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Course Change Detection of River AIE Using RS and GIS

Porag Jyoti Pathak¹, Mimi Das Saikia²

P.G. Student, Department of Civil Engineering Assam Down Town University, Assam, India¹

Professor, Department of Civil Engineering Assam Down Town University, Assam, India²

ABSTRACT: It is a natural phenomenon of a River to change or shift its course, without which it is impossible to imagine of the formation of vast alluvial plains on the surface of Earth, which in turn serves as fertile agricultural lands. In fact this is an inbuilt mechanism in the alluviation process around all Rivers of the world. River Aie too changes its course frequently over time and the change in course was determined by comparing the Toposheet and Satellite data of the year 1955, 2009 and 2015. The river often leaves the old course and takes new course very often over the span of the time and which has led to increase and decrease of the length of the River.

KEYWORDS: River, Toposheet, Satellite Image, Course change.

I. INTRODUCTION

The River course change has played a very destructive role in humans as well as on other living beings too. The River course change has been a pattern being followed by most of the River of alluvial bed, as the alluvial particle has least binding property, when the River carries the flash flood; it tends to take the path in the weakest way possible. The River AIE, which originates from the Sub-Himalayan range of Bhutan (27°00'19"N 90°15'32"E), which is known as River MAO in Bhutan, travels towards the south eastern direction and heads south ward in between the hill locks to reach out to the India –Bhutan border through Gelephu city of Sarpang district at Hatichar (26°51'14"N 90°30'04"E) in the state of Assam is shown in Figure 1. At Hatichar, the River is named as River AIE, which travels 98 km southwardly through Chirang Reserve forest of Chirang district. Then it heads southeast smoothly through Bongaigaon district of Assam. The upper reach of the River is passing through Bhutan and Reserve forest areas of Chirang district and lower reach is passing through alluvial plain of Bongaigaon district and also a portion of Barpeta district at outfall.

II. RELATED WORK

Das.J.D., et al (2007).,[1] has detected the changes in the Barak River channel, N.E. India using Remote Sensing and GIS application. The River flowing through alluvium having low gradient reduces the velocity which in turn leads to the creation of meanders and zigzag paths. The nature and the intensity of the channel is governed by the geological and tectonic condition of the River basin. Topographic data of two different years and four different years of satellite image were acquired and used in detecting the channel shift. The conclusion made after the analysis Subsequent change of channel position was seen. Abandoned loops due to cut-off can be seen on both sides of the channel. Vegetation pattern can be seen away from the banks of the channel. Strong northward shift at three places at the past and recently shifting can be seen towards southward.

Gogoi, et al (2012).,[2] have carried out Remote Sensing (RS) and Geographical Information System (GIS) based study at upper Assam valley, NE India to delineate two important fluvio-morphological changes that took place in the confluences of Dihang, Dibang and Lohit Rivers; and in increasing valley width of the River Brahmaputra. The study is conducted with TM+ and MSS 25 years time gapped satellite imageries of year 1986 and 2011. The main stream of Lohit River is diverted along Dangori River and presently flows along the south of Dibru-saikhowa. Due to divergence,

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the confluence point of Dibang and Lohit Rivers which was formerly located at Saikhowaghat, near Sadiya at NE of Dibru-saikhowa, is shifted towards south-western side of Dibru-saikhowa by about 59.76 km in valley length. However, the confluence between Dibang and Dihang Rivers shifted westward about 3.34 km from the Kobo Chapori. The changes were also attributed by broadening of the valley width of the Rivers. There is a total loss of 846 km² area due to migration of River bank lines or River enlargement up to 86% of the original size measured in 1986. The average rate of bank line migration is about 115 m per year in some sections.

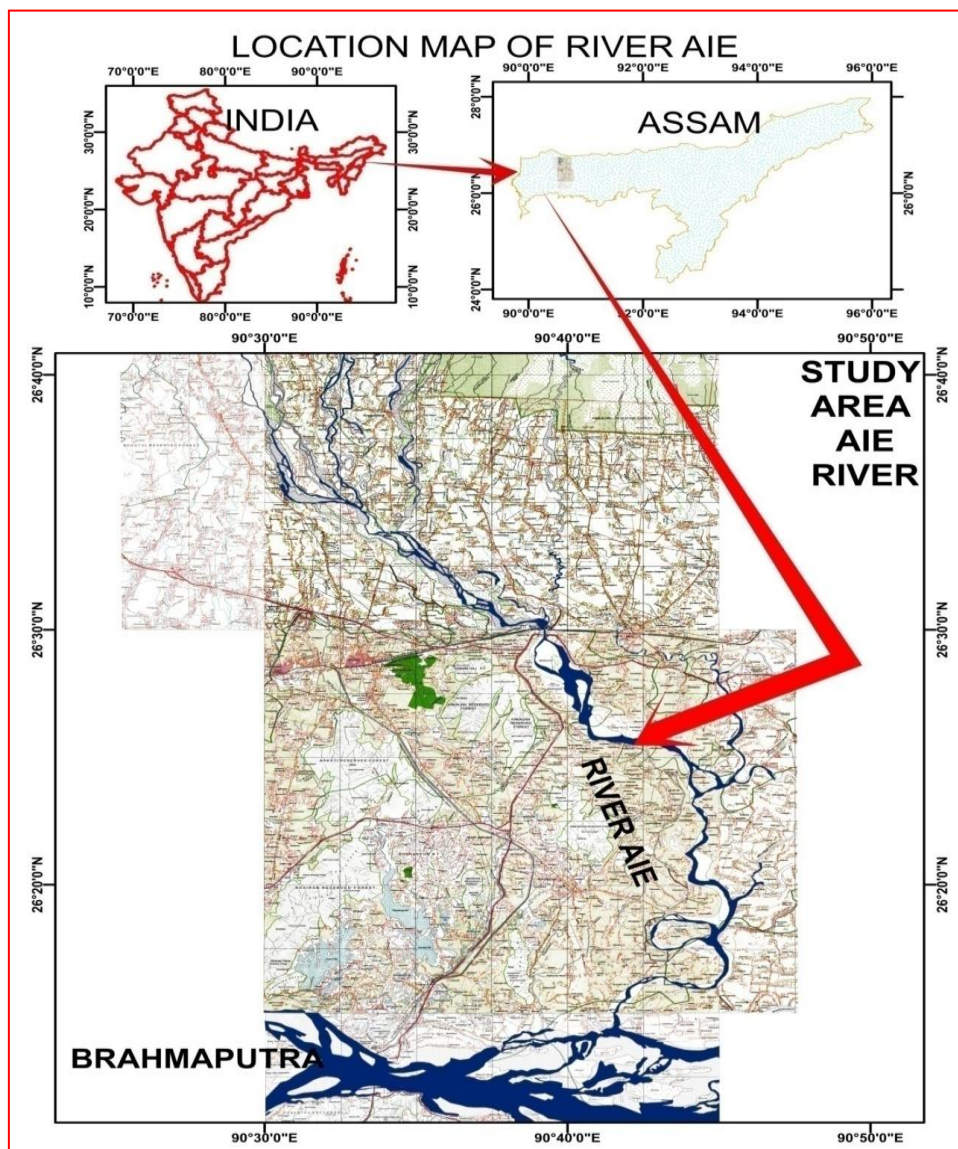


Figure.1:- Location map of River AIE at India

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III. MATERIALS

The remote sensing and topographic data used for the detection of course change are as follows:-

- i. Toposheet map prepared by Survey of India:- a).1955 of 1:250,000 scale, b). 2009 of 1:50,000 scale.
- ii. LISS III (24m) multi-spectral digital data (Acquisition date: NOV 09, 2015).

The software used for the processing of the raw data was ArcGIS 9.2.

Figure 2, shows the overall comparison of the course that changed from 1955 to 2015. Firstly, the Toposheet of Survey of India for the year 1955 & 2009 was digitized using Arc-GIS and both the toposheet were overlaid and the course change in lateral and longitudinal ways of the

River was determined for the toposheet released in the year 2009 by Survey of India, taking toposheet of the year 1955 as the reference as shown in figure.3. Secondly, the Remote sensing data LISS III for the year 2015 was downloaded from ISRO's website "BHUVAN" and processed the LISS III data using Arc-GIS software and the processed image was overlaid on Survey of India released 2009 toposheet and the difference was determined for both lateral and longitudinal ways of the River, the difference was determined by keeping the 2009 Survey of India toposheet as reference as shown in figure 4. During the process the increase/decrease of length of the River could be determined as well the lateral shift of the River was determined at every 5th kilometer.

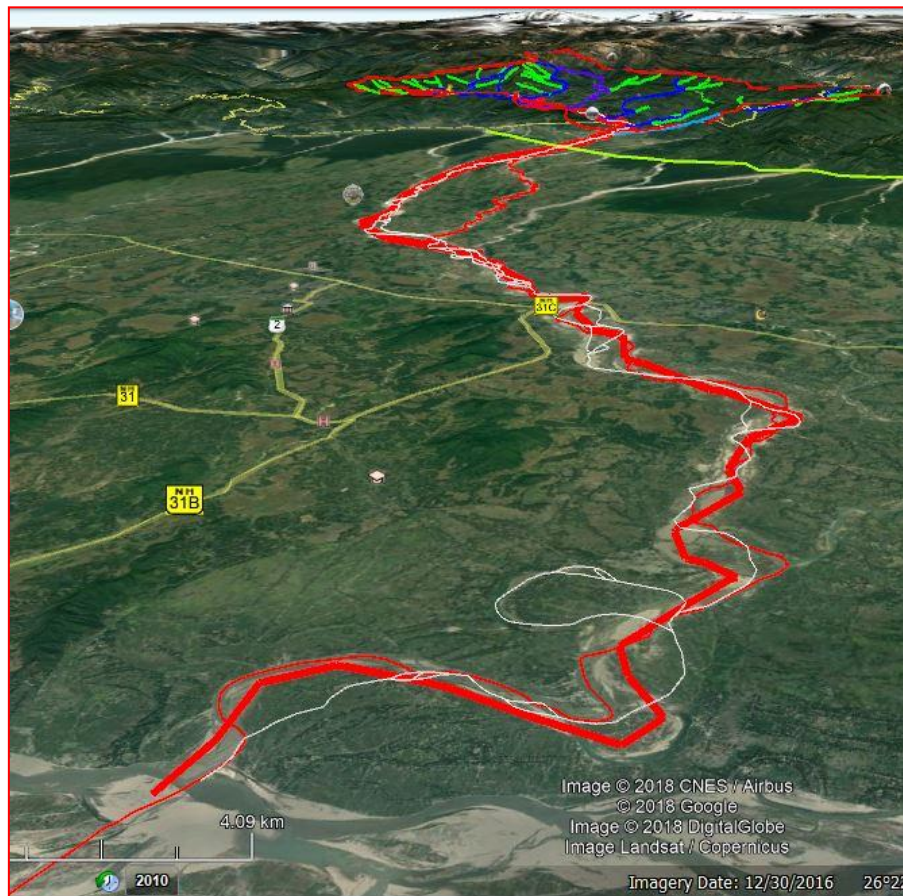


Figure 2:- Over-lapping of extracted alignments of 1955 (broad red line), 2009 (white line) and 2015 (thin red line).

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IV. RESULT AND DISCUSSION

Present study deals with the shifting of River course of the River Aie, in which the shifting was identified and mapped using remote sensing data from Bhuvan and topographical maps from survey of India. With the help of the multi-temporal satellite data the courses of different times were collected and processed in satellite image processing software like ArcGIS or QuantumGIS, and the final output is compared with the oldest and newest courses of the river and the amount of deviation from the old course is determined.

In Figure 3, 1955 & 2009 alignment was overlaid and keeping 1955 as reference line and the lateral deviation was determined, as well the reduction in length was determined.

Again by the same process, in Figure 4, 2009 & 2015 alignment were overlaid and keeping 2009 as reference line and the lateral deviation was determined, as well the reduction in length was determined.

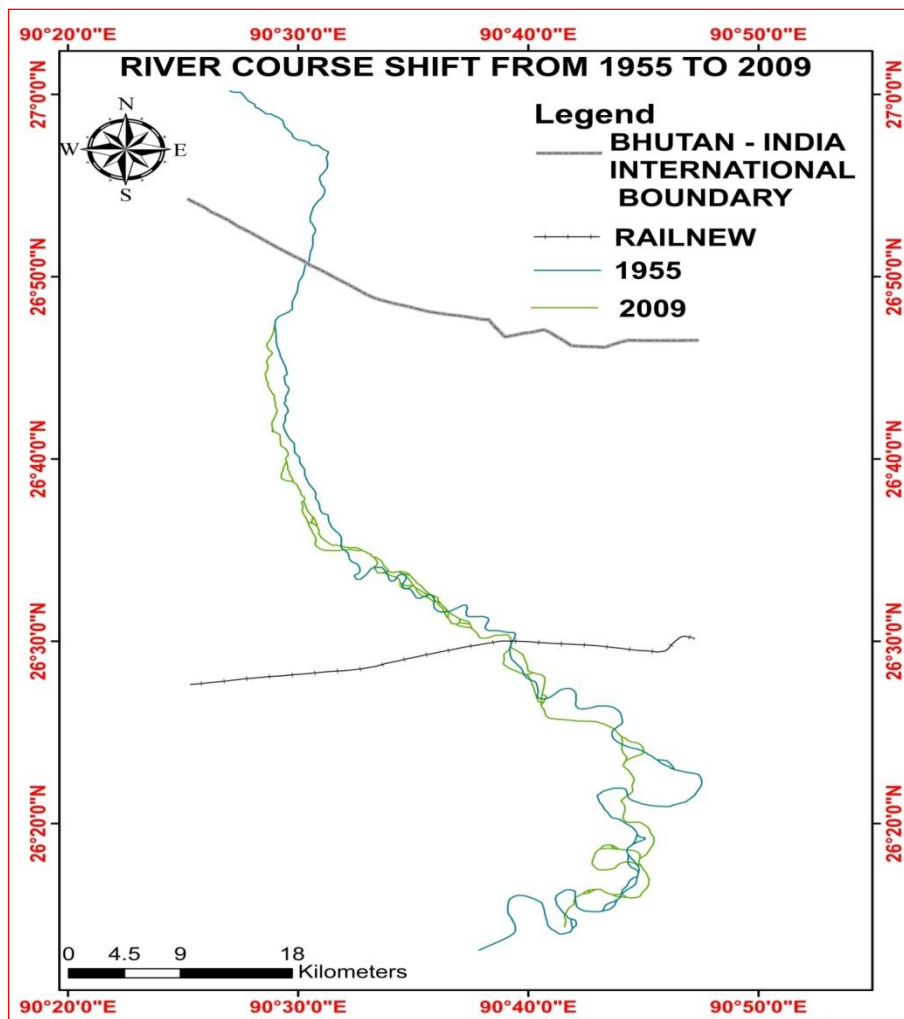


Figure 3: Overlapping of image of the River course of the year 1955 & 2009.

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From the analysis of lateral and longitudinal displacement or shifting it can be concluded that during the span of years from 1955 to 2009, it has been seen that the River has an average lateral shifting of 1.43 Km and reduction in longitudinal distance of the River by 42.71 Km

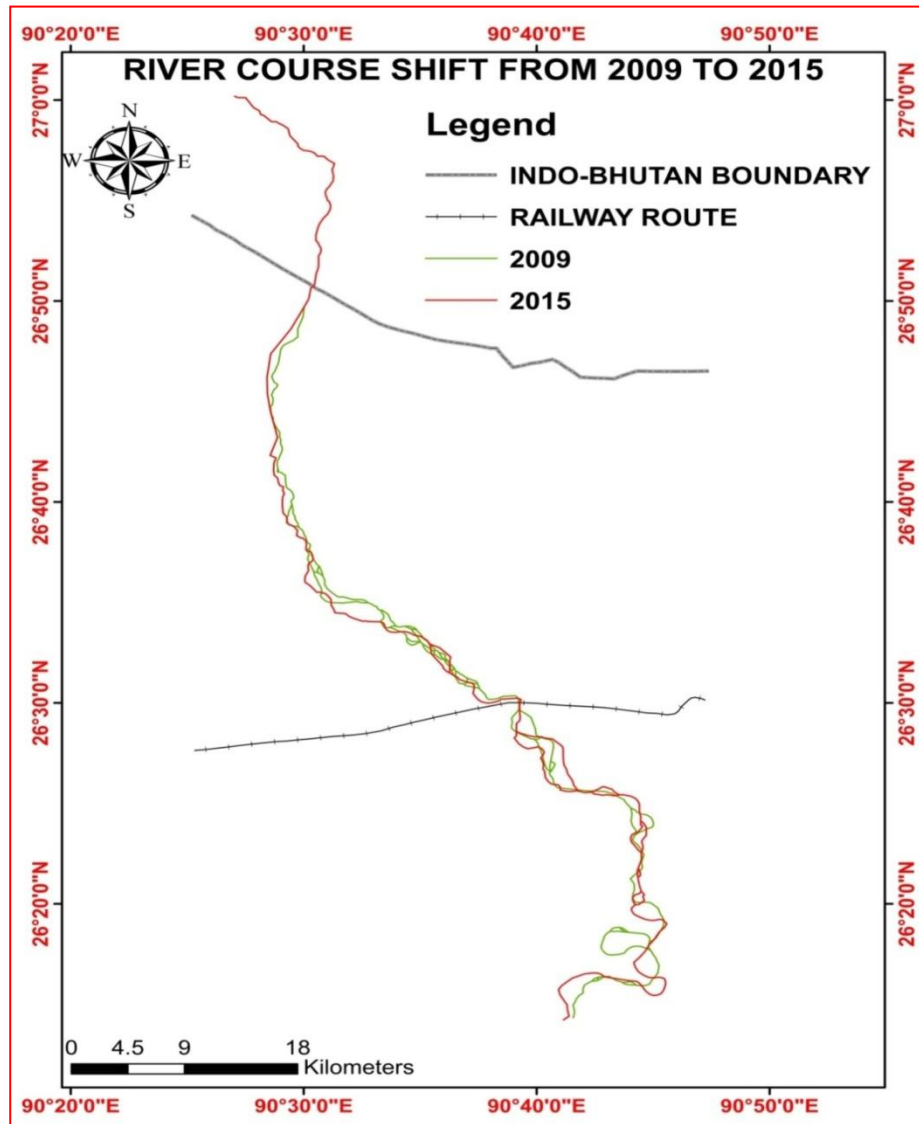


Figure 4: Overlapping of image of the River course of the year 2009 & 2015.

From the analysis of lateral and longitudinal displacement or shifting it can be concluded that during the span of years from 2009 to 2015, it has been seen that the River has an average lateral shifting of 0.32 Km and increase in longitudinal distance of the River by 7.96 Km.

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V. CONCLUSION

From the analysis of lateral and longitudinal displacement or shifting it can be concluded that during the span of years from 1955 to 2009, it has been seen that the River has an average lateral shifting of 1.43 Km and reduction in longitudinal distance of the River by 42.71 Km. And from the analysis of lateral and longitudinal displacement or shifting it can be concluded that during the span of years from 2009 to 2015, it has been seen that the River has an average lateral shifting of 0.32 Km and increase in longitudinal distance of the River by 7.96 Km. Overall the River has an average shift of 0.875 Km.

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