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Developmental project and its impact on adjacent river ecology: A case study of Kolaghat thermal power plant, West Bengal, India

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ABSTRACT

The Kolaghat Thermal Power Plant (K.T.P..P) is situated (22025' latitude &87052'30 longitude') on the right bank of the river Rupnarayan in Purba Medinipur district, West Bengal. It is well connected with south-eastern Railway, NH- 6 and NH-41. This power plant was established during the sixth Five Years Plan period (1980-85). WBPDCL (West Bengal Power Development Corporation Limited) took the charge of this power plant since 1985. Presently its total power generating capacity is 1260MW, with six units, 210 MW each. KTPP generates around 7500-8000 metric tons of fly ash every day following the consumption of 18000 tons of coal (Source: KTPP office, 2009). The power plant disposed ash mixed hot waste water on the river Rupnarayan and consequently it has an adverse impact on the said river. So the physico-chemical characteristics of the river have been changed. A number of studies have prove that a large amount of toxic substance, like lead, copper, nickel and sometimes radionuclide (uranium & thorium) enrichment have been found in the disposal water. Moreover, due to continuous deposition of fly ash on the river the river depth have been reduced. This change has prevented Hilsa fish (Tenualosa ilisha) migration and laying eggs (Hilsa fish of river Rupnarayan is famous for its taste and smell). As a result the amount of Hilsa fish caught in the Rupnarayan has declined in an alarming way. The amount of other fish caught like, mango fish, prawn are also being observed in declining trends. The present paper is an attempt to examine the nature and extent of ecological disturbance of the river and also suggest some way in order to minimize this menace.

Key Words: Physico-chemical, Radionuclide, Hilsa, Mango fish.

1. Introduction

The Kolaghat Thermal Power Plant (K.T.PP.) is situated ($22^0 25'$, $87^0 52' 30''$) on the right bank of the river Rupnarayan in Purba Medinipur district, West Bengal. It is well connected with south-eastern Railway, NH- 6 and NH-41. This power plant was established during the sixth Five Years Plan period (1980-85). W.B.P.D.C.L. (West Bengal Power Development Corporation Limited) took the charge of this power plant since 1985. Presently its total power generating capacity is 1260MW, with six units, 210 MW each. K.T.P.P. generates around 7500-8000 metric tons of fly ash every day following the consumption of 18000 tons of coal (Source: K.T.P.P. office, 2009). The power plant disposed ash mixed hot water on river Rupnarayana and consequently changes its physic-chemical characteristics. The natural condition particularly depth of the river has been changed due to continuous deposition of fly ash on the river. This change has prevented Hilsa fish(*Tenualosa ilisha*) migration and laying eggs (Hilsa fish of river Rupnarayana is famous for its taste and smell). As a result the amount of hilsa fish caught in the Rupnarayana has declined in an alarming way. The present paper is an attempt to examine the nature and extent of ecological disturbance of the river and also suggest some way in order to minimize this menace.

2.1 Location of the study area

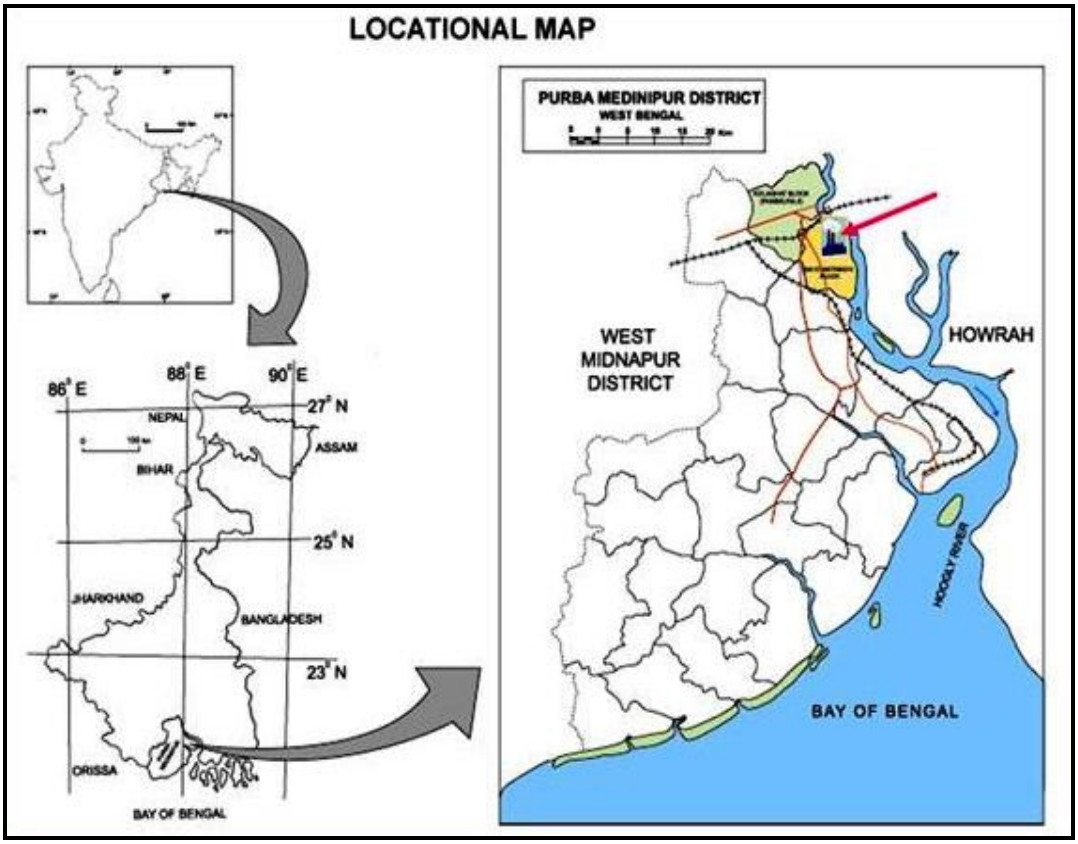

Figure 1: Location of the study area

The Kolaghat Thermal Power Plant is situated on the right bank of the river Rupnarayan in the district of Purba Medinipur, West Bengal. It is located ($22^0$25'N, & 87^0 52'30"E) 60 km south west from Kolkata and 55 km north-west of Haldia.

The study area also includes 10 kms upstream and 10 kms downstream from the point where K.T.P.P. disposed waste water in the form of – ash mixed (from ash ponds) and oil, etc. mixed hot water in the river Rupnarayan (as a tidal river).

3.1 Material and methods

In order to investigate the present scenario of the fishing in the river Rupnarayan, particularly the trends of Hilsa fish catches, the questionnaire survey has been conducted among 40 fishermen and 10 fish traders who are actively engaged in fishing in the river Rupnarayan or fish trading for more than 30 years in the K.T.P.P. surrounding.

Due to tidal flux, the physico-chemical characteristics, like BOD, DO, TC, FC, etc are shows within permissible limit. To comprehend the actual reality for such declining trend of Hilsa fish catches in the Rupnarayan river, the researcher decided to measure the present channel configuration of the river adjacent to KTPP surroundings. The entire process includes two methods of study- primary data collected through the field survey and secondary data from Remote Sensing and GIS technique. The field survey has been conducted by the researcher boarding on a boat. The entire survey has been conducted in the following situations such as

(a) in spite of being a tidal river, there was no high or ebb tide at the time of survey, (b) rain water or any other mass of water did not influence the movement of the river water at the time of measurement and (c) the weather conditions including wind speed were quite normal at that time.

At first four cross sections A, B, C and D each 500 meter apart were selected on the river Rupnarayan. Then the depth had been measured at the interval of 10 meter through every cross section. The measurement had been done by a handmade scale. The scale is made of stout rope having indicator of scale at regular intervals with a small cone-shaped heavy steel substance at the end. Secondary data collected and analyzed: Surface elevation data of the river Rupnarayan at the K.T.P.P. surrounding has been collected in the form of digital elevation model from the data published by different organization's published data, such as NOAA, SRTM, ASTAR, CARTOSAT, etc. These digital data are available as .txt format. Then it is converted into GRID formats by using ARC GIS- spatial analysis tools, which representing the surface elevation. Finally A, B, C and D cross section are measured by using river cross section tools (e GIS survey tools or river bathymetric tools).

3.2 Findings

3.2.1 Degradation of river Rupnarayan

A considerable number of households (100 – 150) in the surrounding at kolaghat (K.T.P.P.) are dependent on the fishing activities. River Rupnarayan which flow just the behind the thermal power project is famous for Hilsa fish due to its unique test and smell. Hilsa is an anadromous fish which basically grows in deep sea but lay eggs in the fresh water. This fish comes in huge group towards the inland water (river) during monsoon season (July – September) to lay eggs. The fishermen catch these fishes and sell it to the market at high price and this helps them to earn good amount of money. In order to investigate the recent trends of fishing in the river Rupnarayan, particularly the amount of Hilsa fish catches, the researcher conducted a field survey through questionnaire, on 40 fishermen and 10 fish traders who actively engaged in fishing in the river or fish trading for more than 30 years in the K.T.P.P. surrounding. The fishermen and some fish merchants observed that the Hilsa catch has declined to a large extent in recent times. They remembered that the Hilsa catch in the K.T.P.P. surrounding was 120 – 140 kg during peak season (monsoon period) in a week at the time when there was no affect of K.T.P.P. (Before 1984). But presently the production has gone down to 15 – 20 kg in a week during peak season. In the off season there was catch of 10 – 15 kg per week earlier but now in off season (Oct – Feb) there is virtually no catch. During field survey through questionnaire, almost all the fish merchants and traders are admits that the amount of Hilsa fish catch have been decline rapidly during last 15 years (the commercial operation of phase – II, units 4,5 and 6 were started in 1995).The table shows that after 1995 the production of the fish catch has drastically gone down and in recent time the fish catch becomes negligible.

Table 1: Declining trend in Hilsa catch in river Rupnarayan

Year	Total Catch in Quintal in a year	Year	Total Catch in Quintal in a year
1985	37	2000	7.5
1990	32	2005	2.5
1995	22	2010	01

Source: Primary survey

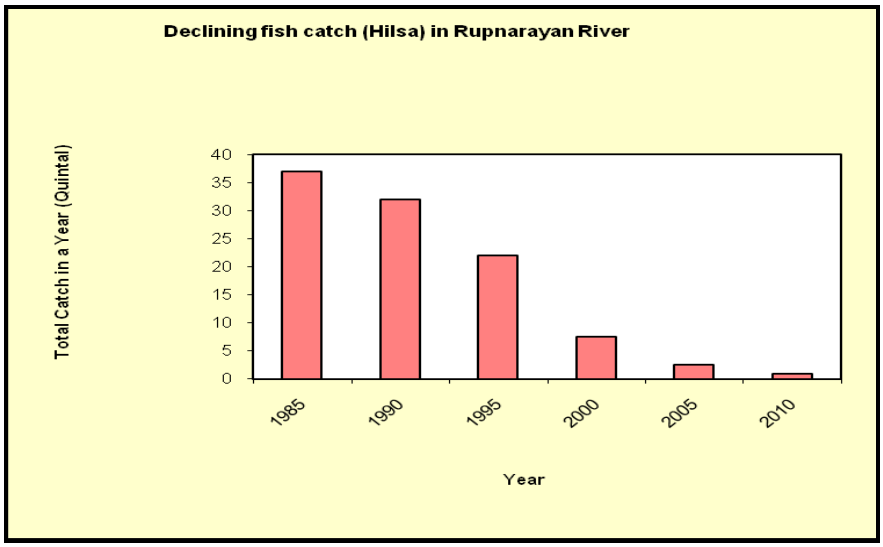

Figure 2: Location of the study area

The fishermen have also informed that the catch of other fishes such as Prawn, Topse, etc. have also reduced at some rate. In the peak season (Feb – March), the catch of Topse fish was 5 kg/day which has been reduced to 500 gm/ day in peak season at present period. What are the reasons for decline in Hilsa and other fish catches?

The laboratory analysis of river water have been done for investigating any physicochemical characteristics changes occurred due to continuous solid waste (fly ash) disposed into the river. The level of Biochemical Oxygen Demand (BOD) and Dissolved Oxygen (DO) and Fecal Coliform (FC) as found at the time of sampling (January, 2013 and July, 2013) are illustrated below:

Table 2: Monitoring of Physiochemical characteristics of Rupnarayan river water- January, 2013 and July, 2013

Parameters	January, 2013	July, 2013
BOD (in mg/L)	01.95	01.30
DO (in mg/L)	11.81	08.56
T.C. (in 100 MNP/100ml)	130 .00	1100.00
F.C. (in 100 MNP/100ml)	79.00	500.00

Source: Laboratory Analysis.

After that, the researcher further trying to investigate the exact caused behind such declining trend of Hilsa fish catch (as observed by fishermen and fish merchant at K.T.P.P.surrounding), the researcher finally decided to measure the present channel configuration of the river adjacent to K.T.P.P. The entire process are includes two different way – primary data obtained from field measurement and secondary data collected and analyzed from Remote sensing and GIS.

4. Result and discussion

From intensive field survey (measuring depth of the river Rupnarayan), following findings have been observed:

4.1 Depth of river water

The depth of the river water is reducing rapidly and significantly. Average depth for Hilsa migration in river needed 14m to 18m. (Source: Mojumdar, 1939b) But the depth of the river water in the Rupnarayan at present is only 1m to 10m.

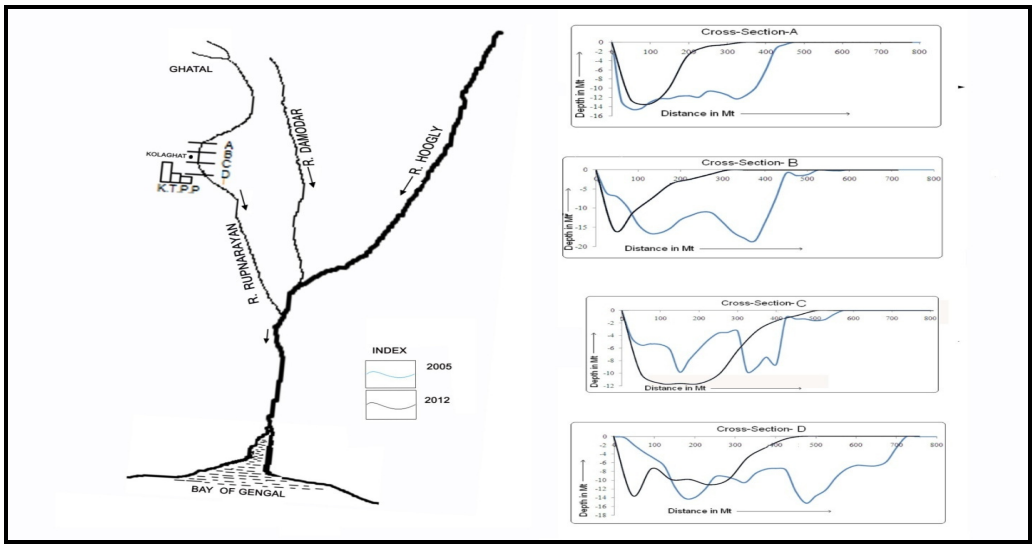

Figure 3: Depth of the Rupnarayan River along four crosses section (A, B, C and D) in 2012 in respect of 2005

4.2 Sedimentation

Excessive amount of ash-mixed water is being deposited in the river causing severe sedimentation.

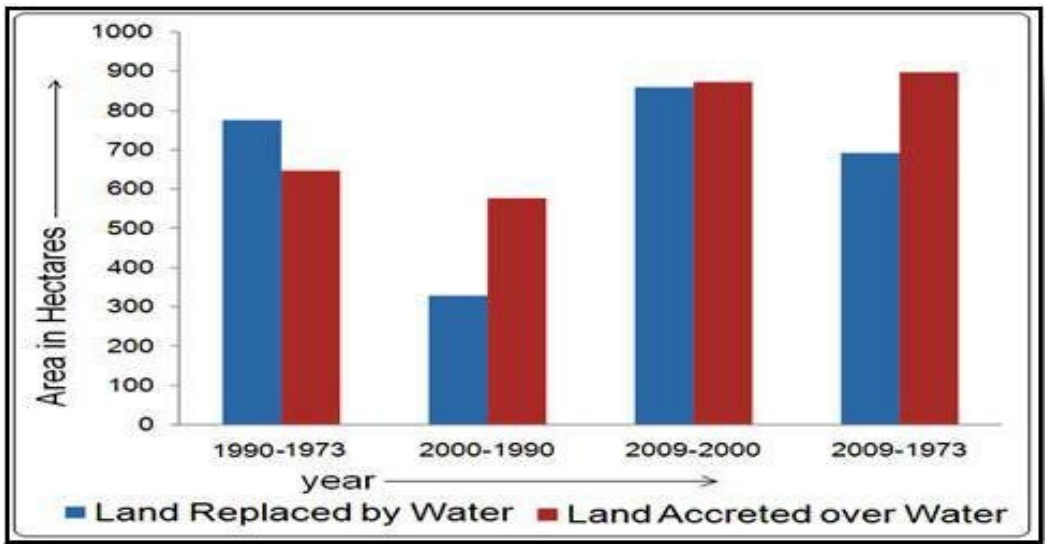

Figure 4: Land replaced and accreted by water

4.3 Want of food

Diatom, green and blue algae, organic detritus, mud, sand and smaller crustaceans are preferable food items for Hilsa (Chandrashekar, J.S. et al., 2003). But these food items are also decreasing rapidly as it has become difficult for them to survive due to huge ash deposition at the bottom floor of the river and it increases turbidity which hampers photosynthesis.

4.4 Breeding problem

Besides, the upstream migration of Hilsa during the main breeding season appears to depend largely on the commencement of the south- west monsoon and consequently flood in the river (Das, M.K. et al. 2007). But since 1978 the flood condition in the Rupnarayan river surrounding Kolaghat area has been controlled successfully with an aim to protect the thermal power project (Source: Field survey).

5. Conclusion

The depth of the Rupnarayan River at the surrounding of K.T.P.P. has been reduced rapidly during last decade. Kolaghat Thermal Power Plant authority cannot avoid their responsibility in this regard. The disposal of waste water must be treated properly before disposing them into the Rupnarayan river – is the only reliable way to avoiding such menace.

6. References

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