

Study on the adverse effects of hydropower development on international shipping

Changhong Wang¹

1. Tianjin Research Institute for Water Transport Engineering, Tianjin 300456, China
45221707@qq.com

Abstract. The Lancang - Mekong river is an important international waterway to Southeast Asia and South Asia, which has important strategic significance for promoting regional economic cooperation and safeguarding national economic and security interests. On the Mekong River, the main aim is to develop hydropower resources utilization and shipping. River Hydropower Stations are in Laos and designed by foreign enterprises according to the construction of BOT. In this study, on the basis of a lot of research work and extensive collection of relevant information, and, through in-depth analysis of research, it reveals that the upper Mekong River hydropower development have many adverse effects on international shipping, put forward related suggestions for the healthy and sustainable development of international shipping.

1 River profile

The Lancang river flows through China, Burma, Laos, Thailand, Kampuchea and Vietnam, which is the longest river of Southeast Asia. It is the only international rivers in Asia, which originates from China Qinghai province, and its length is 4880km. It is known as "Oriental The Danube". It is called the Lancang River in China, from Burma No. 243 monument after leaving the country, which is called the Mekong river. The Mekong River flows through Burma, Laos, Thailand, Kampuchea and Vietnam to the South China Sea near Ho Chi Minh City. In addition to China and Burma, they are members of the Mekong River Commission^[1]. The Mekong River from Burma No. 243 tablet, is 2750 km long, which located in Laos and Kampuchea border at the port hole waterfall, a large drop and is unnavigable. In this regard, the waterfall above is the upper Mekong River, a river that is long 1984.6 km. The Mekong River's length is 919.5 km. In recent years, with Laos, Burma, Thailand and other countries for the development of the national economy, the growing importance of the Mekong River hydropower development, multiple cascade hydropower station construction planning.

The construction of power station in Mekong River will provide basic conditions for the Mekong River international waterway improvement. However, the economic and technological development of Laos is relatively backward, and the Mekong River power station was built by multinational companies in the form of BOT investment. The early construction of the Mekong power station was also completed by different design units. Now Laos's construction engineering standards, technical specifications are not perfect, the examination and approval procedures are not standardized, investment and construction companies will often take into account the maximum investment interests, do not pay attention to shipping. Investment construction enterprises and government are lack of effective long-term development planning and coordination mechanism. There will be many adverse effects to the development of the Lancang Mekong River international shipping.

2 Overview of Mekong River Hydropower Development



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2.1 Current situation of hydropower development

The upper Mekong River is a mountain river, the river drop is large, water yield is abundant, hydropower development is potential. Water resources are the largest natural resources in the Mekong River Basin, which is about 50 million KW, so it is paid more and more attention by the international community. 1957 ~ 1970, generating capacity of up to 2 million 500 thousand KW of the Mekong River tributary hydropower project has been completed. In Thailand, Laos, Kampuchea, Vietnam built a total of 3 million 270 thousand KW power engineering from 1971 to 1980. The countries of Mekong River regard the development of the Mekong River water resources as an important way to get rid of poverty, develop the industry and revitalize the economy, and the development of the Mekong River cascade hydropower stations are formulated by the Mekong River Commission ^[2]. Once the completion of the cascade power plant, it will have 36950 thousand KW installed capacity, to ensure that the output power of 15730 thousand KW, providing annual power of 146.1 billion degrees. The Mekong River will become one of the most important hydro energy production centers in Asia, which can greatly meet the needs of the economic development of the region.

Water resources is the largest resources in Laos, and there are more than 20 rivers above 200km throughout the process, one of the longest is 1846.8km in Laos, accounting for about 44.4% of the total length of the Mekong River. The Mekong River water resources fall of 484m, more than 60% of the reserves in Laos. After years of development, the electric power industry has become one of the industries with the advantages of Laos, is the focus of social and economic development. From 1988 to 1995, foreign investment projects in Laos more than 10, amounting to \$4 billion.

2.2 On the Mekong River Hydropower Development Planning

In 1970, the MRC proposed "watershed planning guidance" in 1970, 7 level of water conservancy project in the river river estuary to the Qing Sheng among more than 2400 km. 1989 also proposed amendments to the program, including the 7 and the level of the two comparison program, recommended by the 8 level program. Under the auspices of the United Nations development program and the French government, after more than 2 years of research and exploration, in 1994 proposed a 9 level development program. In 1995, under the auspices of the United Nations Program and the French government, after two years of re investigation of the proposed 12 level development program. At present, the Mekong River planning according to the 12 step development project of [3], in the north, Luang Prabang, Sayaboury, ballee, Sara Kang (Lao river), pamong, bancu (old Thai border), Lastua (diversion, Thakho, Lao river), sombo treng (more than for the lower Mekong River).

In July 1, 2009, Laos Mekong River Hydropower Station Optimization on the ultimate outcome of the meeting held in Vientiane, Laos energy power conference by our Ministry of Mines (DOE) host, Secretary of the Mekong River Commission Office (MRC), Laos Mekong River five project developers and other participants. The meeting informed the final results of the research on the optimization of the Mekong River dry water power station. This paper mainly studies the influence of Laos, the North Luang Prabang station may have on the upper Mekong River upper reaches of Luang Prabang international shipping.

3 International shipping situation on the Mekong River

Lancang Mekong international has shipping navigation for over ten years, which is still in a starting period, the freight volume of about 30-40 million tons per year, mainly between Thailand complementary merchandise and agricultural and sideline products, travel in the Thai tourism group, at present, the main international shipping to Jinghong to Thailand kingsone Chinese Hong Kong 345km [4] voyage. Since the formal navigation of international shipping, the rapid development. Cargo cargo transportation from single to diversification transformation, mainly including refrigerated goods and fresh vegetables, groceries, containers, oil products, and the opening of the international shipping water tourism transportation.

The current Sino Burma Laos houayxay 331km channel, from 2002 to 2004 the channel improvement project, the current year navigation 150t class ships, in the flood period is navigable for

200 ~ 300t class ships, and the arrangement of navigation marks; Laos - Luang Prabang channel: 299.5km houayxay without any improvement, but focus on the beach section installed simple navigation in Laos mark, dry season can only 60t level of ship navigation. At present, according to the old Burma and Thailand are jointly prepared to reach a consensus on the Lancang Mekong international shipping development planning, planning on the Mekong River international shipping meet class 500t ship navigation standards, combined with the long-term channel reach 500t level navigation standard.

4 Adverse effects of hydropower development on international shipping

On the Mekong River Drainage River power plant, increase the water level upstream, reservoir formation channel, greatly increase the channel depth, in order to improve the channel level; at the same time, the hydropower development of canalized river channel in reservoir area can form a large number of submerged navigation rapids, and has a smooth, navigable flow condition of the current flow of good [5]. Therefore, hydropower development of canalized river channel to enhance the level, improve navigation conditions to provide basic conditions, but must be in the hub of water level between reasonable convergence, simultaneous construction of navigation facilities to meet the standard, general layout, power station, navigation during the construction, lock management should meet the navigation requirements as the premise, otherwise it will produce many adverse effects for international shipping.

4.1 Station Mekong mainstream planning scale of the lock standard is not unified

The Mekong River hydropower development plan 12 cascade development scheme, 8 power plants and old Thai Laos Laos inland river has entered the early stage of construction. These power stations by multinational companies to invest in the construction of BOT, and by the different design units in the country to carry out pre work and design. Navigation facilities are the hub of the North lock, Luang Prabang power station is the 12 cascade development scheme of upstream first, level 2, the lock was grade 500t, 500t grade ship designed ships, according to double lock design, reserved line lock. Some of the lower reaches of the lock according to the 1000t level design, and some locks are designed according to the 500t level, the lock is designed according to a single line. Visible, river power station unified navigation facilities lock scale, standard, through the ability of coordination, will restrict the lock by ability, affecting the sustainable development of ship navigation safety and expedite international shipping.

4.2 The North Luang Prabang hub lock scale is small, the ability to meet the requirements of the future development of shipping

"The MRC" clearly stated in the Mekong River Hydropower "navigation guide": "long term hydropower project with investment and the use of lock, lock and scale must be considered in the next 50 years to meet the development of shipping and traffic demand". The north and Luang Prabang hub lock scale 120 * 12m small, even if the optimization of ship form of single and double line two-way through capacity is only 6 million 30 thousand tons and 12 million 60 thousand tons, it is difficult to meet the requirements of international shipping development in the future, will lead to lock constraints through the ability to form navigation bottleneck.

4.3 There is no connection between the water level

At present, the research of only Laos and Luang Prabang two north of the hub, and has entered the early stage of construction. This is the end of the 5m North hub base level convergence, nearly 30km channel for the dehydration section, in natural state, Luang Prabang hub downstream of 4.43M water level does not converge, nearly 30km channel for dehydration, which is in natural state, can not meet the requirements of navigation depth.

4.4 North hub layout and lock navigation design needs to be further deepened and optimized

The North navigable shiplock layout design, the lower lock head and channel connection method is undeserved, can cause adverse flow and sediment deposition, the design of ship in the chamber area can not be used effectively, through the impact of capacity, the chamber and approach channel structure will affect the project cost and economy.

4.5 Power plant operation mode and lock management mode

The Mekong River hydropower station is built by overseas enterprises to invest in the construction, often take into account the power generation benefit and business interests, while ignoring the benefits of shipping, such as avionics hub using unified management model, often lead to power plant operation is difficult to fully reflect the demand for shipping, navigation condition and influence through capacity.

5 Recommendations

The river development and utilization of resources must be comprehensive and overall planned and utilized. The development of the Mekong River Hydropower should fully embody the principle of comprehensive utilization, realizing the coordinated development of shipping, water and electricity, and the sustainable development of international shipping. In the upper Mekong River hydropower development may have many adverse effects on international shipping advice, (1) to create conditions for the establishment of Lancang Mekong River basin management institutions; (2) the "hanglian committee" should attract the full attention of hydropower development on international shipping, research measures; (3) the "hanglian Committee" should promote the establishment of shipping on the Mekong hydropower, bilateral negotiation mechanism as soon as possible; (4) should adjust hanglian committee functions, rationalize the international shipping management system.

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