DISTURBANCES TO ECOLOGICAL RESOURCES IN THE MEKONG RIVER BASIN

MEKONG RIVER COMMISSION
MRC
FOR SUSTAINABLE DEVELOPMENT

Lesson Learning Goals

At the end of this lesson you should be able to:

- ➔ Identify development activities which pose a threat to ecological sustainability in the Mekong River Basin
- ➔ Discuss the current state of the MRB's ecological resources
- ➔ Provide specific examples of adverse environmental consequences of economic development in the Basin

Ecological Disturbances in the MRB

- Ecological resources of the MRB have been diagnosed as fair to poor following a two-decade long period of economic growth in Thailand and post-war reconstruction in Cambodia, Lao PDR and Vietnam
- These activities have led to large scale, unsustainable resource exploitation in the MRB and have resulted in degradation of the Basin's ecological resources

Ecological Disturbances in the MRB (Cont'd)

- Two main contributors to degradation of ecological resources in the MRB are:
  - Inadequate infrastructure (i.e., water supply, solid waste disposal and sewage treatment) for major urban centres has led to accelerating decline in water quality
  - Continuing poverty in rural communities and lack of awareness of environmental issues resulting in unsustainable harvesting of ecological resources (e.g., fisheries) and expansion of primary agriculture into ecologically-sensitive areas

Threats to Ecological Sustainability

- Human activities are impacting extensively on the integrity of the Basin's ecosystems, which are increasingly threatened by development
- Biodiversity in the MRB, which is among the richest in the world, is being impacted by habitat loss as a result of forestry, agriculture and hydropower development combined with excessive harvesting of wild flora and fauna
- The result is rapid declines in fisheries, species diversity and wildlife populations

Threats to Ecological Sustainability (Cont'd)

- Pressures on environmental resources in the MRB are closely interlinked
- Factors such as poverty, insecure land tenure, human migration, and lack of environmental awareness, have combined to cause environmental degradation
- Natural resources have been exploited rather than conserved or harvested in a sustainable manner

Threats to Ecological Sustainability (Cont'd)

- Intensifying development in the MRB will further alter the physical landscape, ecosystem integrity, and living conditions for humans
- Development is inevitable
- Therefore, sound management will be necessary to mitigate expected environmental and social impacts and to ensure the long-term sustainability of natural resources, the environment and quality of life of the Basin's people

Hydrological Change

- Hydrological regimes are subject to direct or indirect changes as a result of development activities in the MRB (e.g., hydropower development, navigation improvements, water diversion, forestry, dredging and industrial and urban expansion)
- Undesirable impacts of development activities with respect to the hydrological regime include:
  - Impairment of quality and quantity of water supply
  - Degradation of critical fish habitat

Hydrological Change (Cont'd)

- Flood control measures (e.g., mainstream hydropower and water diversion schemes) have high potential to affect annual flood pattern and dry season flows
- To date, mainstream water diversion and hydropower projects have not been assessed for their Basin-wide hydrological impacts; only recently have assessments of cumulative effects of multiple projects within one country or individual projects in more than one country been attempted

Water Quality

- Deteriorating surface water quality in the MRB threatens resources and sustainability
- Pollution impacts include:
  - Nutrients from agricultural run-off, industrial effluent discharges and domestic wastes can lead to severe eutrophication, especially in lakes
  - Organic loadings from industrial, agricultural and urban development can negatively impact on aquatic organisms (e.g., depleted dissolved oxygen)

Water Quality (Cont'd)

- Loadings of chemicals and metals from industrial effluent and urban waste water discharges and run-off can reduce drinking water and irrigation water quality and negatively impact on aquatic organisms
- Increased sedimentation occurring as a result of land use changes such as agriculture, forestry, mining and urbanization can impact hydrological regimes, disturb aquatic ecosystems and fisheries, and affect navigation

Wetland Depletion

- Wetlands are increasingly impacted by economic activities, e.g.:
  - harvesting of wetland trees and flooded forests occurs for timber, fuel wood, charcoal, and construction materials
  - clearing for agricultural use and fish capture
  - coastal mangrove habitat is extensively cleared for shrimp cultivation
  - encroachment by urban expansion and industrialization results in incremental loss of urban wetlands

Wetland Depletion (Cont'd)

- Destruction and degradation of wetlands can severely impact on fish and bird populations
- Continuing loss of wetlands in lower MRB countries is likely contributing to declining fish and bird populations and an overall reduction in biodiversity
- Of particular concern is the potential for degradation of critical wetland systems (e.g., Great Lake and Tonle Sap River; RAMSAR designated wetlands)

Economic Development

- MRB riparian country economies, although impacted by overall economic recession in SE Asia, are expected to continue to grow rapidly
- Economic growth results in increased rates of resource use with corresponding intensification of pressure on sensitive ecosystems
- Management challenge is to benefit from economic growth through sustainable consumption of natural resources while limiting environmental degradation

Major Development Activities

Development activities in the MRB include:

- agriculture
- logging
- fisheries
- mining
- irrigation and water diversion
- hydropower
- transportation
- urban and industrial

Agricultural Development

- Agriculture is the predominant economic sector in the MRB (e.g., involving about 3/4 of population in Cambodia and Vietnam)
- Intensification of farming involving increasing use of agro-chemicals (i.e., fertilizers and pesticides) can have serious impact on surface and groundwater quality and health of both humans and animals; particularly persistent pesticides which, although effective, pose a serious long-term human health and environmental threat

Agricultural Development (Cont'd)

- Shifting cultivation is widely criticized as a significant contributor to forest degradation and erosion; traditional shifting cultivation is a sustainable practice but, with increasing population densities, cultivation cycles become too short, land becomes less fertile and the practice becomes unsustainable
- Widespread clearing of forests for expansion of agriculture exacerbates erosion and soil problems caused by deforestation; farming of forests lands usually not sustainable due to declining yields in nutrient-poor soils

Forestry Development

- Rural populations depend predominantly on the use of fuel wood for their cooking and heating needs; impacts are generally much less severe than for commercial logging operations
- Commercial logging operations pose a serious threat to forest ecosystems in the MRB; export demand for high-value logs and lumber provides the impetus for intensive logging
- Intent of logging bans and moratoriums has been largely frustrated by illegal or unregulated logging

Forestry Development (Cont'd)

- Afforestation rates are generally insufficient to compensate for forest depletion as a result of logging operations
- Second growth forests provide little of the biodiversity of virgin forest
- Logging impacts to aquatic and terrestrial fauna utilizing stream and river habitat not addressed by afforestation (e.g., monoculture forests typically do not provide beneficial forest cover preferred by aquatic and terrestrial fauna)

Forest Depletion

- Difficult to assess the relative impacts of human activities but cumulative effects of uncontrolled activities are clearly evident in all MRB countries
- Management responses have generally not been effective in addressing the problem of forest loss
- Consequences of widespread forest loss include:
  - loss of wildlife and biodiversity
  - damage to aquatic habitats and wetlands
  - increased erosion and sedimentation
  - disturbed hydrological regime

Fisheries Development

- Fishing and aquaculture are an important source of low-cost and high-quality protein for the people of the MRB as well as generating export earnings
- Major capture fisheries take place in:
  - the Mekong River and its major tributaries
  - the Great Lake and Tonle Sap River
  - the floodplains extending downstream from Phnom Penh to the Mekong Delta in Vietnam
  - reservoirs in Lao PDR and northeastern Thailand
  - the brackish waters of the Mekong Estuary

Fisheries Development (Cont'd)

- Capture fisheries provide 90% of total production with culture fisheries making up remaining 10% but balance is shifting as capture fishery catches decline due to over-fishing and habitat destruction
- Issues relating to culture fisheries include:
  - health and hygiene concerns related to traditional small scale culture fisheries
  - poorly-planned commercial aquaculture can be unsustainable; leading to destruction of terrestrial flora and deterioration of surface water quality

Impacts to Fisheries

- Limited data is available of fisheries populations in the MRB
- Likely that unsustainable capture rates combined with impacts to habitats from development activities are severely stressing fish populations
- Populations are further stressed by declining water quality due to pollution and reduced flow rates as a result of water diversions for irrigation and dam construction

Mining Development

- Mining not yet extensive but likely to expand; Lao PDR has significant mineral resources; Cambodia and Vietnam also have exploitable resources
- Mining can have serious environmental impacts if operations are not properly regulated
- Potential impacts include:
  - vegetation destruction
  - landscape modification (i.e., aesthetic)
  - surface and groundwater pollution
  - air pollution

Mining Development (Cont'd)

- Regulation of mining activities is complicated and consequently made less effective by several factors:
  - Lack of scientific understanding of potential environmental effects
  - Non-comprehensive nature of environmental impact assessments
  - Poor scrutiny of actual impacts during mining operations
  - Inaccessibility of remote mine locations

Irrigation and Water Diversions

- Although irrigation development is widespread, large scale diversions have been confined primarily to the upper MRB
- Environmental impacts from major diversion projects include:
  - hydrological changes
  - downstream wetland and estuary ecosystems dependent on seasonal flooding may be impacted
  - losses of inundated forests to create reservoirs
  - resettlement of people

Hydropower Development

- The Mekong River has considerable hydropower potential (i.e., highest in east Asia)
- Main driver for hydropower development is demand for electricity, particularly in Thailand and Vietnam
- Hydropower projects have a high potential to cause environmental and social impacts
- Although dam projects can have positive impacts (e.g., flood control), careful consideration must be given to negative impacts

Hydropower Development (Cont'd)

- Fisheries are likely to be most severely impacted by hydropower development
- Potential impacts result from:
  - water level fluctuations
  - water quality degradation
  - loss of spawning habitat through inundation
  - loss of spawning and rearing habitat through changes in hydrology

Transportation Development

- Substantial transportation development is planned or proposed to facilitate development in the Greater Mekong Subregion
- The centrepiece of transportation development is the construction of road corridors:
  - eastern seaboard connection between Bangkok - Phnom Penh - Vung Tau
  - east-west connection between Thailand - Lao PDR - Vietnam
  - north-south connection between Chang Rai - Myanmar - Lao PDR - Kumming, China

Transportation Development (Cont'd)

- Development of transportation links and associated infrastructure (e.g., bridges, power lines) has a high potential to cause environmental and social impacts such as:
  - encroachment of pristine environments with resulting loss of biodiversity
  - impairment of fisheries and aquatic ecology
  - increased erosion and sedimentation
  - loss of cultural values and/or tourism potential
  - human resettlement
  - air pollution

Urban and Industrial Development

- Urbanization in MRB is relatively low at approximately 11% but is expected to increase significantly in the next decade as rural-urban migration continues
- Industrialization in the MRB has been limited compared to other SE Asian countries; this pattern is likely to change in the next decade as ongoing and planned infrastructure developments are completed

Urban and Industrial Development (Cont'd)

- Environmental implications of expanding urbanization and industrialization in the MRB are profound; undesirable impacts observable in other industrialized countries include:
  - degraded receiving water quality
  - impacts to fisheries
  - loss of aesthetic values
  - reduced quality of life (e.g., air pollution)
  - overwhelmed waste treatment facilities

Concluding Thoughts

Important points to remember are:

- Environmental health in the MRB is increasingly threatened by intensifying development pressures
- The Basin's ecological resources have been diagnosed as being in fair to poor condition
- Adoption of sound management practices will be necessary to mitigate development-related impacts and ensure the sustainability of ecological resources in the MRB