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TOPIC 11

Wetland Threats

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WETLAND THREATS

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THREATS TO WETLANDS

According to some experts, the world may have lost half of its wetlands since 1990 (Maltby, 1986). Globally, freshwater wetlands are probably being degraded and lost at a rate faster than that of tropical forests. There has not been a comparison study in Asia, but it can be assumed that the rate of wetland degradation and loss in Asia is much higher than the average global rate, because of the higher population and development pressure in many Asian countries (Chan et al., 2001). For the developing world, little detailed information is available on the rates of wetland loss. However, the past records give rise to considerable concern that entire wetland ecosystems have been and are now under threats. For examples :

Cambodia : Mangrove cleared for firewood, charcoal production, aquaculture. Pollution. Agricultural runoff.

China : Climate change. Agricultural, industrial, tourism development. Land reclamation. Urbanization. Pollution.

India : The diversion of water from the Banganga and Gambhir rivers for irrigation and other human uses is reported to be impacting the Keoladeo National Park (Anonymous, 1997).

Indonesia : 40 % of the country's mangroves and 38 % of swamp forests in Sumatra have been lost up until the late 1980s (Chan et al., 2001). Large peat areas have been drained for agriculture (Maltby, 1986). Much of the estimated original 20-30 million ha of peat swamp forests have been lost due to unsustainable logging and agriculture (Anonymous, 1997).

Malaysia : In 1979, 42 of the major rivers were declared dead as a result of pollution, primary from oil palm and rubber effluents, sewage and industrial wastes. These rivers no longer supported fish, shell-fish, or crustaceans, and were unfit for drinking or washing (Dugan, 1990). The country's commercial production of pineapples for the canning industry has been based almost exclusively on peatlands (Maltby, 1986; Anonymous, 1997). 90 % of the freshwater swamps have been reclaimed for rice cultivation, intensive agriculture, urbanization, and mining (Roggeri, 1995). Urbanisation and rapid industrial growth have affected water quality within the Klang River system (Anonymous, 1997).

Myanmar : The combined forces of economic development (state, market and farmer) have been powerful agents for wetland reclamation. Since 1880s the total extent of wetlands in the Irrawaddy region has decreased by 75 %. This decline is countered by a growth over the same century of wet rice lands (Anonymous, 1997).

Nepal : Wetlands are threatened by intensive agriculture and fisheries. Fishing threatens natural swamps like Ghodaghodi Tal, where indigenous fish and other

aquatic animals have become extinct. Contractors drain water off lakes and destroy their ecosystems. Drying and diverting water by putting cross barriers in rivers also occur (Bhandari, Shrestha and McEachern, 1994).

Pakistan : Pollution and disturbance from agro-chemicals factories, steel mill and port construction posed serious threats to the estuaries of the Indus delta (Maltby, 1986). The past century has also seen the River Indus, progressively dammed and its waters diverted into one of the largest and most complex irrigation systems in the world. Storage reservoirs, dams, canals, farm channels and water courses have been built and the Indus has become the "bread-basket" for most of modern Pakistan's people. However, the productivity has been threatened by the lack of drainage system, water leakage, rising water table, and salinization. The diversion of water has also threatened the future of the Indus Delta. Over 70% of the Indus' water is withdrawn for irrigation, leaving less than 30% to be discharged below the Kotri, the lowest barrage on the river. Because most of this flow to the delta occurs during the monsoon, the Indus does not flow out into the sea for the rest of the year. The dams also retain the silt carried by the river and only 25% reaches the delta. As a result, the front edge of the delta is beginning to erode and future sea-level rise will gradually eat away the delta. Combined with high evaporation, the reduced freshwater flow has raised salinity in many of the delta's creeks. The high salinity stunts growth and kills mangrove seedlings. The biological productivity of the delta, particularly fish and crustaceans, which use mangroves as nursery areas, are in danger of dying out (Dugan, 1993).

Philippines : 67 % of the country's mangrove resources were lost in the 60 years from 1920-1980. The National Pollution Control Commission estimates that copper mining has polluted 14 rivers in Luzon, the Visayas, Palawan, and Marinduques. Where these rivers enter the sea, fishing yields have declined by 50 % (Dugan, 1990). In Lake Lanao, the accidental introduction of a fish species, the Goby *Glossogobius giurus*, has caused the extinction of the majority of the 15 or so endemic cyprinids which once inhabited the lake (Chan et al., 2001).

Sri Lanka : Dams constructed on the Mahaweli have altered the flow to several of small individual wetlands (villus) (Dugan, 1993).

Thailand : Drainage of the central plains for rice cultivation since the early 20th century destroyed most of the riverine wetlands and led to the extinction of Schomburgk's Deer *Cervus schomburgki* in the 1930s (Chan et al., 2001). Over 55 % of riverine flooded forests in the Songkhram River basin in the Northeast has been lost during the past 40 years. 51 % of the mangroves mapped in 1961 were no longer in existence by 1989 (Anonymous, 1997). The drained peatlands are particularly prone to fire, as seen in 2005 at Phru Khan Thulee peatswamp forest in Surat Thani province. Don Hoi Lot intertidal mudflats, a Ramsar Site in Samut Songkhram, is threatened by industrialization and a mega-project proposed building a bridge crossing the Gulf of Thailand. Fortunately, the project has been halted amidst voices of disagreement. Pollution.

Vietnam : Development of potential acid sulphate soils of the melaleuca forest in the Mekong delta for agriculture has faced with the danger of acidified soils (Maltby, 1986). Reclamation of estuarial and coastal wetlands for agriculture, aquaculture, construction of ports, residential and industrial areas. Pollution. Overexploitation of coastal wetland resources.

CATEGORIES OF WETLAND THREATS

Threats to wetlands can be grouped into 2 major categories : human threats (both direct and indirect) and natural threats (Maltby, 1986; Dugan, 1990; Anonymous, 1997; Maitland and Morgan, 1997). Some are described below.

Human threats :

Direct

- *Drainage for agriculture and forestry.* Many wetlands have been modified into ricefields, cash crops cultivation e.g. oil palm, and fast-growing trees plantation, detrimentally affect natural flora and associated fauna. The fauna has also suffered from the application of pesticides, modification of habitats, and is correspondingly reduced in diversity. All stages of forestry have impacts on freshwater, sedimentation in streams and lakes, increased nutrients from leaching and fertilizers. *Eucalyptus* trees have been planted in marshy areas to produce a rapidly growing crop of timber and accelerated marsh drainage by transpiration.
- *Dredging and stream channelization for navigation, flood protection, water storage, reservoir maintenance.* Straightening and canalization of river courses has degraded many rivers and destroyed riverine forest habitats. Accelerating water flow velocity and deepening erosion of the main channel leads to continued lowering of the water table, with detrimental effects on wetlands situated on the floodplains.
- *Filling for solid waste disposal, roads and highways, commercial, residential and industrial development.*
- *Conversion for aquaculture and mariculture.* Aquaculture has been practised in Southeast Asia and increased in many parts. In many cases, natural wetlands are modified by impoundments into which extraneous materials are added as fertilizer or fish food. Effluents rich in organic matter, solids from waste feed and faeces pass into wetlands, silting the bed and deoxygenating water.
- *Construction of dikes, dams, reservoirs, and levees, seawalls for flood control, water supply, irrigation and storm protection.* Effects are not only local, changes occur in the river system below them. Hydroelectric schemes have deleterious effects. Fluctuating water levels devastates the littoral flora and fauna and benthic feeders, which occupy the littoral areas.
- *Discharges of pesticides, herbicides, other pollutants, and nutrients from domestic sewages, agricultural runoff, industries, and other land development.* Pollutants can act in 3 main ways : by settling out on the substrates and smothering life there; by being acutely toxic and killing organisms directly; or by reducing the oxygen supply so much as to kill organisms indirectly. Organic materials in sewage effluents are a source of major pollution. Though these effluents often contain plant nutrients, these cannot be used because of the high oxygen demand of the decomposing organic materials. In lakes and slow-flowing rivers, so much oxygen may be used up that anaerobic conditions result and no organisms other than bacteria and some fungi can exist.
- *Mining of wetland soils for peat, coal, sand, gravel, phosphate, salt, and other materials.* Commercial peat digging usually leads to their complete destruction and when extraction is terminated, the land is put to either agriculture or forestry. Gravel workings on floodplains completely destroy existing wetlands and result in flooded gravel pits.
- *Water abstraction.* Effects of abstraction vary in extent, from year to year, and place to place. In standing waters subject to rapid level fluctuations caused by pumping or flood-control projects, the shorelines experiences similar changes to those in abstracted rivers. There is a great reduction in macrophytes and

invertebrates that cannot withstand desiccation. Consequently, the shallow littoral areas of abstracted lakes and rivers, normally the richest zones, have poor production.

- *Tourism.* Many recreational uses of wetlands can cause pollution and disturbance to certain plant and animal species by actively killing them, disturbing or frightening them away – an important problem with roosting and nesting birds. Although tourism provides economic benefits, income and occupational opportunities to local inhabitants, excessive number of tourists and recreational activities, increase of waste discharged from hotels, resorts, and restaurants contribute to deterioration of various wetlands.
- *Burning / Fires.* Burning of peatlands and herbaceous swamps and marshes reduces the vegetation diversity. In peatlands, burning leads to a solidified surface which is not suitable for plant establishment. In marshlands where reed cutting is carried out to provide material for thatching, roofing, fencing and other purposes, the reed beds are often burned during the dormant season to produce clean early growths, with consequent decline in both floristic and structural diversity.
- *Control of mosquitoes, weeds and diseases.* Pesticides and a wide range of toxic chemicals have been used on a large scale in many wetlands to control vectors of diseases such as mosquitoes, snails, and weeds e.g. water hyacinth. It is rarely possible to do this in a species-specific manner, so many other invertebrate species are killed at the same time. The introduced mosquito fish has proliferated in tropical wetlands and exterminates populations of other species. Efforts and attempts to control the spread out of the Avian Flu has terminated many life of some wetland birds.
- *Accidentally and deliberate introduction of alien invasive species.* Introduced aquatic plants e.g. *Eichhornia, Pistia, Salvinia* natives of South America, are found throughout the tropics, shading the native plant species, deoxygenating the water below their mats, blocking rivers and canals. Introduced Apple Snail *Pomacea canaliculata, Pomacea gigas* is now destroying rice productivity in many southeast Asian countries. 10,000-12,000 Apple Snails can eat and totally destroy 1 rai (1,600 sq.m.) of ricefield within only one night (Termvidchakorn et al., 2003). *Mimosa pigra* has now become a serious problem in many wetlands in Southeast Asia.
- *Over exploitation of biological resources, illegal hunting, inappropriate fishing practices.* Wetlands are threatened by increased exploitation of biological resources. Most wetlands in the region have suffered a marked decline in waterbird populations and associated biodiversity. Illegal hunting, collection of wildlife's eggs, and inappropriate fishing practices cause loss of endangered species and biodiversity; loss of breeding, nursing grounds and habitats for aquatic biota.
- *Others ……*

Indirect

- *Forest clearing in the upper catchment areas* increases the runoff and the rate of erosion with subsequent silting and nutrient increase in the waters draining into wetlands, especially coastal wetlands.
- *Sediment diversion by dams, deep channels and other structures.*
- *Hydrological alterations by canals, roads and highways, and other structures.* Changes in hydrological regimes or inflow reduction due to construction of roads or barriers encircling wetlands often have impacts on wetland ecosystems by

obstructing connection with adjacent wetlands and may deteriorate surface water quantity and quality, threaten wetland resources and sustainability, prevent species migration, disrupt life cycles and adversely affect their survival, and result in significant reduction of species abundance.

- *Subsidence due to extraction of groundwater, oil gas and other minerals.*
- *Population growth* remains high in the SCS countries (e.g. 2.6% in Cambodia and 1.7% in Vietnam, exceeding the East Asia/Pacific regional average of 1.6%). A large proportion of population still live below the poverty line. These people in poverty are often those depending on wetland resources for their subsistence livelihoods. Wetland loss and degradation has led to loss of occupation and income. Future increase in population, added up with economic crisis, will place additional pressure on wetlands and wetland resources.
- *Change in the socioeconomic and cultural perception and behaviour of local indigenous people towards wetland conservation and management.* Under the influence of the need for modern lifestyle, whereby the bonds between humans and wetlands have weekened, wetlands that were once held in reverence have now become the objects of widespread abuse.
- *Others …….*

Natural threats :

- *Global climate change.* World temperature is predicted to rise above the 1985 average by about 1-2 degree celcius by 2025, with temperature increases in the polar zones between 2.5-5 times the global average (Dugan, 1993). Rainfall patterns are likely to change, with precipitation predicted to be higher than average throughout much of the world. In the tropics, climatic extremes are predicted to increase in their severity. Monsoons and tropical storm surges may become more intense. Increasing temperatures, changes in precipitation and evaporation, changes in river flows and runoff, and sea level rise are likely to occur. Floods and droughts are likely to increase in number as well as in severity and duration. These are among the main aspects of climate change that will affect wetland ecosystems. Wetlands are totally dependent on water levels. Changes in climate conditions that affect hydrological cycle and alter water availability may cause wetland loss, shift the geographical distribution of wetlands, and degrade wetland benefits and services. Climate change may affect both surface and groundwater systems, and impact wetland requirements, domestic water supply, irrigation, hydropower generation, industrial use, navigation and water based tourism.
- *Sea-level rise.* Sea level rise and increases in storm surges associated with climate change could result in the erosion of shorelines and coastal wetlands, increase salinity of estuaries and freshwater aquifers, decrease freshwater supplies due to salt water intrusion, change water quality available for agricultural, domestic and industrial uses, alter tidal ranges in rivers and streams, change sediment and nutrient transport, increase coastal flooding and increase the vulnerability of some coastal populations.
- *Extremes – especially floods and droughts.*
- *Storms, waves, winds.* Between May and September 1994, Southeast Asia was devastated by 5 months of storms and floods that destroyed 220,000 houses in the Mekong Delta of Vietnam and caused major losses in the rice crop. Tropical

storms battered and drenched southern China, Vietnam and Thailand during the period of June-November 1995.

- *Subsidence ……*
- *Erosion ……..…*
- *Biotic effects ……..……..*
- *Others ……..……..*

The loss and degradation of wetlands is driven by several factors. Present and foreseeable threats to wetlands are many and varied. Some may abruptly destroy the valuable nature of wetlands and their intrinsic functions, but most of them may trigger serious and long-term ecological and socioeconomic consequences. **Threats to wetlands can also be grouped into 2 major categories : on-site and off-site threats.**

The South China Sea region and countries bordering the South China Sea have experienced high rates of economic growth and rapid coastal development in recent decades and will continue to place increasing stress on the ecological systems.

Loss and degradation of wetlands bordering the South China Sea have been continuing at a high rate due to the increasing human population size, particularly in coastal areas, poverty, and people's dependency on wetland resources. Actions are urgently needed to halt the degradation of coastal wetlands around the South China Sea.

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