on the environment and public health. In future years, all of this will be increasingly compounded by climate change, both as an effect of economic development and as a direct agent of biodiversity loss itself, such as through the production of biofuels. These trends are all combining to threaten one of the world's greatest biodiversity regions at a rapid pace.

But these negative effects associated with economic development are also being accompanied by hopeful trends that can favor environmental protection. Some of these include:

- Rising incomes, increasing awareness, and demand for environmental protection
- Large Asian investment in science and technology (nanotech, biotech, scientific

education) that can be directed to reducing pollution and increasing sustainability

- Climate change mitigation strategies that could promote renewables, green technologies, and new green jobs
- International communications and globalization that can spur democracy and advances in environmental protection
- Growing access to education for females
- International demand for sustainably produced goods driving the greening of supply chains and private sector investment in local communities and environments

The six primary drivers identified by this Asia's Future project have all resulted, directly or indirectly, from economic development, both in Asia and globally. Once again, they are:

1. **Rapid Economic Development and Rising Living Standards in Asia**
2. **Globalization of Trade and Demand for Asian Natural Resources**
3. **Rise of Asian Science and Technology**
4. **Exploding Energy Demand in Asia and Globally**
5. **Projected Effects of Climate Change and Post-Kyoto Mitigation Approaches**
6. **Continued Population Growth and Urbanization**

Most of these, with the possible exception of Post-Kyoto Mitigation Approaches, are already on a trajectory to continue. Asia and the world are already committed to a larger more urbanized population as a means of increasing living standards. Globalized trade and the ever-expanding demand for natural resources and energy to fuel economic growth show no sign of slowing down.



However, many of the sub-trends that these are driving are still amenable to change, in both speed and even in direction. Intervention can permit slowing or halting them or even changing their environmental impacts from negative to positive.

Recognizing the links between these trends and Asia's future environment is the first step to changing them, and ameliorating the negative impacts of demand and supply, consumption and production. Education, globalization, communication can be applied to improving environmental sustainability. Science and technology can be harnessed to minimize pollution or to develop substitutes that reduce the ever-growing global need for more energy and raw materials. Investing in education (especially for girls) and family planning and health care can help to reduce poverty and slow population growth, while increasing social demand for democracy and transparency and healthy environments. Greater awareness of the extent and causes of environmental degradation can spur improved environmental regulations and enforcement leading to improved health of terrestrial and marine ecosystems. Looking at the drivers and sub-trends together as a whole can help to reveal interactions and points of intervention with maximal potential impact and success. In the same way that fisheries conservation and family planning projects have been combined for synergistic beneficial outcomes, other trends can be addressed in concert, improving the return on investments and Asia's environmental future.

7.2 The Economics of Sustainability in Asia

This Asia's Future project has revealed that what is required to shield Asia's environment from the negative effects of the trends described here is a renewed commitment to sustainability in all areas of endeavor, including both political will and the capacity to implement it. USAID has years of experience

in assisting with education and strengthening awareness, as well as building human and technical capacity. Environmental procedures that require assessing the environmental consequences of all USAID-funded activities (22 CFR 206 / Reg. 206) are already helping to build the concept of environmental sustainability into all USAID projects. But the commitment to sustainability must also be adopted by Asian governments, and development assistance be designed to that end. Environmental protection depends on strong governance, and sound governance must be built on a commitment to environmental sustainability.

Many of the trends described here are related to economics, because human economic activity both directly and indirectly drives environmental degradation and biodiversity loss. Therefore, the most direct path toward sustainability is getting the economics right. More accurately and comprehensively incorporating environmental costs and benefits into prices for goods and services helps to send the correct messages and incentives to markets, leading to preservation of the natural capital upon which human economic systems ultimately depend. Too often, development frameworks based on economic indicators ignore this foundation, pitting economic growth against environmental health. Water is treated as a commodity for agriculture, industry, or consumption. Timber is a product. Land is a means of production. Biodiversity is considered a luxury good. In reality, water, land, biodiversity, and natural resources are the very foundation of healthy economies. This natural capital must be counted in economic measures and national accounting systems in order to guarantee its ability to provide a strong foundation to national economies over time.

Even if only for a few years, the financial crisis is likely to slow the global demand driving the frantic rush for natural resource extraction, such as logging and mining, as well



as the regional rise in demand for goods and energy. This breathing space could provide a brief opportunity to help these Asian countries get their environmental governance, enforcement, and economics on a more sustainable footing. The time can be used to help them plan more holistically—across sectors, ministries, and ecosystems.

Taking an ecosystem perspective (perhaps based on river basins, mountain ranges, coastal ecosystems, etc) uncovers not only downstream effects, but also transboundary and regional impacts. More investment is also needed in helping to develop robust regional transboundary cooperation mechanisms, such as the CTI, to help in the management of the regional environment and biodiversity. The financial downturn can also provide some time to examine the social and human security aspects of development projects and government planning, especially

those related to water, food, and energy security. Rather than allowing economics to compete against the environment, this is the time for mainstreaming environmental protection into economic development.

With the lightning-fast pace of economic development in Asia, the next twenty years will be crucial for determining its impacts on the environment. One of the most notable trends is that even the rate of change is increasing, and the need for flexibility and adaptability is greater than ever. As USAID continues its commitment to the environment including climate change and biodiversity of the region, its investments can work together with these positive trends to assist the region in taking a new path to development; a path that pursues an environmentally sustainable, biodiversity-friendly, and low carbon route to economic development.



REFERENCES

This is only a small set of the documents consulted in compiling this report. The full list is posted in on the Asia's Future site located on the Wilson Center website at: <http://www.wilsoncenter.org/asiasfuture>

- Anderson, Janna Q. and Rainie, Lee. (2008, December 14). "The Future of the Internet III." *Pew Internet & American Life Project Report*. [Online]. Available: <http://www.pewinternet.org/Reports/2008/The-Future-of-the-Internet-III.aspx>.
- Agence France-Presse. (2009, March 3). "Asia's biofuel dreams shelved as crude oil tumbles." Reprinted in Environmental News Service. [Online]. Available: http://www.enn.com/top_stories/article/39406.
- Ahmed, A. U, et al. (2007). "The world's most deprived characteristics and causes of extreme poverty and hunger." 2020 Discussion Paper 43. *International Food Policy Research Institute*, Washington, DC
- Alley, Patrick. (2009). "Corruption in Trade of Asian Natural Resources." Presentation at USAID Asia's Future Workshop, 30–31 March 2009, Bangkok, Thailand.
- "Are developing economies exceptional in cranking up their output of S&E graduates?" (2008, January 25). *Science* V319. p. 399.
- ASEAN. (2006, November). *Third ASEAN State of the Environment Report 2006*. ASEAN Secretariat: Jakarta
- Balfour, Frederik. (2009). "Impact of the Economic Downturn on Asia's Environmental Future." Presentation at USAID Asia's Future Workshop, 30–31 March 2009, Bangkok, Thailand.
- Balfour, Frederik. (2009, February 18). "Clinton Arrives in a Surprisingly Strong Indonesia." *Business Week*. [Online]. Available: http://www.businessweek.com/print/globalbiz/content/feb2009/gb20090218_835153.htm.
- Balfour, Frederik. (2009, January 26). "China's Recyclers: Is a Rebound Ahead" *Business Week*. [Online]. Available: http://www.businessweek.com/print/globalbiz/content/jan2009/gb20090126_576842.htm.
- Bayes, Abdul, et al. (2008). *Agricultural and Rural Development for Reducing Poverty and Hunger in Asia*. IFPRI and ADB. [Online]. Available: <http://www.ifpri.org/pubs/cp/ADBManilaSynopsis.pdf>.
- BBC News. (2008, November 21). "US global dominance 'set to wane'" [Online]. Available: <http://news.bbc.co.uk/go/pr/fr/-/2/hi/americas/7741049.stm>
- Borton, James. (2005, August 22). "Venture Investments Boost China Biotech Industry." *China Venture News*. [Online]. Available: http://www.chinaventurenews.com/50226711/venture_investments_boost_china_biotech_industry.php.
- Chan, M.L. (2009). "Accelerating the Greening of China: Joint US-China Cooperation on Clean Energy." Presentation at USAID Asia's Future Workshop, 30–31 March 2009, Bangkok, Thailand. [Online]. Available: www.wilsoncenter.org/AsiasFuture.
- Cincotta, Richard P. and Elizabeth Leahy. (2007). "Population Age Structure and Its Relation to Civil Conflict: A Graphic Metric." *Environmental Change and Security Report*. Issue 12. 2006–2007. pp. 55–58.
- Club of Rome. (2008). "Did You Know 3.0?" [Online]. Available: <http://www.youtube.com/watch?v=jpEnFwiqdx8>.
- Colwell, Rita R. & Michael Greene. (2008, January 25). "Solutions for Nigeria." *Science*. V319. p. 385.
- Conservation International. (2009.) [Online]. Available: <http://www.biodiversityhotspots.org/>.
- Cord, L, et. al. (2009). "The Global Economic Crisis: Assessing Vulnerability with a Poverty Lens." World Bank Policy Note. [Online]. Available: <http://siteresources.worldbank.org/NEWS/Resources/WBGVulnerableCountriesBrief.pdf>.
- Cronin, Richard. (2009). "Natural Resources



- and the Development-Environment Dilemma." In *Exploiting Natural Resources: Growth, Instability, and Conflict in the Middle East and Asia*, eds. Richard Cronin and Amit Pandya, Henry L. Stimson Center: Washington, DC. pp. 63–81.
- D'Agnes, Leona. (2009). "Asia's Future: PHE Prism View." Presentation at USAID Asia's Future Workshop, 30–31 March 2009, Bangkok, Thailand. [Online]. Available: www.wilsoncenter.org/AsiasFuture.
- Dhakal, Shobhakar. (2009). "Major Trends in Urbanization and Urban Environment." Presentation at USAID Asia's Future Workshop, 30–31 March 2009, Bangkok, Thailand. [Online]. Available: www.wilsoncenter.org/AsiasFuture.
- Dhakal, Shobhakar. (2008). "Creating an Urban Movement for Sustainable Living." *Global Asia*. Vol. 3. No. 3. Fall 2008. pp. 16–20.
- Dhas, Albert Christopher. (2008, July 14). "Population Pressures and Land Use Changes in Southeast Asian Countries: Recent Evidences." *MPRA Paper No. 9570*, 21:01. [Online]. Available: <http://mpra.ub.uni-muenchen.de/9570/>.
- Ehrlich, Paul R. 1968. *The Population Bomb*. Binghamton, NY: Sierra Club.
- Ehrlich, Paul R. and Anne H. Ehrlich. 1990. *The Population Explosion*. Simon & Schuster, New York, USA.
- Ellis Linden J. and Jennifer L. Turner. (2007, May 7). "Aquaculture and Environmental Health in China." *China Environmental Health Research Brief*. [Online]. Available: http://www.wilsoncenter.org/topics/docs/fish_may07.pdf http://www.wilsoncenter.org/topics/docs/fish_may07.pdf.
- Eilperin, Juliet. (2008, December 12). "Developing Nations Plan Emission Cuts: Shift Seen as Crucial to New Climate Pact." *Washington Post*. Section A10.
- Extractive Industries Transparency Initiative. (2009). "EITI Fact Sheet." [Online]. Available: <http://eititransparency.org/document/factsheet>.
- Fairley, Peter. (2008, December 17). "China Closes the Clean-Coal Gap." *Technology Review*. [Online]. Available: <http://www.technologyreview.com/energy/21887/?a=f>.
- FAO Fisheries and Aquaculture Department. (2007). *The State Of World Fisheries and Aquaculture 2006*. Food and Agriculture Organization of the United Nations: Rome.
- FAO. (2008). "The State of Food Insecurity in the World 2008: High Food Prices and Food Security: Threats and Opportunities." [Online]. Available: <http://www.fao.org/docrep/011/i0291e/i0291e00.htm>.
- Friedman, Thomas. (2009, March 7). "The Inflection is Near?" *nytimes.com*. [Online]. Available: http://www.nytimes.com/2009/03/08/opinion/08friedman.html?_r=1&emc=eta1.
- Glitnir Seafood Team. (2006, November). "China Seafood Industry Report." [Online]. Available: <http://hugin.info/133924/R/1164653/228097.pdf>.
- Hamlin, Timothy. (2009). "Resource Exploitation in Southeast Asia: The Unanticipated Costs." In *Exploiting Natural Resources: Growth, Instability, and Conflict in the Middle East and Asia*, eds. Richard Cronin and Amit Pandya, Henry L. Stimson Center: Washington, DC. pp. 68–69.
- Hardin, Garret. (1968, December 13). "The Tragedy of the Commons." *Science* Vol. 162. no. 3859, pp. 1243 – 1248.
- Holdren, John P. (2008, January 25). "Science and Technology for Sustainable Well-Being." *Science* Vol. 319. p. 424–434.
- International Centre for Trade and Sustainable Development. (2009, March 4). "ASEAN pushes for deeper integration, Signs FTA with Australia, New Zealand" *Bridges Weekly Trade News Digest*. Vol. 13. No. 8.
- International Monetary Fund. (2009, January 28). *World Economic Outlook Update - Global Economic Slump Challenges Policies*. [Online]. Available: <http://www.imf.org/external/pubs/ft/weo/2009/update/01/>.
- Jarvie, James. (2009). "Asia's Future and Climate Change." Presentation at USAID Asia's Future Workshop, 30–31 March 2009, Bangkok, Thailand. [Online]. Available: www.wilsoncenter.org/AsiasFuture.
- Johnston, Leslie. (2008). "Lower Mekong River Basin Hydropower Report." 2008. USAID Report, USAID/Washington, EGAT/ESP.



- Knudson, Tom. (2009, January 19). "The Cost of the Biofuel Boom: Destroying Indonesia's Forests." *Yale Environment 360*. [Online]. Available: <http://e360.yale.edu/content/feature.msp?id=2112>.
- Kobayashi, Junko. (2009). "Making the Connections: Water, Forests, and Minerals Exploitation in South and Southeast Asia." In *Exploiting Natural Resources: Growth, Instability, and Conflict in the Middle East and Asia*. eds. Richard Cronin and Amit Pandya, Henry L. Stimson Center: Washington, DC. pp. 49–62.
- Levin, Dan. (2009, March 12). China's Big Recycling Market is Sagging. *New York Times*. [Online]. Available: <http://www.nytimes.com/2009/03/12/business/worldbusiness/12recyclehtml?r=1&th&emc=th>.
- Li, Jennifer C. (2006). "China's Rising Demand for Minerals and Emerging Global Norms and Practices in the Mining Industry." USAID and Foundation for Environmental Security & Sustainability. Working Paper No. 2. [Online]. Available: <http://www.fess-global.org/WorkPapers.cfm>.
- Mackenzie, Debora. (2008, December 4). "Rich countries carry out '21st century land grab.'" *New Scientist*. Issue 2685. pp. 8–9.
- Mackenzie, Tom. (2009, March 26). "China's giant step into nanotech." *The Guardian*. [Online]. Available: <http://www.guardian.co.uk/technology/2009/mar/26/nanotechnology-china>.
- MacKinnon, Ian. (2008, November 22). "The resentment rises as villagers are stripped of holdings and livelihood." *The Guardian*. [Online]. Available: www.guardian.co.uk/environment/2008nov/22/food-biofuels-laos.
- Malthus, Thomas R. (1798). *An Essay on the Principle of Population*. 1st edition. London.
- Malthus, Thomas R. (1826). *An Essay on the Principle of Population*. 6th edition. John Murray: London. [Online]. Available: <http://www.econlib.org/library/Malthus/malPlong.html>.
- Matisoff, Adina and Michelle Chan. (2008, November) "The Green Evolution: Environmental Policies and Practice in China's Banking Sector." *Friends of the Earth-U.S.* November 2008. Friends of the Earth-U.S. [Online]. Available: http://www.banktrack.org/download/the_green_evolution_environmental_policies_and_practice_in_the_chinese_banking_sector/green_evolution_2008_foe_final.pdf.
- Mauzerall, Denise L. (2009). "Interconnections between Air Pollution, Climate Change and Health: Promoting Sino U.S. Cooperation." Presentation at Woodrow Wilson Center. 12 May 2009. [Online]. Available: http://www.wilsoncenter.org/index.cfm?topic_id=1413&fuseaction=topics.event_summary&event_id=518594.
- Meadows, D. H., et al. (1972). *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind*. Universe Books: New York.
- Meadows, D.H, Meadows, D.L. and Randers, J. (1992). *Beyond the Limits: Global Collapse or a Sustainable Future*. Earthscan Publications Ltd.: London.
- Miller, Daniel. (2009). Searching for Grass and Water: Rangeland Ecosystem Sustainability and Climate Change on the Tibetan Plateau." Presentation at USAID Asia's Future Workshop, 30–31 March 2009, Bangkok, Thailand. [Online]. Available: www.wilsoncenter.org/AsiasFuture.
- National Intelligence Council. (2008, November). *Global Trends 2025: A Transformed World*. NIC 2008-003 [Online]. Available: www.dni.gov/nic/NIC_2025_project.html.
- Nieva, Maria A. O. (2009, January 12). "Statistical Compendium on RP Migration and Development Launched." *abs-cbnNEWS.com*. [Online]. Available: <https://abs-cbnnews.com/pinoy-migration/01/12/09/statistical-compendium-rp-migration-and-development-launched>.
- Pew Center on Global Climate Change and Asia Society –Center on U.S.–China Relations. (2009, January). "A Roadmap for U.S.–China Cooperation on Energy and Climate Change." [Online]. Available: <http://www.pewclimate.org/US-China>.
- Population Reference Bureau. (2008, September). "World Population Highlights: Key Findings from PRB's 2008 World Population Data Sheet." *Population Bulletin*. Vol. 63, No. 3 September 2008. [Online].



- Available: <http://www.prb.org/pdf08/63.3highlights.pdf>.
- Revkin, Andrew C. (2009, March 11). "U.N.: Young and Old Boom on the Road to 9 Billion." Dot Earth. [Online]. Available: <http://dotearth.blogs.nytimes.com/2009/03/11/un-young-old-boom-on-road-to-9-billion/>.
- Samad, Madar. (2009). "Asia's Water Future." Presentation at USAID Asia's Future Workshop, 30-31 March 2009, Bangkok, Thailand. [Online]. Available: www.wilsoncenter.org/AsiasFuture.
- Tharakan, Pradeep. (2009). Biofuels in Asia: Key Trends and Implications. Presentation at USAID Asia's Future Workshop, 30-31 March 2009, Bangkok, Thailand. [Online]. Available: www.wilsoncenter.org/AsiasFuture.
- Tianjie, Ma. (2008, August). "Interconnected Forests: Global and Domestic Impacts of China's Forestry Conservation." *A China Environmental Health Project Research Brief*. China Environment Forum.
- Turner, Graham, M. (2008). "A comparison of The Limits to Growth with 30 years of reality." *Global Environmental Change*. Vol. 18. pp. 397-411.
- U.N. (2009). "The Secretary General's High Level Task Force on the Global Food Security Crisis." [Online]. Available: <http://www.un.org/issues/food/taskforce/index.shtml>.
- U.N. Economic and Social Commission for Asia and the Pacific. (2005). *Urban Environmental Governance - For Sustainable Development in Asia and the Pacific: A Regional Overview*. [Online]. Available: <http://www.unescap.org/publications/detail.asp?id=1126>.
- U.N. Economic and Social Commission for Asia and the Pacific. (2006). "State of the Environment in Asia and the Pacific 2005: Economic Growth and Sustainability." United Nations: Bangkok.
- U.N. Office for the Coordination of Humanitarian Affairs. (2009, March 2). "Philippines: Global downturn threatens poverty goal" *IRIN Humanitarian News and Analysis*. [Online]. Available: <http://www.irinnews.org/PrintReport.aspx?ReportID=83213>.
- UNESCO. (2009, March 13). "New Report Highlights Crucial Role of Water in Development." *Water Online*. [Online]. Available: <http://www.wateronline.com/article.mvc/New-Report-Highlights-Crucial-Role-Of-Water-0001?VNETCOOKIE=NO>.
- "Up in smoke? Asia and the Pacific: The Threat from Climate Change to Human Development and the Environment." (2007, November). *The 5th Report from the Working Group on Climate Change and Development*. New Economics Foundation: London, UK. [Online]. Available: http://www.oxfam.de/download/up_in_smoke.pdf.
- "USAID: Asia and the Near East. Protecting the Environment." (2009). [Online]. Available: http://www.usaid.gov/locations/asia_near_east/sectors/env/index.html.
- USAID/RDMA. (2008, July). *Global Climate Change in the Asia-Pacific Region: An Analysis and Road Map for the USAID Regional Development Mission for Asia*. USAID/Asia, Bangkok. [Online]. Available: http://www.usaid.gov/rdma/documents/RDMA_GCC_Analysis_Road_Map_2008_07_24.pdf.
- Walsh, Kathleen. (2003). "Foreign High-Tech R&D in China: Risks, rewards, and implications for U.S.-China relations." Stimson Center: Washington, DC. [Online]. Available: <http://www.stimson.org/pub.cfm?id=82>.
- Wang, X and DL Mauzerall. (2004). "Characterizing Distributions of Surface Ozone and its Impact on Grain Production in China, Japan and South Korea: 1990 and 2020," *Atmospheric Environment*, 38, pp. 4383-4402.
- Wassman, Reiner. (2009). "Trends in Crop Production and Environment: Emphasizing Climate Change." Presentation at USAID Asia's Future Workshop, 30-31 March 2009, Bangkok, Thailand. [Online]. Available: www.wilsoncenter.org/AsiasFuture.
- Working Group on Climate Change and Development. (2007, November). *Up in smoke? Asia and the Pacific - The Threat from Climate Change to Human Development and the Environment*. New Economics Foundation: London. [Online]. Available:



- http://www.oxfam.de/download/up_in_smoke.pdf.
- World Bank. (2009). "Swimming against the tide: How developing countries are coping with the Global crisis." Background Paper prepared by World Bank Staff for the G20 Finance Ministers and Central Bank Governors Meeting, Horsham, United Kingdom on March 13-14, 2009. [Online]. Available: <http://siteresources.worldbank.org/NEWS/Resources/swimmingagainstthetide-march2009.pdf>.
- World Bank. (2009). "Global Economic Prospects: Commodities at the Crossroads." [Online]. Available: <http://web.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTDECPROSPECTS/GEPEXT/EXTGEP2009/0,,contentMDK:21959964~pagePK:64167702~piPK:64167676~theSitePK:5530498,00.html>.
- World Commission on Dams. (2009). "Dams and Development: A New Framework. The Report of the World Commission on Dams for Decision-Making. [Online]. Available: <http://www.dams.org/report/>.
- "World Population Estimates." (2008). Wikipedia. [Online]. Available: http://en.wikipedia.org/wiki/World_population_estimates. Last modified 30 Nov 2008. Viewed 4 Dec 2008.
- Worsnip, Patrick. (2009, March 12). "Action needed to avoid world water crisis, UN says." Reuters. [Online]. Available: <http://www.reuters.com/article/latestCrisis/idUSN12399772>.

APPENDIX A:
List of Experts Consulted in
Asia Future Project

Appendix A: List of Experts Consulted in Asia's Future Project

Internal Wilson Center Staff Meeting		
	Andrew Maynard	Project on Emerging Nanotechnologies
	Kent Hughes	Science, Technology, America and the Global Economy
	Julia Moore	Project on Emerging Nanotechnologies
	Stapleton Roy	Kissinger Institute
	Evelyn Goh	Visiting WWC Fellow
	Jill Shankleman	Visiting WWC Fellow
San Francisco Roundtable		
	Robert Collier	San Francisco Chronicle/University of California, Berkeley
	David Gordon	Pacific Environment
	Isabel Hilton	China Dialogue
	Xiumin Li	Pacific Environment
	Flynn McDonald	Two Degrees Venture Partners
	Robin Marsh	University of California, Berkeley
	Sean Randolph	Bay Area Council Economic Institute
	David Roland-Holst	University of California, Berkeley
	Ellen Spitalnik	University of California, Berkeley
USAID Agency Staff		
	Heather D'Agnes	GH/PRH/PEC
	Hannah Fairbank	EGAT/NRM/B
	Judith Dunbar	USAID
	Bill Breed	USAID
	Patrick Smith	EGAT
	Alicia Grimes	EGAT/NRM/F
	Anastasia Liu	EGAT/EG
US Government Interagency		
	Charles Barber	Agency for International Development
	Barbara Best	Agency for International Development
	Cynthia Brady	Agency for International Development
	Jennifer L. Conje	Forestry Service
	Heather D'Agnes	Agency for International Development

	Patrick M. Hudak	Department of State
	Jehan S. Jones	Department of State
	Larry Lanes	Department of Energy
	Aubrey K. Larsen	Defense Intelligence Agency
	Erin E. Lillie	Defense Intelligence Agency
	Stephen Lynch	Department of Defense
	Jack May	Department of Defense
	Dan Milstein	Department of Energy
	Suk Bae "Steve" Rhee	Department of State
	Erwin Rose	Department of State
	Ingrid M. Verstraeten	US Geological Survey
New York Roundtable		
	Arlene Adler	Neuberger Berman
	Julie Chan	Pfizer
	Chris Costigan	Pfizer
	Alex De Sherbinin	CIESIN
	Suzanne Dimaggio	Asia Society
	Eileen Kaufman	Social Accountability International
	Matti Lehtonen	UN Peacebuilding Commission
	Sumi Metha	Health Effects Institute
	Howard Shapiro	Mars, Inc.
	Rachel Tronstein	Clinton Global Initiative
USAID Asia Bureau		
	Anne Dix	
	Dennis Sharma	
	Claire Ehmann	
	Blair King	
	Michelle Schimpp	
	Flynn Fuller	
	Gavin Helf	
	Zdenek Suda	

China Meeting		
	Crawford Allan	WWF
	Elizabeth Economy	Council on Foreign Relations
	Erika Downs	Brookings Institution
	Suzanne Giannini-Spohn	Environmental Protection Agency
	Elizabeth Malone	Joint Global Change Research Institute
	Dan Millison	Consultant, Asia Development Bank
	Bruce Rich	Environmental Defense
	Kirk Talbott	First Voice International
	Ma Ying	Shanghai Institute of International Studies
January 23 Meeting		
	Tom Dillon	WWF
	Michele Schimpp	USAID
	Peter Dykstra	Woodrow Wilson Center
	Bob Engleman	Worldwatch Institute
	Ellen Frost	Peterson Institute
	Tony Janetos	Joint Global Change Research Institute
	Joanna Lewis	Georgetown University
	Barney Long	WWF
	Hunter Lovins	Natural Capitalism Solutions
	Theresa Sabonis-Helf	National Defense University
	Ronald Zweig	Aquatic Resources, Coastal Zone & Inland Fisheries Management Specialist
	Bill Breed	USAID
	Avery Ouellette	USAID
January 29 Roundtable		
	Patrick Alley	Global Witness
	Roberto Bocca	BP
	Peter Fiske	Pax Scientific
	Jim Jarvie	Mercy Corps
	David Lustig	Unilever
	Judy Oglethorpe	WWF
	Cristina del Rio Rumbaitis	Rockefeller Foundation
	Howard Shapiro	Mars, Inc.
Individual Interview		
	Jonathan Woetzel	McKinsey and Company (Shanghai Office)

Asia's Future Project Coordinators		
	Mary Melnyk	USAID
	Geoff Dabelko	Woodrow Wilson Center - Environmental Change and Security Program
	Jennifer L. Turner	Woodrow Wilson Center – China Environment Forum
	Linden Ellis	Woodrow Wilson Center – China Environment Forum
	Dorothy Zbicz	Woodrow Wilson Center

APPENDIX B:
List of Expert
Presenters and Participants



USAID
FROM THE AMERICAN PEOPLE



**Woodrow Wilson
International
Center
for Scholars**

The U.S. Agency for International Development and the Woodrow Wilson Center Present:

Asia's Future: Critical Thinking for a Changing Environment
March 30 – April 1, 2009

Speakers

Patrick Alley
Frederik Balfour
ML Chan
Leona D'Agnes

Shobhakar Dhakal
Jim Jarvie
Madar Samad
Pradeep Tharakan
Reiner Wassmann

Affiliation

Global Witness
BusinessWeek
JUCCCE and Quanta Technology, LLC
PATH Foundation Philippines
Global Carbon Project & National Institute of Environmental Studies
Mercy Corps
International Water Management Institute
IRG
International Rice Research Institute

Resource People

Stephan Bognar
Markku Kanninen
Andrew Noble
Ujjwal Prasad Pradhan
Mark Tupper
Sheila Wertz-Kanounnikoff

Affiliation

MJP Foundation
CIFOR
International Water Management Institute
ICRAF
Worldfish
CIFOR

Asia's Future Project Team

Geoff Dabelko
Linden Ellis
Mary Melnyk
Jennifer Turner
Dorothy Zbicz

Affiliation

Wilson Center, Environmental Change and Security Program
Wilson Center, China Environment Forum
USAID/Washington/Asia Bureau
Wilson Center, China Environment Forum
Independent Consultant

U.S. Embassy Bangkok

Selma Garrido

Office

Regional Environment Officer

USAID Participants

Rene Acosta
Oliver Agoncillo
Patrick Alley
Orestes Anastasia
Andrei Barannik
Rob Bertram
Winston Bowman
Angela Rodrigues Da Cruz
Barry Flaming
Ronit Kirshner Gerard
Warren Harrity
Angela Hogg
Catalina (Lina) Jensen

Office

RDMA/Coral Triangle Initiative
Philippines/Office of Energy and the Environment
Global Witness
RDMA/Regional Environment Officer
Central Asia Region
Washington/Environment & Science Policy Officer
RDMA/Regional Environment Officer
East Timor/Poverty Reduction Officer
RDMA/Regional Environment Officer
Cambodia/Office of General Development
RDMA/Project Development Officer
Cambodia/Poverty Reduction Officer
Afghanistan/Alternative Development and Agriculture



USAID
FROM THE AMERICAN PEOPLE



**Woodrow Wilson
International
Center
for Scholars**

Teresa Leonardo	Washington/Global Climate Change Team
Hal Lipper	RDMA/Project Development Officer
Azharul Mazumder	Bangladesh/Economic Growth-Environment
Aurelia Micko	Philippines/Office of Energy and the Environment
Joshua Mike	USAID/RDMA
Daniel Miller	India/General Development Officer
Alfred Nakatsuma	Indonesia/Basic Human Services
John Pasch	RDMA/Regional Environment Officer
Piyachatr Pradubrag	USAID/RDMA
Saengroaj Srisawaskraisorn	RDMA/Regional Environment Officer
Michael Stievater	RDMA/General Development Officer
Jesse Taweekan	RDMA
Ann Techasarin	RDMA
Sara Walter	RDMA/Project Development Officer
Heather Ward	RDMA
Corina Warfield	RDMA
Shelia Wertz-Kanounnikoff	Center for International Forestry Research
John Wilson	USAID/Washington/Asia Bureau

APPENDIX C:
USAID Asia's Workshop —
Bangkok, Thailand



USAID
FROM THE AMERICAN PEOPLE

ASIA

Conserving Biodiversity

2009



Marco Polo sheep, an endangered species found in the mountainous Wakhan Corridor of Afghanistan and adjoining regions of China, Pakistan, and Tajikistan, are under serious threat from poaching and uncontrolled trophy hunting. USAID supports conservation activities for the Marco Polo sheep in the Wakhan Corridor and programs in other biologically important areas of Afghanistan, such as Band-e Amir, which is a proposed UNESCO World Heritage Site. (Photo: Wildlife Conservation Society)

(Photo: Wildlife Conservation Society)

ASIA BUREAU BIODIVERSITY PROGRAMS

Afghanistan, Bangladesh, Cambodia, Indonesia, Nepal, Papua New Guinea, Philippines, Regional Development Mission for Asia, Timor Leste, and Vietnam

CONTACT INFORMATION

Mary Melnyk
Environment Officer
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BACKGROUND

USAID pioneers conservation activities that address economic growth, governance, and security challenges in Asia. USAID activities conserve over 6 million hectares of biologically significant areas throughout Asia, using innovative approaches, such as linking conservation with income generation and public-private sector alliances. In fiscal year 2008, USAID's support for biodiversity in Asia totaled over \$40 million.

PROGRAMS

COMBATING ILLEGAL WILDLIFE TRADE

USAID assists members of the Association of South East Asian Nations in implementing a regional Wildlife Enforcement Network to counter the multi-billion dollar black market in illegal wildlife. The network provides the means for government agencies to respond effectively to illegal wildlife trade occurring between countries, through intelligence exchange and joint cross-border operations. The "SOLD-OUT" public awareness campaign against illegal wildlife trade in Thailand generated over 200 media stories on wildlife crime, raising the profile of this issue. This success has made the network a model for a similar effort in South Asia.

BUILDING ALLIANCES TO REDUCE ILLEGAL LOGGING

Forest loss due to illegal logging will contribute to the extinction of an estimated 20 percent of Asia's species during this century. Public-private alliances to reduce illegal logging across Southeast Asia are catalyzing the shift in global trade away from illegal wood products to legal and conflict-free ones. USAID partners have signed memoranda of understanding with 29 forest enterprises, with commitments to improve forest management in approximately 2.5 million hectares of tropical forest and initial improvement achieved in over 600,000 hectares.

SAFEGUARDING MARINE AND COASTAL RESOURCES

The Coral Triangle Initiative (CTI) is a multilateral partnership to protect a 5.7 million square kilometer region known for its extraordinary marine biodiversity. The CTI is a commitment by the governments of Indonesia, Malaysia, Papua New Guinea, the Philippines, Timor Leste, and the Solomon Islands to safeguard the region's marine and coastal biological resources by promoting sustainable fisheries, sustainable livelihoods, and climate change resilience and adaptation measures.

RESOLVING RESOURCE CONFLICT

From Afghanistan to Papua New Guinea, at least 13 countries experience violent conflict over forest resources. According to USAID analyses, from the 1990s to 2005, 1.7 million Cambodians were victims of evictions from or violence over forest lands, and 40 percent of the population of

FACT SHEET CONTINUED



Forest user group members in Nepal remove an animal trap placed by an illegal poacher in Bardia District. Forest user groups have promoted principles of good governance such as participation, inclusion, transparency, and accountability, while improving the management of forests. (Photo:

CARE/Nepal)



Indigenous Bugkalot upland farmers in Cadikitan, Northern Luzon, Philippines, have been awarded a certificate of ancestral domain rights to their land and are helping protect the forests by maintaining checkpoints along the access roads. (Photo: DAI)

Indonesia's forested provinces was affected by deforestation stirring grievances or violent conflict. As a result, throughout Asia, USAID has been working to clarify who owns the forests, facilitate community mapping of forests, and establish standards that reject conflict timber from markets. In the Philippines, changes have occurred to allow local governments and communities to co-manage forest lands with the environment department, resulting in improvements of nearly 300,000 hectares, most of which were formerly under dispute. USAID has also successfully used forest and marine conservation as a tool for reconciliation in Muslim Mindanao.

ENGAGING STAKEHOLDERS TO PROTECT ORANGUTANS

In Indonesia, USAID's Orangutan Conservation Services Program participated in a multi-stakeholder process that resulted in a national plan to ensure the long-term survival of the orangutan. Indonesian President Susilo Bambang Yudhoyono demonstrated the country's highest support for the plan by launching it at an event at the United Nations Climate Conference in Bali in 2007. The program and its partners are working to conserve 3.3 million hectares that are home to 40 percent of Indonesia's orangutan population.

INCREASING BIODIVERSITY THROUGH CO-MANAGEMENT

In Bangladesh, USAID has helped establish 80 wetland sanctuaries that are co-managed by local communities and the government. As a result, migratory birds returned in great numbers from 300 birds of 16 species in 2004 to 7,000 birds of 33 species in 2006. In addition, over 6,000 Forest Department staff and community members have been trained to effectively manage five protected areas through shared authority and responsibility for conservation. These successful co-management models are now being nationalized for all critical ecosystems in Bangladesh, including the Sundarbans – the world's largest mangrove ecosystem.

MAINTAINING BIODIVERSITY CORRIDORS

In the Greater Mekong Region, USAID aims to connect important natural areas, such as national parks, to restore biodiversity and encourage wildlife migration. The program is implementing a pilot biodiversity corridor in Vietnam while establishing policies for payments for environmental services. Lessons learned are shared with other countries in the region. The program has improved the management of 650,000 hectares in the pilot corridor and restored over 1,000 hectares of degraded forests by planting five endangered native timber species.

ASIA'S FUTURE

Critical Thinking for a Changing Environment

By Dorothy C. Zbicz, Ph.D.

With input from Jennifer Turner, Ph.D., and
Linden Ellis China Environment Forum

Funded by and prepared for the USAID Asia Bureau through
an agreement with the USAID Global Health Bureau by:

The Woodrow Wilson International Center for Scholars
The Environmental Change & Security Program
The China Environment Forum

The author's views expressed in this publication do not necessarily
reflect the views of the United States Agency for International
Development or the United States Government.

Edited by
Peter Marsters

Copy Edited by
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Design and Production
Sarah Coon

Interns
Kexin Liu, Alan Campana, Tod Kaiser, Rongkun Liu, William Rogers,
Erika Scull, Elisa Lai

Cover Photograph
"Rapeseed Fields, Yunnan Province, China" by Luke Partridge
Photograph available at www.sxc.hu

