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CHANGE ANALYSIS OF BANK LINE MIGRATION, EROSION AND SEDIMENTATION PATTERNS AT LOWER REACHES OF MAHI RIVER, GUJARAT USING REMOTE SENSING AND GIS

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Abstract — *A number of dams have been constructed across the Mahi River in Gujarat state. Lower reaches of Mahi River from Sindhrot dam, near Vadodara to Gulf of khambhat, in 176 km length, has been selected for the change analysis of bank line migration, erosion and sedimentation pattern. Satellite imageries (LISS III) from 1990 to 2016 and google earth images have been used in the analysis in GIS environment. The study indicated that the river reaches from Tithor to Sona Talavadi is currently under active erosion .It has been observed that area of erosion is more than deposition. Probably it is due to checking of the sediments by the dams located in the upstream. Migration of bank lines from 1990 to 2016 is maximum towards southern side in the central portion and in the northern side at the river mouth within the flood plain.*

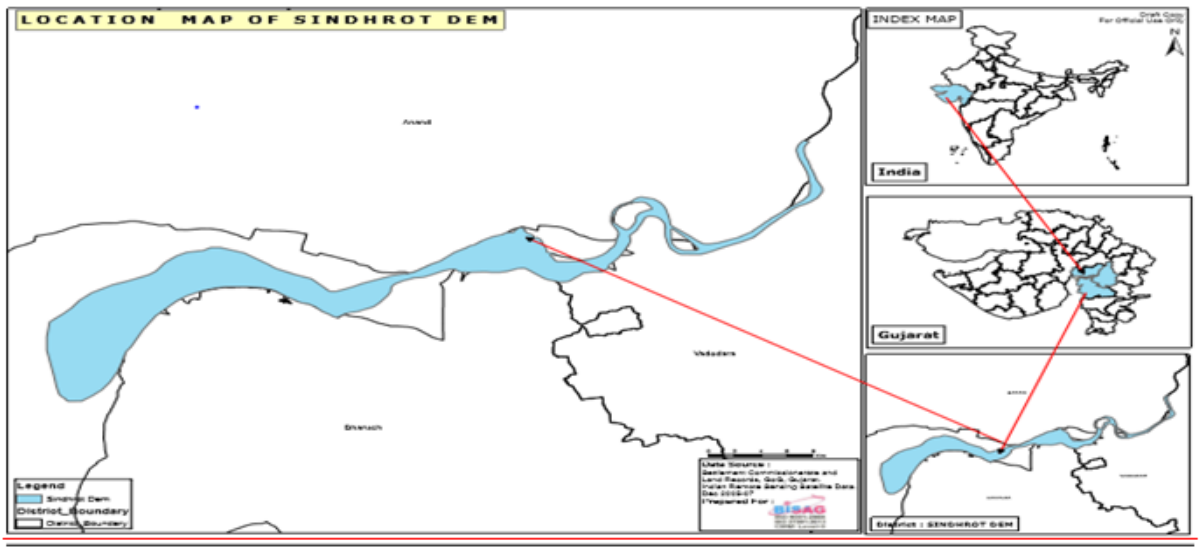
Keywords-*bank line erosion, Bank line migration, static changes*

I. INTRODUCTION

The river Mahi is third major west flowing interstate river of India, draining into the Gulf of Khambhat. It is one of the four major perennial rivers in Gujarat (Directorate of information G.O.G., 1960). It originates in the northern slopes of Vindhyas mountain ranges at an elevation of 500 m. above mean sea level (Rao , 1975), at about 22° 35' N and 74 ° 15' E near the village Sardarpur in Dhar district of Madhya Pradesh (Narmada Water Resources And Water Supply Department,1999). Its total length is 583 km, traversing 167 km. in Madhya Pradesh, 174 km. in Rajasthan and remaining 242 km. in Gujarat. Downstream of Wanakbori weir and up to the mouth, the basin is flat, fertile and well developed alluvial tract. The flat area causes of free movement of flow so there are continuous change along the length of lower reaches of Mahi River. The study area from Sindhrot check dam to Gulf of khambhat has been selected as the river is having free flow in this reach. The dam was constructed in the year 2005. Therefore, change analysis of the river bank lines has been done for the period 1990 and 2016 that is before and after construction of this check dam.

II. STUDY AREA

The watershed area of lower Mahi River from Sindhrot check dam to Gulf of khambhat is about 1564 km² between longitude 72º 33 to 73º 03E and latitude 22º 14 to 22º 18 (Fig. 1). The river is flowing from Sindhrot Check dam to Gulf of khambhat in 176km length. The sandbars have been observed at valvod and SonaTalavadi. Important places/ villages located in the study area along river on the left bank are Khambhat, Vasna,Dhuvaran,Valvad and Umeta, on the right bank Kambai,Mohmadpura and sarod.



III. MEHODOLOGY

Following methodology has been adopted show in figure 2

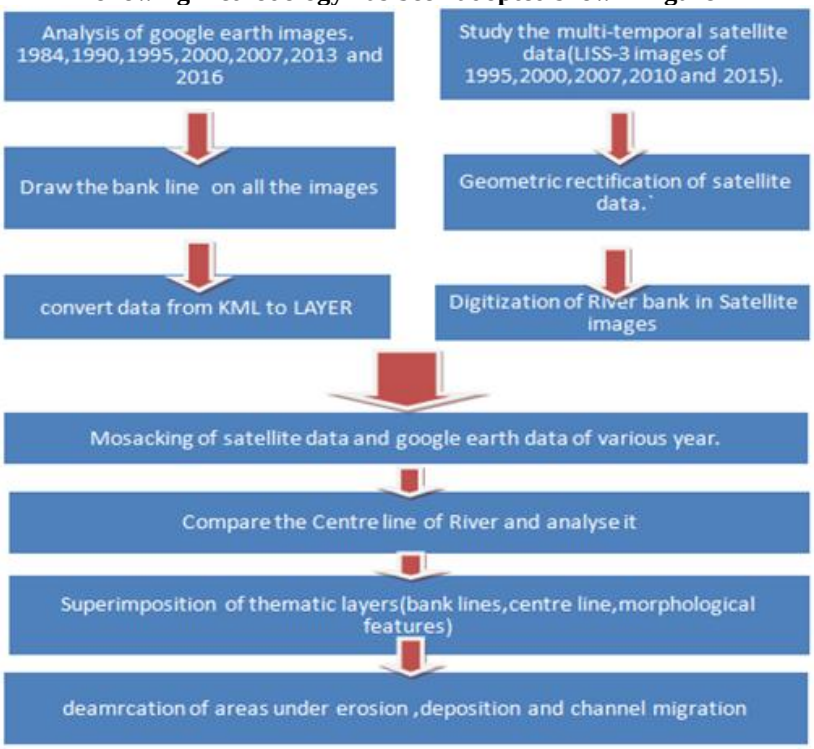


Figure 2: Flow chart of methodology

IV. RESULTS AND DISCUSSION

Analysis of data from Liss III images and google earth images from 1990 to 2016 has been carried out using GIS technology, Superimposition of the bank lines on these images have indicated that river is migrating within and adjacent flood plain in the study area (Fig.3) In the central part of the river more erosion has been observed. In this part, erosion is mainly confined in the northern side and deposition in the southern side that is on right and left bank, respectively.

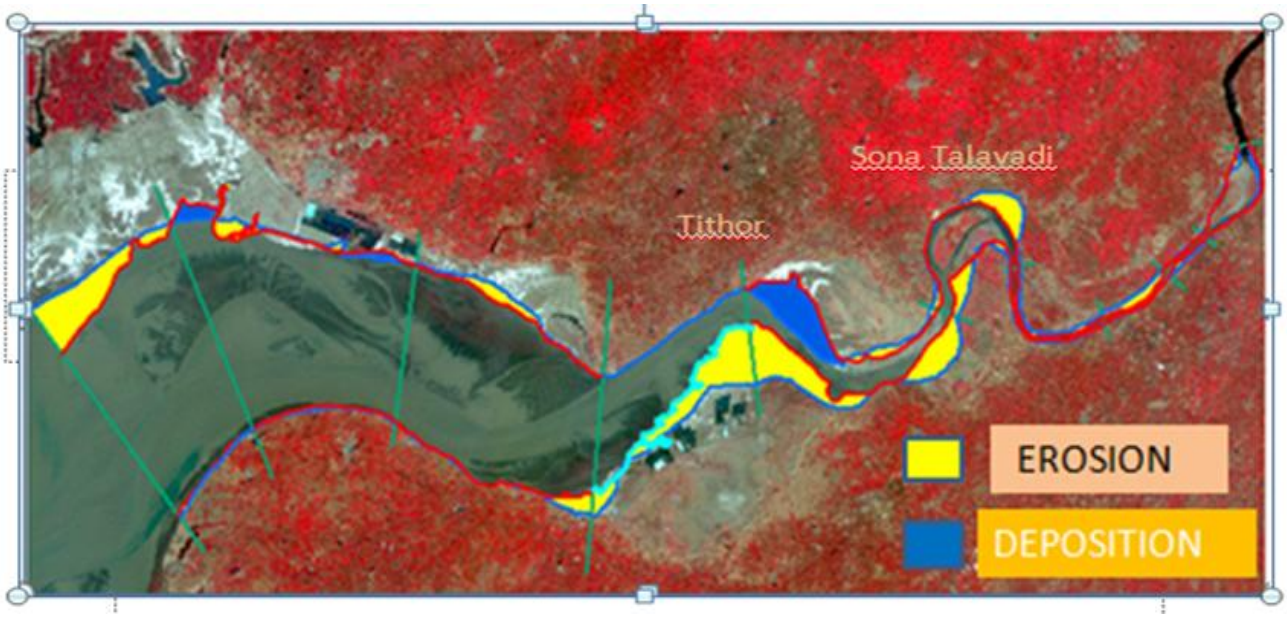


Figure 3: Erosion and Deposition along both banks of Lower Mahi River from 1990 to 2016

Figure no:4 shows the total amount of erosion and deposition along the Mahi River banks. ,

The total amount of erosion estimated is in 54.632 km² area and deposition in 10.079 km² area.

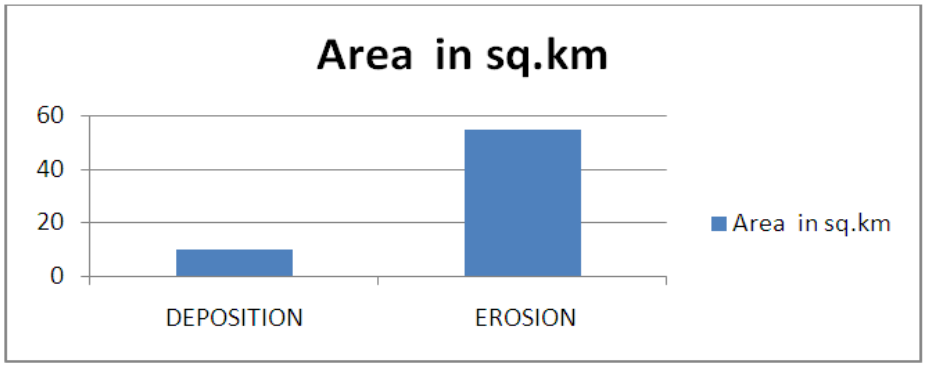


Figure 4-Total erosion/deposition along banks of lower Mahi River from 1990 to 2016.

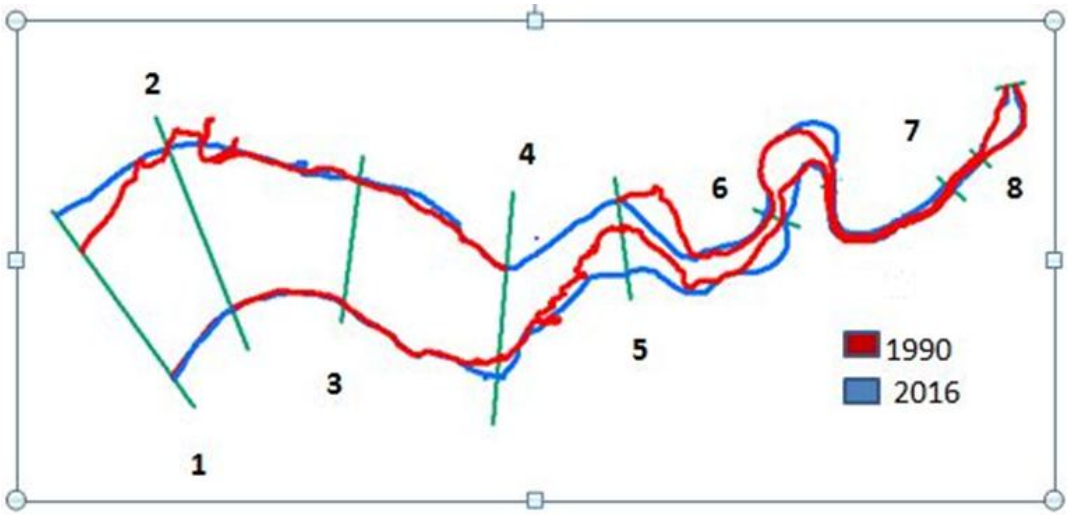


Figure5 -Bank lines of lower Mahi River in different years along with cross section.

Table 1 – Changes in length of bank lines (in metre) from 1990 to 2016

sections	Left bank	Right bank
1	-1528.03	11.98
2	-16049.63	-45.82
3	-2190.13	7516.12
4	-466.58	7180.32
5	-1492.26	-5891.95
6	478.51	-3452.43
7	-23.14	-204.05
8	-384.71	-49.73

Minus sign (-) means changes in length due to erosion and plus sign (+) means changes due to deposition.

Figure No. 5 shows changes in the bank line of Mahi River from 1990 to 2016. Table No. 1 represents the changing of channel from 1990 to 2016 measured along both Change analysis has been done in eight section. The highest erosion has been observed in left bank at section 2(16049.63 m²).Results indicate that erosion is relatively higher than deposition. The amount of total erosion of right bank is more than left bank of Mahi River. More erosion and less deposition indicate that sediments flow in the river from upstream to downstream is being checked in the reservoir of successive dams constructed in the catchment area.

V. CONCLUSIONS

The study indicated that the river reaches from Tithor to Sona Talavadi is currently under active erosion .It has been observed that area of erosion is more than deposition. Probably it is due to checking of the sediments by the dams located in the upstream. Erosion is more pronounced on both banks than the sedimentation. A large part of agricultural land as well as plantation and rural settlements are affected by erosion every year. It is suggested to provide flood and erosion protection measures such as earthen embankments, spurs, porcupines etc. to protect the area.

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