

FLOOD AND ITS RELATIONSHIP TO DEVELOPMENTAL ACTIVITIES IN RAPTİ RİVER BASIN, GORAKHPUR

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ABSTRACT

Floods are among the most devastating natural hazards in the world, claiming more lives and causing more property damages than any other natural phenomena. Floods are caused due to combination of various natural and anthropogenic factors. Gorakhpur is one of the worst flood affected district of eastern Uttar Pradesh. Attempts have been made to study relationship between flooding and developmental activities and suggest measures for the optimum utilization of resources in the region.

Keywords: Floods, Developmental activities, Gorakhpur

INTRODUCTION

Floods are the most prevalent natural hazard that affect people, infrastructure, and the natural environment. They occur in many ways and in many environments. Specially in the tropical and subtropical monsoon climate river flooding is natural event. Generally river floods are due to heavy, prolonged rainfall or rapid snowfall in upstream watershed or abundant rainfall over a short period in relatively flat terrain exceeding the absorptive capacity of the soil and the flow capacity of the channel. This results watercourse to overflow its banks and inundating the adjacent the areas.

Recent years have experienced more frequent and more severe floods. Certainly these disasters are accelerated by anthropogenic impact, not only by taming rivers flow un-ecologically but also creating more vulnerability with unsafe settlement and unplanned land use practices. This paper deals particularly with the effect of

agriculture, forestry and urbanization on flooding in the Gorakhpur district and measures have been suggested to minimize their effect on flooding.

STUDY AREA

Gorakhpur district lies in the lower reaches of Rapti river basin which occupies extreme north-eastern part of Uttar Pradesh and is between 26°15' - 27°06' north latitude and 83° 06' - 83°45' east longitude (**figure1**), falling in the Survey of India Toposheet 63N. The district is bounded by Maharajganj district in the north, river Ghaghara in the south, Deoria district in the east and St Kabirnagar district in the west. Rapti River has its source in Nepal near Rukumkot in Mahabharat range of lesser Himalayas. It flows a distance of about 640 km in India. It meets Ghaghara River near Barhaj in Deoria district. It is a major left side tributary of Ghaghara River which is the part of the Ganga River system. The major tributary of Rapti are Burhi Rapti, Ami,

Taraina, Tura, Gaura, and Rohini (**figure 2**). Basic information about the district is given in **table 1, 2**.

METHODOLOGY

Hydrogeomorphic map (**figure 2**) of the area is prepared using SOI Toposheets and Landsat ETM + data on Arc GIS 9. Primary data were collected through field visit and secondary data from District Statistical handbook of various years. Land use pattern (**table 3**) of the Gorakhpur district, especially agriculture, forestry and urbanization are studied and its effect on flooding. Measures have been suggested to embrace such means so as to minimize the adverse consequences of development activities in the form of flooding.

RESULTS

Land Surface Characteristics Related to Floods.

District is almost a flat with gentle slope towards southeast. The difference of elevation from the northern most parts to the southern most parts is 13.70 m. The average slope of the land surface is about 20 cm/km due south throughout the district. Geomorphic features (**figure 2**) of the district consist of Khadar which is also called younger alluvium composed of unconsolidated material. The deposits are thick near the river margins and thin out toward the valley slope. Other geomorphic features are older alluvium (Bangar), sand bars, older meanders, ox-bow lakes. The soil of the district is mainly transported i.e. alluvial soil comprises of sand silt and clay in varying proportion and rich in humus. The major causes of flood is heavy rainfall over a short period during south-west monsoon extending from June to September and raising of river beds due to siltation which reduces the carrying capacity of the river. Anthropogenic factors like clearing land for agriculture, deforestation and urbanization have reduced absorptive capacity of the soil and the flow capacity of rivers and thereby increasing the risk due to flooding.

Effects of Development Practices on Flood.

In this region during a major flood, a considerable part of the flow of a stream with a wide floodplain is carried by that floodplain. Clearing the land for agriculture in the catchment area has resulted in progressively higher percentage of flood discharge. The proportion of net sown area in the district varied around 75 per cent to 78 per cent during 1980-81 to 1999-2000 (**table 3, 4**). The net sown area as percentage of total reporting area had hovered around 77 per cent after 1996-97 which is vividly high as a result of which some parts of the floodplain are eroded and other parts are built up by deposition of coarse sediment, while the channel capacity of the river channel is gradually reduced.

Forest vegetation in general increases rainfall and evaporation while it absorbs moisture and lessens runoff. Deforestation or logging practices have reduced the vegetation and a forest's absorption capacity, thus increasing runoff. Forest cover in the district is abysmally low. The forest land fluctuated around 8.75 to 8.5 per cent of total reporting area during the period 1960-61 to 1989-90. Thereafter in the next four years i.e. during 1989-90 to 1993-94, declined and fluctuated around 6.3 per cent. The area under forest further decreased to around 1.72 per cent by 2000-01 (**table 4**).

Urbanization of a floodplain or adjacent areas and its attendant construction has increased runoff and the rate of runoff because it reduces the amount of surface land area available to absorb rainfall and channels its flow into sewers and drainage ways much more quickly. In urban area the number of residential houses has been increasing and the share of urban population has also been increasing because of migration. But even more importantly, the area under urban limits has also been increasing. The urban area of undivided Gorakhpur was 82.8 sq.km. in 1981, while the urban area under divided Gorakhpur in 1991 was 195.1 sq.km (**table 5**). That is area under urban limits had increased by more than 135 per cent during the decade 1981-91.

DISCUSSION

Agriculture being the dominant activity and the livelihood of about 80% of the people in the region, is indispensable. Efforts should be made to reduce run off, check removal of top fertile soil. on the one hand and maintain infiltration on the other. The catchment area of each water route should be mapped out and the programme to manage rain water should start from the highest land and end at the drainage basin. There are several cheap ways to make contours, if this is taken up collectively. The strip plantations of multipurpose trees or shelter belts for crop lands will provide wood/leaf fodder and also ameliorate environment. Water reservoir tanks/ponds be constructed at places where main drain routes meet. This will involve shaping farm land and also the catchment area of water course which will slow down the flow of water and thereby increase infiltration into soil.

Cropping pattern in the district has not significantly changed during the last 20 years. The only crop which continues to be important during all these years is paddy. Area under paddy cultivation had hovered around 60 per cent of net sown area. It is suggested that efforts should be made to facilitate the adoption of flood and water logging resistant varieties of rice and other crops. Less resistant crops may be grown in the non flood season.

The area under forest could be brought to around 3 per cent of total reporting area, if some part of the land under other fallow and some part of land under culturable waste is brought under forest. This could be done by forming Joint Forest Management Committees consisting of plant growers from poor peasantry class and representatives of forest department and land use committee. A cell should be formed to provide them the financial support and infra-structural support so that they could get suitable plants, methods to protect them and finally marketing of forest produce. Secondly, development of such forests should be linked with watershed

management in the area. For this purpose an area of 500 hectares to 1000 hectares should be chosen as unit for micro-watershed management.

With the forest area having become very small, increase of land put to nonagricultural uses needs to be restricted severely. Failing which, it would not be possible to convert land available under other uses to bring under plantation. Barren and unculturable land can be used for further expansion of residential places, playgrounds and construction of building for common uses such as school or panchayat bhawan. If cultivation is not possible then it could be converted into area for social forestry or developed as pasture and other grazing land. Currently area under culturable waste is 1.03 per cent of total reporting area (**table 4**). A part of it (say around 0.50 per cent) could be converted into social forestry and the rest i.e. around 0.53 per cent could be developed as pasture and other grazing land. Gorakhpur had two major rivers and many tributaries flowing through it. The patches of land along side these rivers are undulating and at some place with high mounds. These areas could be developed as reserved forest strips with one to two kilometers width.

CONCLUSION

One of the dominant cause of flooding is increase run off and siltation of river beds. With growing population and limited land resources it is imperative to pursue development activities in such a way so as to minimize the risk of flooding which involves adopting measures to increase infiltration rate.

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Figure 1

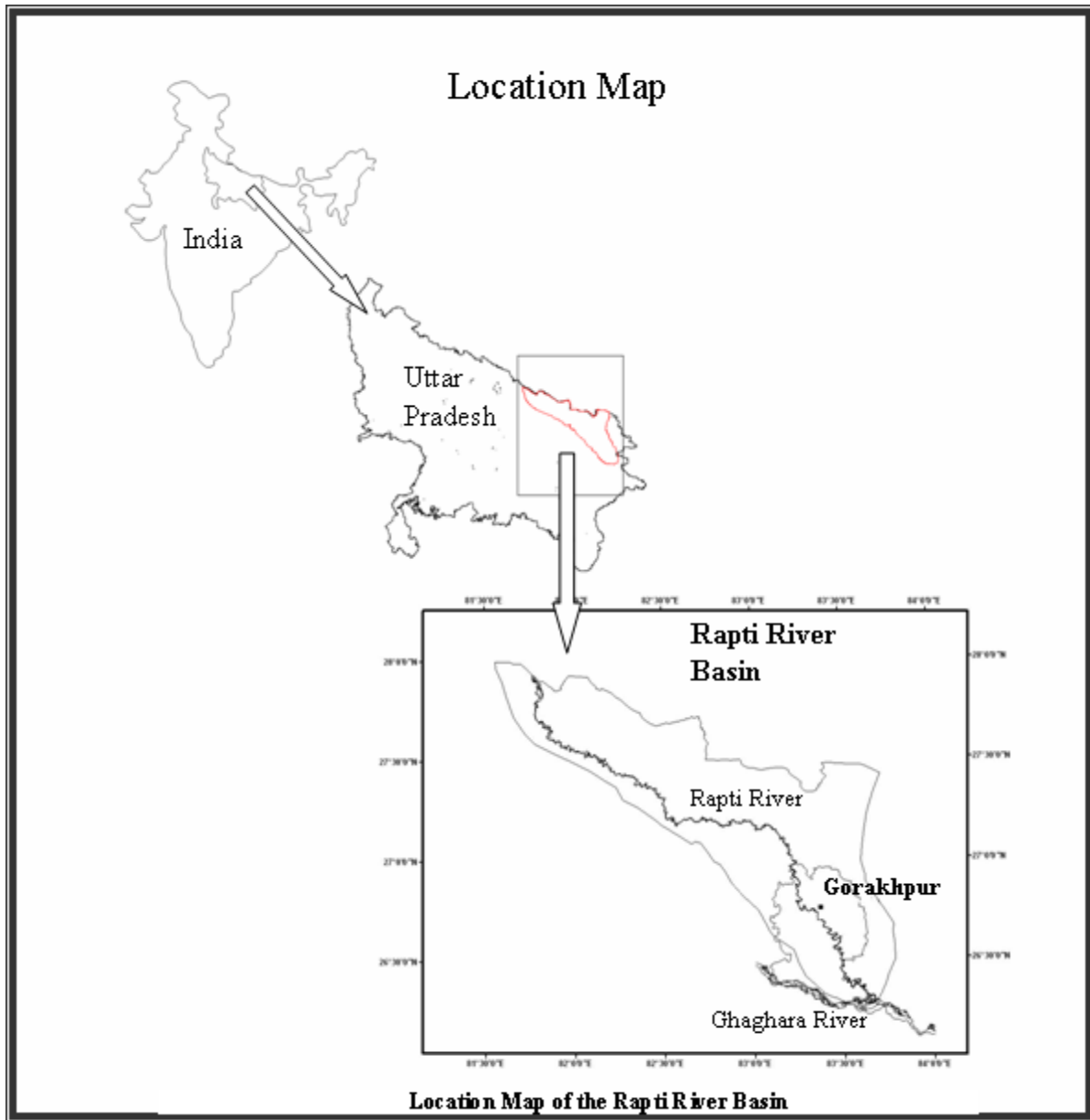


Figure 2

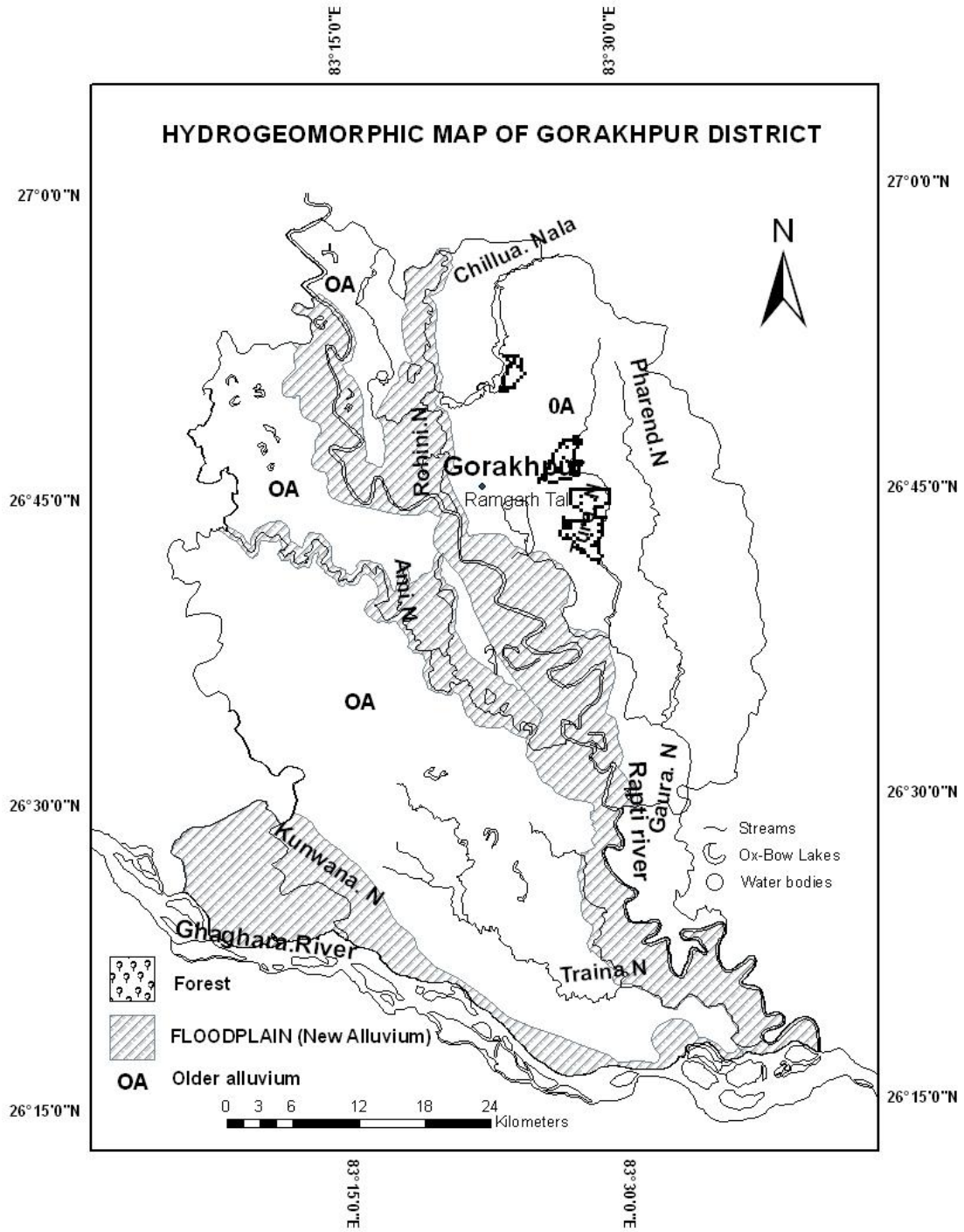


Table 1
General information

Total area	3483.3 square km
Total population	37,69,456
Urban population	19.60 %
Rural population	80.40%
Sex ratio	959
Literacy	43.30%
Male literacy	60.60%
Female literacy	24.40%
Main rivers	Rapti (134 km), Ghaghara (77 km)
Main lake	Ramgarh Tal
Main crops	Paddy, wheat, pulses, sugarcane.
Main industries	Sugar mills, handloom and textile

Source: Gorakhpur district official website www.gorakhpur.nic.in

Table 2
Distribution of workers

Distribution of workers	Cultivators	Agricultural labourers	Trade & coomerce	Industries	Others
	41 %	30 %	6 %	5 %	18 %

Source: Gorakhpur district official website www.gorakhpur.nic.in

Table 3

Total Reporting Area (TRA) and Land Use Pattern in Gorakhpur District, (in percent)

Years	Reporting Area for Land Utilization (in hectares)	Forest	Barren & unculturable land	Land Put to Non Agricultural use	Culturable waste	PP & OGL	LUMTC & G	Current fallow	Other fallow land	Net sown area
1989-90	643004	8.68	0.81	NA	0.82	NA	NA	NA	NA	72.07
1990-91	353189	6.28	1.13	11.06	1.06	0.06	1.10	0.51	2.93	74.16
1991-92	353325	6.28	1.14	11.66	1.12	0.07	1.06	2.17	2.84	73.67
1992-93	353325	6.30	1.14	11.29	1.13	0.08	1.07	1.55	2.72	74.72
1993-94	353325	6.30	1.15	11.31	1.12	0.08	1.05	1.76	2.55	74.68
1994-95	342925	2.97	1.18	11.65	1.11	0.08	1.08	1.63	2.80	77.49
1995-96	342925	2.97	1.20	11.73	1.35	0.08	1.06	1.98	2.65	76.98
1996-97	338436	1.68	1.30	12.03	1.43	0.07	1.15	1.63	3.11	77.60
1997-98	336223	1.03	1.28	12.20	1.41	0.06	1.21	1.60	3.14	78.07
1998-99	336223	0.87	1.28	12.34	1.33	0.06	1.32	1.54	3.06	78.19

1999-2000	366223	1.61	1.16	11.31	1.11	0.06	0.31	2.31	5.12	77.46
2000-01	335223	1.72	1.21	12.27	1.03	0.05	0.45	2.38	2.80	77.88

Source : State Land Use Board, Lucknow, Uttar Pradesh

Table 4
Net Sown Area as % of Total Reporting Area in Gorakhpur District

	1980-81	1985-86	1989-90	1996-97	1999-2000
Rural		75.92	72.52	78.96	79.01
Urban	12.00	15.34	11.76	35.65	31.21
Total District	74.94	76.39	72.07	77.60	77.46

Source: District Statistical Handbook

Table 5
Settlement Profile of the District Gorakhpur

Particular	Area	2001	1991	1981	1971	1961
Area in Sq.Km	Total	3321	3483.8	3397.0	6316.0	6375.3
	Rural	NA	3288.7	6189.2	6273.5	6332.8
	Urban	NA	195.1	82.8	42.5	42.5

Source : State Land Use Board, Lucknow, Uttar Pradesh

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