

Assessments of climate change scenarios and impacts on the key sectors

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Drivers of Environmental Degradation and Climate Change

Industrialization

- Industrialization has intensified contributing to 2 decades of strong economic growth fueled by intense exploitation of natural resources;
- In 2008, industry's share of gross domestic product (GDP) reached 40% while agriculture's share declined to 22%. Viet Nam's industrial growth has driven annual increases in energy consumption, and corresponding GHG emissions

Drivers of Environmental Degradation and Climate Change

- **Urbanization:** one of the fastest urban transitions in the world. It is the main driving force for economic growth.
- 27% live in urban areas => expected to increase to 45%, or 46 million people, by 2020 and to 50% by 2030.
- Cities already account for 70% of GDP

Drivers of Environmental Degradation and Climate Change

Agricultural intensification and encroachment:

Land use intensity is high, with yields above the mean level for Asia and an average of nearly two rice crops per year;

Pressure to develop land and the conversion of marginal lands previously regarded as unsuitable for agriculture, with consequent deforestation and over-intensive land utilization is leading to greater levels of soil erosion and reduced soil fertility

Predicted Climate Threats

- Climate and climate change scenarios for Viet Nam
- Viet Nam has a tropical monsoon climate. The highest annual mean temperature is 27.7°C and the lowest is 12.8°C. Average annual rainfall usually ranges from 1.400 to 2.400 mm.
- Viet Nam's acute vulnerability to sea-level rise, temperature increases, precipitation changes, and extreme weather events; According to "Climate change and sea level rise scenarios for Viet Nam" published in 2012, in the medium emission scenario, by the end of the 21st century, annual mean temperature would increase by from 2°C to 3°C; annual rainfall would increase by from 2% to 7%; and average sea level would rise by from 57 cm to 73 cm.
- Most of the studies have focused on the Mekong Delta, and to a lesser extent the Red River Delta.
- These studies have employed a variety of tools, models, and approaches

CLIMATE CHANGE IMPACTS AND ADAPTATION MEASURES

- Climate change scenarios:
- Published in 2009, climate change scenarios for Viet Nam's climate zones in the 21st century include projections of temperature, rainfall and sea-level rise. The following climate change impact assessments were made based on the medium climate change scenario.

Water resources

- Annual flows of rivers in the North and Northern area of North Central Coast are set to increase. In contrast, annual flows of rivers in the southern area of North Central Coast to the northern area of South Central Coast are bound to decrease.
- Flood flows in most rivers tend to increase while flows during dry season are declining.
- Annual potential evapotranspiration rapidly scales up in the South Central Coast and the Mekong Delta regions, reflecting the highest level of increase.
- After 2020, the groundwater level may drop drastically.
- Adaptation measures must focus on planning for the sustainable development of water resources in river basins and prioritize the review of existing, and the development of new systems of reservoirs, dams, and dykes, to incorporate climate change factors.

Coastal zones

- With rising sea level, the annual flood-ridden area will expand. The Mekong River Delta would be most impacted, containing as much as 90% of the national floodplain area. Sea-level rise may also lead to higher risks of saltwater intrusion of rivers and underground water resources, causing serious social and economic losses.
- Climate change may have serious impacts on coastal ecosystems, reserves and mangrove forests.
- By the year 2100, climate change will affect approximately 4.4% of Viet Nam's population, cause the loss of 5,469 km² of arable land and the submersion of 168 km² of aquaculture area and 320 km² of forest land would be submerged.
- Adaptation strategies for Viet Nam are classified into three categories: full protection, adaptation and withdrawal.

Agriculture

- Total annual temperature is projected to increase between 8% and 11% by 2100. In most regions, the number of days when temperatures exceed 25°C will increase notably while the number of days when temperatures drop below 20°C will decrease. Water demand for agriculture may increase two or three-fold compared with that of 2000.
- Tropical plants will tend to shift further north and towards higher altitudes.
- Crop water shortage would be exacerbated with decreased coverage of hygrophytes and rising evapotranspiration rates.
- Spring crop outputs are set to decline at a faster rate than summer crop outputs.
- Winter maize productivity may increase in the Red River Delta but decrease in Central Coast and the Mekong River Delta.
- Climate change may also threaten the life cycle (i.e. growth and reproduction) of cattle and increase the incidence and spread of diseases.

Agriculture (*cont.*)

- Adaptation measures include: Short-term measures (controlling erosion, building reservoirs, picking crops and crop growing seasons that suit new climate conditions, developing new cropping and stockbreeding techniques, etc.).
- Long-term measures (developing alternative cropping patterns, crossbreeding; modernizing cultivation techniques).
- Management and planning (developing new crop-livestock systems, designing new agricultural incentive systems, setting up insurance policies for crops and cattle, etc.).

Forestry

- Climate change will have a diverse range of impacts on forest ecosystems and flora.
- By 2100, native forest cover comprised of closed tropical moist semi-deciduous forests and closed evergreen forests, amongst others, will decrease. The ecosystems of closed tropical moist semi-deciduous forests are likely to be most affected by climate change.
- Climate change will heighten risks of forest fires in all regions, primarily during the dry-hot season. In addition, warmer conditions will facilitate the spread of forest pests, hampering the growth of forest ecosystems.
- Adaptation measures for forestry focus on promoting the sustainable management and development of forests, undertaking research, selecting and expanding coverage of drought and pest resistant species, and establishing a forest fire management and prevention program.

Aquaculture

- Climate change adversely impacts the ecosystems of coral reefs, maritime and estuarine sea grass beds, and causes reductions in fish stocks.
- Sea-level rise would exacerbate salinization in coastal zones, causing the retreat of mangrove forests with accompanying losses in habitat for numerous species.
- Furthermore, the advance of saltwater leads to the replacement of freshwater species by their brackish and saline water counterparts in estuaries and coastal lagoons.
- Finally, rising temperatures weaken aquatic species and foster the growth of harmful microorganisms.
- Adaptation measures must focus on developing specific aquaculture planning for different eco-regions, preserving marine biodiversity and ecosystem, cultivating species more tolerant to higher water temperatures, and building capacity in aqua-farming management.

Energy and transportation

- Rising temperatures will raise energy consumption for climate-sensitive sectors.
- Electricity transmission and distribution networks, along with oil-rigs, oil and LNG pipelines and shipments will be negatively impacted by rising sea levels and extreme weather. Hydroelectric power generation will be affected by changing river flows, posing new challenges to the management of reservoirs.
- Industrial facilities, equipments, power stations and transmission lines in coastal zones face the risk of flooding.
- A rise of 100 cm in sea level could lead to the submersion of 11,000 km of road infrastructure, paralyze the country's transportation activities and cause considerable damage to the economy.
- Adaptation measures focus on mainstreaming climate change issues into national development strategies, planning in energy and transportation, enhancing energy efficiency and conservation, and making improvements, reinforcements and modification to energy and transportation infrastructure in regions vulnerable to climate change.

Human health

- Climate change impacts human health directly through changing climate conditions, abnormal heat waves and increased occurrence of natural disasters.
- Indirectly, rising sea level and temperature affect agricultural land, food security, and increase the risks of food shortages while warmer conditions facilitate the spread of infectious diseases and epidemics.
- Adaptation measures need to focus on reviewing and developing new standards and regulations for urban wind load, heat load and drainage. In vulnerable areas, urban planning must be updated to take into consideration impacts of natural disasters.
- Capacity building for local community health-care institutions needs to be strengthened.
- Weather forecasts, and more importantly disaster and disease break-out warnings, need to be improved and their accessibility enhanced. Research and development should be encouraged and information on climate change and epidemics should be widely disseminated.

Transboundary Issues Linked to Climate Change

- Management of the Mekong River and Red River: A high-priority transboundary issue linked to environmental degradation and climate change will be the management of the Mekong River and Red River;
- With decreasing water availability due to shifting seasonal precipitation patterns and upstream hydropower, agricultural, and urban development, tensions between riparian countries may increase over water allocation, management, and quality

Thank you !