

Evaluating the Solution to Flood Control by Building Dams in the Yellow River Basin

Zhongbin Hu, Yueting Zhang

School of Geography, University of Nottingham, NG7 2RD, Nottinghamshire, UK

Abstract: The second longest river in China is the Yellow River. And it is known as the birthplace of Chinese culture (Li et al., 2020). Because of flowing through the loess plateau, it carries a large amount of sediment, with an annual sediment load of 1.6 billion tons, ranking first in the world's rivers (Wang et al., 2007), which leads to a severe flood threat. To effectively control the flood, the Chinese government has taken a measure to build dams on the Yellow River. This essay mainly evaluates the feasibility of this measure. After a combination of multiple criteria for evaluation, it is considered acceptable.

Keywords: The Yellow River; The dam; Flood control

1. Advantage: Adjust and control water resources

The dams can adjust and control water resources in terms of time and space and settle the sediment to effectively mitigate the flood threat of the Yellow River. The first dam on the Yellow River called Sanmenxia Dam was put into operation in 1960 (Wang et al., 2007). As part of the Sanmenxia Dam, the Sanmenxia Reservoir has accumulated lots of water, thus regulating the discharge downstream. Wang et al.(2007) point out that the construction of Sanmenxia Dam greatly reduces the flow of water in extreme events. Additionally, they also note that approximately 7.1 billion cubic meters of sediment had been deposited over 45 years, significantly reducing the sediment load downstream of this dam. Before the dam is built, large amounts of sediment from upstream soil erosion accumulates in the downstream channel. As a result, the river bed become shallow and widened causing flooding in the middle or lower reaches of the river (Knighton, 1998). So it is necessary to build dams to control the river sediment load. I think dams on the Yellow River, represented by Sanmenxia Dam, achieve to change their operating mode based on the flow of water and sediment load of the river. For example, during the rainy season, when increased rainfall leads to increased discharge, the dam can close some of the gates to store water, which directly reduces the possibility of downstream flooding. In addition, if severe soil erosion upstream causes excessive river sediment load, the dam can also effectively control the amount of sediment released by adjusting its operating mode. Some people worry that the silt deposited in the dam can lead to blocked gates and reduces water storage capacity. In fact, these problems did exist in the early stages of dam construction, but were all solved after optimizing the structure of the dam (Wang et al., 2005). According to the published literature, Wu et al.(2007) explain the process of this adjustment after the optimization of dam structure. And they divide it into two parts, non-flood season and flood season. During the non-flood season which is usually from November to June, water storage runs at higher pool levels, while during the flood season which is usually from July to October, the pool level is declined to wash away sediments settled during the early non-flood season (Wu et al., 2007). As a result, the input and output of dam sediments can be balanced.

2. Advantage: Bring great economic benefits

The construction of dams on the Yellow River also brings great economic benefits. There are a lot of people who are against to build the dams at first. Because they consider that the construction of the dams will require plenty of manpower and material resources, and will bring a lot of trouble, such as the issue of coastal settlement, farmland expropriation and so on. But it turns out that the economic benefits of the dams after they are built are much greater than the previous investment. Not only can they prevent flooding, but also they can use the energy of water to generate electricity, which is very environmentally friendly. The stored water is used for agricultural irrigation directly. After filtering and purification, the water from the Yellow river can also be turned into daily residential water for people to use. What is more, the dams are conducive to navigation, and can even develop into a tourism industry (Wang et al., 2005). The construction of dams can not just bring direct economic benefits, such as the income from the tertiary industry, but many indirect ones that are easily overlooked by people (Dănilă et al., 2019). Dănilă et al(2019) point out in their article that flooding is the most common natural process that causes the property loss and the loss of life in the geographic area. In my opinion, the construction of dams to control floods, and then avoid these losses by preventing floods, think about it from another perspective, this is indeed a benefit.

3. Disadvantage: Interfer with the ecological environment

Building the dams artificially interferes with the ecological environment of the Yellow River. Taking the Sanmenxia Dam as an example, it affects the interplay between surface water and groundwater in the lower Yellow River basin (Zhang et al., 2020). In addition, the tourism industry developed in Sanmenxia due to water resources causes the huge damage to the water environment in various aspects, such as the water quality deterioration and the disequilibrium of the distribution of biological communities and so on (Cheng, 2021). It is an undeniable fact that the construction of the dams is based on the loss of habitats for the creatures in or arounding the Yellow rivers. To make matters worse, some species may be endangered due to this. And the subsequent incision process affects the evolution of the river course upstream of the dam. To a certain extent, it is possible that the change of the base level may aggravate the soil erosion in the upstream. This possibility is closely related to the vegetation type and the vegetation coverage rate upstream of the dam.

4. Conclusion

Deciding whether to build a dam or not requires us to weigh the advantages and disadvantages. I am basically in favor of building dams on the Yellow River. As the decision to build the dams was decided by all stakeholders together, the benefits were bound to outweigh the drawbacks. However, it is still necessary to take measures to minimize the loss (Eslami et al., 2021). For example, the government compensated the farmers who lost their land and made proper arrangements for coastal residents (Eslami et al., 2021). Besides, the ecological scientists should study some specific species further to protect them from extinction. The ecological inimizing of the Yellow River bank also need everyone to pay more attention to protect them. By inimizing the advantages and inimizing the disadvantages, the decision to build dams would become more rewarding and worthwhile.

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