



A Review Research Paper on Large Dams and Its Impact and the Control Measures

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Abstract: - Water is very important natural element of mankind for drinking as well as purposes related to human life and human need. Rivers are the primary source to meet water demand for human needs as well as ecosystem function and structure. Flowing water in a river is one of the important determinants and primary driving forces that influence aquatic ecosystems and the health of the river. Increasing demand of water caused the construction large dams for agricultural purposes, drinking, industrial, flood mitigation, hydropower generation, recreational, fishery and tourist etc. Large dams can remarkably effect on the environment as a non-stabilizing factor in nature in various stages of construction, operation and end of life by stopping the flow of the river and stored water. If the environment destruction or damage will gradually rise and the objective of dam construction will be lost. In this paper, we will review the environmental impact of construction large dams on some rivers in the India and we will suggest some ways to deal with these effects and finally we will separately examine the use of several small dams instead of big dams as an important and effective option.

Keywords: - Dams, Impact, Control measures, river, catchment and ecosystem.

I. INTRODUCTION

A reservoir is a large, artificial lake created by constructing a dam across the river. Broadly speaking, any water pool or lake may be termed a reservoir. However, the term reservoir in water resources engineer is used in a restricted sense for a comparatively large body of water stored on the upstream of a dam constructed for this purpose. Thus, a dam and a reservoir exist together. This is especially for a country like India in which about 75% of the total precipitation occurs during the monsoon season from June to September. Most of the river carry very little or no water during non- monsoon period, except the Himalaya rivers, which also carry substantial discharge in the non-monsoon period due to melting of snow. During the period of low flow, it is not possible to meet the water demand for various purpose such as irrigation, water supply and hydroelectric power. To regulate the water supplies, a reservoir is created on the river to store water during rainy season. The store water is later released during the period of low flows to meet the demand. In the monsoon season, the reservoir store excess water when the discharged in the river is high. Thus, besides releasing the water during the period of flows, the reservoir also helps in flood control.

Human activities can have a large and sometimes devastating impact on these factors. Humans often increase storage capacity by constructing reservoirs and decrease it by draining wetlands. Water conservation is a practice in which the effective and efficient way of use water that reduce the demand of water for establishment. For example, recycling of wastewater comes from domestic and industrial activity used for some other purposes like cleaning, agricultural, etc. The reality is that, the environmental effects are not considered fully and completely for the most dams have been constructed in Iran. India is the second biggest inland fish producer in the world. However, though blessed with one of the richest riverine fish gene pools and a network on hundreds of rivers, floodplains, ox bows and estuaries, the contribution of riverine and capture fisheries is declining sharply and many have collapsed, despite having a great potential to grow. India has 14 major and 44 medium rivers and countless tributaries, floodplains, riparian tracts, mangroves and estuaries.

How dams are useful in the modern world for the society.

- ❖ Providing adequate water for domestic and city use
- ❖ Water supply for irrigation purposes
- ❖ Water is need for many industries
- ❖ Hydroelectric Power Generation
- ❖ River navigation purposes
- ❖ Watershed management or Drainage control
- ❖ They are useful to control the flow of river, helping in flood mitigation
- ❖ Dams Reservoirs are used for fishing and boating purpose
- ❖ Dams provide livelihood to many e.g. tourism, creating jobs.

II. REVIEW OF LITERATURE

- i. **Wazir Singh Lakra (2010)** in the present communication habitat ecology, species diversity; distribution and different indices of fish biodiversity management were studied in a Central India river. Correlation between fish species richness with the hydrological attributes showed good relationship and water depth, dissolved oxygen and pH were found the most important variables in shaping fish assemblage. Altogether, sixty-three fish species belonging to 20 families and 45 genera were collected from five sampling stations spread along the upstream, mid-stream and lower streams. Cyprinids were the most dominated group represented by 26 species belonging to 15 genera,

followed by Bagridae (6 species from 3 genera), and Schilbeidae (4 species from 4 genera). The distribution of fish showed interesting pattern and about 10% species were common to all the sites showing long migration range. Shannon-Weiner diversity index showed considerable variation and ranged from 1.89 to 3.51. Out of 63 species status of 10 species were not known due to data deficit, 29 categorized as lower risk, 14 as vulnerable, 8 as endangered, while the remaining two species were introduced. Our study shows that the River supports considerable diversity of the fishes and is important for conservation and about 34% fish fauna is threatened being either vulnerable or endangered. We assessed that the river supports considerable percentage of food fish (89.47), ornamental fish (49.12%) and sport fish (5.26%). Among the eight major types of fish habitats identified along the entire stretch of river, Open River, shallow water and deep pools were habitats contributing maximum diversity. Trophic niche model may be useful for assessing altered as well as less altered fish habitat of the tropical rivers. Issues related to various threats to aquatic environment and conservation management strategies have been discussed.

- ii. **Uttam Kumar Sarkar (2015)** the reservoirs play an important role in the developmental process of a Nation and also have an integral role in fisheries and livelihood security of the local community. With the increase in population growth reservoirs are becoming important provider of animal protein and for generation of employment in particular to poorer sectors of the people. Reservoirs have many uses from generation of electricity to irrigation purpose and also providing habitat to fishes and other aquatic life and in turn also help to provide feed and create revenue for fish communities. In India, reservoirs are playing a crucial role in the fisheries. Fish communities are often used as indicators of environmental quality. In terms of fish diversity altogether 117 fish species were recorded from Indian reservoirs exhibiting rich fish diversity. These reservoirs have both positive and negative impacts on fishes and other aquatic environment. Therefore, present study is emphasized on synthesizing the available information on fish diversity and community structure of the potential Indian reservoirs and its effects on fisheries and other aquatic environment in reservoirs in India. Some strategies have been suggested for sustaining river and reservoir fish biodiversity.
- iii. **Utpal Bhaumik (2016)** Narmada, the oldest river system in India, originates from 'Amarkantak' in Madhya Pradesh, flows east-west, and joins with the Gulf of Cambay on the Arabian Sea. The river drains 45.64 km³ of annual run-off and a series of dams was proposed to hold some of its water resources for multipurpose use. Currently, three dams have been built in Madhya Pradesh and one is under construction in Gujarat. A comparison of pre- and post-impoundment eco-environment and fisheries revealed changes in water quality, productivity, and aquatic flora and fauna of the river system. Among the fish, species like Tortor, 'Labeofimbriatus' and 'Labeodyocheilus' suffered most. The percentage contributions to total yield of Carp, Catfish, and miscellaneous groups have significantly changed, indicating falls of 17%, 36% and an increase of 410% respectively. The percentage contribution to catches of Macro brachiumrosenbergii and Tenualosailisha has also declined by 46% and about 75% in the estuarine stretch of the river system. Suitable conservation measures for sustenance and development of fishery have been suggested.

- iv. **A. Uday Kumar and K. V. Jayakumar (2018)** Natural flow plays a vital role in forming biotic diversity by controlling essential environmental conditions within the river channel and floodplain. This paper assesses the changes in streamflow and ecology caused on Krishna River by Srisaillam dam. Regulated and unregulated river flow discharge data were collected at Nagarjuna Sagar gauge station which is located downstream end of Srisaillam dam. Flow Health (FH) software developed by the International Water Centre, Brisbane is used to calculate the hydrological alteration and environmental flow requirements due to Srisaillam dam. Results show that impoundment of the dam mainly decreases the high flows by storing flood flow for water supply, irrigation purposes, etc., and enhances low flows due to hydropower operation. Regulation of the dam significantly affected the mean flow in August, September, and October. Mean annual flow (MAF) decreased considerably and seasonal flow shifted. The minimum flow released from the dam to downstream be calculated by two options, namely, low risk and medium risk to the environment. Low risk achieved a score of 0.61 FH and 0.5 FH was achieved by high risk, with a MAF volume of 40% (i.e., 7,225 m³) and 30% (5,847 m³), respectively. In the current study, the impacts of Srisaillam dam on the natural hydrologic flow regime in the lower reach of Krishna River basin is quantified by using FH Software developed by the International Water Center, Brisbane. An average FH score of 0.43 was observed for nine hydrological indicators for the test year. Only one of the hydrological indicators was primarily altered, whereas the remaining eight were highly altered. Reservoir-regulation activities have a significantly negative influence on high flows and a positive impact on low flows.

III. FOUR ENVIRONMENTAL IMPACT OF LARGE DAMS IN INDIAN PENINSULA

Below are some of the damaging environmental effects of dams according to the guidelines of the International Committee on Large Dams.

- a) Creation barrier motion of water, sedimentation in reservoirs, severe erosion along the river and valve blockage, fog formation.
- b) Raising the relative humidity should responsible for climate changes, ground shaking, increased surface evaporation, rising ground water level, changing lands to salinity.
- c) Reduce nutrient concentrations downstream of dams, triggers Plankton growth, which leads to extinction of some species, getting limited fish spawning areas, production of new species, decline in fish populations, serious changes in water quality.
- d) Increasing urban population, immigration, creation of false jobs, destruction of roads and power transmission lines, loss of agricultural lands, unemployment.
- e) Destruction of historical and archaeological sites at upstream face of dam, destruction of some places with specific topographic importance.
- f) During construction phase, disturbing the peace, leaving the nest wildlife, increased risk of loss of animals. Flooding and the destruction of surrounding habitat, dammed rivers create a reservoir upstream from the dam, which spills out into the surrounding environments and floods ecosystems.

IV. SOME SUGGESTION TO REDUCE THE IMPACT OF LARGE DAM ON ENVIRONMENT

- ❖ It is expected that by considering various factors for choosing a dam site and creating a gravity relationship between them, it will be possible to optimize the number of short dams in the catchment. Regarding the importance of the economic approach in a project and benefit to cost ratio, which is one of the most important parameters in the decision making of stakeholders, in condition that the dams' heights decrease or we substitute the large dams with small ones, the drop in benefit of implementation of projects for a big region would be less in comparison with the losses and costs we may face because of reservoir damage or natural resources losses.
- ❖ Short dam construction, as a strategy, can be used in order to make water reservoirs in some points in the upstream rather than a large reservoir in downstream, it will be effective not only for creating opportunities for development in the upstream but also it will be effective in flood control. Small dams are constructed for water storage for agricultural purposes, control seasonal and possible flooding, aquaculture, tourism and making new job opportunities.
- ❖ One of the other purposes of this project is development and improvement of agricultural lands of downstream. Small dams don't take underwater a large area like big dams and also be constructed with less capital. Geographically, there is also distribution in the construction of small dams and arid have been used. Small dams and bunds also play an important role in reducing water loss. It is also anticipated construction dam short chain also usefully contributes to solve the problems of sediment.
- ❖ The different dams coming up in the Himalayan region should be properly instrumented to record ground motions, amplification of motions through the dam and displacements of the dam, so that better understanding of the seismic behaviors of large earth and rock fill dams can be achieved and proper mitigation measures can be put in place before hand in case a disaster strikes.
- ❖ Within the framework of the set principles, this guided the formation of Rehabilitation Policy, an attractive and a liberal rehabilitation package was evolved, which has been improved from time to time without changing its basic features.

A. Abbreviations and Acronyms-

MAF- Mean annual flow, WCD- World Commission on Dams and FH- Flow Health.

B. Units-

Km- kilometer and m- Meter.

IV. CONCLUSION

- In ancient times, dams were built for the single purpose of water supply or irrigation, as civilization developed; dams may be built multipurpose which served many purposes such as water supply, irrigation, flood control, navigation, Hydropower and sediment control.
- The demand for water is steadily increasing throughout the world. There is no life on the earth without water, our most important resources apart from air and land.
- Due to the highly seasonal nature of the monsoon season in India, a large number of dams, storages and barrages are constructed to use the water in the tropical monsoon season for domestic, irrigation and industrial uses.

- This study will provide the some necessary information for the water management authority to continue water requirements management for ecology without disturbing domestic and agricultural use.

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