

Environmental Influence of re-navigation in the Henan Yellow River

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Abstract: It has been a long history of navigation in Henan Yellow River which has made a great contribution to the economy, society and culture in Henan, even to the whole Chinese nation. Currently, the waterway in Henan province is under the development far behind the increasing demand for transportation. Therefore, the restoration of Henan shipping is very essential for the development of inland economy, so as to the environmental protection, which can improve the transportation condition, directly affect the flood hazard proof and sediment reduction in the Lower Yellow River, and the coordinated development of economy and society, which will improve the environment obviously.

Introduction

Inland shipping is a basic industry of national economy and also an indispensable mode of transport in transportation system. Inland shipping has the characteristics of large volume, low energy consumption, investment and environmental pollution (which includes noise, vibration and dust, etc.) as well as small land occupation, so it is a resource-saving and environment-friendly mode of transport^[1]. Further more, inland shipping suits a wide adaptability and a unique advantage in coal, mining, oil and bulk cargo transport. The Yellow river shipping in Henan Province used to be very well developed, while the reduction of the natural runoff of the Yellow River and surge of sediment content resulted in a lot of sediment deposited on the riverbed. In particular, the Yellow River flood control and navigation-dam have been a serious impediment to the development of inland shipping so that the natural advantages of the Yellow River could not be fully developed compared with road and rail transport. The recovery of the Yellow River navigation in Henan Province has important social and economic value, which can promote tertiary industry development of Henan Province and facilitate the environment etc.

The Henan Yellow River is located in the middle and lower reach of Yellow River, where Sanmenxia and Xiaolangdi (including Xixiayuan Regulating Reservoir) Water Control Project have been built. Its channel stretching from Yangjia to Zhangzhuang is 757 km² in length. The navigable channel is 552 km², in which there is a V-class waterway from Xiaolangdi to Yongjia at a total length of 254km. The basic characteristic of the Henan Yellow River includes wide-shallow channel and main flow changing frequently. It changes remarkably and belongs to the type of wandering river. Due to the large amount of sediment deposition, the river gradually raises and the river is 3-5 meters above ground presently. Near Caogang, Fengqiu County in Henan Province, the bed level is 10 meters above the ground and known as the suspended river, and the watershed of Huai River and Hai River.

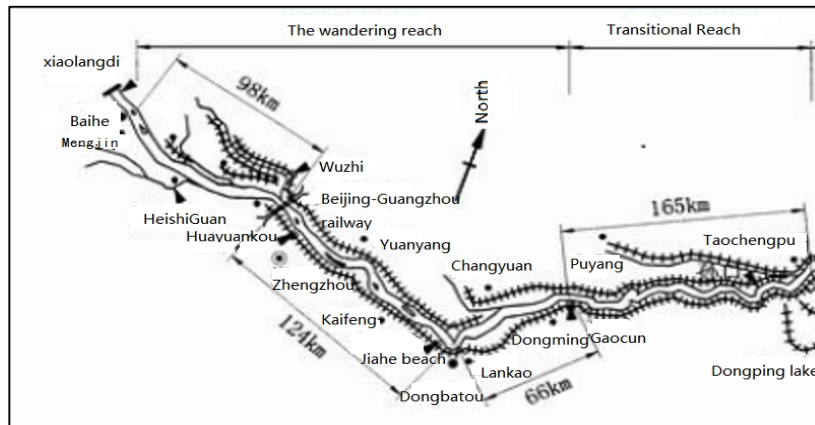


Fig.1 the Henan Yellow River

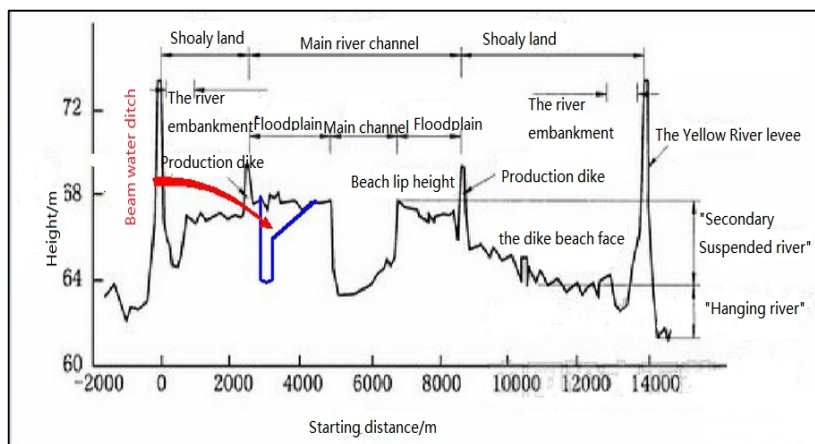


Fig.2 the suspended river

Environmental Benefits of Re-navigation

Inland shipping is one of the most economical transportation modes. In China, inland shipping has also undertaken transporting tasks of the petroleum, chemical industry, metallurgy, electricity, machinery and other key productions [2]. To develop shipping industry so as to promote economic development, which can bring economic benefits, has low resources consumption, and make little environmental pollution, will have a profound impact on the economic development in Henan Province. Comparing with other various transportation modes, shipping produces relatively small emissions. The canalization of shipping channel can effectively protect the ecological environment on both sides and improve people's living environment, so as to achieve the harmonious development of shipping, ecological environment, and living environment. Unlike the environmental constraint of the transportation construction of road, rail and some other modes, shipping is an environmental friendly transportation mode.

Conducive to the coordinated develop of waterway transportation. Henan has initially formed a comprehensive transport system, which is based on the railway as the backbone, the highway as the support, coordinated development of water transport, civil aviation, pipeline and other transport modes, in which the position of the railway and highway transportation is very important, so the navigation development is lagged [3]. But navigation is the basic industry and an indispensable means of transport in the comprehensive transportation system. Canalized the internal channel, the conduct joint transportation of waterways, roads, railways and other forms, can promote the transfer of logistics to water transport. Bring the advantages of water transport into the network of integrated transport, the advantages of water and land transportation system can

gradually increase water transport and optimize the regional integrated transport structure. Comprehensive transportation system of River-Ocean, River, Railway-water way, Medium-highway and Railway, can be formed to take the advantages of various modes of transport to improve the ability of Henan's comprehensive transportation.

Reduce air pollution and carbon dioxide emissions. The traffic capability of shipping in the same amount of energy consumption is 2-4 times to the railway's, 50 times to the highway's, 100 times to the aircraft's. Therefore, water transport has great advantage over the road and aircraft. The unit energy consumption ratio of water transport, railways and highways is 1:2.5:8.6. Water cost is equivalent to half of the railway transport and one third of highway transport^[4]. Completing the same freight volume, shipping consumes the least energy, produces least emission of pollution and carbon dioxide than any other transports, and is one of the environment-friendly style.

Decrease the Utilization of Land Resources. In recent years, with the development of social economy, the demand of highway and railway transportation is increasing, the construction of which have occupied a lot of land resources. Moreover, this kind of land utilization represents a flat expansion trend. Large-scale land transportation of road construction will make the land resources less and less, which restricts the economic development. However, developing inland shipping has an important role in saving and protecting the limited land resources in China^[5]. The development and construction of highway consume large amount of land, and the rapid development will affect the sustainable development of land resources in Henan. The development of the rigid constraints from the land resources are growing, so we must develop low-energy consumption, low-resource consumption and low-environmental pollution to change the way of development. And navigation is just the green transport mode which fulfills the inner requirements.

Water transport uses the natural rivers, consumes little amount of land. In some cases, waterway dredging can also reclaim land, while laying 1 km double-line railway needs to cover an area of 2.0-2.7 km² and building 1 km expressway will cover an area of 3.3-4.0 km²^[6]. On the destruction of land and vegetation, the water transport is more favorable and has better environmental benefits compared to land and air transportation.

Decrease the Sediment Deposition. The re-navigation of the Yellow river requires the improvement, transformation and dredging of the rivers, which will decrease the sediment deposition in order to ensure the convenience of navigation. Further more, besides dam construction, vegetation plantation and river stabilization by wide embankment, water diversion, dredging according to the control of reservoir and river channel sedimentation, are required for river training and renewal. At the same time, actions such as the sediment transport from river mouth to ocean should be taken so that the recycling of sediment and comprehensive utilization can be improved and the optimal regulation configuration of flow and sediment can be optimized, improving the flow condition with the clear of the secondary suspended river.

Problem and strategies

Environmental problems. Water pollution which is the main environmental influencing factor that resume service faces is caused by ship transport and shipping engineering construction. With the rapid development of inland water transport and the extension of the size of the fleet, oil pollution and the emission of domestic sewage that caused by ship transport have to be the main factor which lead to the increasing deterioration of the water environment of inland river basin^[2]. Inland waterway transport engineering construction mainly includes channel improvement, port and pier, berth construction, etc. During the process of channel dredging, ground-launched forming, port construction, producing the constructor's and constructing ship's municipal waste water, oily waste

water and so on are the environment's primary pollution sources. After implementing inland river navigation, the water environment's primary pollution sources include: ground-launched municipal waste water, runoff of rain water, maintenance of oily sewage, ship's municipal waste water and oily waste water.

Strategies. (1) Protecting the water quality. Not allowed to develop the construction of waterways and ports in the surface water source protection areas. The port channel water source protection zone two should be taken strict implementation of water pollution control measures. In the planning and implementation process, the waterway construction involving sensitive water bodies should focus on the channel during construction and under strict pollution control to level-II water quality^[2]. During operation, improve the operation of the ship on the above planning channel. For example, reducing the discharge of pollutants, and ensuring the quality of these areas by using the ship in electrical power or the tug form to drive a plurality of passenger ships^[2], urge those who have not been upgraded to take measures to control pollution in time, and regularly check the operation of pollution prevention facilities.

(2) Sewage disposal. The disposal of domestic and oily sewage on ships should be managed strictly according to the relevant regulations. Ships must collect and store the domestic sewage and apply for maritime ships as reaching the port. The domestic sewage can be received by port operation area or merged into the urban sewage disposal system or domestic sewage disposal facilities which are installed separately by the port. The ship discharging facilities must be controlled and the ship oily sewage is forbidden to pour into water directly. The treated residual oil can be given to the waste oil recycling company. Besides, in the case of oil water separator failures, the ship should get the collection of oily sewage done and apply that the port receives and disposes the oily sewage; the received oily sewage can be gathered and treated by the separator on the port operation area.

(3) Construction Projects. The construction projects include the channel construction, the junction construction and the harbor construction. Among these, the channel construction almost does not take the land and even can build new land^[5]. The dredged material is mainly to heighten and reinforce on both sides of the dike upstream and downstream sites along the coast, stacking low-lying land and pits, which not only solved the problem of spoil and land occupation but also beautified the environment, and the excess soil can be as the raw material to fire the building bricks.

Summary

Navigation in the Henan Yellow River influences the environment obviously. It is important to guarantee Henan province linking with the river and strength the communication with coastal. As the bridge of promoting environment protection, it is the key to improve the comprehensive transportation system in Henan and promote the all round transportation system in Henan province. It has the available advantages on reducing air pollution, carbon emissions, pollution of land resources and strengthening environmental protection. Compared with other modes of transportation, its environmental benefits are obvious. Navigation in Henan Yellow River has great environmental benefit, so as to the obvious significance on the social and economical development of Henan province.

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