

“Shifting Behaviour of River Ganga at Patna- Problem and Solution”

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Importance of rivers has been recognized since time immemorial. Old civilizations all occurred along the rivers showing ups and downs in the social and cultural expressions remarkably well phased with the ups and downs of river behavior. Even today, we can notice that a great many capitals of the world are situated along the rivers. Rivers have occupied a very prominent place in every stage of human development. With the incoming of modernization and mechanization of human life, water and hence rivers are becoming more and more important. In the primitive times, there was absolutely no control on these natural rivers and hence they used to cause tremendous devastations and troubles to human beings. But with the development of science and technology and in a bid to control nature man has developed means to control mighty rivers.

River Ganga, the most worshipped of Indian rivers, has been flowing adjacent to many cities during its long course for centuries. Recently, Ganga is observed to be inclined to leave the banks at unexpected pace. This is much truer at Patna in Bihar. Similar was the condition at Kanpur where a Barrage has been constructed to train the shifted river and bring back to the Kanpur city side which can be said as a success story.

In 1811 A.D., the first survey of Patna was conducted by Francis Buchanan. According to his report, the city was situated south of river Ganga at latitude $25^{\circ}3'N$ and longitude $85^{\circ}15'E$. The present course of the river Ganga is away from this and the characteristic of the river in this zone is migrating. The river Ganga at Patna has a confluence of three main rivers (i) Sone at Maner (ii) Gandak at Hajipur and (iii) Punpun at downstream of Mahatma Gandhi Setu. The river is migrating towards northward direction and presently near *Digha Ghat*, the river has shifted nearly 3 km away leaving the Patna and its old ghats. The trend is of every year shifting towards north.

The river migration has created a problem to the population of Patna. People are not able to perform even the sacred *Chath Puja*. The main river has shifted about 2 to 3 km. away from the Patna bank. There is a new Rail cum Road Bridge near *Dighaghat*, which is almost completed and rail traffic has started partially. The ghats which are touching Ganga are *Gandhighat*, *Ranighat* *Gaighat* up to Mahatma Setu. On the other bank at Dighwara, the river touches the road level during high flood and creates a lot of damage.

The problem of shifting of Ganga seems to be much more complex at Patna because here the river Sone & Gandak confluences in a stretch of about 20 to 25 km, and also that the sediment and flow characteristics of these rivers vary considerably. The problem of shifting of River at Patna seems to be much more complex as here the river confluences with three important rivers in a stretch of about 25km, particularly when the sediment and flow characteristics of these rivers vary considerably. The agricultural activities inside in diara land and vegetative growth of various kinds causing resistance enhancement to the river has caused a concern. Increased human activity on the river bank has also caused resistance to flow, decrease in velocity and sediment deposition, which has caused the river to move to the other bank which is largely unprotected, resulting in erosion of the bank. It is therefore, recommended that the opposite bank be properly reverted. A systematic analysis of all morphological parameters finds engineering way to rehabilitate the river and bring it back to the city side i.e Patna side. The shifting behaviour of river in these reaches, the problems and possible solutions are given in this paper.

Keywords: - Morphology, Shifting, Resistance, River Course.