Monitoring Flood September, 2015 in Bangladesh

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Bangladesh Space Research & Remote Sensing Organization (SPARRSO)

Bangladesh Space Research & Remote Sensing Organization (SPARRSO)

➤ **Research in peaceful application of space technology**
➤ **Monitoring of natural disasters**
➤ **Assisting in optimal utilization of natural resources**
➤ **Playing role in sustainable development of the country**
➤ **Acting as the National Focal Point in space Science Technology and its applications**

Disasters Round the Year in Bangladesh

Pre-monsoon:
Cyclone; Nor'wester;
Flash Flood; Tornado

Winter:
- Fog;
- Cold wave

Monsoon:
- Flood;
- Heavy rainfall

Post-monsoon:
- Cyclone

Satellite Ground Stations at SPARRSO

SPARRSO receives real-time data from 5 satellites using 3 ground stations

Geo-stationary Satellites:

✓ **FY-2** of China **(Meteorological Satellite)**

✓ **MTSAT** of Japan **(Meteorological and Ocean satellite)**

Polar orbiting Satellites:

✓ **NOAA of USA** **(Meteorological and Resource Satellite)**

✓ **TERRA MODIS** of USA **(Resource and Ocean Satellite)**

✓ **AQUA MODIS** of USA **(Resource and Ocean Satellite)**

The received satellite data is very useful for research and application related activities in the country

Post disaster Monitoring and Mapping
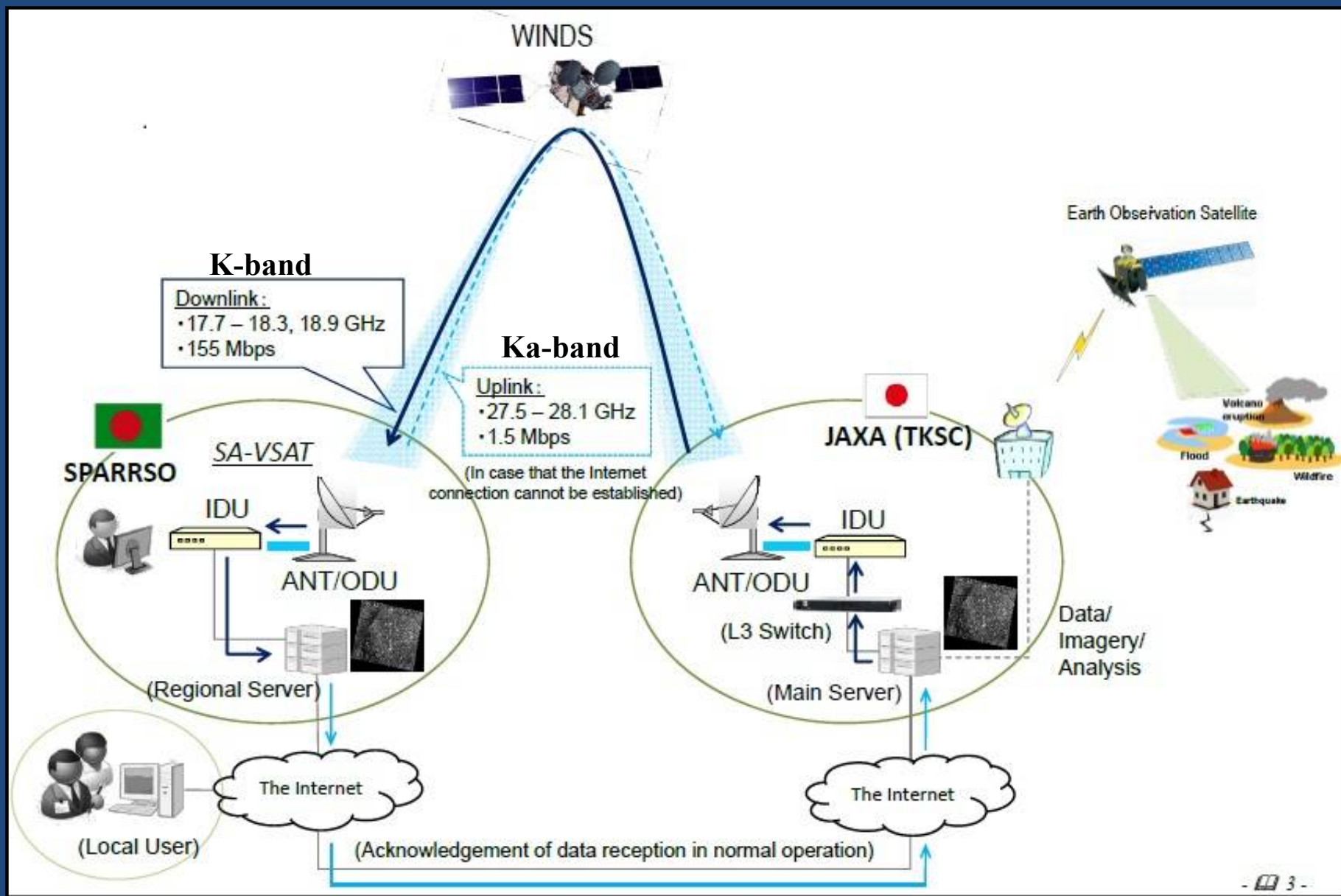
WINDS Station:

WINDS Station:

SPARSO has Established "Remote Sensing and GIS based National Flood Monitoring System (NFMS$_{RG}$)"

❑ **To deliver all the flood relevant information/data under a single package.**

❑ **Presently the system is providing with flood area relevant information in perennial and extended terms.**

❑ **Presently the system is also providing with flood damage information in agriculture sector.**

SPARRSO has Established "Remote Sensing and GIS based National Flood Monitoring System ($NFMS_{RG}$)"
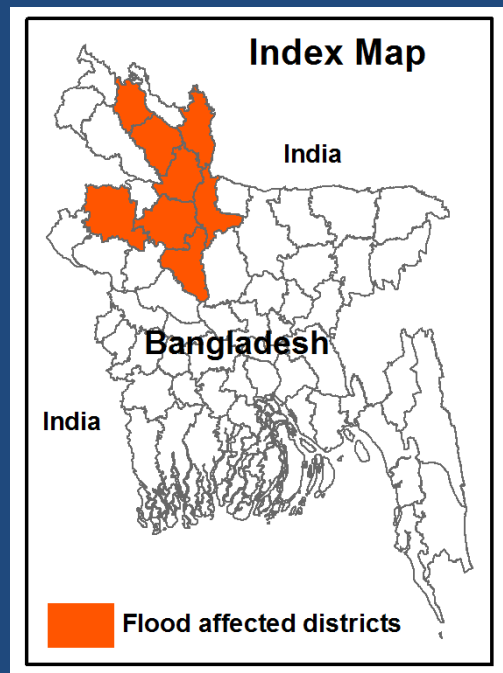
❑ **Recently the system provided flood relevant information for the flood occurred in September, 2015.**

This presentation provides a report on this flood

Some introductory information of the flood occurred in September, 2015.

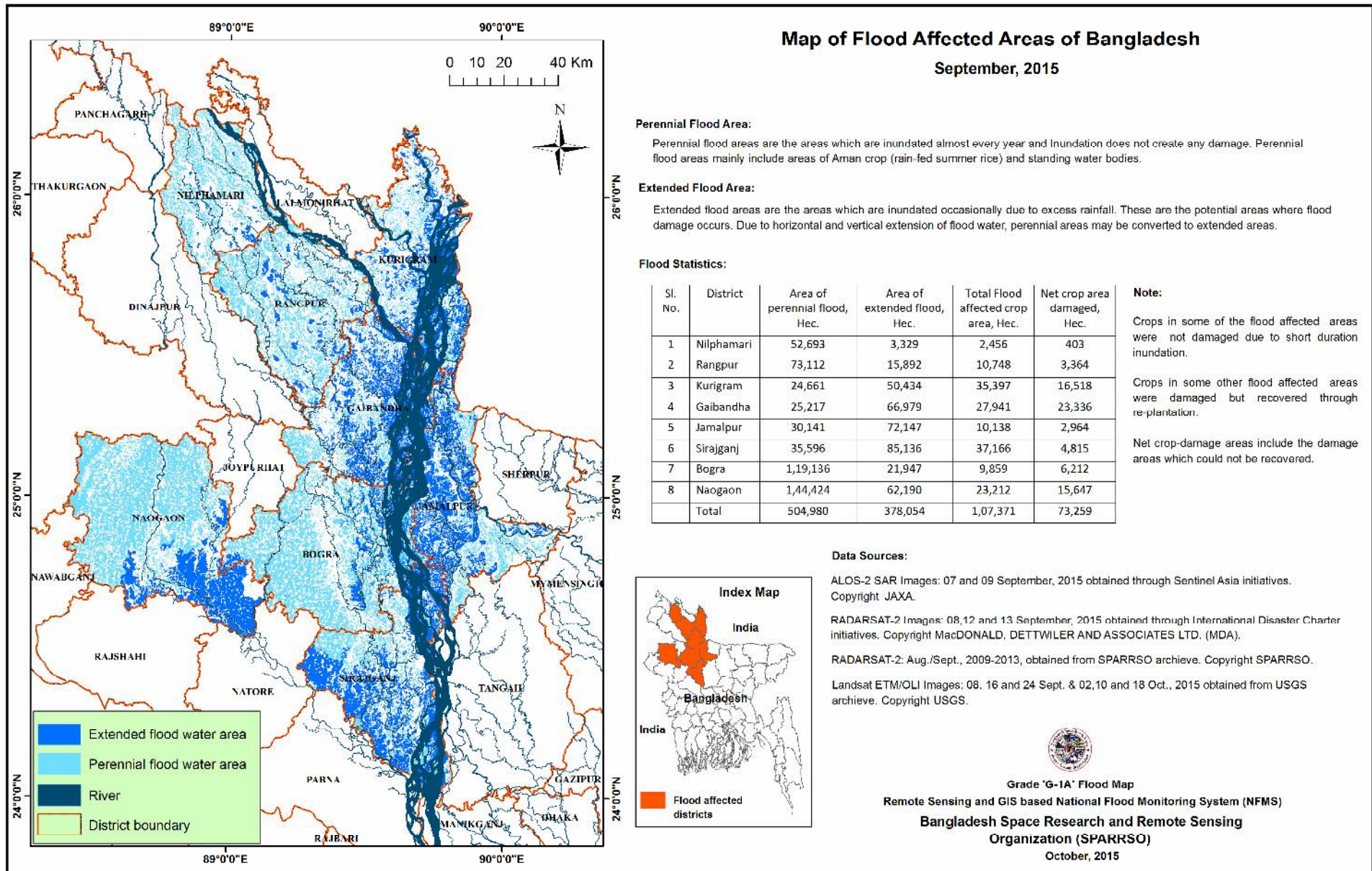Duration of the flood: 1st and 2nd week of September , 2015.

Area affected by flood: Eight districts in the north-western part of Bangladesh

Some introductory information of the flood occurred in September, 2015.

❑ **Request sent to Sentinel Asia for satellite data on: 06 September, 2015.**

❑ **Sentinel Asia data (ALOS -2 Data and Product of AIT) received on: 07 and 09 September, 2015.**

❑ **International Disaster Charter data (RADARSAT-2) received on: 8,12 and 13, September, 2015.**

Map of Flood Affected Areas of Bangladesh

September, 2015

Perennial Flood Area:

Perennial flood areas are the areas which are inundated almost every year and Inundation does not create any damage. Perennial flood areas mainly include areas of Aman crop (rain-fed summer rice) and standing water bodies.

Extended Flood Area:

Extended flood areas are the areas which are inundated occasionally due to excess rainfall. These are the potential areas where flood damage occurs. Due to horizontal and vertical extension of flood water, perennial areas may be converted to extended areas.

Flood Statistics:

Sl. No.	District	Area of perennial flood, Hec.	Area of extended flood, Hec.	Total Flood affected crop area, Hec.	Net crop area damaged, Hec.
1	Nilphamari	52,693	3,329	2,456	403
2	Rangpur	73,112	15,892	10,748	3,364
3	Kurigram	24,661	50,434	35,397	16,518
4	Gaibandha	25,217	66,979	27,941	23,336
5	Jamalpur	30,141	72,147	10,138	2,964
6	Sirajganj	35,596	85,136	37,166	4,815
7	Bogra	1,19,136	21,947	9,859	6,212
8	Naogaon	1,44,424	62,190	23,212	15,647
	Total	504,980	378,054	1,07,371	73,259

Note:

Crops in some of the flood affected areas were not damaged due to short duration inundation.

Crops in some other flood affected areas were damaged but recovered through re-plantation.

Net crop-damage areas include the damage areas which could not be recovered.

Legend:
- Extended flood water area
- Perennial flood water area
- River
- District boundary

Index Map

India

Bangladesh

India

Flood affected districts

Data Sources:

ALOS-2 SAR Images: 07 and 09 September, 2015 obtained through Sentinel Asia initiatives. Copyright JAXA.

RADARSAT-2 Images: 08,12 and 13 September, 2015 obtained through International Disaster Charter initiatives. Copyright MacDONALD, DETTWILER AND ASSOCIATES LTD. (MDA).

RADARSAT-2: Aug./Sept., 2009-2013, obtained from SPARRSO archieve. Copyright SPARRSO.

Landsat ETM/OLI Images: 08, 16 and 24 Sept. & 02,10 and 18 Oct., 2015 obtained from USGS archieve. Copyright USGS.

Grade 'G-1A' Flood Map
Remote Sensing and GIS based National Flood Monitoring System (NFMS)
Bangladesh Space Research and Remote Sensing Organization (SPARRSO)
October, 2015

Map Prepared by SPARRSO for flood occurred in September, 2015.

The map and the statistical information were supplied to,

- ❑ Office of the Prime Minister.

- ❑ Ministry of Agriculture.

- ❑ Ministry of Water Resources.

- ❑ Ministry of Defence.

- ❑ Ministry of Forest and Environment.

- ❑ Department of Disaster Management.

- ❑ Comprehensive Disaster Management Programmed (CDMP)

Problems Faced

1. We received the satellite images and the satellite image based products downloading from Sentinel Asia server; we could not receive them from the regional server installed at SPARRSO because of password problem. The password supplied to us did not work and we could not log in.

   We request to active the server at SPARRSO fully so that we can receive data through it during emergency.

2. SPARRSO has the capacity to generate flood relevant products based on satellite data. So. we request to consider SPARRSO as a Data Analysis Node for the disasters occurred in Bangladesh and to provide it with the original satellite data so that SPARRSO can generate accurate and fruitful product considering all the local and zonal (in-country) technical issues.

Conclusions

Sentinel Asia and International Disaster Charter responded in time to supply satellite data to Bangladesh for the September, 2015 flood.

Flood Monitoring

NOAA- Sept. 1988

RADARSAT- Sept 1998
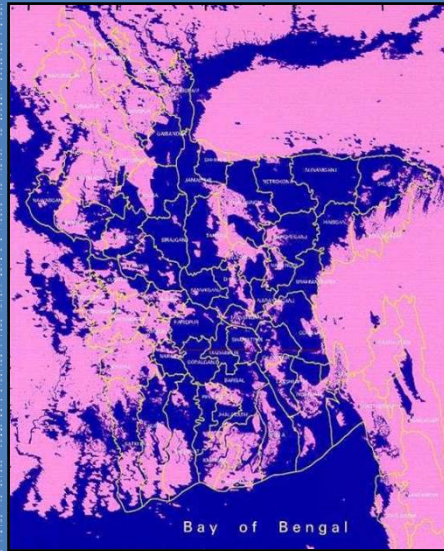
NOAA- July 2004
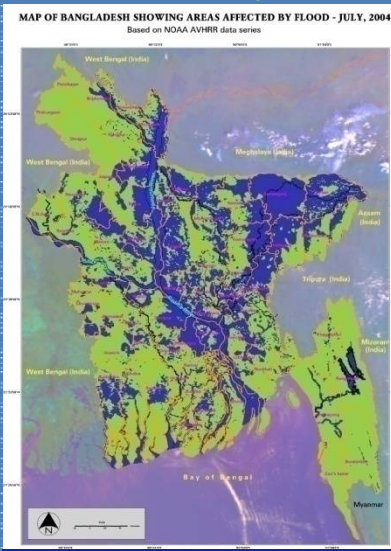
NOAA- Aug. 2007
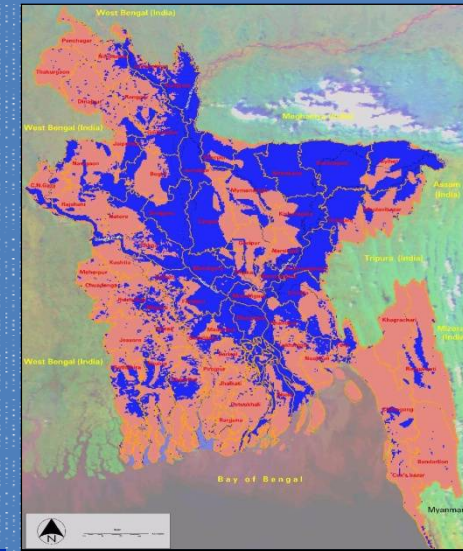
Flood affected area= 39.58% (2004)

Flood affected area= 42.21% (2007)

- **Reports Supplied to the Prime Minister Office, Ministry of Disaster Management & Relief and different Government offices**

- **Publish on the website for the public**

Cyclone Monitoring and Generation of Tracks
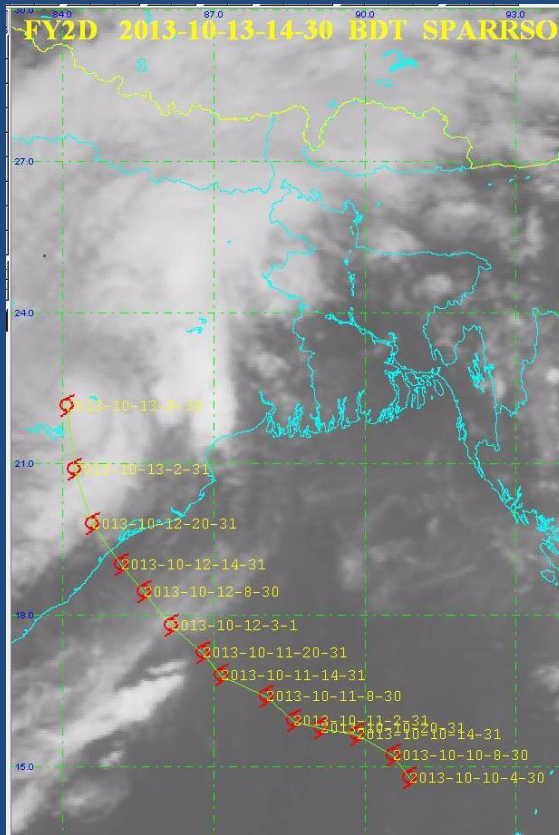
Phailin
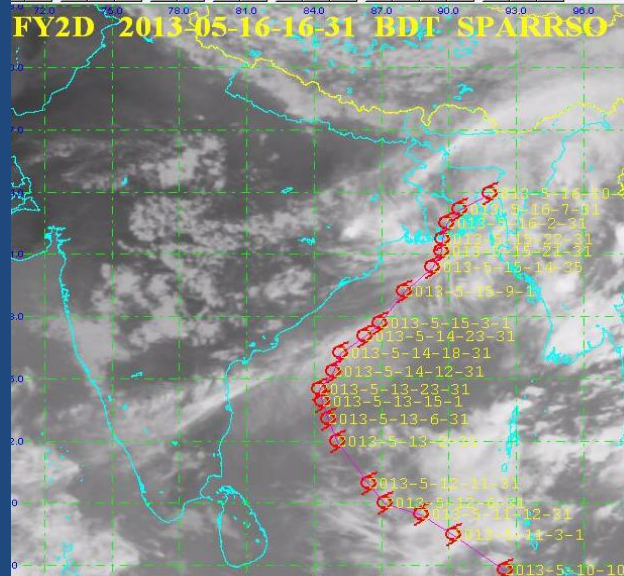
Mahasen
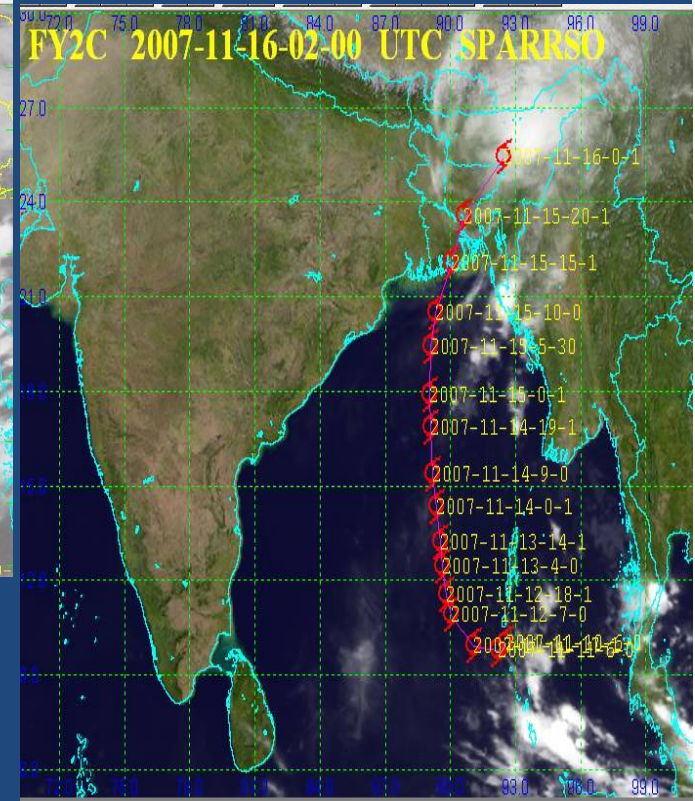
Sidr

Cyclone Phailin in formation stage
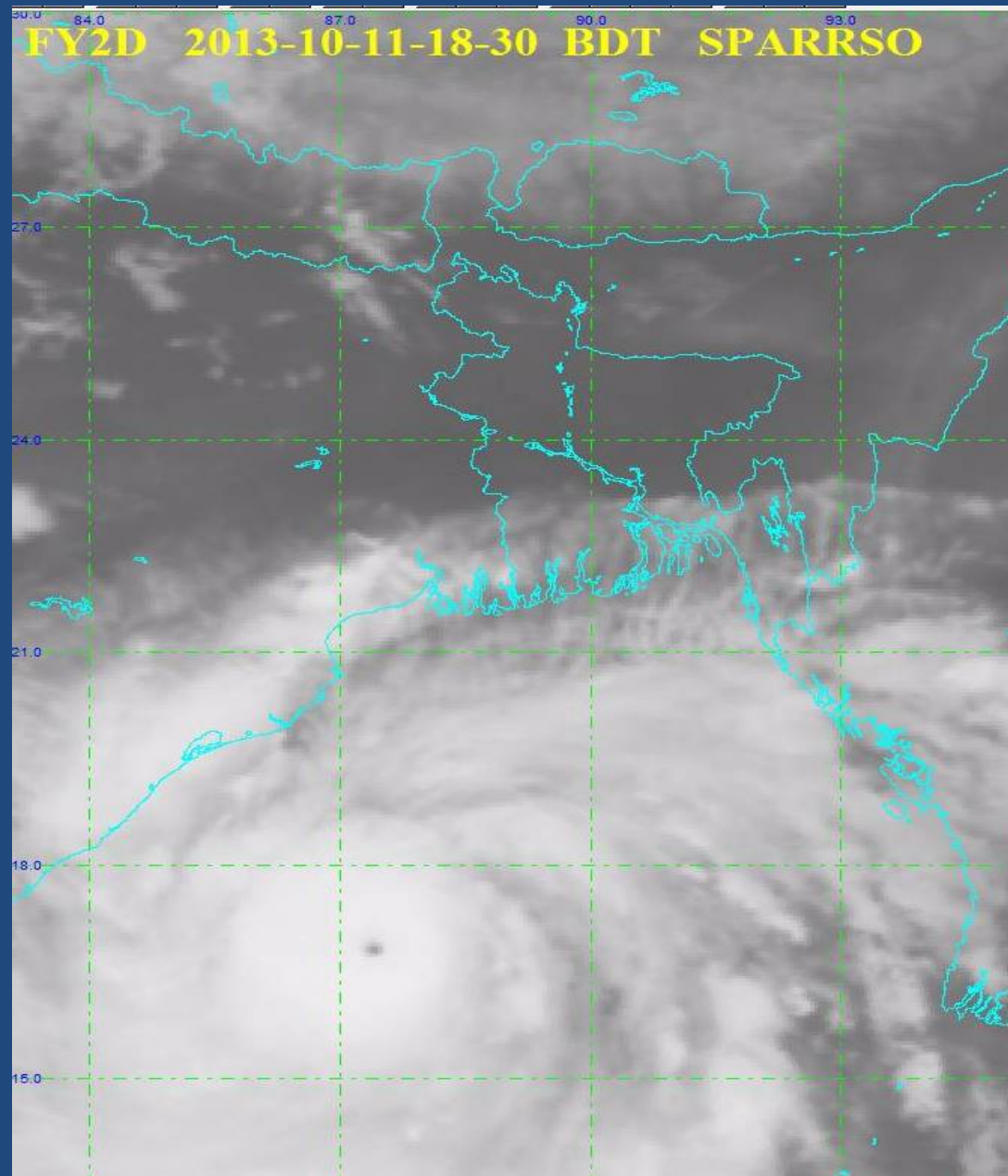
Consequences of Different Major Cyclones Since 1960

Date	Max wind speed (Km/hr)	Storm surge height (ft.)	Deaths
30 Oct. 1960	210	15-20	5,149
09 May 1960	146	08-10	11,466
28 May 1963	203	14-17	11,520
11 May 1965	162	12	19,279
14 Dec. 1965	210	15-20	873
01 Oct. 1966	146	15-30	850
12 Nov. 1970	223	20-30	5,00,000
09 Dec. 1973	122	05-15	183
25 May 1985	154	10-15	11,069
29 Nov. 1988	162	05-10	2,000
29 Apr. 1991	225	20-25	1,38,000
19 May 1997	232	10-15	155
20 May 1998	173	3	14
15 Nov. 2007 (Sidr)	250	15-20	3,500
25 May, 2009 (Aila)	120	08-10	172

Advantage of Early Warning System: Satellite Monitoring and Tracking of Cyclones
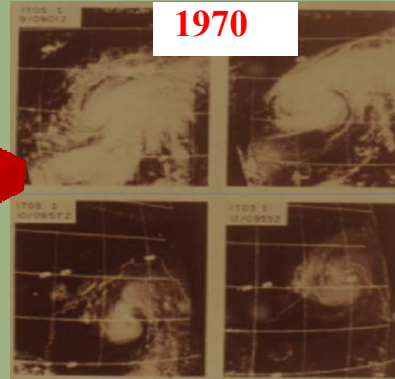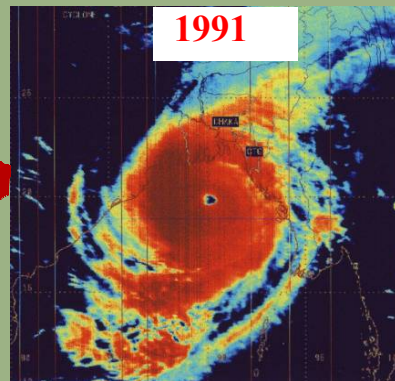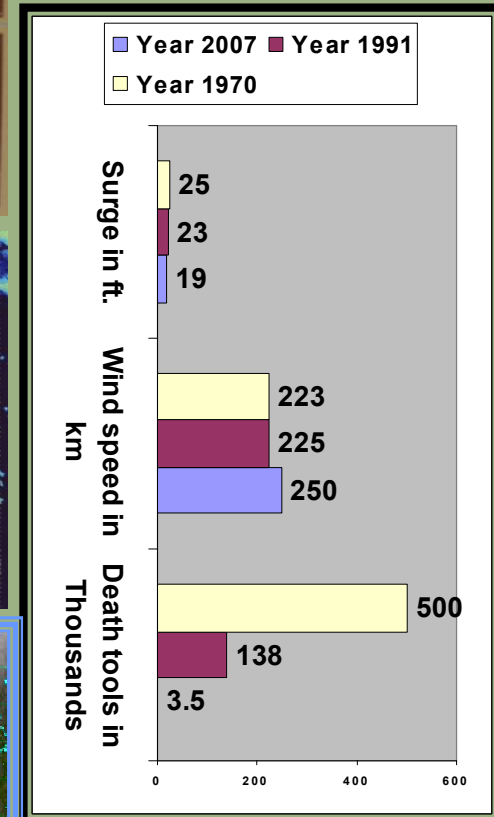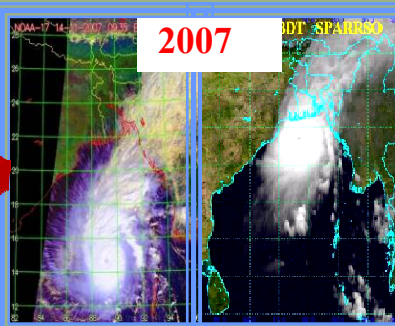
Monitoring FOG 2015

FY2D 2015-01-19-09-30 BDT
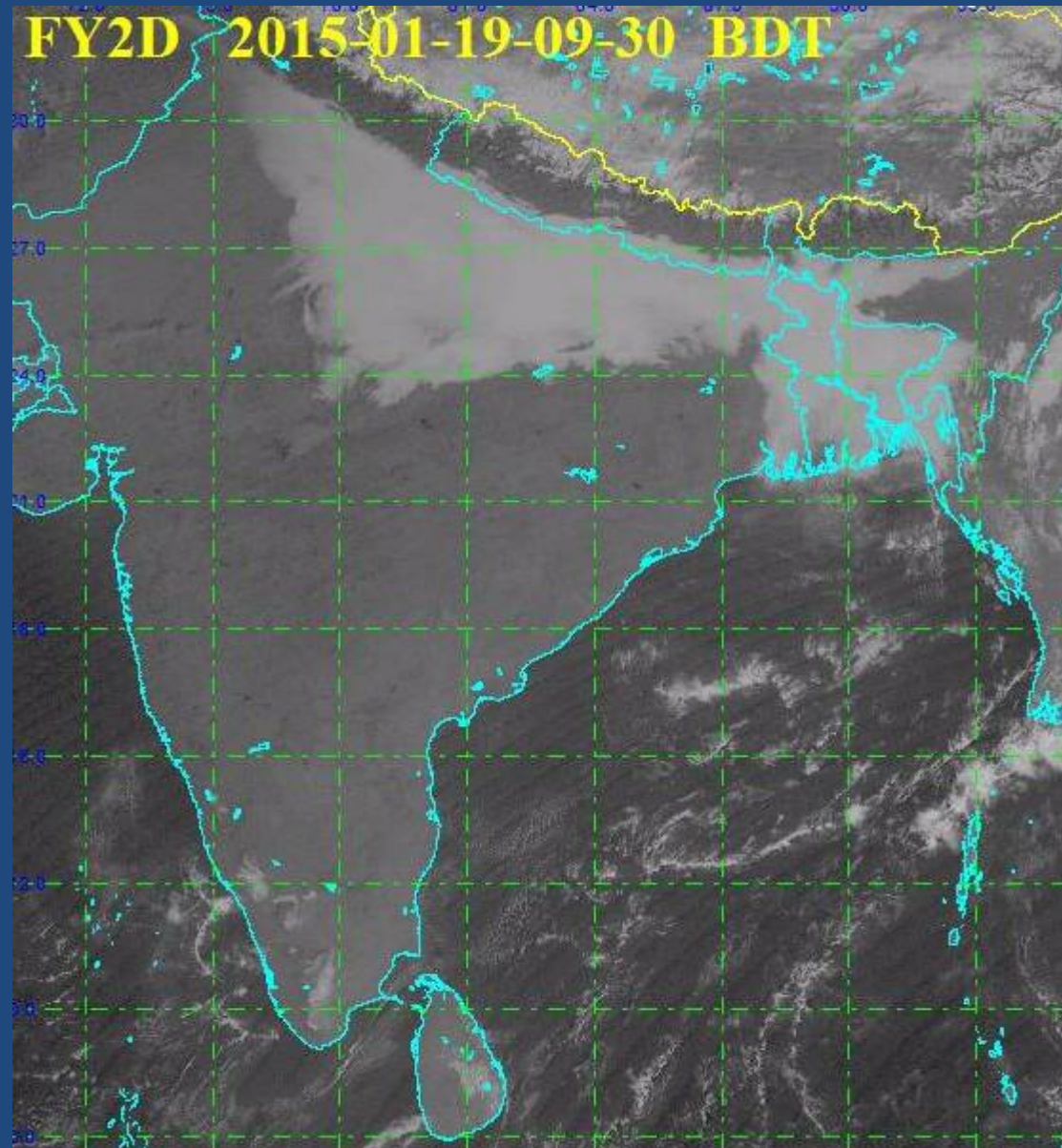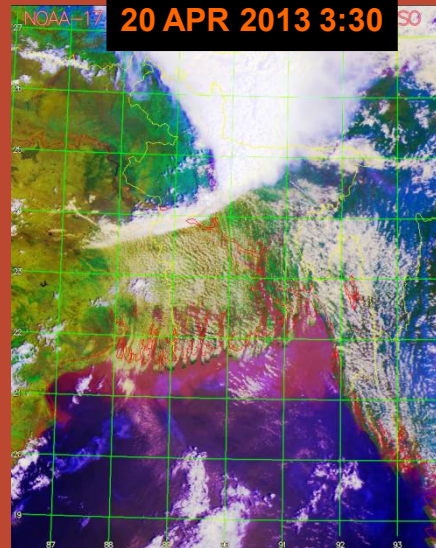
Cold Wave & Persistent Fog Monitoring using Satellite
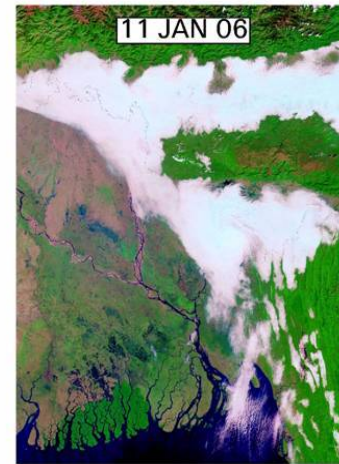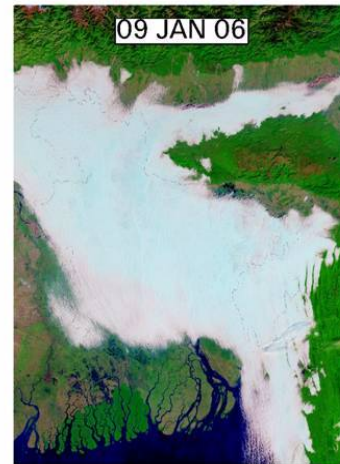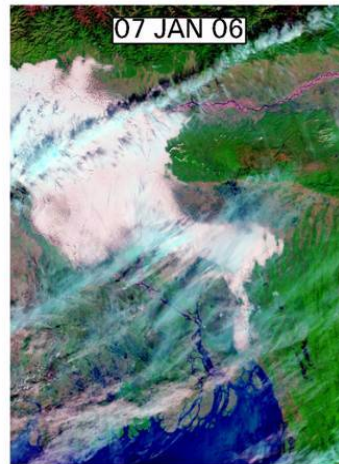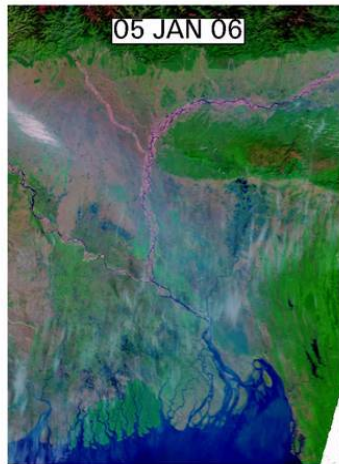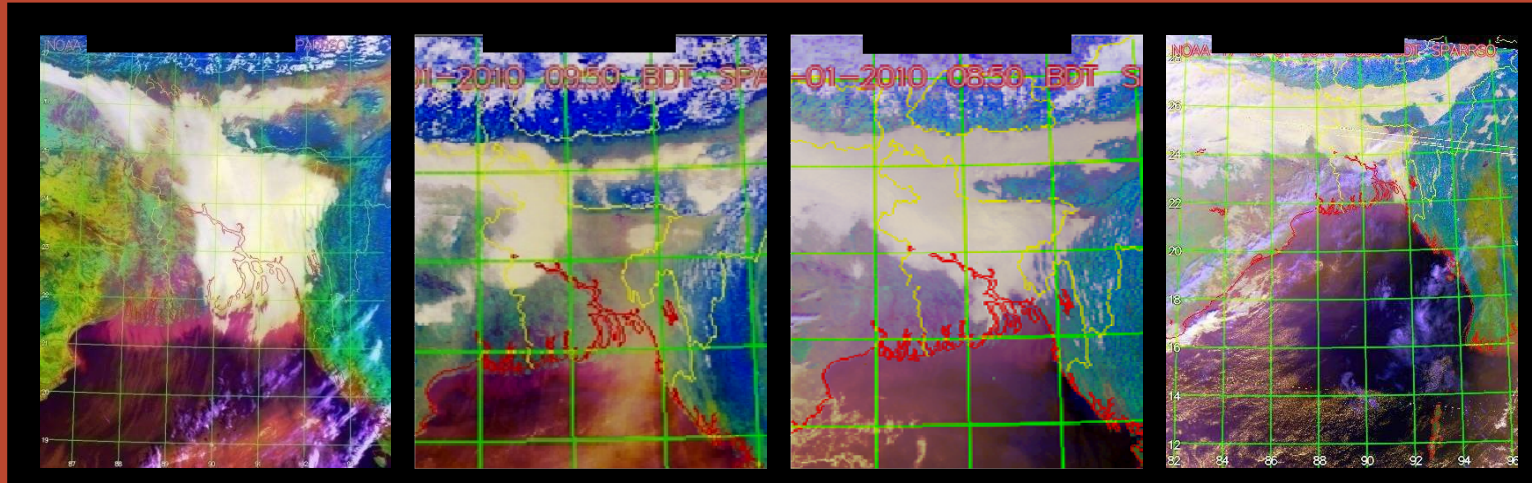
Nor'wester / Tornado Monitoring

12 MAR 13 18:24

20 APR 2013 3:30

20 APR 201318:24
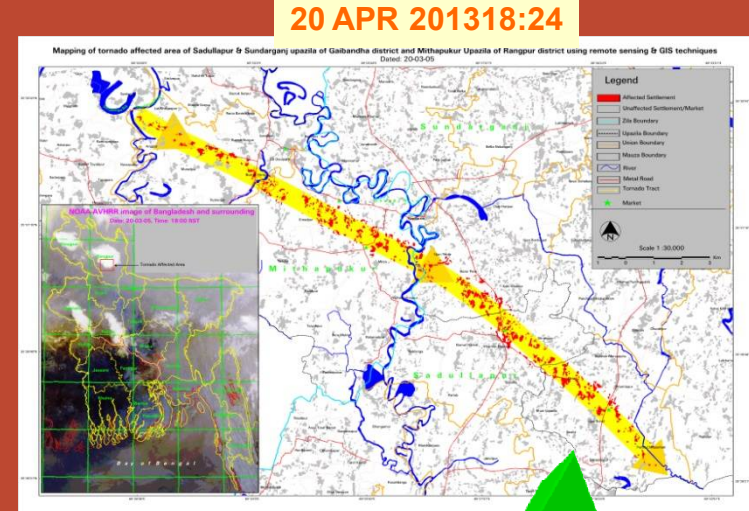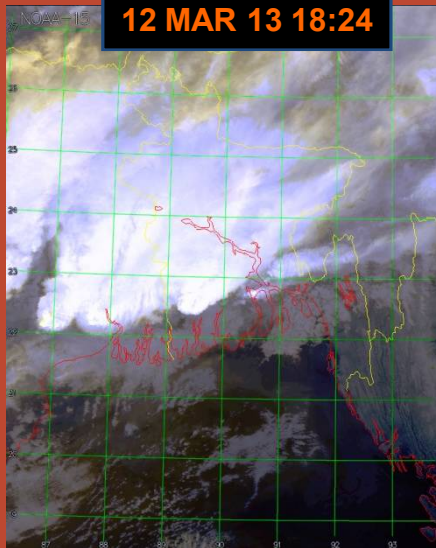
Affected Rangpur & Gaibandha Dists.

20 APR 20013 3:30

21 APR 20013 17:55
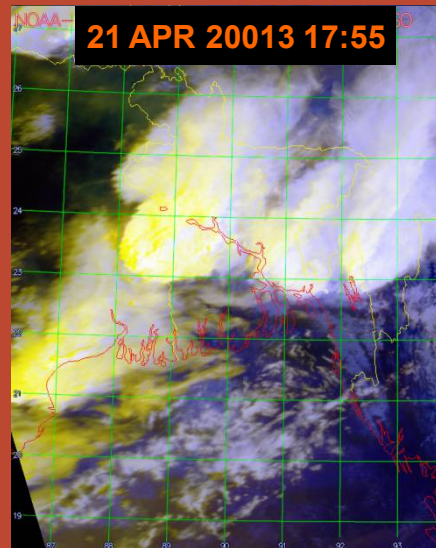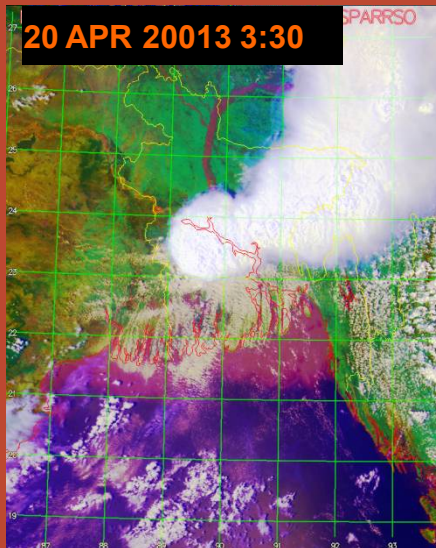
Death toll   - 56
Injured   - 1500
Affected Family - 1800
Affected villages- 20
Damaged crop area- 60 acres

Impact of Storm surge during Aila

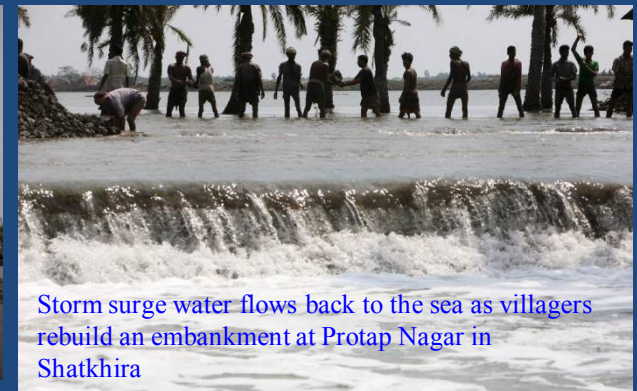Damaged Embankment in Satkhira

Inundated house in Patuakhali

Bouyar Char in Hatiya of Noakhali

A woman tries to retrieve her belongings from her house.

Homes damaged by cyclone Aila are seen on the outskirts of Khulna

Storm surge water flows back to the sea as villagers rebuild an embankment at Protap Nagar in Shatkhira

Storm Surge affected area delineation

- A storm surge occurs when powerful storm winds push water up onto the shoreline.
- This most frequently occurs when a Cyclone makes landfall.
- Cyclones are especially effective at producing a storm surge for these reasons
- Example: Cyclone Aila

- Formed: 22 May 2009
- Dissipated: 26 May 2009
- Highest winds:

  110 kmh (3-minute sustained)

  120 kmh(1-minute sustained)
- Storm Surge Height: 8-10 feet
- Fatalities: 172 total,

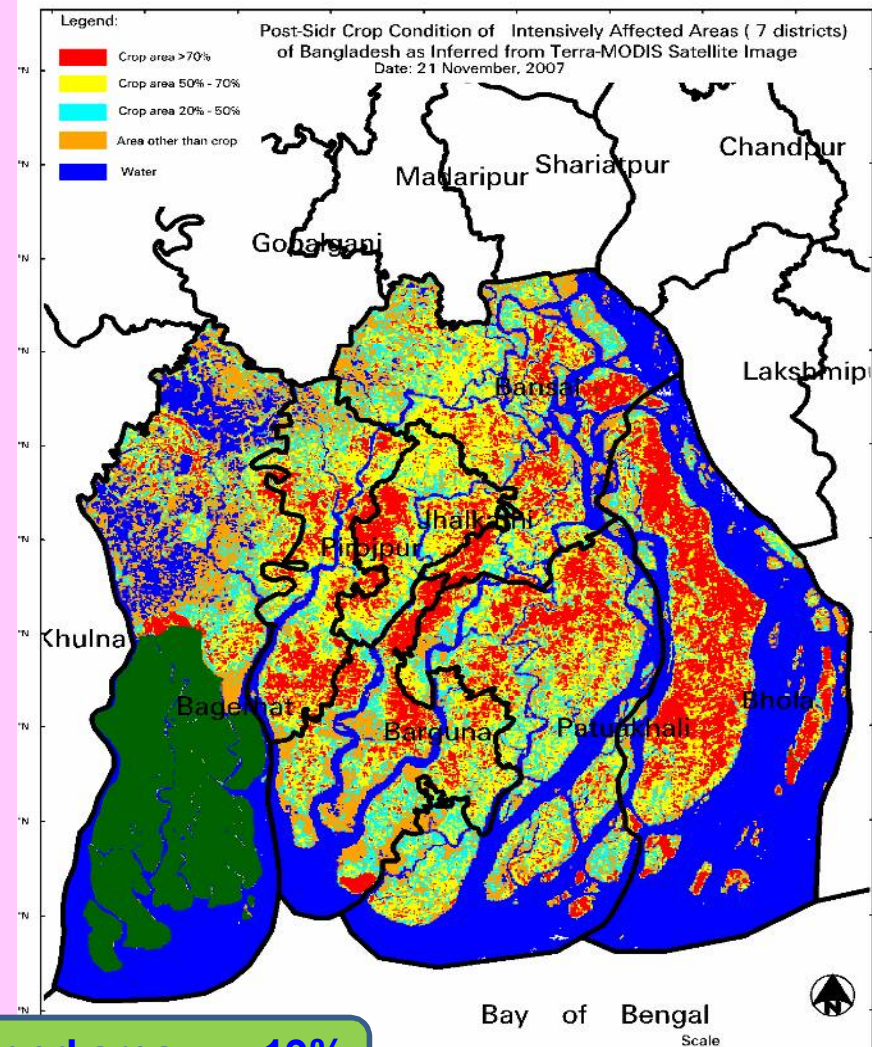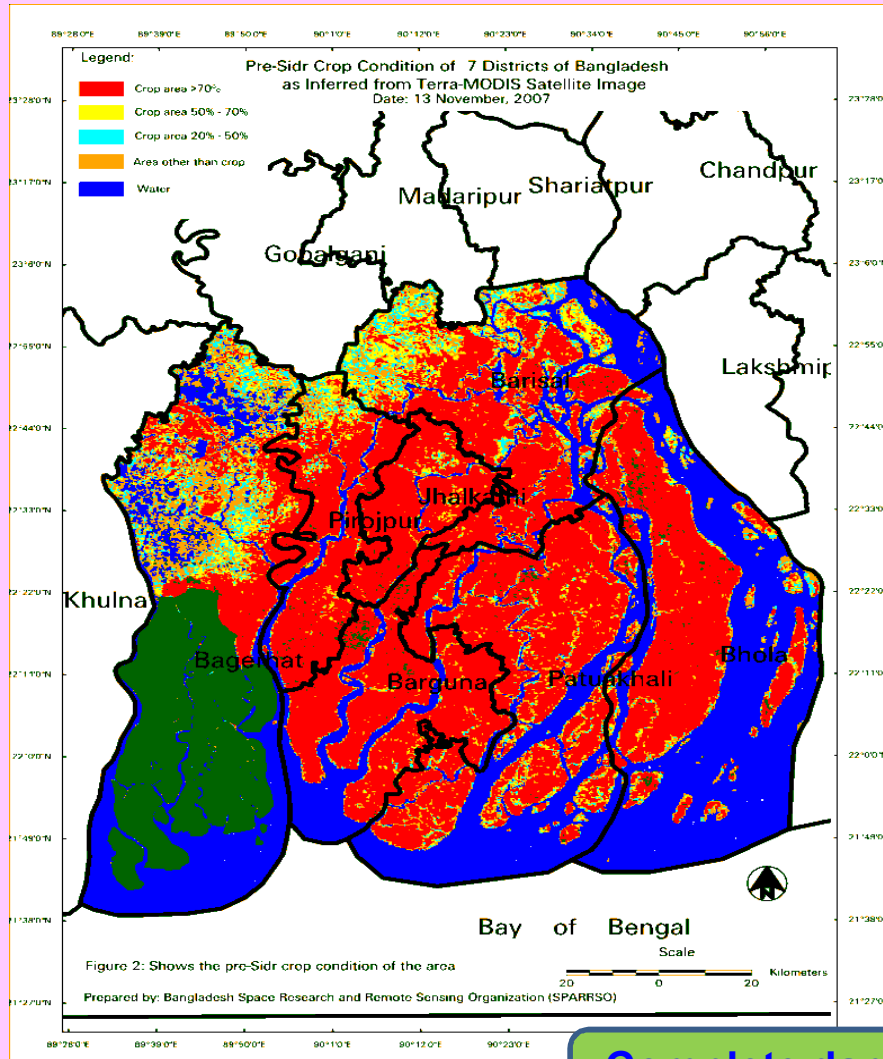 Damage: $40.7 million (USD)
- Most Area affected: 15 district
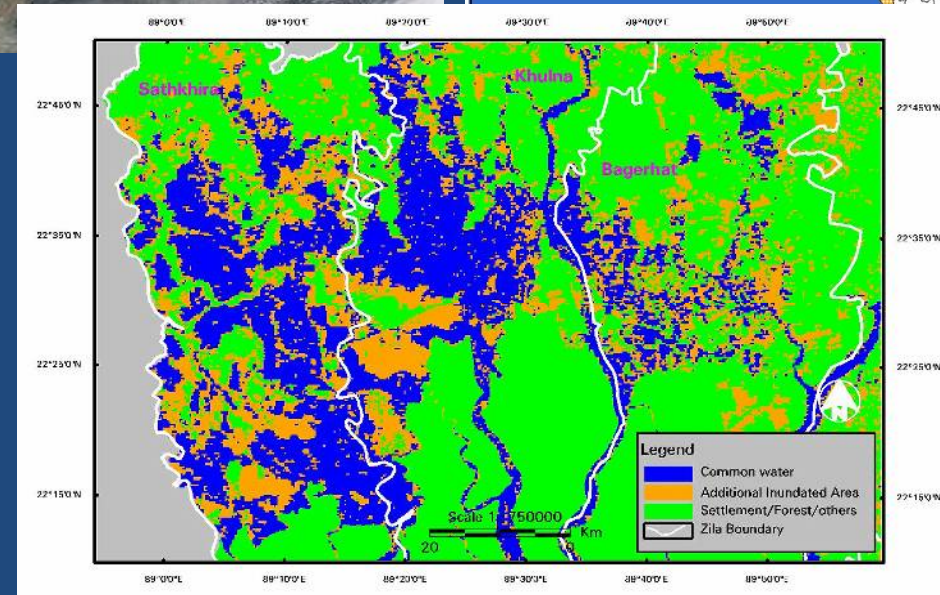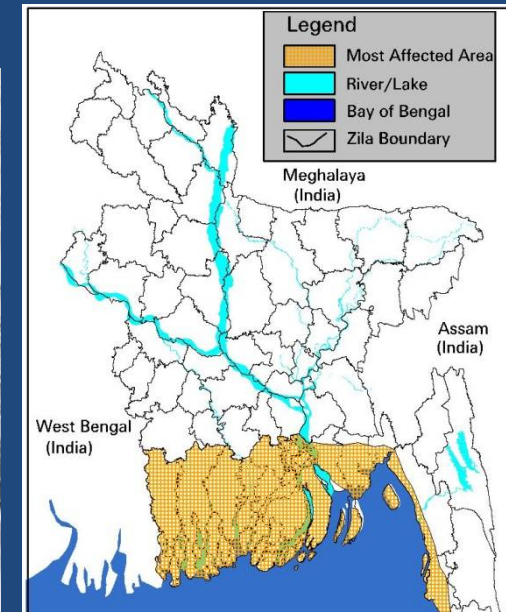
Post-Disaster Crop Damaged Assessment

**Affected seven districts by Cyclone Sidr (2007)**

Before Sidr

Legend:
- Crop area >70%
- Crop area 50% - 70%
- Crop area 20% - 50%
- Area other than crop
- Water

Pre-Sidr Crop Condition of 7 Districts of Bangladesh as Inferred from Terra-MODIS Satellite Image
Date: 13 November, 2007

Figure 2: Shows the pre-Sidr crop condition of the area

Prepared by: Bangladesh Space Research and Remote Sensing Organization (SPARRSO)

Bay of Bengal

After Sidr

Legend:
- Crop area >70%
- Crop area 50% - 70%
- Crop area 20% - 50%
- Area other than crop
- Water

Post-Sidr Crop Condition of Intensively Affected Areas (7 districts) of Bangladesh as Inferred from Terra-MODIS Satellite Image
Date: 21 November, 2007

Bay of Bengal

Complete damaged area   = 19%
Total production damaged= 54%

Estimation of Crop Damage by Flash Flood
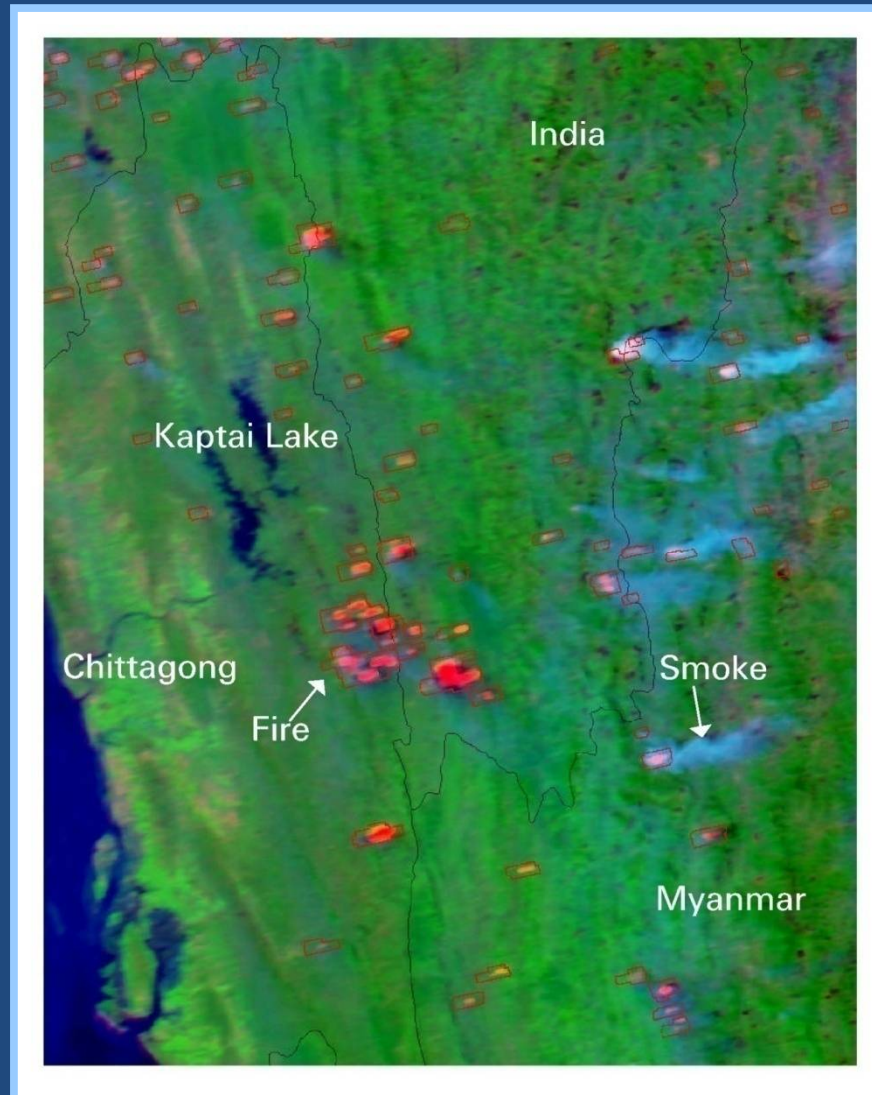
Flash Flood, April 2010
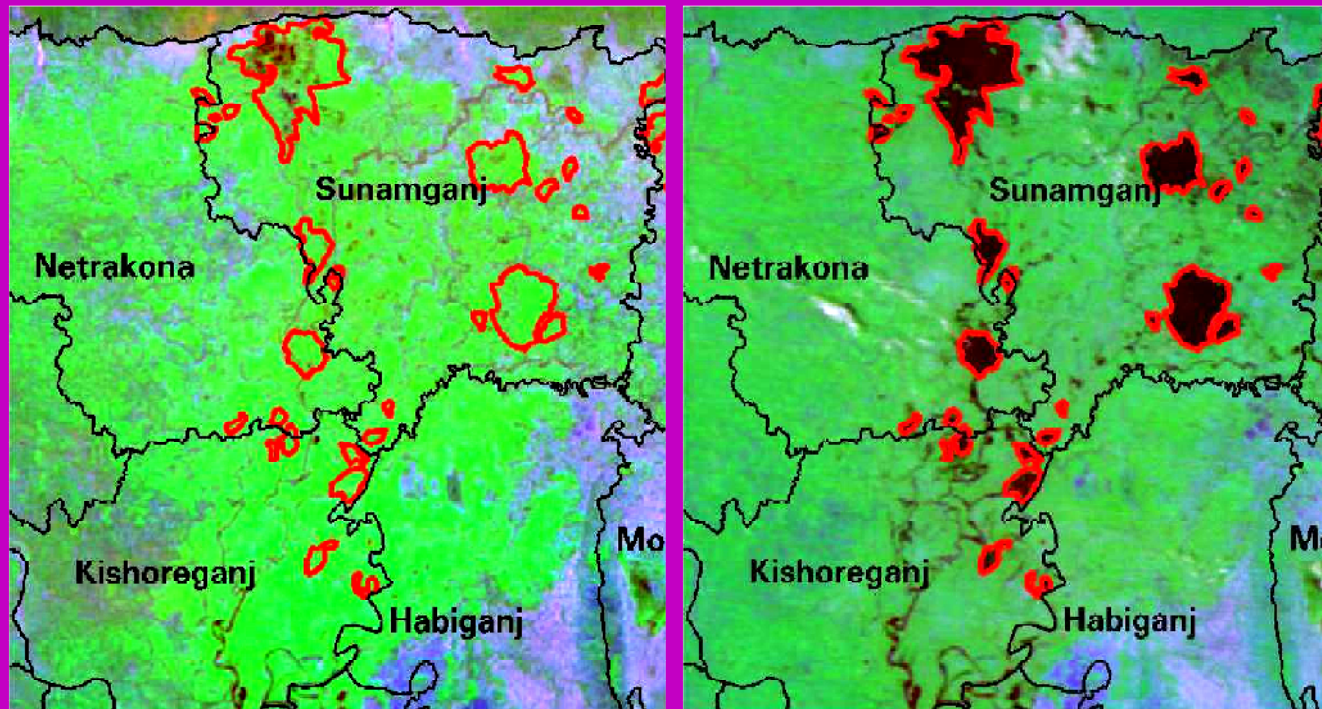
Application of RS/GIS based spatial model

50,500 hectare Boro rice was damaged

Digital product of MODIS pre-flood and flood condition images

Identification of Forest Fire

MODIS Satellite Image, March 21, 2006

Thanks for Watching