
NATURAL RESOURCES IN
THE MEKONG RIVER BASIN
MEKONG RIVER COMMISSION
MRC
FOR SUSTAINABLE DEVELOPMENT

Course Learning Objectives

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

- Discuss limitations of conventional environmental management
- Identify the concepts, principles and tools of integrated resource and environmental management (IREM)
- Describe potential applications of IREM in MRB riparian countries and in the Basin overall
- Give examples of IREM implementation challenges and barriers

Lesson Learning Goals

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

- Define environmental resources
- List the principle natural resource sectors in the MRB and describe their environmental significance
- Identify development pressures on natural resources in the Basin
- Discuss the present state of the Basin's natural resources

What are Natural Resources?

- Defined by human perceptions, wants, technological skills, legal, financial and institutional arrangements
- They are subjective, relative and functional

Natural Resources and Values

Physical Resources	Ecological Resources	Human Use Values	Quality of Life Values
Surface Water Hydrology	Aquatic Ecosystems	Agriculture	Population Demographics
Surface Water Quality	Wetlands	Aquaculture & Fisheries	Public Health
Groundwater Hydrology	Terrestrial Ecosystems	Forestry	Education
Groundwater Quality	Fish & Wildlife	Tourism	Employment
Soils	Biodiversity	Industry	Poverty
Geology & Minerals	Protected Areas	Infrastructure	Gender Issues
Coastline Integrity	Endangered Species	Human Settlements	
Air Quality			
Climate			

Agriculture

Estimated 80% of Basin population dependent on agriculture but:

- carrying capacities reached
- agro-chemical use intensified
- shifting cultivation extensive
- land tenure unsettled
- soil problems (e.g., acid sulfate, saline)
- water availability

Cropping Density Comparison

Country	No. Persons per ha Land Area	Population per ha Cropland
Cambodia	0.53	3.1
Lao PDR	0.21	3.6
Myanmar	0.71	4.6
Thailand	1.12	2.4
Vietnam	2.27	11.5
Yunnan, PRC	0.94	2.5

Shifting Cultivation

- Shifting cultivation is considered to be a significant contributor to forest degradation and erosion but difficult to accurately measure extent as illustrated by data from Lao PDR:
  - National survey estimated that 300,000 ha are annually cleared for shifting cultivation
  - The Tropical Forestry Action Plan estimated that up to 100,000 ha of forest land are cleared annually by shifting cultivators
  - The World Bank puts the figure considerably lower; estimated 67,000 ha cleared each year

(MRC, 1997)

Agricultural Chemicals

- The over-use and abuse of pesticides occurs in some parts of the region
  - organophosphates are less persistent in the environment, but acutely toxic to birds, fish and aquatic insects
  - 2-4,D and lindane - toxic and highly persistent in the environment
  - DDT - highly toxic to wildlife; banned but still measured in the environment; very persistent chemical; possibly still being used illegally

Agricultural Chemicals (Cont'd)

- Increased use of fertilizers in the MRB can contribute to degraded water quality in the region
- Run-off of agricultural drainage water can lead to eutrophication, or excess nutrients, in receiving water bodies
- Algae blooms and fish kills can result from increased nutrient levels

Fisheries

- Approximately 1,300 fish species found in the Mekong River and its tributaries; 120 species are commercially important
- Major source of high-quality, low-cost animal protein and important, dispersed economic activity; total annual catch is estimated at 1,000,000 tonnes
- Threatened by over-fishing, pollution, deforestation, dam construction, infrastructure development, agriculture

(Jensen, 2000)

Capture Fisheries

Substantial capture fisheries take place in the:

- Mainstream Mekong River and its major tributaries
- Great Lake and Tonle Sap River system
- Floodplains from Phnom Penh to the upper Delta in Vietnam
- Reservoirs in Lao PDR and NE Thailand
- Rice fields during flooding
- Brackish water zone of the Delta

Aquaculture

- Aquaculture represents major resource use in the MRB; annual production estimated at 200,000 tonnes
- Unintentional release of hatchery-raised species may affect wild fish populations by reducing the genetic health of the wild fish
- Water quality degradation of concern:
  - waste include ammonia, uneaten food, faeces
  - chemicals used to treat disease end up in river

Wetlands

Wetland systems of most importance in MRB are:

- Great Lake/Tonle Sap in Cambodia
- Plain of Reeds in Cambodia and Vietnam
- *Melaleuca leucadendron* forests in Vietnam
- Chi and Mun river systems in NE Thailand
- Coastline systems (including mangroves)

(MRC, 1997)

Wetlands (Cont'd)

Critical wetland functions include:

- Provide valuable habitat for fish and birds
- Flood mitigation (i.e., water storage)
- Maintain water quality (i.e., remove nutrients and toxic chemicals in surface water run-off)
- Groundwater recharge
- Storm protection and shoreline stabilization

Wetland Depletion

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

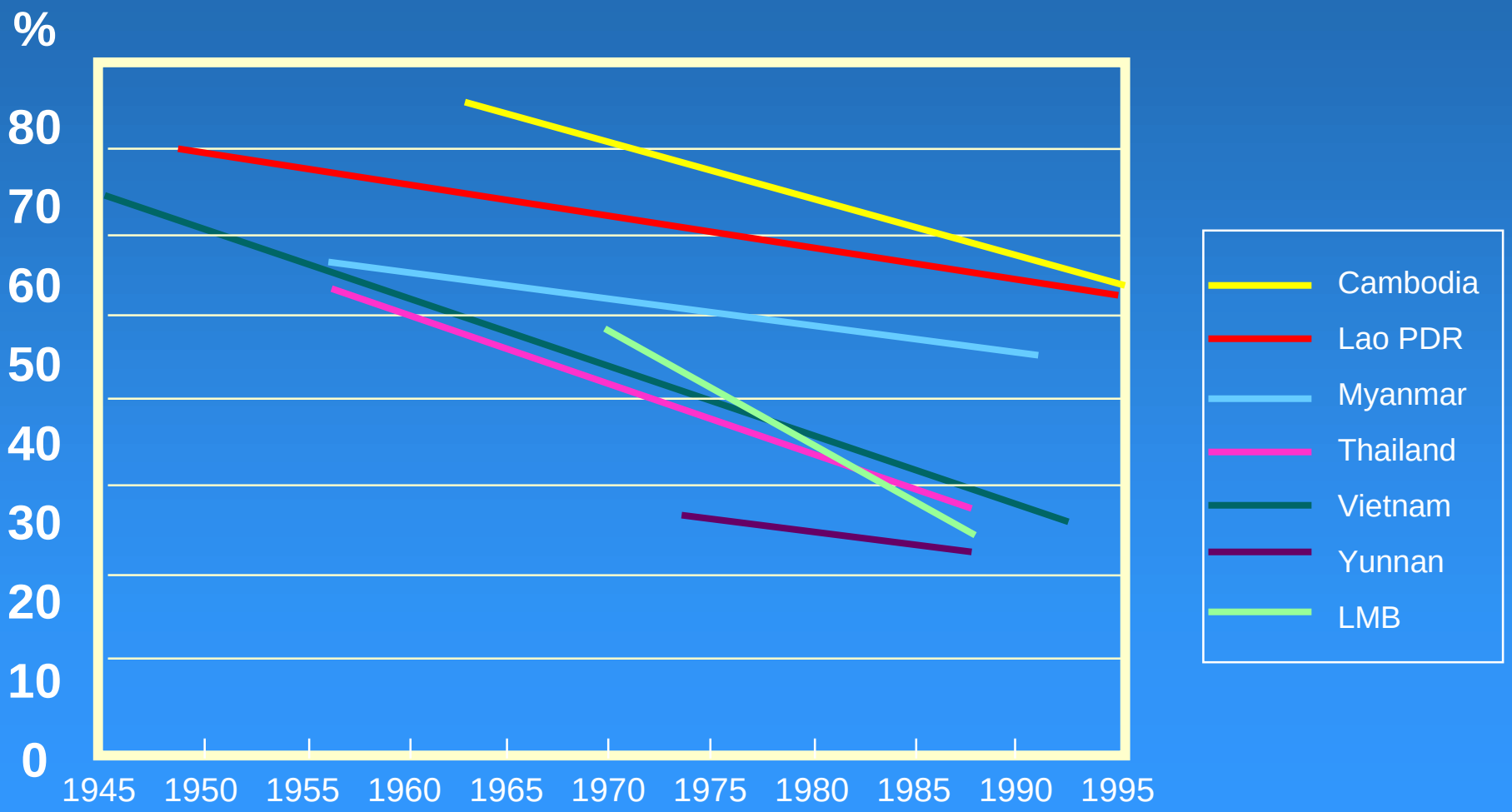
Wetland Depletion (Cont'd)

- Destruction and degradation of wetlands can severely impact fish and bird populations
- Continuing loss of wetlands in MRB 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 system)

Forestry

- Forests provide wide range of important and beneficial ecological functions; undisturbed forests support high biodiversity
- Extensive logging activity blamed for rapid decline in remaining forest cover in MRB in recent years; logging bans have proven ineffective with large-scale cross-border trade still occurring
- Low afforestation rates and bias towards monoculture not compatible with sustainable forestry

Forest Depletion



Biodiversity

- Biodiversity is term used to describe the variety, distribution and abundance of different plant and animal species
- Can be thought as a measure of the complexity of an ecosystem
- Biodiversity is often seen as an indicator of the health or quality of an ecosystem
  - high species diversity equated with high environmental health and quality
  - low species diversity may indicate declining ecosystem health or quality

Biodiversity Types

- Alpha diversity is considered the principal measure of biodiversity
- A measure of the number of different species in a local area
- Can also be called species diversity

Biodiversity Types (Cont'd)

- Beta diversity is a measure of the degree of change in species composition (i.e., diversity occurring between habitats or ecosystems)
- Can also be called habitat diversity
- Gamma diversity is a measure of species diversity across a variety of ecosystems
- Depends upon alpha diversity in each habitat and beta diversity among habitats

Biodiversity Types (Cont'd)

- Delta diversity is a measure of the diversity of the entire plant community
- Can be measured on the scale of individual ecosystem, regionally, or globally

Biodiversity Hotspots in the MRB

- Border triangle of Cambodia, Lao PDR and Vietnam
- Lao PDR/Vietnamese border
- Thai/Cambodia border
- Lao PDR/Myanmar/Thailand/Yunnan quadrangle
- Lao PDR/NE Thailand border

Wildlife Depletion

Serious threats to wildlife in the MRB include:

- Loss of critical wetland and forest habitat
- Uncontrolled hunting
- Extensive local and cross-border trade to satisfy wild food demand
- Sale of endangered species in violation of CITES; all lower MRB countries are signatories to Convention

Biodiversity Status Report

- Cambodia: rich wetland and mixed deciduous forests remaining
- Lao PDR: forested but low endemism
- Myanmar: little data
- Thailand: rich but heavily degraded
- Vietnam: high endemism but fragmented forests
- Yunnan: highest of all Chinese provinces but seriously reduced

(MRC, 1997)

Protected Areas

- MRB countries are taking steps to protect biodiversity and wildlife but:
  - quantitative data incomplete
  - different levels of protection provided
  - management/monitoring highly variable
  - lack of cooperation/coordination
  - transboundary initiatives needed
  - under-funded

Concluding Thoughts

Important points to remember are:

- Terrestrial systems in the MRB degraded by logging, agriculture and over-harvesting
- Aquatic systems degraded by development pressures
- Fish populations declining due to habitat loss and unsustainable harvesting

Concluding Thoughts (Cont'd)

Additional points to remember are:

- Wetlands threatened by hydrological changes, incremental loss and excessive contaminant loadings
- Wildlife populations collapsing due to habitat destruction and over-hunting
- Protected areas are a possible solution but more sustained and comprehensive efforts are required