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Flood Study in Balrampur District of Uttar Pradesh India

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Abstract: ***Rapti is the main river of Balrampur district. In 2017 flood in Rapti affected more than 300 villages of the district causing huge loss of life and property. This study is an attempt to analyse the inundated areas of Balrampur district in 2017 through maps prepared with the help of satellite images. In the anticipation of upcoming flood these maps can be used to demarcate possible vulnerable areas and help in channelizing human and material resources in the right direction in preparing pre-disaster management measures and hence thereby ensuring optimum utilisation of resources.***

Key words: Rapti, Flood, Balrampur, Satellite Images, Maps.

1. Study Area

The district of Balrampur lies in the middle of the central Ganga plain of Uttar Pradesh. In the Survey of India degree sheets 63 E and 63 I, it is bounded by north latitudes 27º 03' and 27º 52'; east Longitudes 82º 01' and 82º 45'. It is located in the foothills of the Shiwaliks. It is surrounded by Nepal in the north and Gonda district in the south, Shrawasti district in the west and Siddharthnagar and Basti district in the east. It geographical area is 3349 sqkm. The total population of the district is 21, 48,656 according to the 2011 population census. Agricultural area Kharif and Rabi are 1, 71,229 and 1, 47,185 hectares respectively. Administratively, the district is divided into 3 tehsils namely Balrampur, Utraula and Tulsipur and 9 developmental blocks. These 9 development blocks are Balrampur, Tulsipur, Utraula, Haraya Satgharwa, Gainsara, Pachperwa, Sriduttaganj, Rehra Bazar and Gaindas Buzurg. Total numbers of revenue villages are 1017 out of which 18 are uninhabited.

2. Geomorphology

Generally the district comprises of undulating plains. The district can be demarcated into two units, the older alluvium and the newer alluvium. The upland plains consist of the older alluvium and the Low land plain consist of the newer alluvium. The local relief of the topography surface varies from about 160 m above msl at Bankatwa in the North West of the district to 96.5 m above msl at Sadulla Nagar; block Rehra Bazaar in the south east.

The general slope of the surface is from northwest to southeast. The topography is by and large influenced or modified by the existing network of rivers and streams. The part of the district towards the north comprises of gently undulating plains and uplands. This area is just south of Nepal Himalayas and Shiwaliks. It is made up of Bhabhar formations. Geomorphologically, the area is characterised by Pediments and Pediplains. The general slope of the uplands and the rolling plains is towards south.

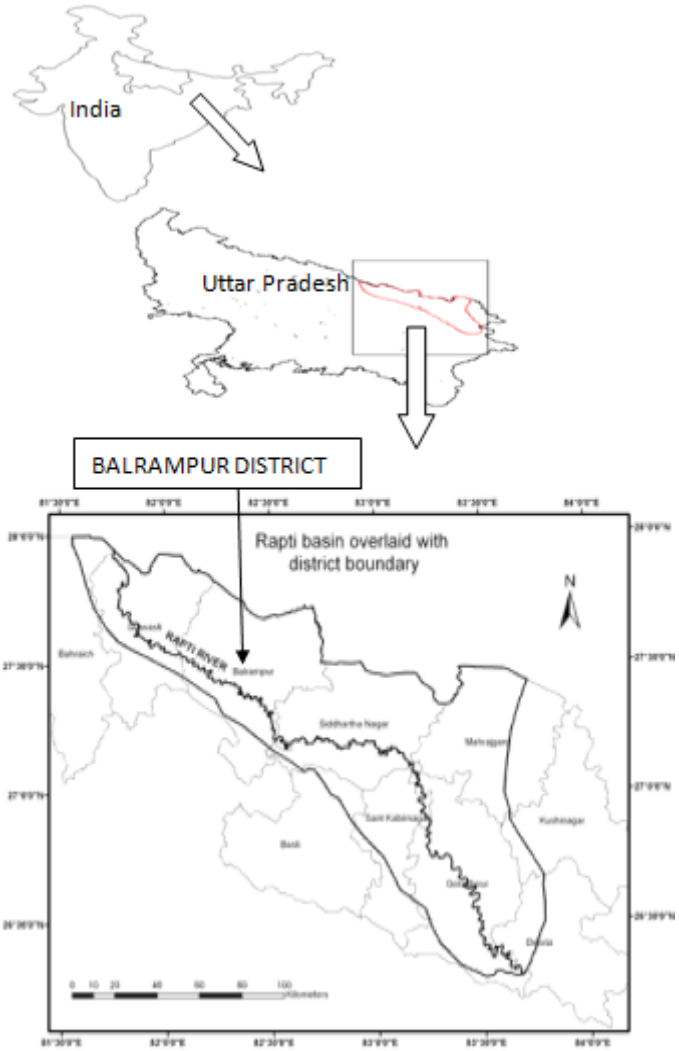


Figure 1: East Longitudes 82º 01' and 82º 45'

The area to the south of the upland plains comprises of younger alluvium and has a comparatively gentler slope. Rapti river traverses the district through the lowland plains and is characterised by a several sand bars and vast alluvial tracts. The flood plains in the central part of the district is characterised by meanders, all along the Rapti river as well as the other perennial small streams. These are low lying areas situated between 98 and 110 meters above msl.

Drainage

Rapti river is the major river of the district Balrampur and flows from north- west towards south-east. The district is divided by the river almost into two parts. The north part consist of large number of temporarily flowing streams (Dhobania, Kharjhar, Bhambhar etc.) and few perennial nalas, which flow southwards into the Rapti River. To the south of the Rapti river, its two tributaries Suwawan and Kuwana almost run parallel to Rapti before their convergence in the adjacent Basti district. It has been seen that the tributaries of the Rapti river flow from north to south, but that on to the right bank, i.e. south of Rapti they are more wandering and generally have an eastward flow. Thus it appears that, the watershed slope in the southern part of the district is from west to east, whereas in the area north of Rapti River it slopes from north to the south.

Flood mapping and Observation

The district is prone to flooding especially the lowlands in the southern part of the district. Rapti river covers almost a distance of 75 km in the district. The river also collects water from the small streams coming out of the Himalaya Mountains. Excessive rainfall during the monsoon season connects the drainage system of the whole area and which in turn swells up causing the rivers to overflow creating havoc and devastation in the region. Flood mapping involves the process of identifying on map areas at risk of flooding. It helps in creating good data base for efficient flood-risk management. Flood maps are extremely helpful in preparing flood-risk management plans, for preventing of losses due to floods, in land use management, for providing timely information on floods, in rescue operations and in calculating what the lowest allowable construction elevation should be in order to avoid possible flood damages. Based on the analysis of satellite data Sentinel 1A SAR on August 16, 2017 and Radarsat-2 SAR on dated August 19, 2017 and on August 21, 2017 which covers part of Uttar Pradesh State, major Inundation is observed in Balrampur district (FMISC, Lucknow). Flood map which is prepared comprises of riverine flood, rainfall induced floods, low lying areas, wet areas and isolated patches of waterlogged areas. Inundation includes accumulated rain water / flood water in low lying areas. •

Table 1

	16-Aug-2017	19-Aug-2017	21-Aug-2017
Blocks	inundated area In Ha.	Inundated area In Ha.	inundated area In Ha.
Tulsipur	1093.67	1135.62	885.21
Sri Dutta Ganj	435.92.01	1418.33	1571.58
Balrampur	3491.18	5228.77	3921.46
Gainsara	3140.48	3418.58	2850.04
Utraula	783.60	2538.22	2806.69
Gaindas Buzurg	599.40	1955.53	1897.71
Haraya Satgharwa	2459.29	1767.44	820.27
Pachperwa	3856.53	5176.05	3693.04
Total inundated area in Ha	15424.15	22638.54	18446

Source: FMISC Lucknow

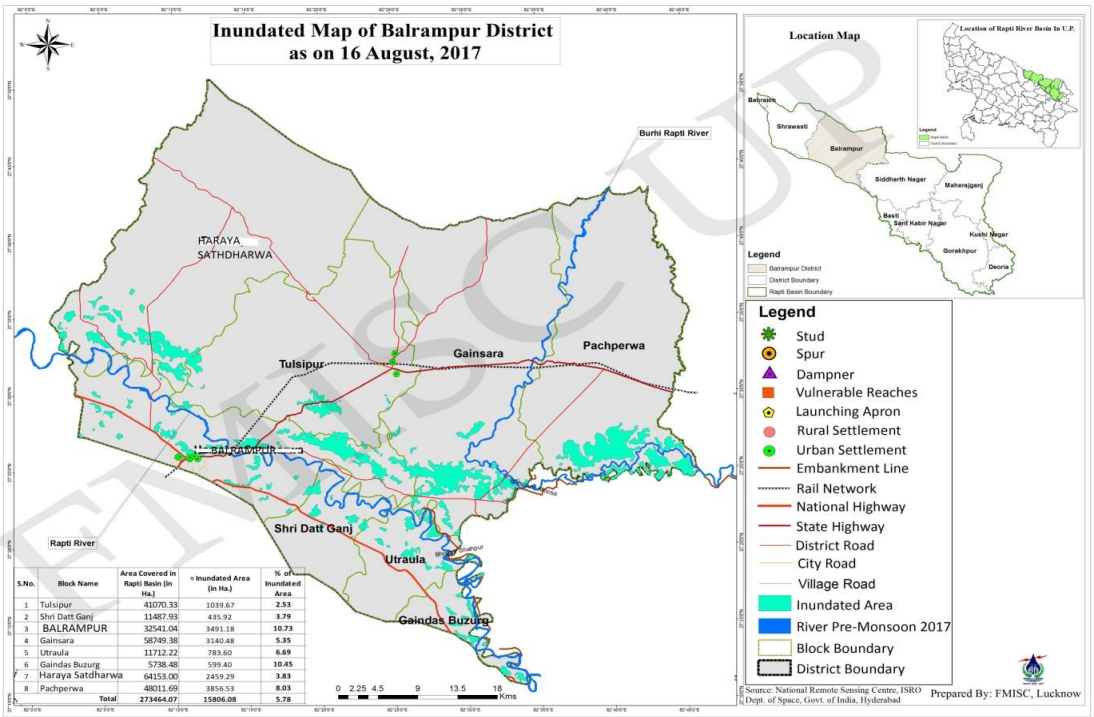
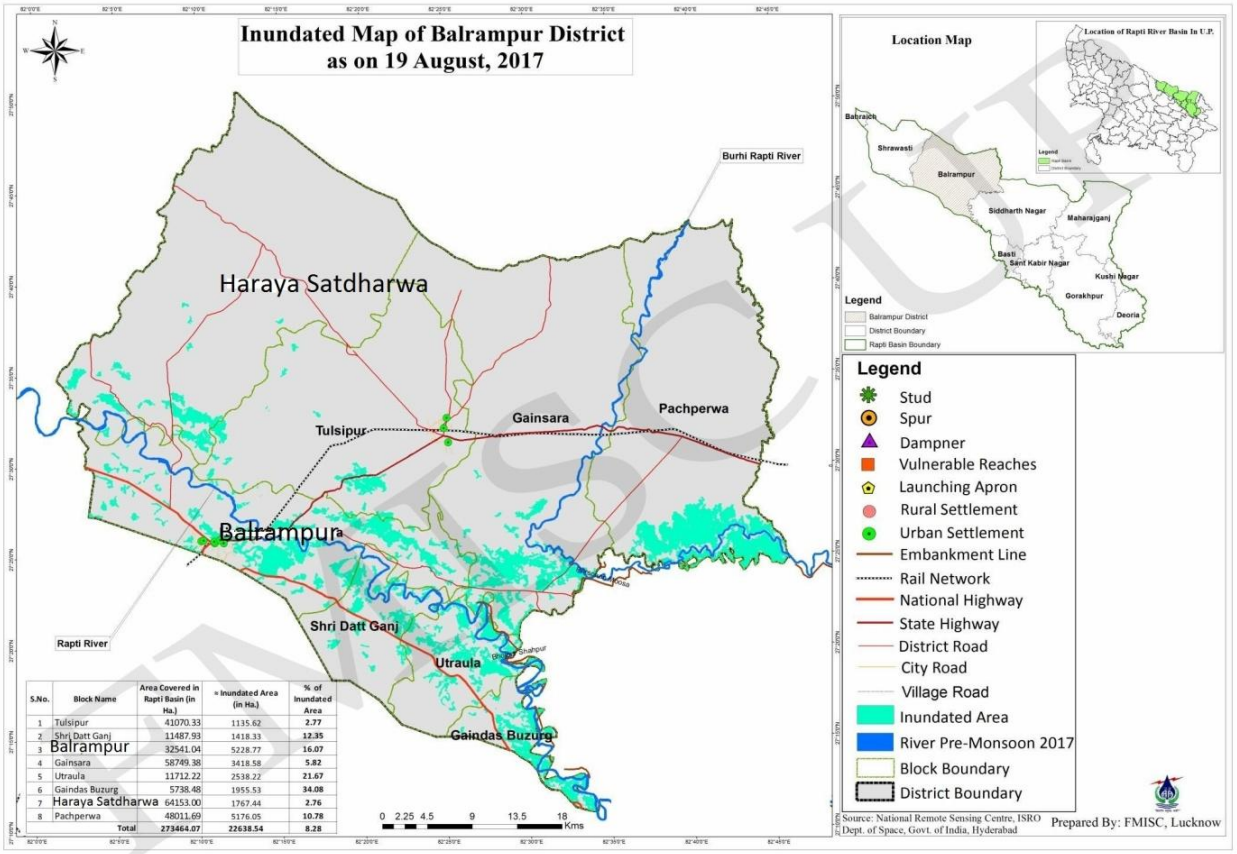
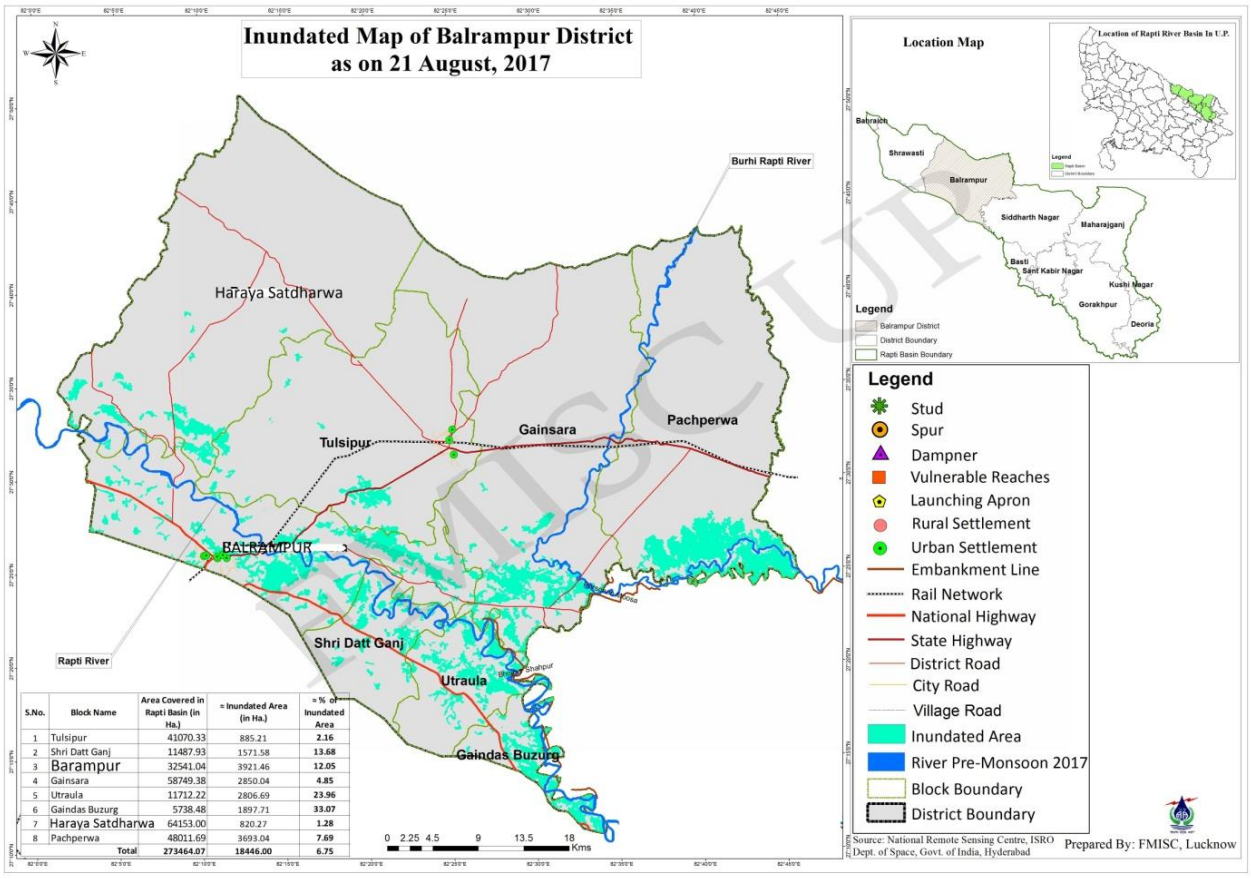


Figure 2
Source: FMISC Lucknow



S.No.	Block Name	Area Covered in Rapti Basin (in Ha.)	≈ Inundated Area (in Ha.)	% of Inundated Area
1	Tulsipur	41070.33	1135.62	2.77
2	Shri Datt Ganj	11487.93	1418.33	12.35
3	Balrampur	32541.04	5228.77	16.07
4	Gainsara	58749.38	3418.58	5.82
5	Utraula	11712.22	2538.22	21.67
6	Gaindas Buzurg	5738.48	1955.53	34.08
7	Haraya Satdharwa	64153.00	1767.44	2.76
8	Pachperwa	48011.69	5176.05	10.78
	Total	273464.07	22638.54	8.28

Figure 3
Source: FMISC Lucknow



S.No.	Block Name	Area Covered in Rapti Basin (in Ha.)	≈ Inundated Area (in Ha.)	≈ % of Inundated Area
1	Tulsipur	41070.33	885.21	2.16
2	Shri Datt Ganj	11487.93	1571.58	13.68
3	Barampur	32541.04	3921.46	12.05
4	Gainsara	58749.38	2850.04	4.85
5	Utraula	11712.22	2806.69	23.96
6	Gaindas Buzurg	5738.48	1897.71	33.07
7	Haraya Satdharwa	64153.00	820.27	1.28
8	Pachperwa	48011.69	3693.04	7.69
	Total	273464.07	18446.00	6.75

Figure 4
Source: FMISC Lucknow

On studying the flood map of Balrampur district on 16 august 2017 (Figure 2), 19 august 2017 (Figure 3) and 21 august 2017 (Figure 4), maximum inundation is found on 19 august 2017. The extent of total inundated area is 22638.54 ha. Maximum inundation is found in Balrampur block 5228.77 ha. Next most affected block is Pachperwa 5176.05 ha followed by Gainsara 3418.58 ha (Table 1). Flood maps were prepared by giving careful attention to the reliability and accuracy of the source of information based on satellite images Sentinel 1A SAR and Radarsat-2 SAR (NRSC, Hyderabad).

3. Conclusion

The flood maps are based on observations and thus they are dependable, particularly if the derived flooded area is prepared from accurate aerial photographs or satellite images or from the field markings. Flood Map are useful for flood risk assessment and flood management, flood control etc. Flood Map together with hydrological data may help to provide flood alert and warning if flood water level at certain point is rising. Flood maps can assist in identifying places situated at higher levels so that during inundation people can be moved out to safer places and help authorities in flood rescue and relief operations. All these parameters are useful in forecasting and mitigation of the flood. The main vision of this document is to initiate coordinated efforts to have an effective flood management strategy for the State, which will minimise the impact of future disasters. The tragedy and the lessons learnt from the severe floods have changed the mindset of the government and the focus of disaster management shifted from "Rescue, Relief and Restoration" to "Planning, Preparedness & Prevention". Uttar Pradesh regularly faces the challenges of severe flooding due to low terrain relief, meandering characteristics of rivers and large amount of suspended sediment load. Since agriculture is the main occupation of the people in the region, hence flood maps are very important for flood risk and damage assessment. Therefore measures need to be taken up on the basis of information collected by the conventional methodologies together with state of the art technology, which could be cost effective and time saving.

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