

## 25. Inland Navigation in the Mekong: Issues and Prospects for Sustainability

*Jagath Manatunge\**, *Yuzo Akatsuka\*\**, *Takashi Asaeda\**, *Takeshi Fujino\**

**Summary :** Developing the Mekong as an inland waterway, linking the six riparians, has identified as a necessity to boost the fast growing economies of the region. Sedimentation, associated with extreme deforestation of the basin has obvious negative impacts on the river ecosystem. Navigation development activities should be carried out with utmost care not to jeopardise other uses of basin's resources. The objective of this study is to focus attention on water management issues with particular emphasis on identifying environmental impacts associated with improvement of inland navigation in the Mekong.

**Keywords :** *The Mekong, inland navigation, watershed degradation, deforestation, sedimentation*

### 1.0 The Mekong Basin and its Characteristics

The Mekong is the twelfth longest river in the world (4,200 km) and ranks tenth in terms of total annual flow (475 Billion m<sup>3</sup>). Though mighty of flow, it remains the least developed of Asia's great rivers with modest in uses. From its origin in the Tanggula Mountains of the Tibetan Plateau, the Mekong flows half its length in China and borders or runs through Myanmar, Lao PDR, Thailand, Cambodia and Viet Nam (Figure 1).

The total catchment of the Mekong is 795,000 km<sup>2</sup>, out of which more than 75% falls in the Lower Mekong Basin. The tropical nature of the basin, with two monsoon patterns governing the climate is the major determinant of flow patterns of the Mekong. The south-west monsoon begins in May and continues until October (wet season), while north-east monsoons prevail from November to March (dry season) with relatively little rain. Almost 80-90% of the rainfall occurs in the wet season. Mean annual rainfall ranges from 1,000 mm near central north-eastern Thailand to 4,000 mm in mountain fringes of Lao PDR and Viet Nam.

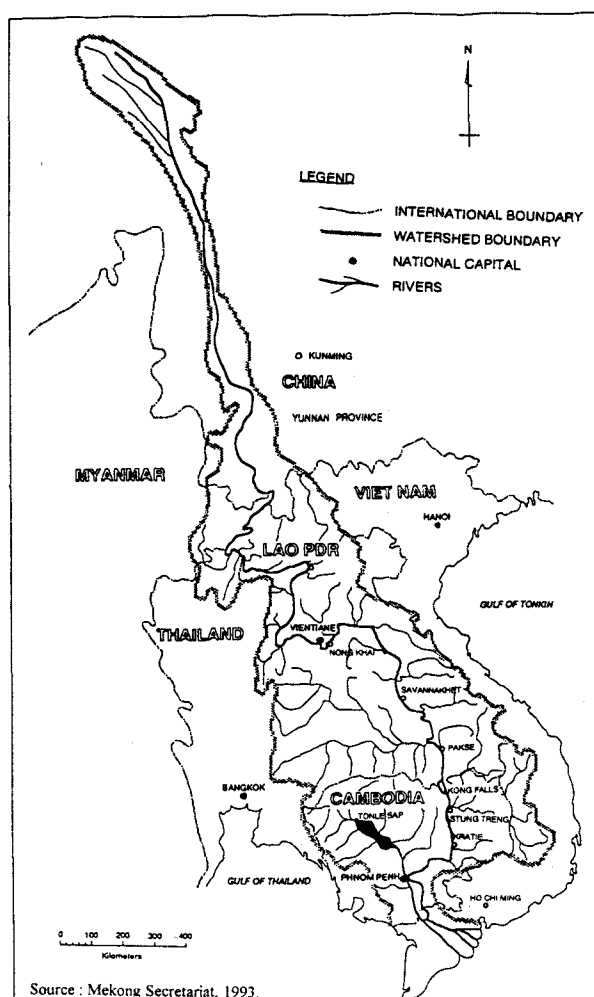


FIGURE 1: Location Map of the Mekong Basin

\*Department of Environmental Science and Human Engineering, Saitama University, Urawa-shi, Saitama 338.

\*\*Department of Civil and Environmental Engineering, Saitama University, Urawa-shi, Saitama 338.

## **2.0 Navigation in the Mekong**

### **2.1 Needs of Riparian Countries**

The population in the Mekong Basin is estimated at 50 million and they are among the poorest in the world. Most parts of the region suffered from armed conflicts and political unrest that have left them underdeveloped and stuck in poverty. The end of hostilities is a golden opportunity for the region to reap benefits of the fast growing economic activities of the East Asian region. The closed economies of the region (except for Thailand) are experiencing market oriented reforms recently, with increased economic activities within and among the riparians. Inadequate transport infrastructure is seen as a major impediment for such activities to grow and to procure full prospects of feasible opportunities. Navigation is a major mode of conveyance from early days, which is still restricted to small scale passenger transport and cargo handling. Several committees have identified that navigational improvements would derive immense benefits, but cost the least to all riparians. Moreover, it would lead to stimulation of vigorous economic activities to prop up throughout the region.

China expects to use the Mekong as a major route linking Yunnan Province with other riparian countries and open up new markets and to improve navigation. Landlocked Lao PDR favours use of the Mekong as its main transport artery for maintaining contacts with the external world along with reducing its dependency on other countries for access to sea ports. Cambodia also depends on the Mekong for major cargo handling and fuel imports, apart from domestic traffic needs catered by inland navigation sub-sector. The river navigation infrastructure in the Delta region is complex and most activities are firmly established associated with navigation. Myanmar's portion of the Mekong is important in developing the channel as an international transport corridor. Two way border trade too, is quite significant among the riparians especially between Cambodia and Thailand.

### **2.2 Current Status**

The Mekong is navigable in various sections between Yunnan and the South China Sea, with maximum possible vessel capacity depends on the physical characteristics of the river. The Mekong Sub-region involves six riparians with divergent interests and international co-operation among them could be seen as the single most important factor promoting inland navigation. The reconciliation of the differences and willingness to co-operate to achieve common goals were witnessed when two separate agreements on the Mekong navigation were reached in 1994. The four Upper Mekong riparians entered into a draft agreement that allows vessels to sail 'freely' on the Mekong route. The Agreement on the Co-operation for the Sustainable Development of the Lower Mekong Basin ensures the freedom of navigation throughout the mainstream of the Mekong without regard to territorial boundaries for transportation and communication and to promote regional co-operation and development.

2.3 Constraints to Further Development

Apart from other constraints, physical characteristics of the river itself poses several barriers to navigation development. These include rapids, shoals, sharp bends in several locations, sand bars and rock outcrops. Run-off in the river varies in a wide range (Fig.2), which eventually leads to significant changes in the water depth. In most segments, the depth reaches more than 10 m during the rainy season, while in the dry season it falls down to even 1 m (Fig.3). Therefore, although there are fewer constraints for navigation in the wet season, it is extremely interrupted in the dry season. The rock outcrops and shallows become hazardous especially during the dry season. The extreme deforestation of the basin has further aggravated the situation with deterioration the watershed's ability to feed the river. Special attention has to be paid to rectify these obstructions to make the channel suitable for navigation throughout the year without interruption and to maintain adequate depth. In general, these include river training works such as installation of groynes, dikes or bottom panels, removal of rock outcrops, dredging of local shallows and sandbars, among other things.

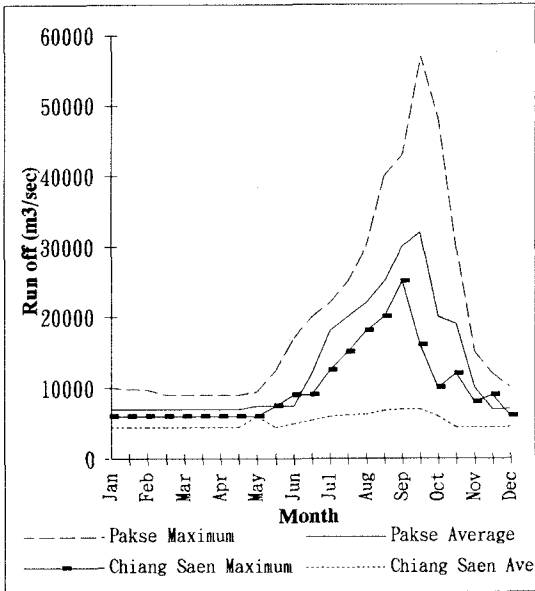


Figure 2: Run off at two stations (1960-1994)  
source: Mekong Secretariat(1994)

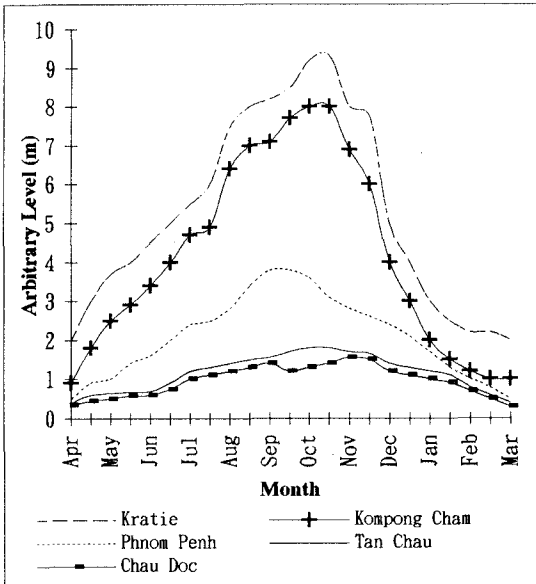


Figure 3: Monthly average water level (1961)  
source: Akatsuka & Asaeda (1995)

3.0 Environmental Degradation and Navigation

3.1 Deforestation and Sedimentation

The forest cover in the basin is lost at an alarming rate of 500,000 ha per annum as predicted by the ADB. The forest cover is estimated to have declined from about 50% to about 27% of the land cover from 1970 to 1985. The forest cover around the Great Lake in Cambodia is decreasing drastically. This is a result mainly arisen from commercial logging, slash and burn agriculture and other unplanned land use patterns. Timber export is a major source of foreign exchange for the riparians, while fuelwood is a primary derivation of energy in most parts of the basin. Poverty, which has led to lack of options for the poor could be directly related to this unfortunate condition. The rate of population growth has worsen this problem further.

Apart from other environmental damages, deforestation has a definite negative impact on inland navigation. Unlike other transport modes, waterborne transport heavily depends upon the hydrological characteristics of the river. The Mekong flow is highly dependent on the rainfall pattern of the basin and consequently navigability of the channel. The surface runoff is reduced as a result of clearing of vegetative cover and the effects are notable during the dry season. Furthermore, deforestation accelerates the runoff during the rainy season, thus increasing the flood flow and arrival time of flood downstream. Also, deforestation has led to high sediment loads carried downstream of the river. It has been observed that sediment concentrations in some tributaries of the Mekong well exceed 1,000 ppm by weight, which is more than 100 times higher than those rivers in other regions with comparable dimensions (Fig.4). These sediment particles silt along the river and form sand bars along the channel thus decreasing the navigable depth and leading to huge amounts of extra dredging.

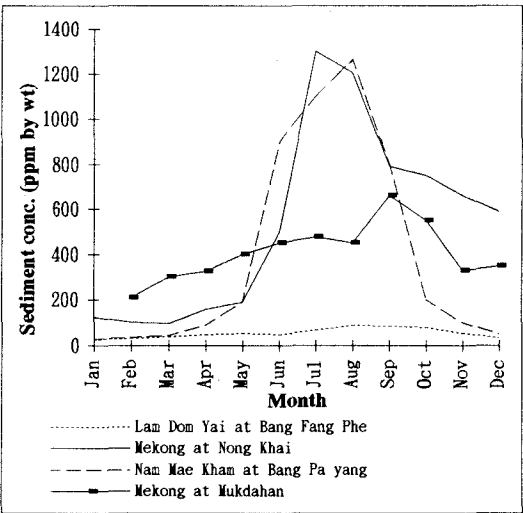


Figure 4: sediment run off at four stations  
source: Akatsuka & Asaeda (1995)

### 3.2 Effects of Improved Navigation on the Environment

Huge construction works have to be carried out to make the Mekong navigable all the way from Yunnan Province to lower riparian countries. River training works, such as installation of groynes, dikes or bottom panels to establish the channel pattern and dredging to maintain adequate depth, are necessary to improve navigation. The alteration of the natural river flow pattern can cause physical, chemical and biological changes in the Mekong, causing direct and indirect adverse impacts on basin's ecosystem as a whole. The Mekong carries large amounts of sediments to lower reaches of the river, mainly due to extensive deforestation in upstream watershed. Change or a disturbance to the Mekong flow associated with construction works to enhance navigability of the channel could worsen the situation. Removal of rocks or sand bars would reduce flow resistance, thereby decreasing the depth of the entire section and the desired depth is not always attained. This may have scouring effects upstream of the river and likely to risk hydrological structures built in the river. Change of river morphology may contribute additional sediment loads to carry downstream, thereby aggravating sedimentation problem prevalent at present. Dredging works will undoubtedly result in huge amounts of material to be disposed of, alongside the shoreline. Improper disposal may create unforeseen problems. The shoreline along the Mekong is unstable at many locations and further development activities may cause further deterioration, if countermeasures are not taken. The outcome of improved navigation is shoreline development, construction of port facilities apart from

increased navigational traffic. These activities may introduce or generate pollutants of anthropogenic nature, which are not existent at present.

The Lower Mekong Basin is rich in wetland habitats. The functioning of these ecosystems is highly connected to the flow characteristics of the Mekong. Any hydrologic modification should be carried out with utmost care not to endanger these rich habitats. The Great Lake in Cambodia, which is one of the most important natural resources of the country, is experiencing severe sedimentation loads carried into the lake. The function of the Great Lake acting as a buffer and thereby regulating the flow in the Mekong during the dry season may be greatly reduced, if high sedimentation rates persist. The flow in the Mekong governs the saline water intrusion mechanism in the delta, an area which accounts for a substantial portion in Viet Nam's paddy cultivation. Changes of flood patterns, sediment loads carried downstream, changes in water regulation by the Great Lake would expose rice crops to adverse conditions, which are worth investigating further.

#### **4.0 Towards Sustainable Development of Basin's Resources**

##### **4.1 Basic Rationale**

The World Commission on Environment and Development (WCED) defined Sustainable Development as 'meeting the needs of the present without compromising the ability of the future generations to meet their own needs'. The basic rationale or objective behind improving inland navigation should be to support and enhance economic development of the riparians, while preserving the resource base on which the development activities are based upon. Any activity therefore, demands strict scrutiny and careful consideration before any changes to the natural environment are carried out. Responsible development strategies must be designed and implemented with strengths and opportunities of the riparian nations keeping in mind.

##### **4.2 Poverty Reduction and Watershed Preservation**

Degradation of the critical watershed areas is a direct result arisen from rural poverty. Poverty Reduction and Environmental Improvement in Remote Watersheds in the Greater Mekong Sub-region, the programme proposed by the ADB is expected to address rural poverty and resource degradation. Any development activity should be primarily aim at addressing problems of poverty in the region without which environmental improvements cannot be expected to realise. Further deforestation should be discouraged while encouraging reforestation.

##### **4.3 Minimising Environmental Degradation**

Development of the navigation sub-sector is certainly a sheer necessity for the upliftment of economic activities in the sub-region. In achieving this objective the riparians should pay attention to mitigate any negative impacts on the river ecosystem and the supporting environment. Thorough consideration must be given to ensure that effects of construction, operation and maintenance works of the river connected with navigation improvements do not,

- damage ecologically sensitive habitats along the Mekong (wetlands, delta, aquatic flora and fauna endangered species, etc.)
- adversely affect existing resources (wetlands, fisheries, etc.)
- create siltation patterns which require excessive maintenance

Removal of navigation hazards and deepening of channels to improve navigation would create additional sediment loads, which is a problem even at present. Extensive dredging demands continuous monitoring and substantial financial commitments. Ability of the riparian nations to bear the extremely high costs associated with these activities should be explored. Construction of multi-purpose dams in the upper reaches of the mainstream and tributaries may be effective in reducing the sediments carried downstream. The controlled discharging of water from the dam is expected to be effective in maintaining the minimum depth during the dry season. In the mean time, there may be obvious environmental impacts that may arise due to construction of dams or reservoirs and have to be addressed separately. The disposal of dredged material could be used either to strengthen the banks of the river or to fill lowland areas.

## **5.0 Conclusions**

Historically, the Mekong was utilised as an important and economically sensible means of transport. High sediment runoff associated with extreme deforestation has identified as a major threat for sustainability of navigation. Conservation strategies designed to combat deforestation would definitely have a positive impact on Navigation. The development of the waterway may result in hydrological alterations and thereby damaging the flood plain, increased erosion, loss of vegetation, flooding and drainage of wetlands, etc. It is of vital importance to realise that mitigation action should be taken to minimise these impacts for sustainable utilisation of basin's resources. The challenge is to reap maximum benefits while preserving the resource base on which these benefits depend on.

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