The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) Working Group showed that from 1850 to 2005, the average global temperature increased by about 0.76 degrees Celsius, and global mean sea level rose by 12 to 22 centimeters over the last century. This authoritative report concluded that the “warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level.”

Consequently, the future resilience of ecosystems will not be spared by climate change. The IPCC report cited that the resilience of many ecosystems is likely to be exceeded this century by an unprecedented combination of climate change; associated disturbances (e.g., flooding, drought, wildfire, insect infestations, and ocean acidification); and other drivers of global change such as land use change, pollution, and the over-exploitation of resources.

There is ample evidence that climate change affects biodiversity. The Millennium Ecosystem Assessment reports that climate change is likely to become the dominant direct driver of biodiversity loss by the end of the century.

The IPCC report predicts that in Asia up to 50 per cent of biodiversity is at risk, and as much as 88 per cent of coral reefs may be lost in the next 30 years as a result of climate change. Globally, about 20 to 30 per cent of species will be at an increasingly high risk of extinction – possibly succumbing by year 2100, as global mean temperatures exceed two to three degrees Celsius above pre-industrial levels.

The implications of climate change for the ASEAN region’s biodiversity resources are projected to be serious. Climate change will exacerbate the many factors that are already endangering biodiversity in Southeast Asia. These stressors will be magnified over time. Much uncertainty remains over the magnitude of climate change in the ASEAN region, and how this will affect biodiversity resources.
It is Southeast Asia’s less developed nations who are most vulnerable to climate change, as its impact is expected to further worsen poverty, particularly the earning capacity of the poor, and exacerbate the already inadequate provisions for health and livelihood.

A significant number of the region’s population remains underprivileged, subsisting mainly on the uninterrupted use of biodiversity resources, the losses of which are scaling up and proceeding largely unabated. These challenges buttress one another: climate change exacerbates poverty and accelerates biodiversity loss; poverty sequentially compels the poor to exploit the environment unsustainably. Degraded environments, in return, intensify poverty and hasten climate change. The bottom line is that if deforestation in the region continues at its current rate, Southeast Asia stands to lose up to three-quarters of its forests and up to 42 per cent of its biodiversity by 2100.

Impact on Species.
Climate change is expected to impact species by affecting their populations, distributions and habitats. While habitat loss and fragmentation have been the primary drivers of past and predicted species extinctions, climate change is now putting additional pressure on many animals and plants. The risk of extinction is increasing for species that are already vulnerable, particularly those with strict habitat requirements and restricted ranges.

Some examples of the impact on species of climate change in Southeast Asia are the following:

- The Irrawaddy dolphin is a coastal species that relies on the flow of fresh water from estuaries in Bangladesh and elsewhere in Southeast Asia. The Wildlife Conservation Society reported that changes in freshwater flow and salinity may have an impact on the species’ long-term survival.

- The hawksbill turtle is an ocean-going reptile with a temperature-dependent biology. Specifically, higher temperatures result in more female hatchlings, a factor that could impact the species’ long-term survival by skewing sex ratios.
Impact on Coastal and Marine Resources. The Asian Development Bank (ADB) cites that climate change will affect coastal and marine resources by: 1) inundating low-lying areas, such as the delta of Cambodia and Viet Nam and certain parts of Bangkok in Thailand, through rising sea levels; 2) affecting seagrass beds in shallow tidal and sub-tidal coastal marine environments along the ASEAN region’s coastline, affecting entire food chains that thrive in seagrass ecosystems, including the “dugong” and several species of turtle and fish that feed on seagrass itself; and 3) amplifying the scale of coral bleaching and degeneration of coral reefs.

In tropical temperate nearshore habitats, climate change causes a shift in species ranges and tolerance. Coral bleaching occurs, caused by high water temperatures that stress corals, leading them to expel the colorful symbiotic algae that corals need for survival, growth and reproduction. Increases in temperature over a long period of time will eventually kill corals, thereby diminishing ecosystem function and service. Fish population is affected by this occurrence, as the degradation of coastal habitats reduces its capacity to sustain fisheries. Poverty increases and food security diminishes as fish stocks are depleted. This drives fishers to use more and more destructive methods to catch what meager supply is left.

The ASEAN Centre for Biodiversity and the Haribon Foundation in the Philippines conducted a study in 2009 on the impacts of climate change on biodiversity in Southeast Asia. Initial findings show that avian response to climate change causes species distributions to shift pole-wards and up-slopes if current and projected ranges do not overlap, and if the species are unable to migrate. Interactions between climate change and landscape changes will impede range shifts, resulting in range contractions and potential extinctions. In general, though research on the ecological impact of climate change on amphibians and reptiles is still in the early stages, a few studies have already linked climate change directly to ongoing population declines and species extinctions in herpetofauna.

The direct and indirect impacts of climate change to marine mammals are expected. Direct impacts include temperature and species range alterations; effects on foraging and reproduction due to sea level rise, change in species range and high juvenile mortality; massive die-offs; and shifts in distribution due to the El Niño. Indirect impacts include shifts in the distribution and productivity of prey species due to changes in temperature range, and because nursery grounds for many fish and invertebrate species that are prey to marine mammals will be affected by changes in storm frequency and intensity.
In the fisheries sector, climate change will likely force critical species of fish to migrate towards the poles, gravely disrupting fisheries and the overall marine ecosystem. Warmer water will lead to the large-scale redistribution of these species, mostly moving towards the poles – shifting by more than 40 kilometers per decade, on average.

Impact on Forests.
The effects of climate change on forests are manifested through the increased occurrence of forest fires during the dry season; the rising number of pest- and disease-infestations in forest areas; the marginalized survival of seedlings consequent to changes in precipitation patterns; an upsurge in the population of invasive alien species; and intensifying soil erosion due to intermittent drought and flooding.

Researchers studying forest fires in Indonesia say that the destruction of forests and peatlands in the country is making it more prone to forest fires, especially during the dry El Niño years. Moreover, according to Dr. Robert Field of the University of Toronto, there was a significant increase in the intensity and scale of fires since the early 1990s, owing to industrial logging and the rapid expansion of oil palm plantations. Dr. Field’s team found that Sumatra has suffered from massive forest fires since the 1960s. In Indonesian Borneo, however, where the industrial conversion of forests started later, forest fires became an occurrence beginning only in 1982, and triggered mainly by the drought years.

In Viet Nam, the Forestry Management and Protection Division of the Ministry of Agriculture and Rural Development (MARD) recorded 226 fires in the first six months of 2009. During this period, a total forest area of 1,200 hectares was destroyed. According to MARD, slash-and-burn agriculture is one of the major causes of forest fires in the country. The occurrence of fires, however, also rose during periods when temperature readings reached over 40 degrees Celsius.

Impact on Agriculture.
Agriculture is one of the most vulnerable industries to the projected impacts of climate change.
Climate change reduces crop yields and intensifies livestock mortality consequent to heat stress and droughts; increases the loss of arable lands due to rising sea levels; and escalates the outbreak of pests and diseases.

The ADB reported that extreme weather events have accounted for economic damage to agricultural production in Indonesia, the Philippines, Singapore, Thailand and Viet Nam.

In 2004, a group of scientists studied the projected impacts of global warming on crop yields. They examined temperature trends and the relationship between temperature and rice yield at the International Rice Research Institute from 1979 to 2003, and found that grain yield declined by ten per cent for every 1 degree Celsius increase in growing-season minimum temperature during the dry season.

Southeast Asia's status as a major producer of grain and various industrial crops is threatened by drought, heat stress and typhoons – factors that are all offshoots of climate change. A significant decline in fish production due to changes in sea levels, salinity and sea temperature has also been predicted. All told, such downtrends in production are likely to aggravate the existing food insecurity in the region.

Impact on Human Health.
According to the World Health Organization (WHO), climate change is affecting the following fundamental requirements for health: sufficient food, clean air and safe drinking water. A recent assessment concluded that the global warming that has begun since the 1970s was accountable for over 140,000 excess deaths annually by year 2004.
Epidemics of dengue, malaria and other vector-borne diseases are the principal health impacts of climate change. Dengue cases are likely to be amplified by temperature elevations and variability in precipitation. The consequent alterations in the environment create favorable breeding conditions for mosquitoes, allowing them to multiply unabated.

In the Philippines, cases of dengue significantly increased from an average of 5,000 cases a year in the early 1990s, to 35,500 cases in 2003. Increasing numbers were similarly observed in Indonesia, Thailand and Viet Nam.

Cases of diarrhea-related illnesses are expected to increase consequent to the escalating frequency of drought and floods. Rising sea levels will promote the proliferation of water-borne infectious diseases.

The poor communities are the ones expected to bear the brunt of the impacts of climate change on health, due to their already compromised health prospects.

Endnotes


2 ibid.


Nozawa, Cristi Marie C. 2009. Climate Change and Biodiversity: Potential Impacts on Species, Sites, Habitat and People. ASEAN Conference on Biodiversity.


*ibid.*

op. cit.


17 ibid.


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Written by
Tuesday, 15 November 2011 09:17 - Last Updated Wednesday, 16 November 2011 15:08

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26
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Source

ASEAN Centre for Biodiversity. 2010. ASEAN Biodiversity Outlook: Drivers of Biodiversity Loss, pp83-87. Los Banos Laguna, Philippines 2010.