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Dr. K.H.V.DURGA RAO, Scientist/Engineer 'SG'
Head, Disaster Management Support Division

Date: September 16, 2018

No: 11-FL-2018-BR/12

Dear Sir,

Sub: Bihar - Near Real Time Flood Inundation Mapping using satellite data

Please refer to our earlier mail dated 14th September 2018 regarding 'Near Real Time Flood Mapping' project using satellite data. So far we have sent Eleven flood map covering floods in Bihar State. Floods were reported due to heavy incessant rains in Bihar state during first week of September 2018. We have analyzed Sentinel-1 SAR satellite data of 15th September 2018 and a flood map for part of Bihar State is prepared. The flood map along with a brief report is enclosed herewith for your kind information. Since the image was acquired during/immediate to the rainfall event, large extents of wet areas were also observed.

Further, we request you to visit flood page in Bhuvan portal (bhuvan-noeda.nrsc.gov.in/disaster/disaster/disaster.php) & NDEM portal for better visualization of flood extent in Bihar State.

In addition, the inundation layer in GIS format is being transmitted to Flood Management Information System Cell (FMISC) and Bihar Remote Sensing Application Centre (BIRSAC), Patna by e-mail for further value addition and dissemination to user departments. Kindly keep us in the mailing list of the user departments.

We will continue to keep a watch on the flood situation and update the information as and when required. Your support and active interaction is highly appreciated. Please provide feedback on the information being provided.

With kind regards

Yours sincerely,
(K H V Durga Rao)

As per the distribution list enclosed in the report.

Floods in Bihar – 2018

1.0 Background

A heavy incessant rain in Bihar is reported during first and second week of September 2018 caused steady rise in water levels in parts of Bihar state. According to reports, River Burhi Ghantak at Khangaria in Khangaria district, River Kosi at Kursela & Baltara in Katihar and Khangaria district, River Punpun at Sripalpur in Patna District, River Ganga at Kahalgaon, Dighaghat, Hathidah and Patna Gandhighat in Bhagalpur and Patna district respectively were flowing above danger level.

(Source: News Media, CWC)

2.0 Satellite Data

Flood Disaster Team is keeping a constant watch on the situation and checked the satellite data coverage over the affected areas. Sentinel-1 SAR satellite data of 15th September 2018 was acquired and analyzed. (Refer Table-1).

Table-1 Satellite Data acquired over Flood Affected Area

S No	Date	Satellite / Sensor	Status
1	06-Jul-18	SENTINEL-1/ SAR	Analysed and 1 flood map was sent.
2	09-Jul-18	RADARSAT-2/ SAR	Analysed and 1 flood map was sent.
3	06-Aug-18	SENTINEL-1/ SAR	Analysed and 1 flood map was sent.
4	13-Aug-18	RADARSAT-2/ SAR	Analysed and 1 flood map was sent.
5	15-Aug-18	SENTINEL-1/ SAR	Analysed and 1 flood map was sent.
6	16-Aug-18	RADARSAT-2/ SAR	Analysed and 1 flood map was sent.
7	30-Aug-18	SENTINEL-1/ SAR	Analysed and 1 flood map was sent.
8	08-Sep-2018	SENTINEL-1/ SAR	Analysed and 1 flood map was sent.
9	09-Sep-2018	RADARSAT-2/ SAR	Analysed and 1 flood map was sent.
10	11-Sep-2018	RADARSAT-2/ SAR	Analysed and 1 flood map was sent.
11	13-Sep-2018 (1800 hrs)	RADARSAT-2/ SAR	Analysed and 1 flood map was sent.
12	15-Sep-2018	SENTINEL-1/ SAR	Analysed and 1 flood map is being sent.

3.0 Data Analysis

Satellite data is rectified and inundation layer is extracted. Further, inundation map is composed for part of Bihar state. The inundation layer is integrated with district

boundaries layer, for extracting district-wise inundation statistics which are shown in the Table-2.

4.0 Observations

Based on the analysis of satellite data, the following points were observed.

- Satellite data covers part of Bihar state.
- Major Inundation is observed in Bhagalpur, Katihar, Purnia, Khagaria and Madhepura districts.
- Observed inundation may include wet areas/ rain water accumulation / water in low lying areas

Table-2: District-wise inundated area statistics

S.No.	District	Approx. Inundated Area (ha)
1	Bhagalpur	29668
2	Katihar	18807
3	Purnia	3171
4	Khagaria	2942
5	Madhepura	2262
	Total	56851

Note:

- Districts with inundation less than 1000 ha are not included in the statistics.
 . * Partially covered in satellite data.

5.0 Distribution List:

1	MHA	<ol style="list-style-type: none"> 1. Joint Secretary, NDM, Ministry of Home Affairs, North Block, New Delhi. 2. NDM control Room, Ministry of Home Affairs, North Block, New Delhi 3. Director, DM-III, NDM, Ministry of Home Affairs, North Block, New Delhi.
2	NODAL MINISTRIES NDRF	<ol style="list-style-type: none"> 1. Vice Chairman, National Disaster Management Authority (NDMA), New Delhi 2. Control Room, National Disaster Management Authority (NDMA), New Delhi 3. DG NDRF, Sector-1, R.K. Puram, New Delhi - 110 066. 4. DIG (Ops&Trg.), Sector-1, R.K. Puram, New Delhi - 110 066
3	STATE	<ol style="list-style-type: none"> 1. Commissioner & Secretary, Disaster Management Department, Govt of Bihar, Old Secretariat, PATNA-800015 (Email & hard copy of the map through FMISC/BIRSAC also) 2. In-charge, Flood Management Information System Cell (FMISC), Patna (With a request to disseminate the information to the concerned departments) 3. Project Director, Bihar Remote Sensing Centre (BIRSAC), Planetarium Complex, Bailey Road, Patna 800001. (With a

		request to disseminate the information to the concerned user depts.)
4	ISRO/DOS	<ol style="list-style-type: none"> 1. Director, NESAC, Dept of Space, Umiam, Meghalaya pin: 793 103. (with a request to disseminate the information to the concerned user depts.) 2. Director, EDPO, ISRO Head Quarters, Antariksha Bhavan, New BEL Road, Bangalore-560094. (e-mail) 3. Programme Director, EDPO, ISRO Head Quarters, Antariksha Bhavan, New BEL Road, Bangalore-560094. (e-mail) 4. Associate Director, EDPO, ISRO Head Quarters, Antariksha Bhavan, New BEL Road, Bangalore-560094. (e-mail)
5	NRSC	<ol style="list-style-type: none"> 1. Director, NRSC 2. Associate Director, NRSC 3. Deputy Director (RSA) & PD, DSC

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