DISTURBANCES TO ECOLOGICAL RESOURCES IN THE MEKONG RIVER BASIN

The inhabitants of the Mekong River Basin (MRB) depend on the natural resource base to sustain their livelihood. As a result of this dependence as well as growing populations, increasing development and limited environmental management, the Basin is experiencing declining environmental health. In the absence of sound management, economic growth and infrastructure development can be expected to further stress water quality and quantity, and ecosystem integrity.

Despite these pressures, the physical resources (i.e., air, soil, minerals, land and water) in the MRB are in relatively good condition, with the exception of some localized areas, including:

- Water pollution of the Mekong River's waters linked to discharges from urban development and intensive agriculture in the Mekong Delta and Korat Plateau
- Alteration of the Mekong River's hydrology as a result of hydropower and irrigation development
- Effects of forestry and agricultural development on capture fisheries and aquaculture.

Human activities are also impacting more broadly 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 fish populations, species diversity and wildlife populations.

Pressures on the environmental resources in the MRB are interlinked in an intricate way. Factors such as poverty, insecure land tenure, migration, and lack of environmental awareness have combined to cause environmental degradation. Natural resources have been exploited rather than conserved or harvested sustainably.

The Basin is entering a new phase of rapid development that may permanently alter the physical landscape, integrity of its ecosystems and quality of life of its people. Development is inevitable: only the form it takes and when it accrues can be managed. Sound management will be necessary to mitigate the expected environmental and social impacts and to ensure the long-term sustainability of natural resources.

DISTURBANCES IN THE MRB

The ecological resources of the MRB are of high importance to Basin inhabitants. People engaged in primary agriculture, fisheries and forestry depend on environmental resources for

their economic livelihood and well as for protection from natural hazards such as flooding.

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 having caused large scale, unsustainable resource exploitation.

Although industrialization in the Basin is linked to localized degradation of environmental quality, the limited extent of industrial development to date has meant that overall impacts are negligible. This situation is likely to change as industrial development accelerates unless steps are taken to avoid or mitigate potential impacts (e.g., through the conduct of proper environmental impact assessment[EIA]).

The two main contributors to the 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 an accelerating decline in local water quality
- Continuing population growth and 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.

ECONOMIC DEVELOPMENT IN THE MEKONG RIVER BASIN

The economies of MRB riparian countries share the characteristic of high growth. Although the recent economic recession conditions in Southeast Asia have slowed the rate of growth, a similar growth pattern is expected to resume as some countries continue to industrialize and other countries evolve into market-orientated economies.

The negative side of economic growth is that it increases the rate of resource use, with corresponding intensification of pressure on sensitive natural ecosystems.

The management challenge for governments is to ensure that the benefits of continued economic growth are broadly distributed (i.e., to eliminate poverty issues in rural communities) and to achieve sustainable consumption of natural resources while limiting environmental degradation.

Agriculture

Agriculture is the primary economic sector in the MRB. In predominantly rural economies such as Cambodia and Vietnam, more than three-quarters of the population are employed in this sector with agriculture being a significant contributor to country gross national product (GNP).

Expansion of available arable land for agricultural use results in extensive removal of standing forests – due to the problem of unexploded ordinance in Cambodia, many farmers choose to clear new land rather than risk farming existing paddy areas.

Intensification of farming in the MRB has resulted in increasing use of agro-chemicals – pesticide use in Thailand increased nearly sixfold between 1976 and 1989 with almost a ½ million tonnes of chemicals being applied. Widespread heavy use of fertilizers and pesticides can negatively

impact on surface and groundwater quality and the health of both humans and animals. Of particular concern are persistent pesticides like DDT, which pose a serious long-term human health and environmental threat.

The practice of shifting cultivation has been widely criticized as being a significant contributor to forest degradation and erosion. Estimating the magnitude of these effects is difficult. Traditional shifting or semi-shifting cultivation are accepted as sustainable practices as long as land is left fallow for sufficiently long intervals to allow the land to naturally rejuvenate. The problem is that, with increasing population densities, cultivation cycles become too short, land becomes less fertile, and the practice becomes unsustainable.

Impacts of unsustainable cultivation tend to exacerbate erosion and soil problems caused by deforestation, particularly on steep slopes. Agricultural encroachment tends to follow logging, which opens access to previously inaccessible areas. Although newly cleared lands initially produce high crop yields (due to the high nutrient content of the soil), productivity usually drops sharply after a few growing cycles leading to further encroachment onto new lands.

Part of the blame for deforestation and land degradation as a result of expanding agricultural land use can be attributed to the issue of land tenure. Farmers often do not own their land or have clear land tenure – due to migration from other provinces or in the case of uncleared ordinance, the need to find safe land to farm in upland areas. Consequently, they are less likely to adopt sustainable farming practices.

Best Management Practices

Best management practices, or BMPs, are any land-use practice that can reduce or eliminate adverse environmental impacts. Nearly all economic sectors in the Mekong River Basin, including agriculture, forestry and aquaculture have BMPs that could reduce negative effects of the activity and prolong the health and usefulness of the resource.

Consider farming, for example. Agriculture in the MRB is often a very polluting activity. Of course it is unrealistic to expect people not to grow food in order to protect the environment. But, there are a number of land use practices associated with farming that can reduce the impacts resulting from agriculture. Some agricultural BMPs follow.

To reduce erosion:

Plant cover crops. This keeps the soil covered and returns organic matter to the soil. It also improves aeration and soil structure, enabling better binding of soil particles.

Seed all ditchbanks and don't leave a strip of uncleared land between ditches and cultivated fields. This helps keep sediment out of ditches and protects against erosion of the ditchbanks. Ultimately, this can reduce the sediment load on the receiving waterbodies.

Plant windbreaks. Rows of trees along the perimeter of cultivated fields can protect the fields from wind damage, thereby reducing soil loss.

To reduce impacts from pesticides and herbicides:

Again, plant cover crops. Small grains or legumes can compete with weeds, thereby reducing the need for chemical control.

If pesticides are required, don't fill or rinse the sprayer in a well. This prevents groundwater contamination.

Forestry

Rural populations in all MRB countries depend heavily on the use of fuelwood for their cooking and heating needs (Cambodia 95%; Lao PDR 80%; Thailand 52%; Vietnam 98%)

Although substantial volumes of wood are used, the actual impacts of fuelwood gathering are thought to be considerably less than commercial logging operations; fuelwoods are collected from more scattered sources and are very unlikely to involve clear-cutting of virgin forested areas.

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 in MRB countries. Despite the imposition of logging bans and moratoriums in Cambodia, Lao PDR, Thailand and Vietnam, cross-border shipments of logs continues largely unabated as a result of unregulated or illegal logging.

Reforestation efforts in the MRB are considered insufficient to compensate for forest depletion as a result of logging operations. Forest plantations consist largely of high-yield species, which are favoured for timber, raw materials for pulp and paper operations, fuelwood and rapid coverage of denuded lands. Despite the extent of reforestation efforts in countries such as Cambodia and Thailand, second-growth forests provide little of the biodiversity of virgin forest. In addition, unless efforts are made to provide buffer zones around streams and rivers during initial logging activities, the resulting impacts on surface freshwater and terrestrial resources are not addressed by reforestation. Long-term impacts to aquatic and terrestrial habitat are not mitigated, as monoculture forests typically do not provide beneficial forest cover needed by aquatic and terrestrial fauna.

Fisheries

In the MRB, of the approximately 120 aquatic species which are commercially harvested, about 30-50 species are considered economically important.

Fish and other aquatic organisms are a source of low-cost and high-quality protein for the people of the Basin as well as generating export earnings. For example, fisheries products such as brackish water shrimp contribute up to 10% of Vietnam's foreign exchange earnings.

Capture fisheries which contribute 90% of total fish production in the MRB occur in:

- The main Mekong River and its major tributaries
- The Great Lake and Tonle Sap River
- The floodplains extending downstream from Phnom Penh to the upper part of the Mekong Delta in Vietnam
- Reservoirs in Lao PDR and northeastern Thailand
- The brackish waters of the Mekong estuary.

Culture fisheries constitute the remaining 10% of total fish production in the MRB. These consist of:

- Traditional pond culture carried out on a small scale by families or villages
- Pen and cage culture mainly on the Great Lake in Cambodia and sections of the Mekong and Bassac rivers in Vietnam

- Non-intensive rice-fish and rice-shrimp culture
- Semi-intensive or intensive commercial culture.

About 30 species are cultured in the MRB. Many operations are closely linked with natural fish populations, such as the extensive cultivation of two species of river catfish in the Mekong Delta of Vietnam. This fishery depends entirely on the capture and grow-out of fingerings captured in the Mekong River near the Vietnamese-Cambodia border.

With the decline in capture fisheries in the MRB, expansion of aquaculture operations is anticipated. Although this is likely to compensate for reduced harvests, there are problems associated with culture fisheries such as:

- Traditional small-scale culture fisheries raise health and hygiene issues and contribute to contamination of the aquatic environment – use of human wastes as fish food facilitates the transmission of water-borne diseases.
- Poorly planned, intensive culture fisheries can be unsustainable, leading to destruction of terrestrial flora. For example, intensive shrimp culture in Vietnam has resulted in extensive destruction of mangrove habitat and deterioration of surface water quality.

Mining

Mining activities in MRB countries are not yet extensive. This situation is likely to change in the future as the economic potential of these resources is realized.

Lao PDR has significant mineral resources (e.g., gem and tin) and mining activity is expected to increase significantly in the near future. Vietnam also has exploitable reserves of kaolin and bauxite in its Central Highlands region. Cambodia has reserves of gold, bauxite and manganese in addition to gems.

Mining and processing activities can have serious environmental impacts if operations are not properly regulated. For this reason, countries such as Lao PDR are closely scrutinizing proposed mining operations (i.e., through rigorous application of EIA) to minimize potential impacts such as:

- Sedimentation
- Vegetation destruction
- Landscape modification (i.e., aesthetic)
- Surface and groundwater pollution (e.g., acid mine drainage or run-off resulting in impacts to irrigation and drinking water quality and fisheries)
- Air pollution (e.g., acid rain)
- Secondary effects (e.g., transportation, hydroelectric power generation for smelting).

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 EIA undertaken
- Poor scrutiny of actual impacts during mining operations
- Inaccessibility of remote mine locations.

Irrigation/Water Diversion

Although irrigation development is widespread, large-scale diversions have been confined primarily to parts of the Mekong Basin (e.g., Korat Plateau of northeastern Thailand).

These projects generally have multiple objectives including:

- Irrigation
- Flood control
- Power generation
- Water supply (e.g., to supplement the Chao Phyra River Basin and increase Bangkok's water supply).

Environmental impacts from major diversion projects may include:

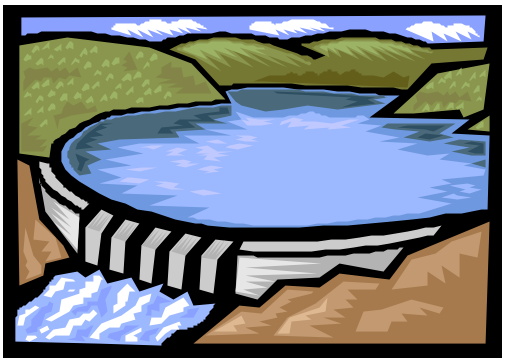
- Hydrological changes
- Downstream wetland and estuary ecosystems dependent on seasonal flooding may be impacted
- Losses of inundated forests to create reservoirs
- Resettlement of people.

Hydropower Development

The Mekong River has considerable hydropower potential (i.e., more than any other river system in east Asia). The high relief in the Lancang River Basin, northern highlands and parts of the eastern highlands and southern uplands make it well suited for hydropower development.

Estimates of the potential hydropower generation capacity vary widely because of the current incomplete understanding of the basin-wide hydrological regime.

The main driver for hydropower development in the MRB is the rising demand for electricity, particularly in Thailand and Vietnam. Recent decreases in demand due to the regional economic downturn are likely to be temporary but resulting price decreases make new hydropower developments less feasible.



Hydropower projects have a high potential to cause environmental and social impacts. Although dam projects can have positive impacts such as flood control and supplementing dry season low flows, careful consideration must be given to negative impacts such as:

- Reduced agricultural productivity in downstream areas due to decreased alluvial deposits because of reduced inundation and/or sediment loads
- Reduction in riverbank and island areas suitable for cultivation due to fluctuations in downstream river flows
- Inundation of forest lands
- Conflicts with existing or proposed biodiversity conservation areas
- Decreased fisheries productivity
- Secondary impacts to forests (e.g., logging, road construction) due to easier access to remote areas
- Social impacts (e.g., displacement, disruption of farming activities).

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

Transportation development in the MRB includes road construction, railways, inland waterways, and ports. Although the existing transportation system is inadequate in most countries (with the exception of Thailand), substantial development is planned or proposed to facilitate regional development through the improved flow of goods and people.

The centrepiece of transportation development in the MRB 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.

The development of transportation links and associated infrastructure (such as bridges and powerlines) have a high potential to cause environmental and social impacts. These impacts include:

- Degradation of fisheries and aquatic habitat
- Increased erosion and sedimentation
- Fragmentation of high quality habitat with a result loss of biodiversity
- Air pollution
- Water pollution
- Human resettlement.