Changing Dynamics of River Beas and Its Socio Economic Impacts: A Case Study of Kapurthala

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Abstract: Rivers are an essential resource for any country because of their various direct and indirect economic, social and environmental advantages. River Beas is one of such important river of Indus system which originates in the Himalayas and merges into river Sutlej at Harike, a Ramsar wetland. Throughout their course, rivers banks go through numerous changes in its spatial dimension due to natural and human interference. River bank degradation, environmental and socio-economic factors and impacts of river dynamics are observed in different countries at different scales. But information on socio-economic consequences of changing river dynamics in terms of total human displacement, loss of occupation, loss of property, impact on health and education, etc.) For all the cases, however small it may be is not available unlike other natural disasters. With land units in the area having shrunk because of erosion, and wages being depressed by the death of agricultural work, resettled families who depended mainly on cultivation for their livelihood had the lowest post-flood earnings. The situation of families who depended on some form of riverine activity for livelihood is also affected because of these changes. In this paper the changing characteristics of the river Beas and its impact on human life, which will help in understanding the socio-economic impacts of river, will be explored using remote sensing techniques and primary data collection techniques.

Keywords: River dynamics, Beas River, Remote sensing and GIS, River course, Significance of river.

INTRODUCTION

River bank erosion is a dynamic process affecting the concave side of the bank, while depositing sediments on the opposite side (Chatterjee and Mistri, 2013). Throughout their course, rivers banks go through numerous changes in their spatial dimension due to natural and human interference. More or less all the rivers of the country, whether big or small, are

responsible for erosion at various points on their bank lines (Baki, 2014). River bank erosion effects the environment and socio-economic conditions and river dynamics are detected on almost every place where a river flow (Karmakar, 2016). The people and resources of the country are under the threat of riverbank erosion due to its geographic and geologic settings and every year hundreds of people migrate with no source of food and shelter (Rana and Nessa, 2017; Das et al, 2017). This vulnerability depends on factors such as population density and the economic conditions of the region's population. Short-term socioeconomic impacts on the displaced population include loss of home, agricultural land, jobs and assets. There will also be long-term socioeconomic impacts on the displaced population, including direct impacts on their living conditions and indirect impacts on human health and development, such as schooling for children and the health of mothers and children (Das et al, 2017).

Remote sensing technique can be effectively utilised in mapping and monitoring the river course changes and associated geographical features (Thomas and Sharma 1998) (Kumar 2016). Risk zoning with the aid of remote sensing and GIS technologies, one can plan for better hazard prevention and preparedness programs (Laha and Bandyapadhyay 2013).

Objectives

In this paper the main focus is to study the characteristics of the river Beas when it enters in the Kapurthala district. The river affects the human life it could be in positive way or in negative way, which will help in understanding the socio-economic impacts of river. The changing dynamics of river will be studied using remote sensing techniques.

- To understand the characteristics of the river Beas.
- To analyse the changing dynamics of river Beas in the study area using Remote Sensing Techniques.
- To explore the socio-economic impact of the river dynamics on the life of people.

STUDY AREA

Punjab means the land of five waters that is Jhelum, Chenab, Ravi, Beas and Sutlej but after partition Punjab is left with two rivers that are Beas and Sutlej. It is the second river that flows in east most part of Punjab. The Himalayas in central Himachal are the main source from where river Beas rises, it flows for more than 470 km from Sutlej(Kumar et al 2017).Beas enters the

Punjab from its north western region. Beas is very important river for Punjab. It enters Punjab through Hoshiarpur, than it moves to northward and forms boundary with Kangra district. After flowing around the Shiwaliks hills, it moves towards south, and there it divide Gurdaspur and Hoshiarpur than it enters Jalandhar and after that again it forms boundary between the two districts that Amritsar and Kapurthala. (Kumar et al, 2015). It joins with river Sutlej in Kapurthala district. Kapurthala district is one of the one of smallest and backward district of Punjab. The reason for backwardness is the continuous flooding and less connectivity of roads. It has population around 98,916 according to census 2011, and the area is also very small (Thomas and Sharma, 1998).

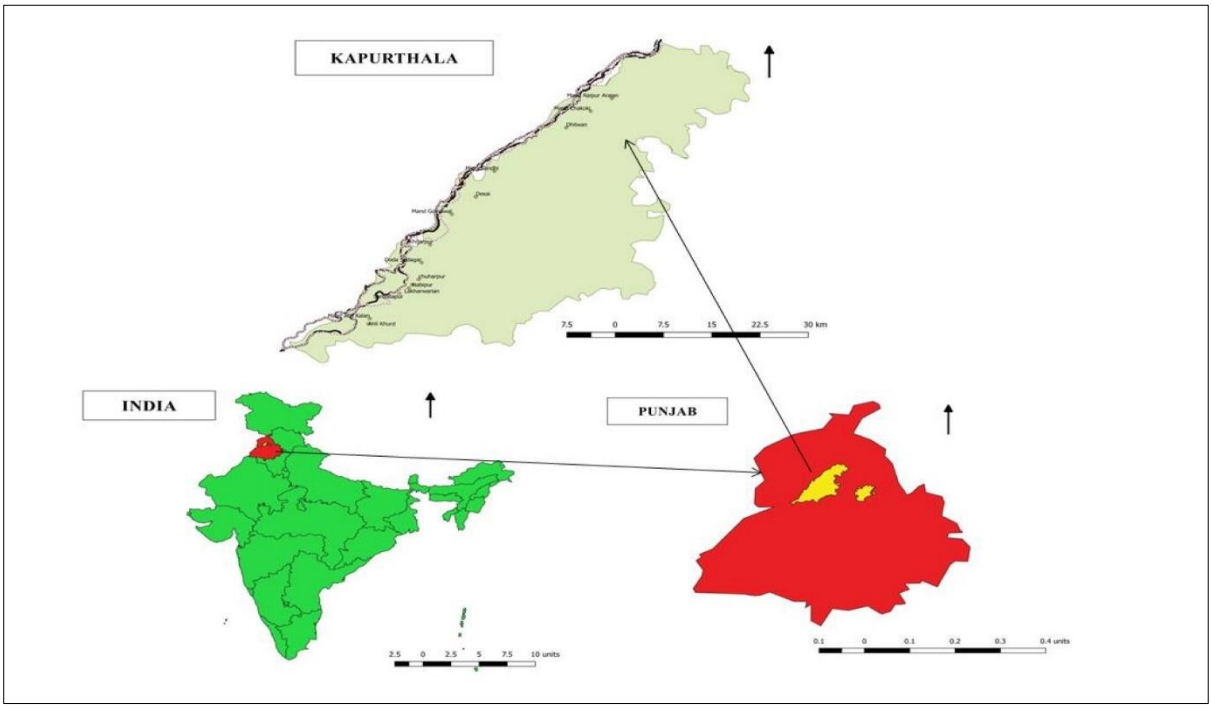

Figure 1 - Location of Beas River and Kapurthala district in Punjab

Table 1 – Characteristics of Beas River

River	Source	Catchment area per sq. km	Distance covered by river
Beas	**Rohtang pass**	**12,560 sq. km**	**470 km**

METHODOLOGY

The data are used from primary and secondary sources. The GIS and remote sensing techniques were used. First of all, the outline map of Kapurthala district was geo-referenced and digitized using QGIS software. The digitized map was converted to kml file and transferred to Google earth. Than the river Beas was traced in Google earth using path tool.

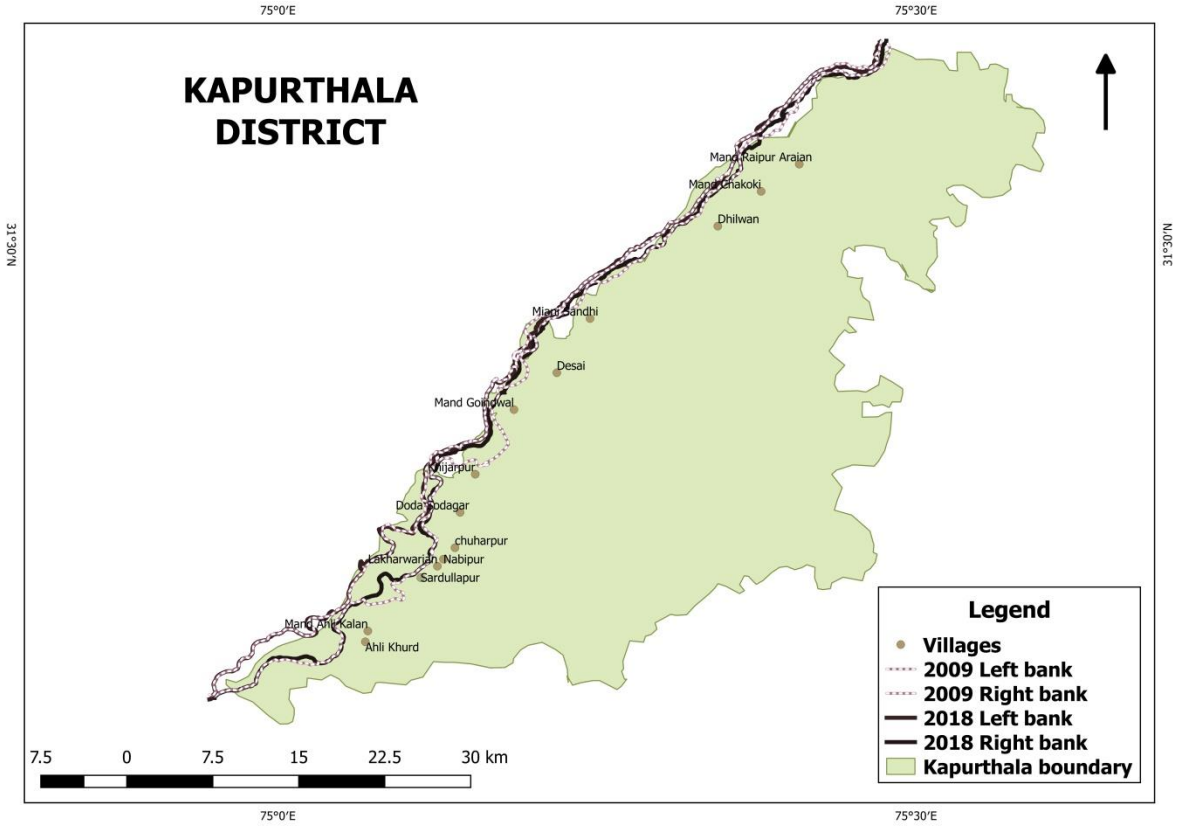

Figure 2 Kapurthala District

The river course of year 2009 and the year 2018 were digitized using the Google Earth software. Then the images of both years were compared to notice the shift in Beas River. To identify the change in river dynamics the change detection using observation techniques has been used. For studying the impact of changes in river Beas on the population, primary data was collected from the selected sample village. A small sample of population was selected purposively to study the impact of changes on the socio-economic conditions of the people. The villages selected were taken from the left bank of the river. There are 12 villages which

were lying at a distance 2 km from the river (left bank) as these are the villages which are most effected by the changes in the river course. The name of the villages are Mand, Raipur Araian, Mand Chakoki , Dhilwan , Miani Sandhi , Desai , Mand Goindwal , Khijarpur, Doda, Sodagar , Chuharpur , Nabhipur , Lakharwarian , Sardullapur , Mand Ahli Kalan and Ahli Khurd. Out of these 12 villages, Dhilwan village was selected, as shift was observed in the river from 2009 and 2018 satellite image. In the village, selected population was chosen purposively for collection of data. The respondents were given the questionnaire to get the information regarding the significance of river dynamics on their daily life and also to know their socioeconomic conditions.

Results and Discussion: Using the above methodology the results were drawn as follow:

River Beas and its changing dynamics-The word 'Punjab' means the land of five waters that is Jhelum, Chenab, Ravi, Beas and Sutlej. The starting point of river Beas is Rohtang pass at the elevation of 3900m where it rises in Central Himalaya and then to the north south direction and then up to Larji and from Larji to Pandoh Dam and after that in Harike in Tarn Taran and Kapurthala, it flows for more than 470 km from Sutlej. River Beas is also known as Arjiki by ancient Indians and Hyphasis to ancient Greeks (Kumar et al 2016).

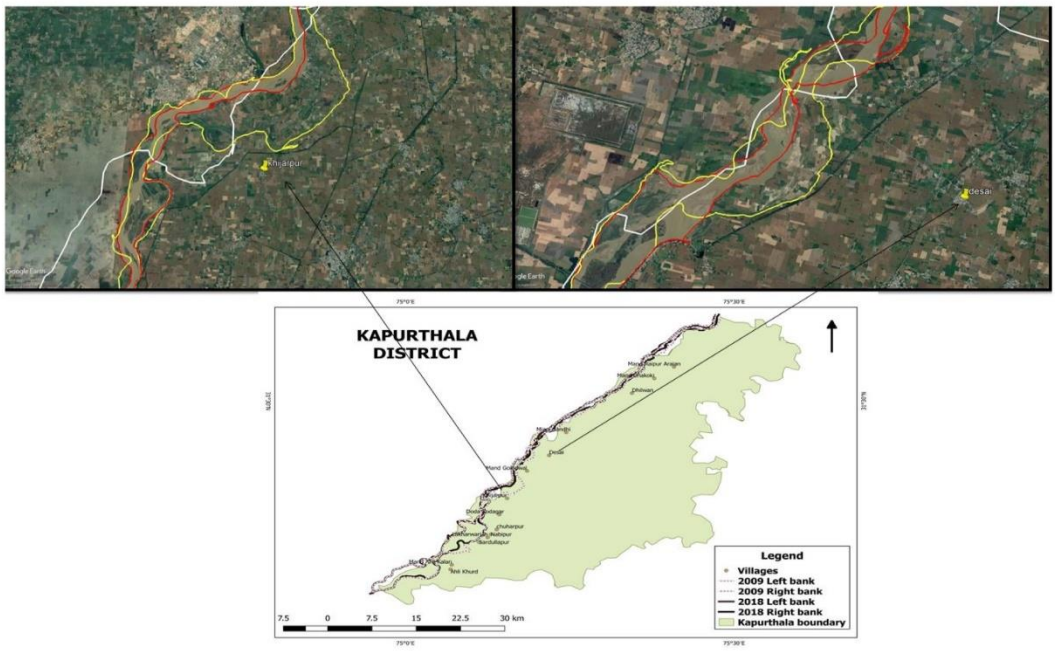

Figure 3 Village Khijarpur and Desai

As the figure 3 and figure 4 are showing the changing dynamics of river Beas 2009(yellow) and 2018(red). The River has shrunken from the past years and also the river is shifting towards the left side more. And the people living on the left bank are suffering as Punjab is a state where the whole economy depends on the agriculture so the people have huge agricultural lands on the banks of river but due to river shift towards the left side the farmers are selling their land at low prices just to avoid the loss to their agricultural production or to avoid the risk. As in image it is clearly visible that due to the Dera's construction activities the river course has been changing over past 9 years.

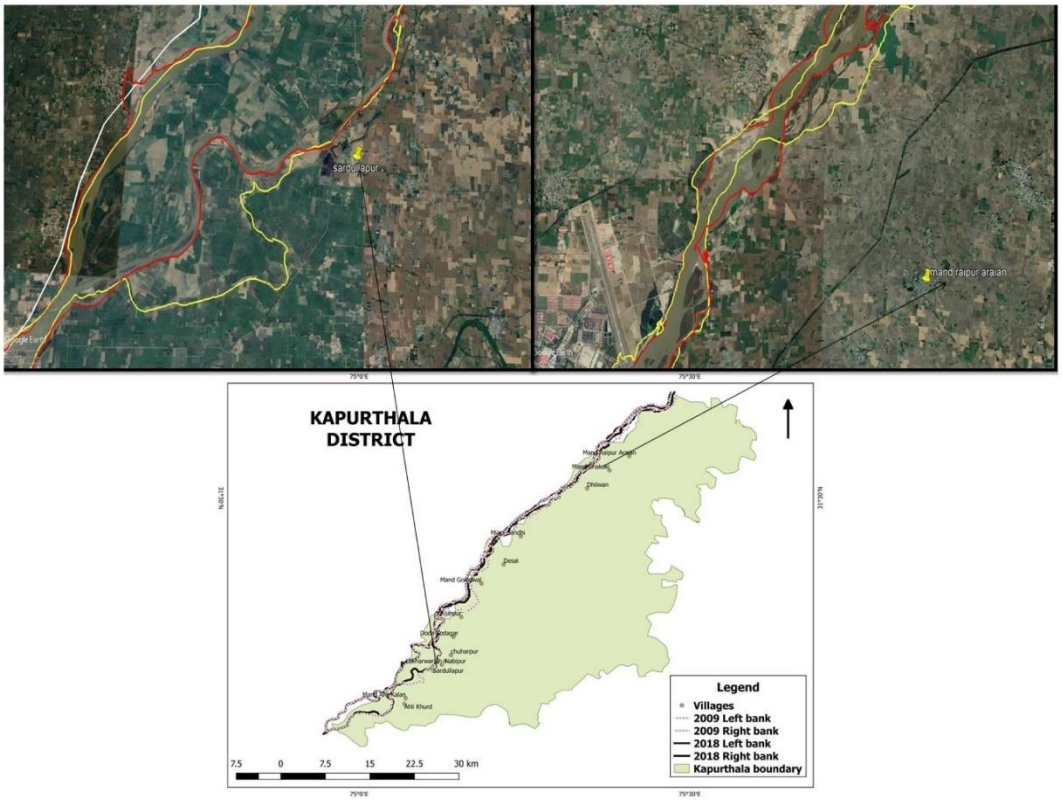

Figure 4 Village Sardullapur and Mand Raipur Araian

Also the quality of the river water has declined; villagers believed that in past years the water was drinkable but now the water quality is really poor. Even recently many fishes died cause of the poisonous water. In the image it can clearly be seen that the river has shrunken and the water quality in the river has also decreased. It can clearly be seen that near village Khijarpur

the river has shrunken its path and the water quantity has been declined and the villagers must have got new land by this change. In some areas, it is observed that some erosion has also taken place along the left border of the river.

Socio-economic impacts of river dynamics

As the survey was conducted in village Dhilwan of district Kapurthala. From the survey it was observed that the maximum population of the village was engaged in agriculture and they belonged to the Sikh religion. The villagers are not that educated. Maximum of them believed that the river is not that useful to them and have more negative effects. As village experience floods in every one to two years. And the year in which floods occur people experience loss in agricultural productivity. To overcome this loss people are selling their fertile lands at very low rate. As on the right bank Dera is carrying construction and manufacturing activities. They are building the elevated banks so the river flow shifts towards the left bank so the Dhilwan is flooded; it also effects the natural flow of river. The villagers have noticed that the river width has shrunken. The water quality has also decreased and the quantity of water has also decreased by the time. There are no facilities for the villagers by government to use river water for irrigation. As sand mining is and illegal process (Chakravartty,2015). But still villagers have noticed illegal sand mining on the right bank of river Beas.

a) Socio-economic and demographic profile

The sample was selected purposively from the village Dhilwan. The village seems to be male dominating as the women were unwilling to answer any questions. The people of the village were not educated, maximum of them were literate up to primary level only. Maximum population of the village was engaged in agriculture or other were out in abroad. The village had the majority Sikh population. As the main occupation of people is farming so they own land near the banks of river too and experience huge loss with changes in the course of river.

b) Significance of river

As the village is situated on the left bank of Beas river villagers have the benefit for fertile agricultural land and also the ground water level of the village was not that low. But according to villagers they are not getting anything from river they said that river has huge negative effect as floods occur on regular basis. They earn nothing from river. People of the village are highly

religious but as a Sikh majority village they don't have religious practice that will affect the river. They are not that connected to the river spiritually as the land near river is prone to floods so the maximum farmers have sold their land to Dera so they are not spiritually that connected to river.

c) Impacts of changing dynamics of river

Villagers may have affected the river by agricultural activities or by the sewerage waste disposed into river other than that they have not affected river in any way. According to villagers, on the right bank of river Beas the Dera is carrying construction and manufacturing activities by building elevated banks which effects the natural flow of river. Another observation by the villagers reveals that sand mining which is an illegal activity is still done on right bank of river Beas. It was informed by the villagers of Dhilwan that they are not allowed to take even a pinch of sand as legal actions are taken against them. According to villagers the rivers do not have any positive effect in their lives. Most of the villagers have lost their land in the floods. They feel threat to their life due to river as water level can rise anytime. Many of them have noticed change in the river, the river has shrunken, the water quality of river has decreased and also quantity of water has decreased. Majority of villagers reported that the changes in the river are due to the human intervention. Villagers have done nothing to control harmful effects because they are not financially strong and no help or financial aid has been provided by the government.

CONCLUSION

River erosion and floods are natural processes and rivers are bound to change their path and shift to any direction. Same has been noticed in case of river Beas as it is eroding agricultural land and due to floods in the river the farmers experience huge loss, floods can be controlled to some extent but government has done nothing in village to control the floods also no benefits are given to farmers who experience loss due to floods so the results are people leaving their land idle or selling it at very low price to avoid the risk of loss. This means the rate of unemployment in the region will increase. To cope with this problem the villagers are moving abroad leaving the dependent population in villages. Government should take the required steps and help the people who have suffered due to the river. As the according to villagers river means nothing to them the water for irrigation is used through tube wells government have

banned the sand mining in region so people cannot use the sand too for their personal use but on the other hand being a huge organization, the Dera is still doing the sand mining. This later on will increase the erosion and chance of floods.

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