JoIG-v1-(2012)-p103-106 Bharali--Sarma---Bank-erosion-of-Brahmaputra-river

Article · October 2012

2 authors, including:

Kishore Kumar Bharali
University of Science and Technology, Meghalaya
5 PUBLICATIONS **0** CITATIONS

SEE PROFILE

Journal of Indian Geomorphology
Volume 1, 2012 • ISSN 2320-0731
Indian Institute of Geomorphologists (IGI)

acb publications
Kolkata, India
acb20@rediffmail.com

Bank Erosion of the Brahmaputra River in the Downstream of Palasbari and Soalkuchi, Kamrup District, Assam

Kishore Kumar Bharali[1] and Santanu Sarma[2]

[1] *Department of Environmental Science, Gauhati University, Guwahati 781014*

[2] *Department of Geology, Cotton College, Guwahati 781001*

Abstract: *A 20-km stretch of the Brahmaputra river is studied for bankline change downstream of Palasbari on the river's south bank and Soalkuchi on the north. Three Survey of India topographical maps of 1972 were compared with IRS-P6 LISS-III satellite image of 2006 in GIS environment. Results show that the area eroded during this period amounts to 31.52 km^2 on the south bank and 65 km^2 on the north bank. The affected resource and infrastructural categories include: wetlands, river channels, farmlands, settlements, roads and embankments.*

Introduction

Variability in channel configuration and sediment transport are the characteristics of the Brahmaputra throughout its 720-km course within the Assam valley. Brahmaputra is an example of a braided river with multiple channels twinning around numerous mid channel bars as well as lateral sandbars. Most part of the Brahmaputra bank line is extremely unstable within the Assam valley, as the river flows through unconsolidated alluvial formations. Because of this, its wide alluvial channel is marked by continuous shift of the thalweg and changes in the geometry and location of sandbars. River bank failure is prominent in the falling stages of the river. Resources and infrastructural facilities located in the areas of bank recession face continuous threat of obliteration, in turn affecting the resident population.

Objectives

The objective of this study is to determine the area and rate of erosion over a 34-year period in a 20-km reach of the Brahmaputra. Loss of various infrastructural and natural resources over this interval because of the bank line recession is also to be estimated.

Previous works

Various studies have been carried out on channel migration and widening of the Brahmaputra and its different tributaries taking the help of remote sensing data (Sarma and Basumallick, 1980; Das *et al.*, 1996; Goswami *et al.*, 1999; Sarma *et al.*, 2007; Sarkar *et al.*, 2012). Goswami (1985) discussed the nature and process of bank failure of the Brahmaputra. In 1980, NRSA published a report on the river migration study of the Brahmaputra river using airborne scanner survey. Sarma (2004) and Sarkar *et al.* (2012)

carried out comprehensive studies of bank erosion and channel migration of the entire stretch of the river in Assam using remote sensing and GIS. Studies on the erosion in the Majuli island within the Brahmaputra have also been carried out by various workers (SAC & BB, 1996; Mani and Patwary, 2000; Sarma and Phukan, 2004).

Study area

The present study area comprises a 20-km reach of the river Brahmaputra in Kamrup district of Assam, downstream of Palasbari on the river's south bank and Soalkuchi on the north bank. The stretch extends from 91°15′ 48′ ′E to 91°32′ 45′ ′E longitude along the 26°10′ N parallel (Fig. 1). Within the studied reach of the river, bankline recession is exceedingly high and the changes in the channel configuration are too drastic. However, bankline migration does not occur at the eastern end of the study area where Precambrian basement rocks jut out from the Quaternary alluvium to form the riverbank (Fig. 2).

Database and methodology

Survey of India (SoI) topographical map numbers 78N/7, 8 & 12 of 1972 and IRS-P6 LISS-III satellite data (path-110 row-053) of 2006 were used for mapping the banklines of the studied reach. For the measurement and analysis, standard methodology was adopted in the ArcGIS environment. Scanned SoI toposheets were georeferenced and projected in UTM projection system (Zone 46N). The satellite image was registered with respect to the rectified toposheets and the bank limits were extracted as polygons. The total area and rates of erosion over the entire reach under study in both the banks for the study period was calculated.

Infrastructure and resource information in the riparian tract of the river were digitised from the toposheets and were clipped by using

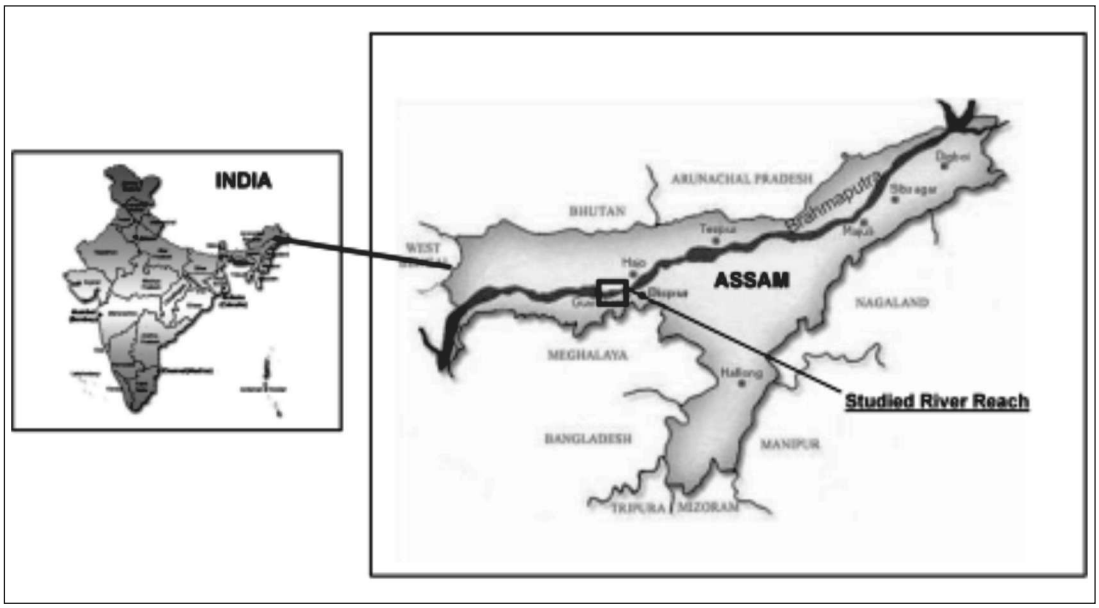

Figure 1. Location map of the studied river reach

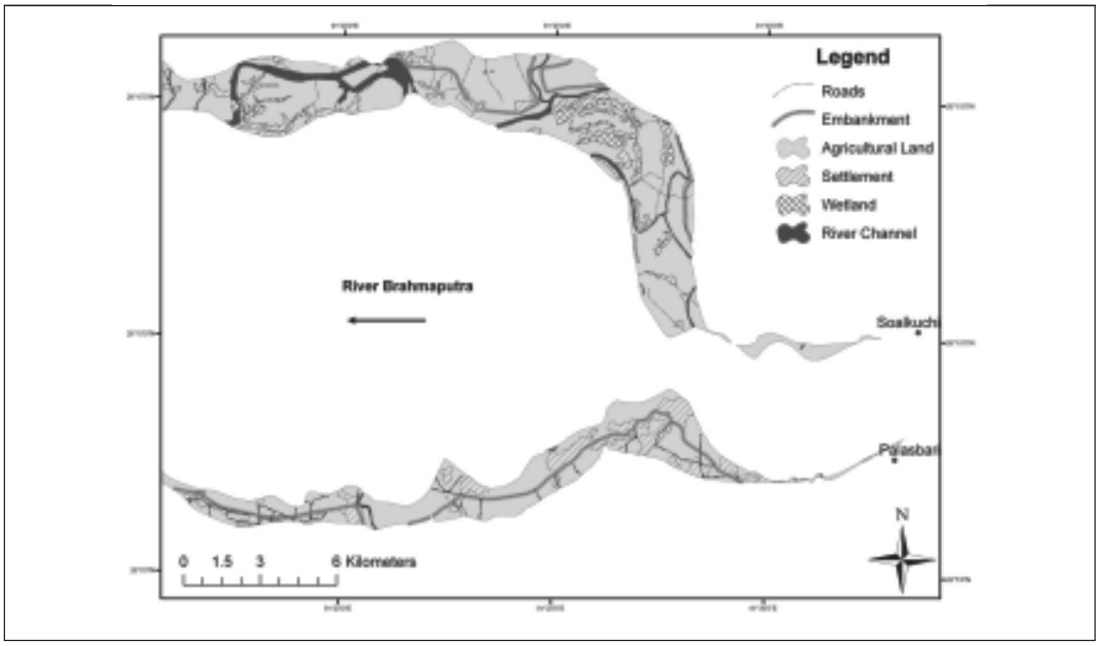

Figure 2. Area eroded between 1972 and 2006 on the south and north banks of the Brahmaputra

the polygons representing the area of erosion between 2006 and 1972. Quantitative measurement in terms of area or length of the resources and infrastructure parameters affected by erosion in the span of 34 years were also determined.

Results

In the studied reach of the river, a vast area in both the banks got eroded between 1972 and 2006. The river shifted as much as 1.6 km towards south and 3 km to the north. Total area of erosion during this period is estimated to be 96.52 km^2, out of which 31.52 km^2 is on the south and 65 km^2 is on the north bank. The average rates of erosion were 0.93 km^2 yr^{-1} and 1.91 km^2 yr^{-1} on south and north banks respectively. Fig. 2 and Table 1 summarises the results.

Concluding notes

The main cause of the erosion in both the riverbanks within the studied reach is because of the natural constriction developed in the upstream of Palasbari in the south and Soalkuchi in the north due to Precambrian rock formations. The abrupt expansion of the channel width downstream of this constriction results in bank erosion of the alluvial stretch. Over the years people residing in both the banks of the studied area is facing great trouble because of the bankline retreat.

Table 1. Resources and infrastructure eroded due to bankline shift of a 20 km stretch of the Brahmaputra: 1972–2006

Resources and infrastructure	Erosion		
	South Bank	North Bank	Total
Wetland (km^2)	0.11	2.87	2.98
River channels (km^2)	0.13	5.53	5.66
Farmland (km^2)	23.22	50.71	73.93
Settlement (km^2)	8.07	6.09	14.16
Roads (km)	26.61	50.88	77.49
Embankments (km)	24.19	15.05	39.24

References

Das, P. K., Duarah, B. P. and Goswami, D.C. (1996) Channel migration study of the Pagladiya river,

Assam using remote sensing and field survey data. *Journal of Geoscience*, 1: 38–45.

Goswami, D. C. (1985) Brahmaputra River, Assam, India: Physiography, Basin Denudation and Channel Aggradation. *Water Resources Research*, 21: 959–978.

Goswami, U., Sarma, J.N. and Patgiri, A.D. (1999) River Channel changes of the Subansiri in Assam, India, *Journal of Geomorphology*, 30(3): 227–244.

Mani, P. and Patwary, B.C. (2000) Erosion trends using remote sensing digital data: A case study at Majuli Island. *Proceedings of the Brain Storming Session on Water Resources Problems of North Eastern Region*, National Institute of Hydrology, Guwahati: 29-35.

NRSA: National Remote Sensing Agency (1980) *Brahmaputra Flood Mapping and River Migration Studies: Airborne Scanner Survey*, NRSA, Indian Space Research Organisation, Hyderabad.

SAC & BB: Space Application Centre and Brahmaputra Board (1996) *Bank Erosion on Majuli Island, Assam: a Study Based on Multi Temporal Satellite Data*. SAC, Indian Space Research Organisation, Ahmedabad: 52p.

Sarma, J.N., Borah, D. and Goswami, U. (2007) Change of river channel and bank erosion of the Burhi Dihing river (Assam), assessed using remote sensing data and GIS. *Journal of Indian Society of Remote Sensing*, 35(1): 93–100.

Sarma, J.N. (2004) Study of the Pattern of Erosion and Channel Migration of the Brahmaputra River in Assam using Remote Sensing Data. Unpublished RESPOND Project Report, ISRO: 190p.

Sarma, J.N. and Phukan, M.K. (2004) Origin and some geomorphological changes of Majuli Island of the Brahmaputra River in Assam, India. *Geomorphology*, 60: 1–19.

Sarma., J.N. and Basumallick, S. (1980) Bank line migration of the Burhi Dihing river, Assam, *Indian Journal of Earth Sciences*, 11(3-4): 199–206.

Date received: 11 September 2011
Date accepted after revision: 30 October 2012