Abstract of the Thesis

Title: BANK EROSION OF THE RIVER GANGA IN BETWEEN RAJMAHAL AND FARAKKA

The main channel of the River Ganga between Rajmahal and Farakka is shifting continuously and steadily to the left since the starting of the last century. The erosion of the left bank in this reach is the manifestation of this lateral shift. During last 10 years, natural morphological changes of the river reach have resulted in the development of two spill channels which are carrying considerable amount of river flow. At present, the river is experiencing the tremendous over curvature due to left-ward swing. In 1963, Panchanandapur was subjected to serious phases of erosion. But the attack subsided within a short span of time. The next phase was predominating near Toffi during the early seventies. Charbabupur on the left bank of the river, immediately upstream of the barrage was the point of focus in the late 1970s which turned again to Panchanandapur. By 1988 the bank between Manikchak Ghat and Moynapur was the alarming reach to be eroded rapidly. But during the years followed by the late 1980s such focal area lost the vigorous rate of erosion and the erosion of the reach immediately downstream got accentuated. Following 1990 the lower reach downstream of Moynapur i.e. parts of Domhat, Nathinagar, and Khaskol-Panchanandapur bend were the areas to be diminished. The situation continued to a faster rate up to 2005. Thus it is evident that the nature of erosion in this reach has been manifested to an intermittent nature and attack to the alternate parts in the alternate decades and can be generalized by close observations as well as from available data.

The alignment of the abandoned loops and differential settlement lines are similar to that of eroding left bank line subsequent to 1922-23 (I & W, West Bengal, 2004). The line which joins these pools is named as 'MARGANG' (Dead River). In flood plains such relics are indicative of the old paleo features of the river. Thus the interfluve area between left bank line of 1922-1923 and the crescent shaped settlement line is indicative of purely riverine char lands and incidents of flood. During 2000 to 2006 actually Manikchak-Gopalpur sector (SOI sheet 72O/16) was active zone of bank erosion as about 700 m shifting of river bank between April 1997 and November 1997 was revealed from the multi-seasonal imagery. Well marked eastward shifting of the Ganga river in comparison

to SOI toposheet no 72P/13 (1970-1971) with the help of imagery of 1997 showed that the Ganga River swinged to a large extent and engulfed the meander loops of the Pagla river (Chakraborty, 1998). At Rajmahal site the river flows through a narrow neck like channel of about 2-3.0 km width with an average depth of about 9 m below pond level (+21.96 m GTs) of Farakka Barrage. The thalweg skirts the right Rajmahal bank of the river. Downstream of Rajmahal the river fans out and within a distance of few kilometers the width enlarges to about 10 km to 11.5 km at the bank full stage. The master channel of the river Ganga in this reach before taking a curve turn from shields of Rajmahal towards Manikchak throws two secondary channels from its right. At present such two channels have developed significantly as viewed in the image plan forms of 1997, 1998 and 2003 from normal to critically developed channels. The Right channel designated as RC takes off at location at about 2 km downstream of Rajmahal and RC traverses for about roughly 17 km (Imagery 2003). Through the channel charlands it finally pours into the master one. The average depth of the channel is about 4 m below the pond level. The central channel designated as CC flows for a distance of 07 km taking off from the main one again joins the same river with an average depth of about 5 m below the pond level. At this level the average widths of both the channels are about 550 m and 350 m respectively. Such a right channel was hardly found in existence prior to1980. Since the Main Channel designated as LC started to be swinged and was developed by eastward cutting of the bank taking Malda side country soil and reappearance of areal extent of the sand bars on the right of the thalweg line of LC extended.

The study reveals academic insights into the matter of micro-regional variations in erosion from time to time. Analysis and computations over maps, satellite imageries and SOI topographical maps make an understandable framework of swinging cum oscillating river pattern within an alluvial riverine trajectory, and can be summarized under the following heads:

i) After the super initial phases of 1917-18 the river made a lobe towards east, though almost with negligible amplitude of curvature during 1929-1930s, which actually culminated during 1970-1971 with a faster rate.

ii) Starting from 1970s to 1980s via the years 1973, 1974, 1975, 1977, 1980 mainly the localities like Dhelparua, Shibganj, Toffi, Charbabupur, up to Laskartola nearer to the Farakka Barrage was in attack and slumping was carried out in almost parallel fashion.

iii) In the next entire decade for the need of maintenance of hydro dynamism and meander cut development with skirting thalweg of the river, the effect was found along Manikchak, Moynapur, Domhat section at the northern part of the river comprising the year marks like 1980, 1981, 1982, 1985, 1986, to 1990s and liaison or off shock effects of lesser propensity was experienced at Panchanandapur, Sakullapur, Khaskol areas which have been experienced more or less erosion withdrawal in this period.

iv) The immediate next phase was of further meander development with sharp meander axis top of the meander curve of the river covering localities like Sakullapur, Panchanandapur, Khaskol, Jot Kasturi, Birodhi etc. mostly starting from 1995 onwards with tremendous severity after 1997, 1998 and 2000 flood effects and continued up to 2005 with a rate of 330-450 hectares of yearly land loss.

Still the problem is lying with the social framework of the affected areas of Diara and is increasing day by day towards more vigorous situations and future projection is really not very secured as there is serious possibility of the victim community to be redefined after any further inter-state resettlement of territory owing to be held. We have no right to strictly train the dynamic adjustment of the river within its own trajectory and future vision should have objectivities to evacuate the backline settlements at least 3 kms from the bank line as during 1997 flood, 600 m shift of the channel along Panchanandapur, Birodhi, Sakullapur, and Jotkasturi was found within 5 days of incessant rainfall. It is a long drawn record on river dynamics that if one bank is being trained, obviously there will be some reactions on the other like pushing back to the other bank and that should be untrained to release the reactions for the above mentioned action. Actually in case of Ganga, Bhutni and Duani (as because of dwelling sites) have obstructed forcefully by circuit embankment mainly, the dynamic reactions which in turn leads to the breakage of left bank side structures. Therefore, the main aim is now to save the life of hundreds of homeless destitute with a view to provide them new vision towards their life expectancy and social well being with flood insurance and to convince people not to fight against flood and bank erosion rather to adjust with and be with the flood/erosion and thereby to cope up successfully in their natural environ for sustenance.

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