

Channel avulsion mechanism for the formation of abandoned channel of the Sankosh River Basin in India

Darshan Chandra Barman

Assistant Professor, Siliguri College

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ABSTRACT

Channel Avulsion is an important key factor for the formation of abandoned channel in the lower course of River flowing over the alluvial flood plain. Channel avulsions are more common in the study area of Sankosh River basin due to the variation of regional slope and high intensity of rainstorms which create the favourable conditions for the formation of abandoned channels. Various type of channel avulsion has been identified during the field survey in the study area in this regard.

Introduction:

Generally, Channel avulsion defined as a rapid and spatially discontinuous shift of a river or distributaries channel to a new course on a floodplain region (Allen,1965) and is considered a major fluvial hazard in large population centres (Jain and Sinha, 2009). Avulsion is commonly occurred when a reach of the alluvial river is at or near an avulsion threshold (Jones and Schumm, 1999). The avulsion process explained through identification and quantitative characterisation of threshold conditions of a particular river and the controlling factors that can help in prediction and to form a channel avulsion. In the study area, channel avulsion has been occurred in different portion of main channel of the Sankosh River and these avulsions differ in their size and frequency.

Factors of Channel avulsion:

Channel avulsion mainly depends upon the regional slope conditions of the river and lowest elevation in the study area. Therefore, it is said that topographic analysis is the key factor controlling channel avulsion. So it is said that the relationship between the channel slopes in the cross sectional and longitudinal direction determine the key point of channel avulsion. Moreover channel movement and temporal changes in Plan form characteristics also influence the avulsion process along the river Sankosh in the study area. In this regard, an increase in sinuosity results in the decrease in the down valley gradient of the channel with respect to cross valley gradient, which in turn may trigger channel avulsion (Jones and Schumm, 1999). Furthermore, changes of bar area or braid channel ratio (Friend and Sinha, 1993) also reflect changes aggradations and degradation processes, which play significant role in channel avulsion process.

Types of Channel avulsion:

Slingerland and Smith (2004) have mentioned that avulsion may be full or partial. According to them, full avulsion result in abandonment of the parent channel downstream of the diversion site, on the other hand, partial avulsion lead to new channel that co-exists with the parent channel within the particular river basin. They also mentioned additional classifications of avulsion which include nodal versus random

and local versus regional avulsion. Nodal avulsions are recurring events that originate from a nodal area of a flood plain in one hand, random avulsions may occur from anywhere along the parent channel on the other hand. Moreover, a local avulsion forms a new channel and alters passing few distances again re-joins with the parent channel in the downstream reach. On the other hand, a regional avulsion indicates a larger scale event, effects the location and position of the channel everywhere in the downstream reach from the site of origin (Heller and Paola, 1996).

Findings:

From the field observation and with the thorough study of necessary toposheet, it is identified that a partial avulsion is occurred along the channel of Sankosh River in 1984 in the study area near upstream. The extension of these partial avulsed channel is around 32 km and after that this partial avulsed channel meet to the main channel of Raidak River-II at 26°19'N latitude and Takula and Jorai Rivers is also joining with this avulsed channel at midstream. Now a day, after field observation it is found that the entrance of the partial avulsed channel has filled with siltation. As a result this avulsed channel become as an abandoned channel in 2018 in the study area (Figure 1).

Another field study revealed that a local avulsion is also occurred along the Sankosh River in 1984 in the study area near upstream and after flowing few km of distance again rejoins its parent channel at River Sankosh. Siltation and vegetation cover gradually increased day by day and finally the entrance of the local avulsed channel filled up in the year 2018. As a result the connectivity with the main channel has been closed and the avulsed channel converted into an abandoned channel(Figure 2).

From the above field investigation, it is mentioned that all the avulsed channels are now a day's become as abandoned channels due to the silt deposition at the entrance of avulsion caused by extreme rainstorms and high sediment load carried by the parent channel during last few decades. On the other hand, vegetation cover at the entrance and anthropogenic activities and growth of human settlement and other factors are

also influenced the process of channel abandonment along the Sankosh River in the study area.

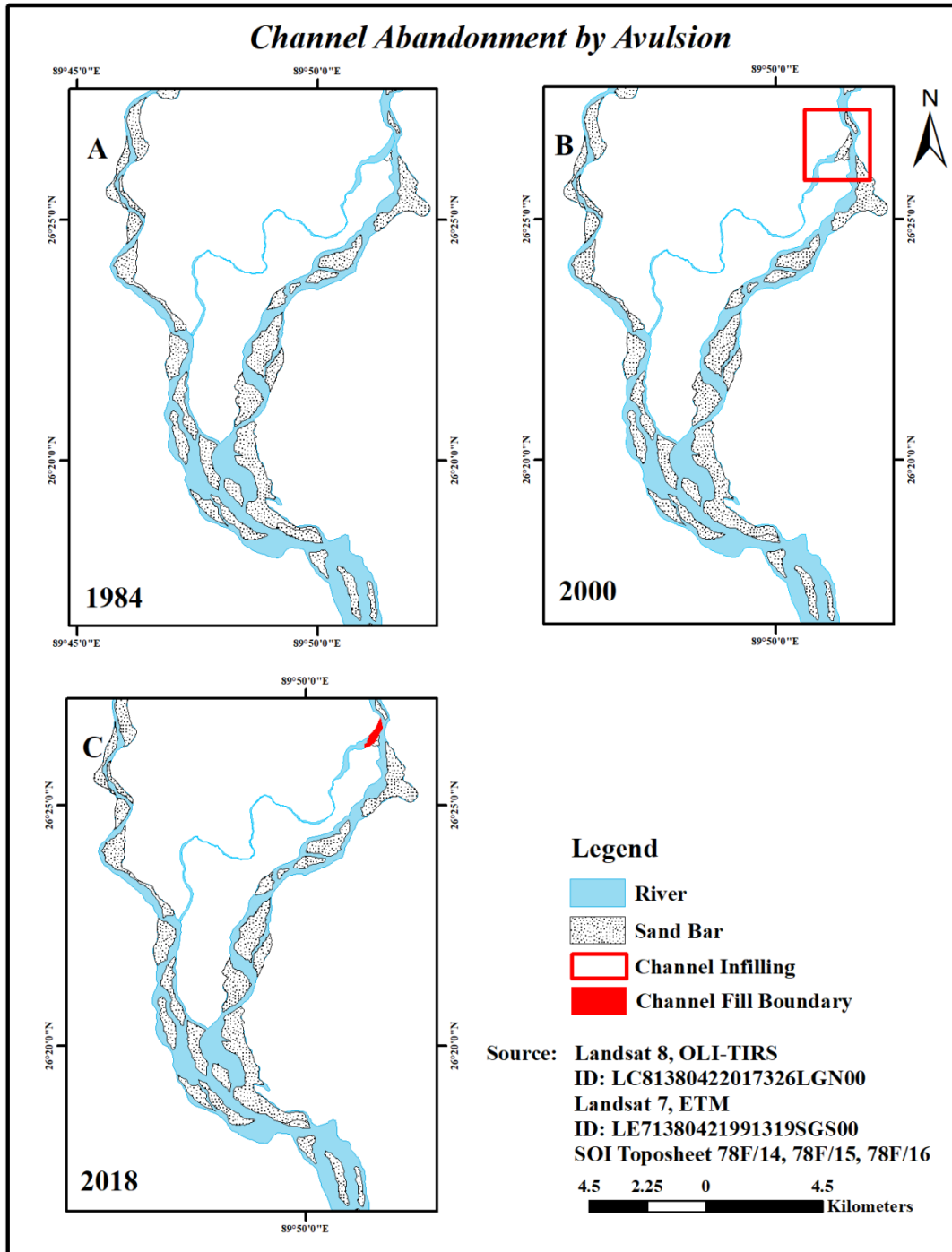


Figure 1: Map shows the channel abandoning by avulsion in the year 1984, 2000 and 2018.

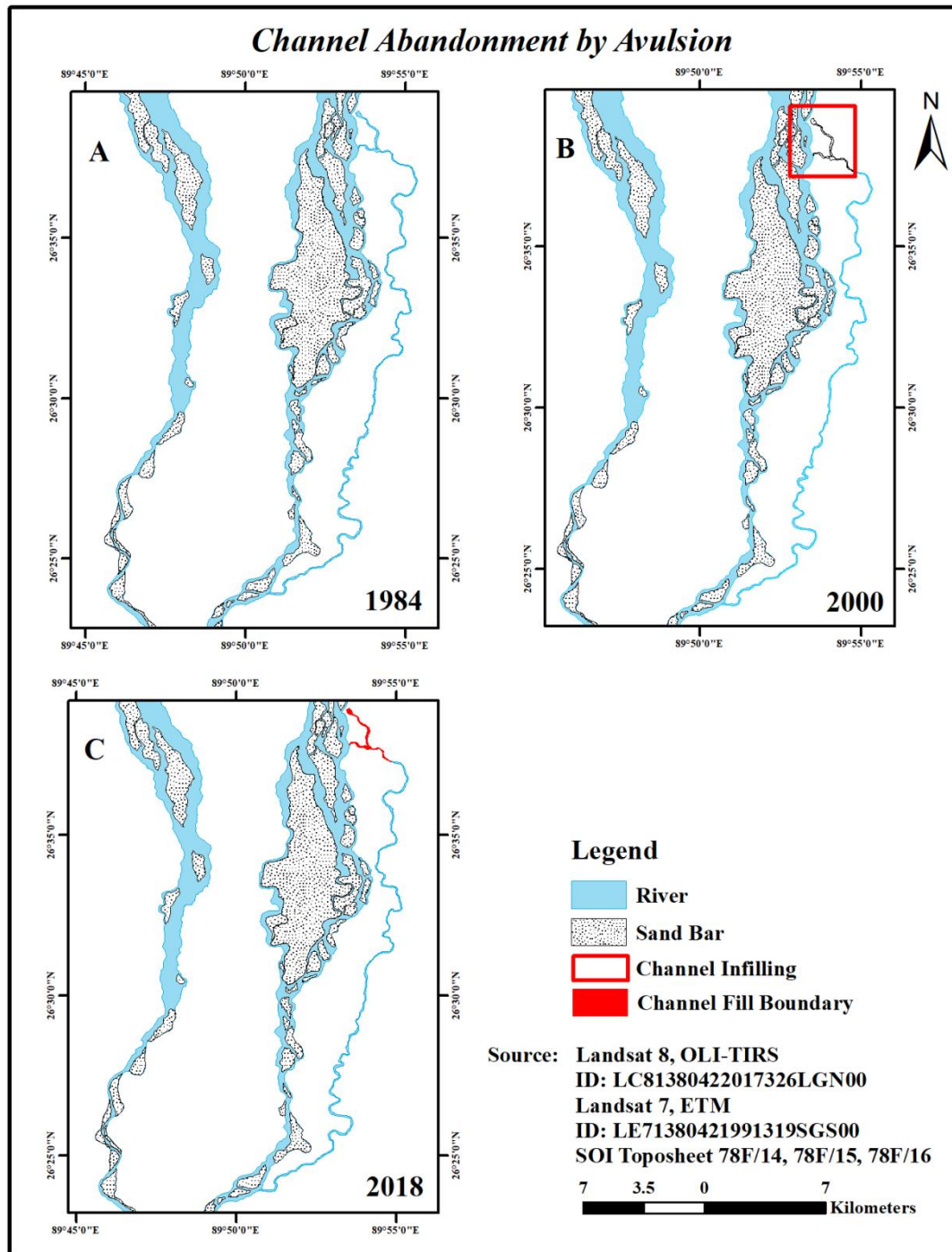


Figure 2: Map shows the channel abandoning by avulsion in the year 1984, 2000 and 2018.

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