

PROCESSES AND PROBLEMS IN THE WORLD OF NATURE



Lesson Learning Goals

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

- Define 'environment' and 'ecosystem'
- Name at least 3 characteristics of ecosystems and what makes them sustainable
- List at least 5 uses of Mekong River Basin freshwater resources
- Describe the main unsustainable effects of human activities in forests, agriculture, fisheries, urban development, wetlands, hydropower, governance

What do we Mean by 'The Environment'?

Air

Water

Land

Minerals

Solar Energy

Plants

Animals

Organisms

Humans

What is an Ecosystem?

Interactions between biological (living) organisms in a defined area, and with their physical environment (air, water, land), and the associated flow and transformation of energy

Ecosystem Characteristics

- Mutual interdependence of all components
- Survival of each type of plant and organism requires specific habitats and physical conditions
- Strive to achieve equilibrium or stasis
- In practice they are in dynamic equilibrium
- Maximize entropy (as in biodiversity)
- When disturbed by an external force, they may adapt or break down
- Fragile and resilient

Ecosystem Sustainability

- Healthy ecosystems are sustainable
- Unhealthy ecosystems will eventually perish
- Sustainable ecosystems are vital to the quality of human life and well-being
- Biodiversity = Resilience and Adaptability

Some Uses of MRB Water Resources

- Water supply and sanitation
- Agriculture
- Urban development
- Hydropower generation
- Fisheries
- Transportation
- Industry
- Recreation
- Low and flatlands management

Average Global Water Renewal Rates

Groundwater	1,400 years
Atmospheric moisture	8 days
Stream/river water	16 days
Soil moisture	1 year
Swamp water	5 years
Lake water	17 years

Harmful Human Activities

- Reduction of forest cover
- Conversion of wetlands to agriculture and aquaculture
- Slash and burn agriculture
- Overuse of pesticides and fertilizer
- Some reservoirs and irrigation projects
- Removal of coastal mangrove forests
- Destructive fishing methods, overfishing
- Expansion of urban populations

Human Impacts on Forests

- MRB forest cover reduced from 50% to 27% of land area in 15 years from 1970 to 1985
- Unsustainable legal and illegal logging
- Collection of firewood - primary energy source for most people
- Clearing of forests for agriculture
- Road building → increased access to remote forest areas

Unsustainable Effects of Forest Loss

- Loss of habitat for plants and animals → lower biodiversity
- Loss of soil fertility from trading short-term agriculture gains for valuable forest species
- Loss of soil due to erosion, landslides
- Higher turbidity and siltation in Mekong River, its tributaries, Tonle Sap, and reservoirs
- Loss of fish spawning and rearing habitat in Great Lake flooded forest
- Global warming

Unsustainability of Plantation Forests

- Species often have high nutrient demands
- Leaf litter damages soil quality
- Low biodiversity - loss of wildlife, increased risk of disease
- Supply little firewood, no medicines, food
- Not labour intensive
- Subject to land speculation, corrupt practices
- Loss of local community rights

Unsustainable Effects of Mangrove Forest Removal

- Reduced protection from coastal erosion
- Loss of habitat for breeding and feeding coastal marine species → lower biodiversity, loss of traditional fisheries
- Pollution from aquaculture wastes and chemicals

Unsustainable Effects of Wetland Loss

- Reduction in biodiversity
- Loss of habitat for:
 - » fish spawning and rearing
 - » birds
 - » microfauna on which fish and birds feed
- Reduction of water storage, flood control
- Increased soil salinity and saltwater intrusion

Unsustainable Fisheries

- Too many people chasing too few fish
- Destruction of fish habitat
- Blockage of fish migration routes by dams
- Increased sedimentation, water turbidity hinders fish feeding and spawning
- Changes in water chemistry unsuitable for fish
- Illegal methods such as dynamite fishing
- Introduction of exotic species

Unsustainable Effects of Dams

- Forced resettlement of communities often results in their impoverishment
- Loss of downstream river flow volumes and natural fluctuations
- Undesirable changes in water chemistry
- Loss of traditional fisheries
- Flooding of uncleared forested areas causes greenhouse gas emissions, navigation and fishing hazards in reservoirs
- Increased risk of saltwater intrusion in Delta

Unsustainable Effects of Irrigation

- High loss of water to evaporation
- Increased salinization of soils
- Inequitable allocation of water - upstream users benefit at expense of downstream
- Reduction in downstream water flow
- Increased agro-chemical run-off to river
- Soil erosion and siltation from run-off
- Landslides in hilly areas

Unsustainable Effects of Urbanization

- Increase in urban poverty
- Overcrowding, overloaded infrastructure
- Lowering of well-being in cities: health, pollution, waste, crime, social tensions, family and community breakdown
- Loss of cultural traditions
- Diminished productive human resources
- Cut off from natural ecosystems

Unsustainable Legal and Bureaucratic Systems

- Countries regulate and manage environment in compartments - water resources, fish, forests, agriculture, industry, mining, tourism
- Generates competition and jurisdictional disputes within and between government departments
- Disconnects political and administrative activities from the 'real world'
- Land is owned by few, worked on by many

Unsustainable Attitudes and Beliefs

- When humans forget we are children of nature and instead believe we can dominate nature
- Taking from nature without caring for and replenishing it
- Caring for the environment is someone else's responsibility

Concluding Thoughts

Important points to remember are:

- Environment is air, water, land, minerals, solar energy, plants, animals, organisms, humans
- Interactions between them create ecosystems
- Healthy ecosystems are sustainable
- Human activities are creating unsustainable impacts on the ecology of the MRB in forests, fisheries, agriculture, river impoundments, wetlands, urban expansion
- Depletion of natural resources in the MRB threatens the livelihood of millions of people