UN/Indonesia International Conference on Integrated Space Technology Applications to Climate Change, 02-04 Sept 2013, Jakarta, Indonesia.

The adaptation strategies and application of space based data in mitigating climate change impact in Bangladesh.

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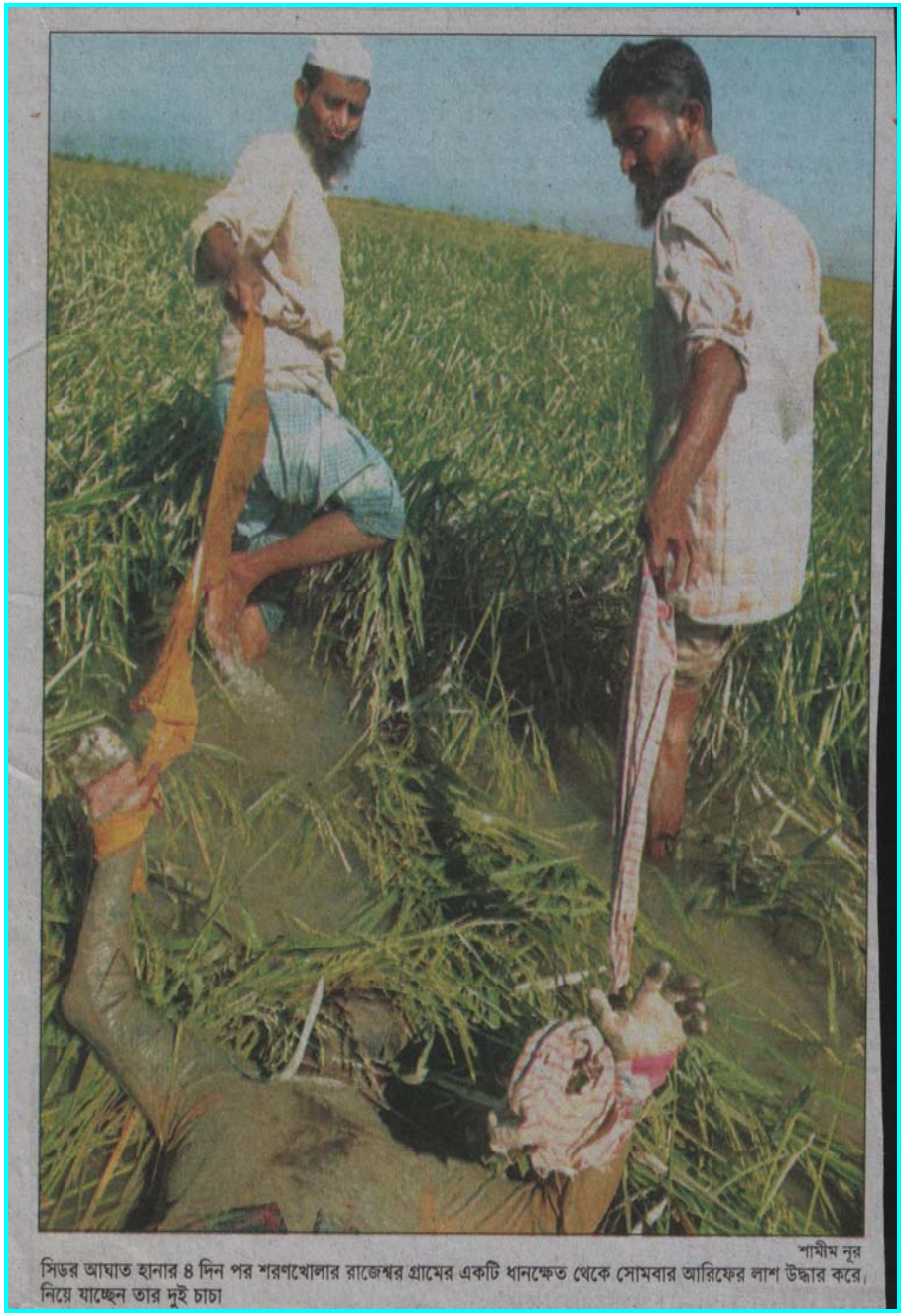
Bangladesh- the most climate-vulnerable country in the world

- **Climate change phenomena**
- **Change impact – *what will happen next ?***
- **Adaptation mechanism**
- **Uses of Space-based information**
- **Success story**

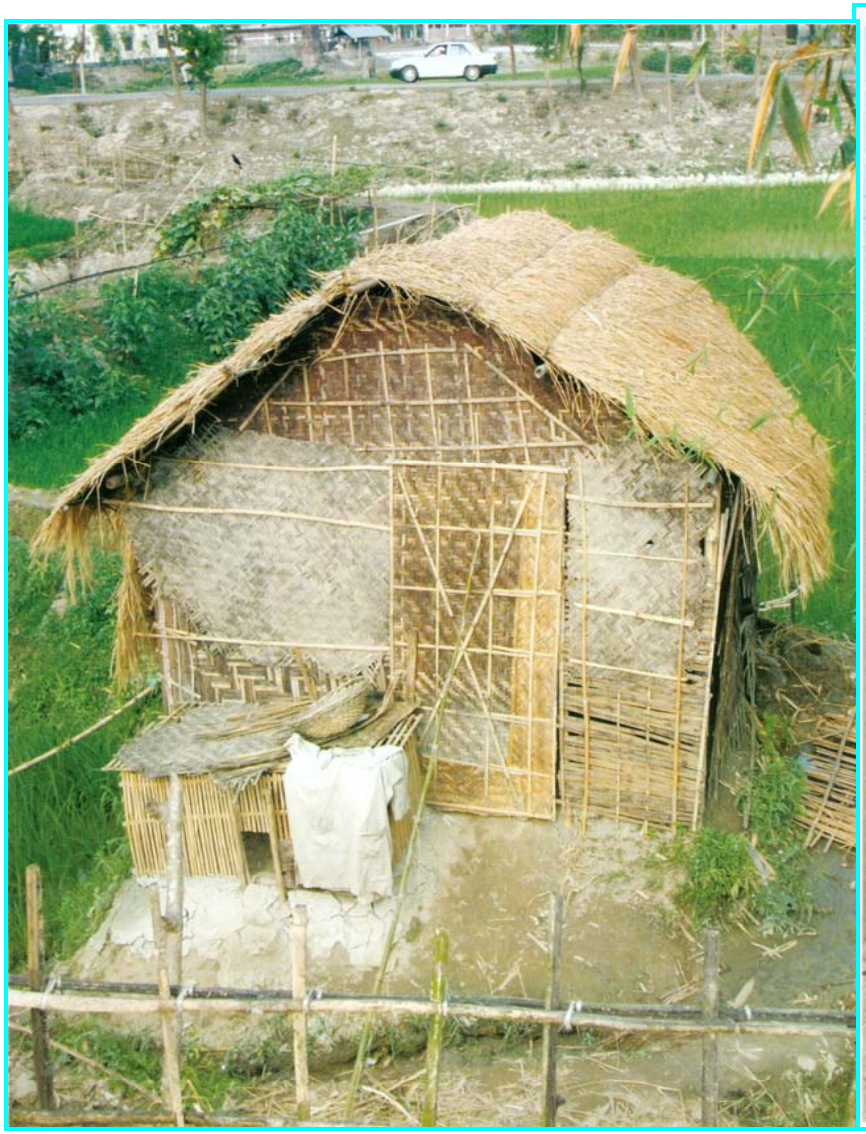
Changing weather patterns - increasing natural disasters

- flood
- cyclone
- tornado
- thundering
- heavy rains
- droughts
- cold/hot waves
- river erosion



শামীম নূর

সিডর আঘাত হানার ৪ দিন পর শরণখোলার রাজেশ্বর গ্রামের একটি ধানক্ষেত থেকে সোমবার আরিফের লাশ উদ্ধার করে নিয়ে যাচ্ছেন তার দুই চাচা



Climate Change Impact

- Water levels decreases
- Temperatures increases
- Salinity intrusion
- Security hazards (humanitarian crisis, civil unrest)
- Shortage of resources (properties, cultivable land, fire woods)
- Population migration/ displacement
  (increase informal employment-day labour,
  increase population in urban/city,
  12% coastal family migrated city areas, 30% did not return),
- Many rivers dried up
- Northern Bangladesh becoming desert - starts desertification
- many fish varieties lost
- Affecting on people's lifestyle, social and economical conditions

Climate Change Impact-2

- **Increase in temperature by 2° C and rise of sea level by 45 cm may cause -**

  29% higher chance of flood risk and permanent inundation

- **Average scenario of 2050**

  sea level rise - 70 cm

  land subsidence - 80 cm (tectonic movement)

  inside shoreline erosion - 2.5 km

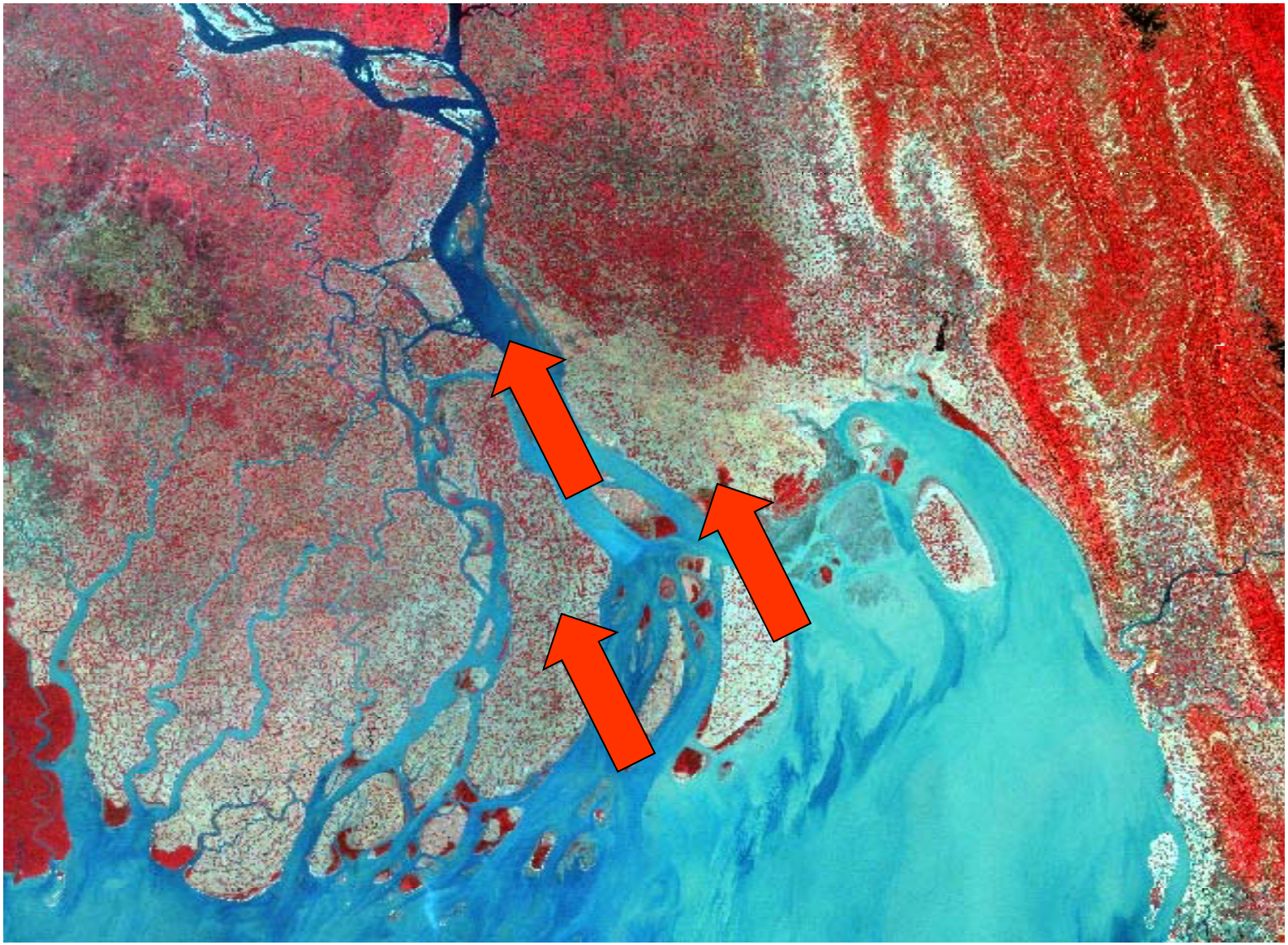
  population displacement and migration - 17%

  (20 million people become homeless)

  reduction of mangrove forest - 45%.

- **Traditional balances (coping mechanism) breakdown**

Intrusion of saline water



Bangladesh becomes innocent victim

- Casualties of human lives increased by natural phenomena

- **Heatstroke - 22 people died, June - July 2012**
- **Cold waves - 35 people died, Jan 2013**
- **Tornado - 24 people died, March 2013**
- **Thundering - 16 people died, April 2013**
- **Landslide - 12 people died, Aug 2012**
- **Cyclone Mahasen - 24 people, 16 May 2013**

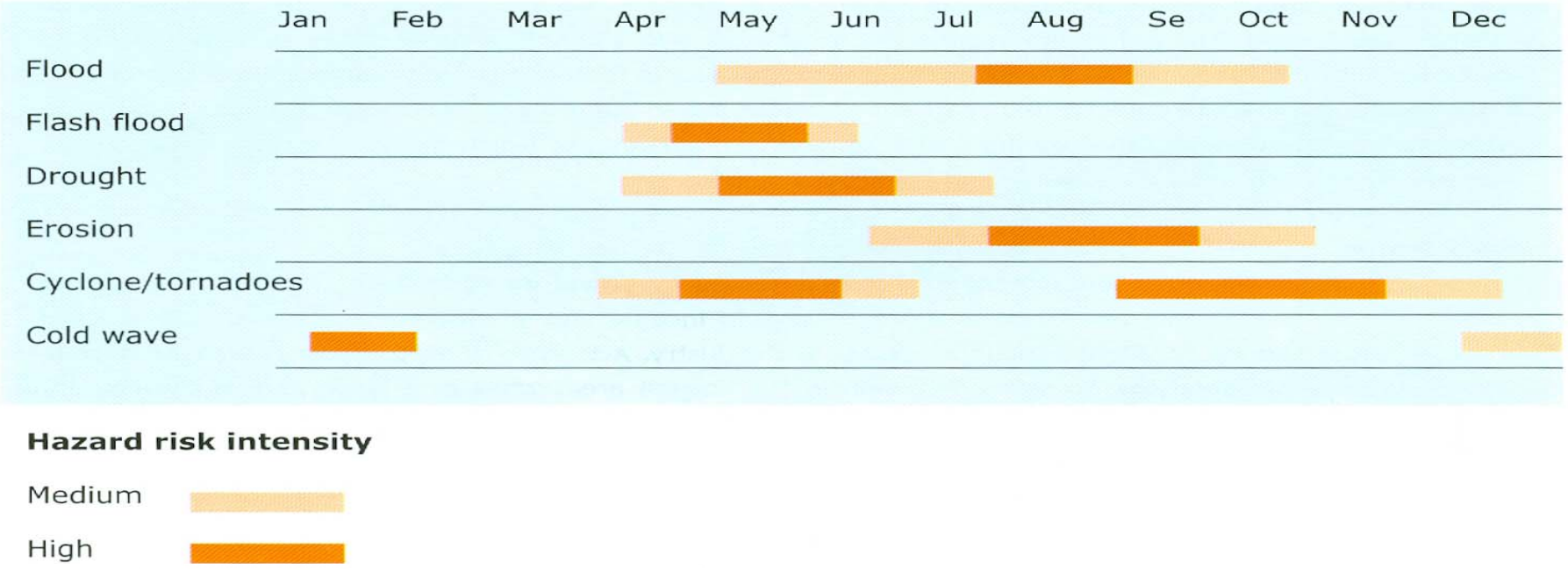
Bangladesh- possible suffer

- **water salinity**
  (tidal water intrusion- goes up to 250 km inside the country, reduce upstream fresh water),
- **water logging**
  (sea water rise, rain water, flood, while no adequate drainage system)
- **soil salinity**
  (more than 12 % land will be saline-affected, decreases soil fertility)
- **Human diseases (skin diseases, virus, diarrhea, malaria)**

- **Salinity in water and soil may cause**

- **shortage of safe drinking water**
- **food security**
- **reduction of crops Boro, Amaon rice- agricultural production**
  (May and November-most cyclone period, July-August-flood period, crops Boro (water needed) - and crop Aman (winter, dry season, irrigation needed),
- **increase food price**

Frequency of Disasters in Bangladesh



Annual Frequency of Cyclone in the Bay of Bengal (%)

J	F	M	A	My	Ju	Jl	A	S	O	N	D	%
3	0	1	12	19	19	2	3	5	13	17	6	100

Vision for climate change adaptation

“Climate resilient Bangladesh is where its people and institutional arrangements address current and emergency development risks,

taking immediate actions to assess, plan, work to reduce risks, and overcome the challenges”

Mitigation Preparedness-1
Adaptation Program

- **Government of Bangladesh has prepared the 'Standing Orders on Disaster Management' (2008)**
- **The 'National Adaptation Program of Action' (2005)**
- **The 'Bangladesh Climate Change Strategy and Action Plan' (2008 and revised 2009) under the recommendations of Bali Action plan.**
- **The government has established a Climate Change Fund- from own resources initial fund $45 million.**
- **Multi Donor Trust Fund - proposed contribution $188 million.**
- **Many development partners taking part in adaptation program and already deposited $ 90 million.**

Multi-donor Fund

Partners	Amount Pledges (US $ million)	Deposits (US $ million)	Unpaid (%)
Aus AID	7.1	7.1	0 %
Denmark	1.8	1.8	0 %
DFID	96.9	28.4	70 %
EU	37.6	18.5	50 %
Sweden	19.3	19.3	0 %
Swiss	12.5	6.0	53 %
US AID	13.0	9.0	31 %
Total	188.2	90.0	

* Projects taken-8, with US $ 151.5 million, 81 % of total pledged amount

Mitigation Preparedness-2 strategy and preparedness plan Adaptation programs

- **better early warning system**
- **river and coastal embankments**
- **cyclone-flood shelter (already built 3200 shelter for vulnerable people)**
- **better irrigation schemes crop production**
- **developing saline-drought-flood adapted crop varieties**

Strategy pillars

- food security
- comprehensive disaster management
- uses of satellite technology, GIS
  - development of meteorological department
  - space and remote sensing research organization
  - early warning and forecasting system using space- based data
- infrastructure development
- low-carbon development
- institutional development and research

Climate change Adaptation-1
Uses of Space-based Information

- **Bangladesh given emphasis on geospatial information systems (GIS)**
- **using satellite technology**
- **developing an understandable early warning and forecasting systems**
- **successfully reduce mass casualties and properties**
- **Satellite images help for preparing better prediction**
- **accurate cyclone and flood tracks**
- **preparedness for crops production**

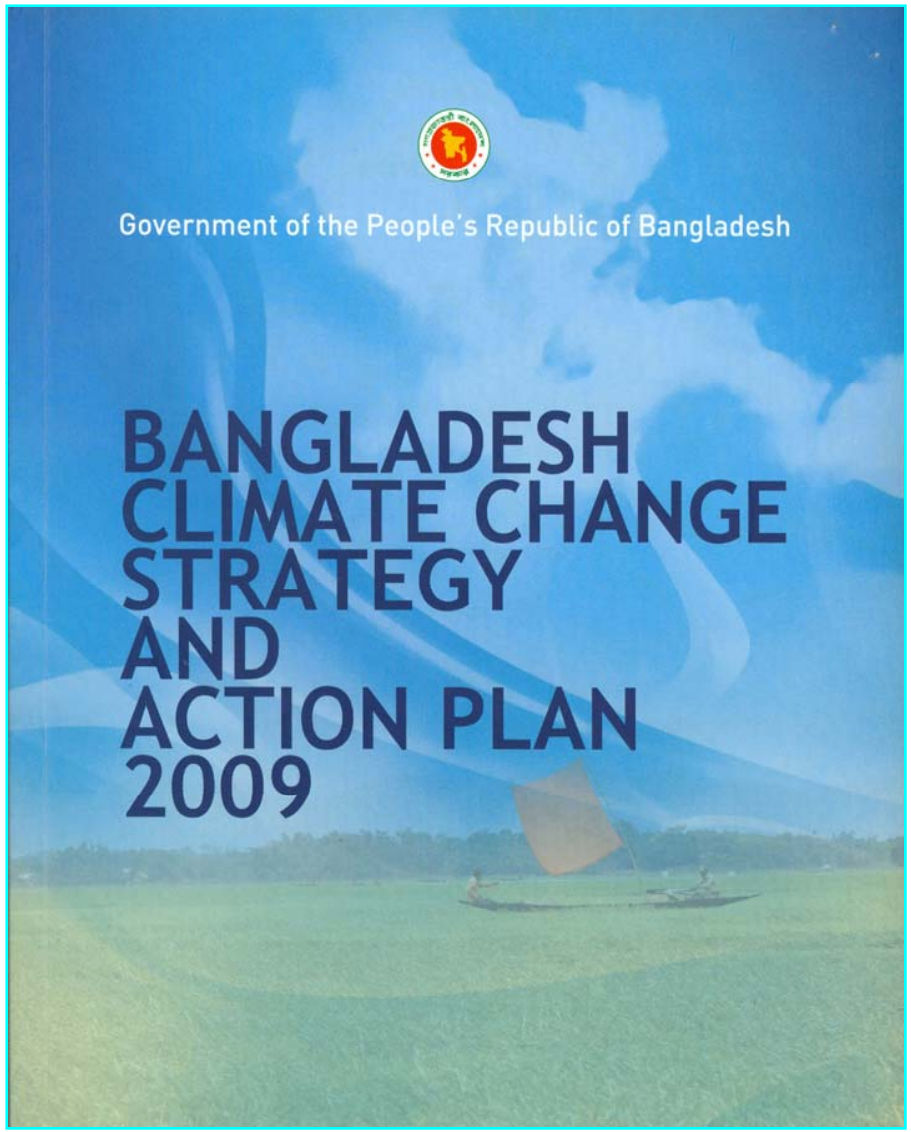
Climate change Adaptation-2
Uses of Space-based Information

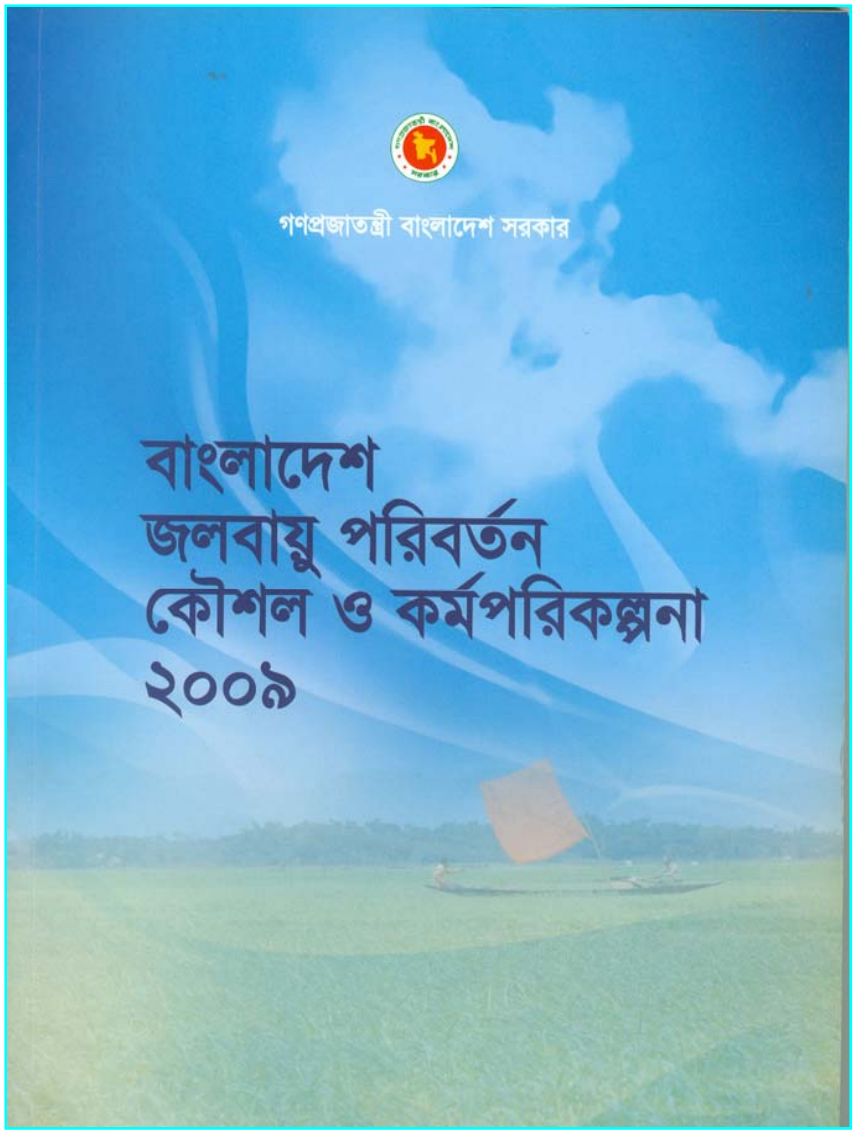
space based technology uses in

- **flood flow,**
- **flood zoning,**
- **river erosion,**
- **accretion, and changes of river direction**
- **crops- vegetation pattern**

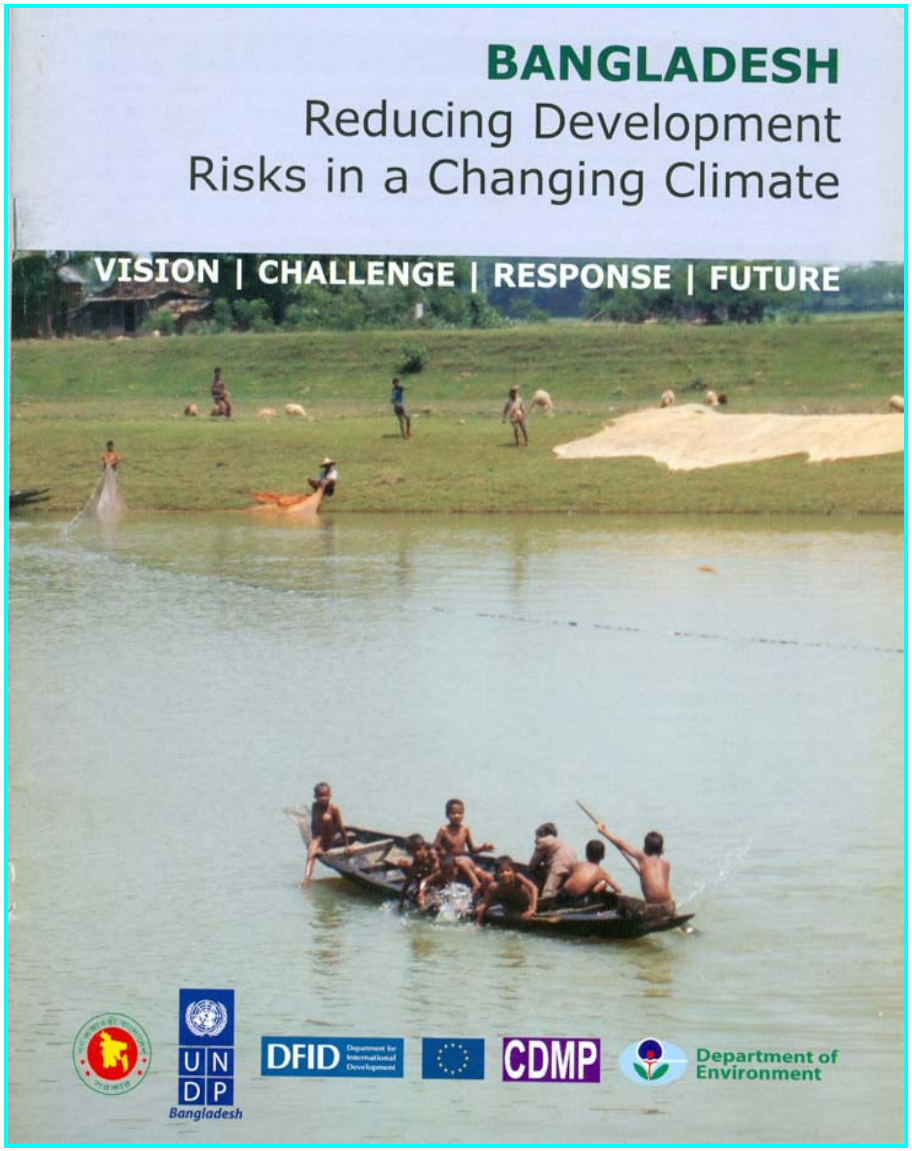
- **satellite images use as first response in disasters.**
- **satellite phones uses for emergency workers.**
- **community-radio alert the vulnerable people to evacuate**
- **satellite technology uses for post-disaster damage detection**

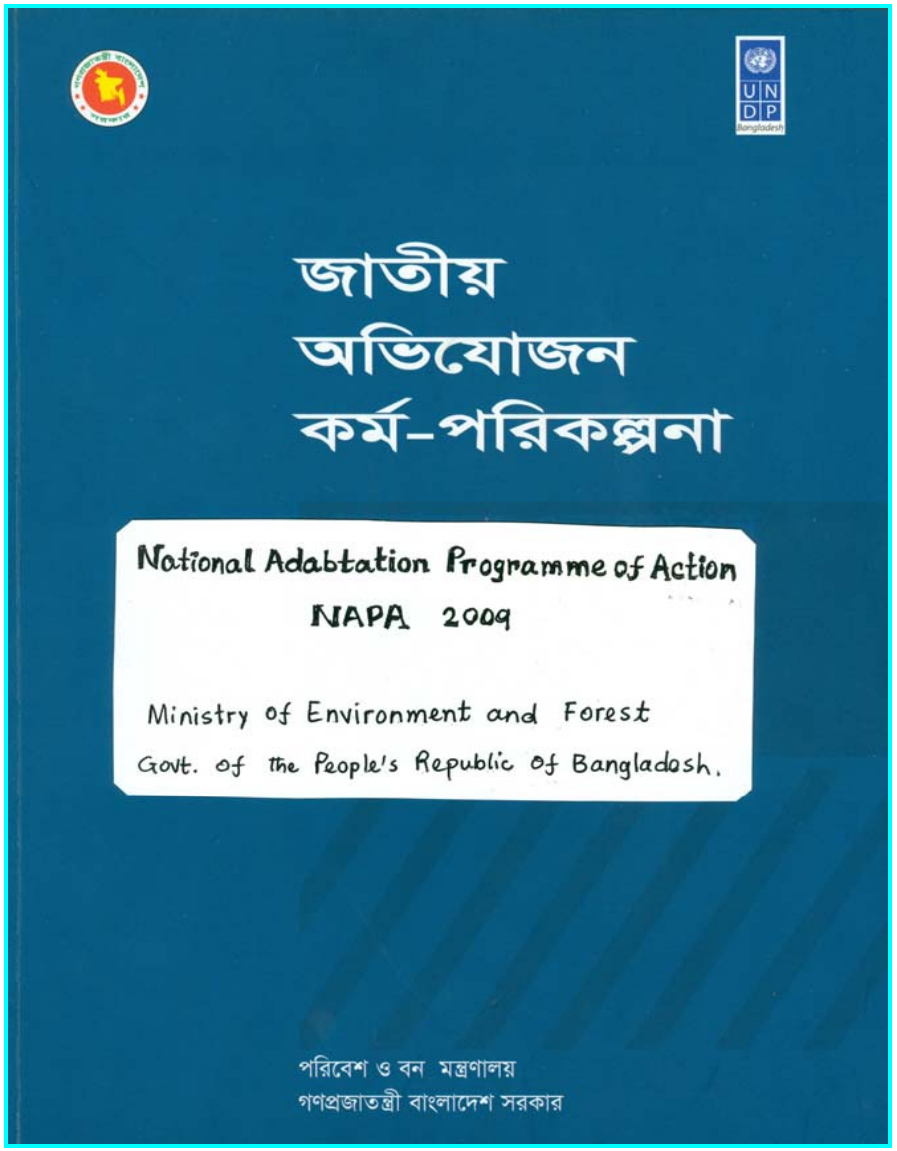
Adaptation Programme in Bangladesh



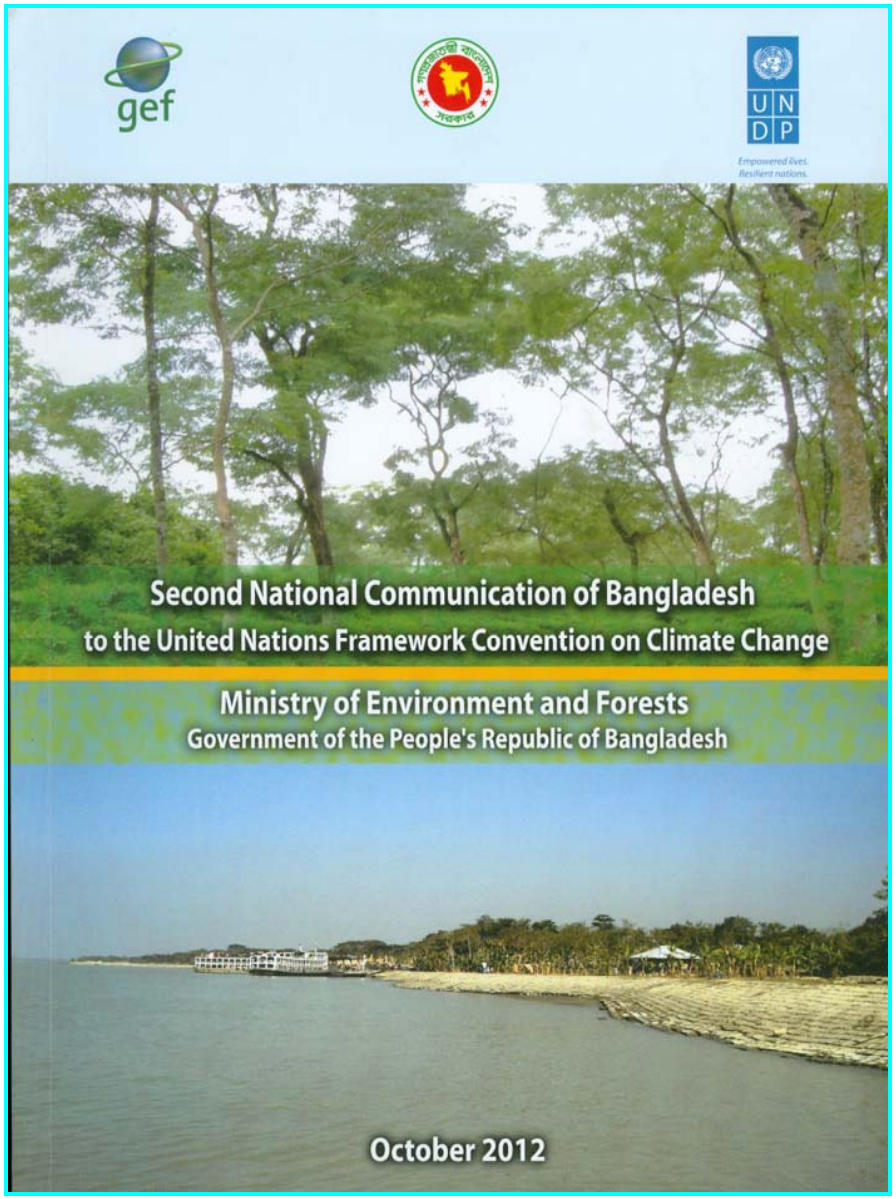


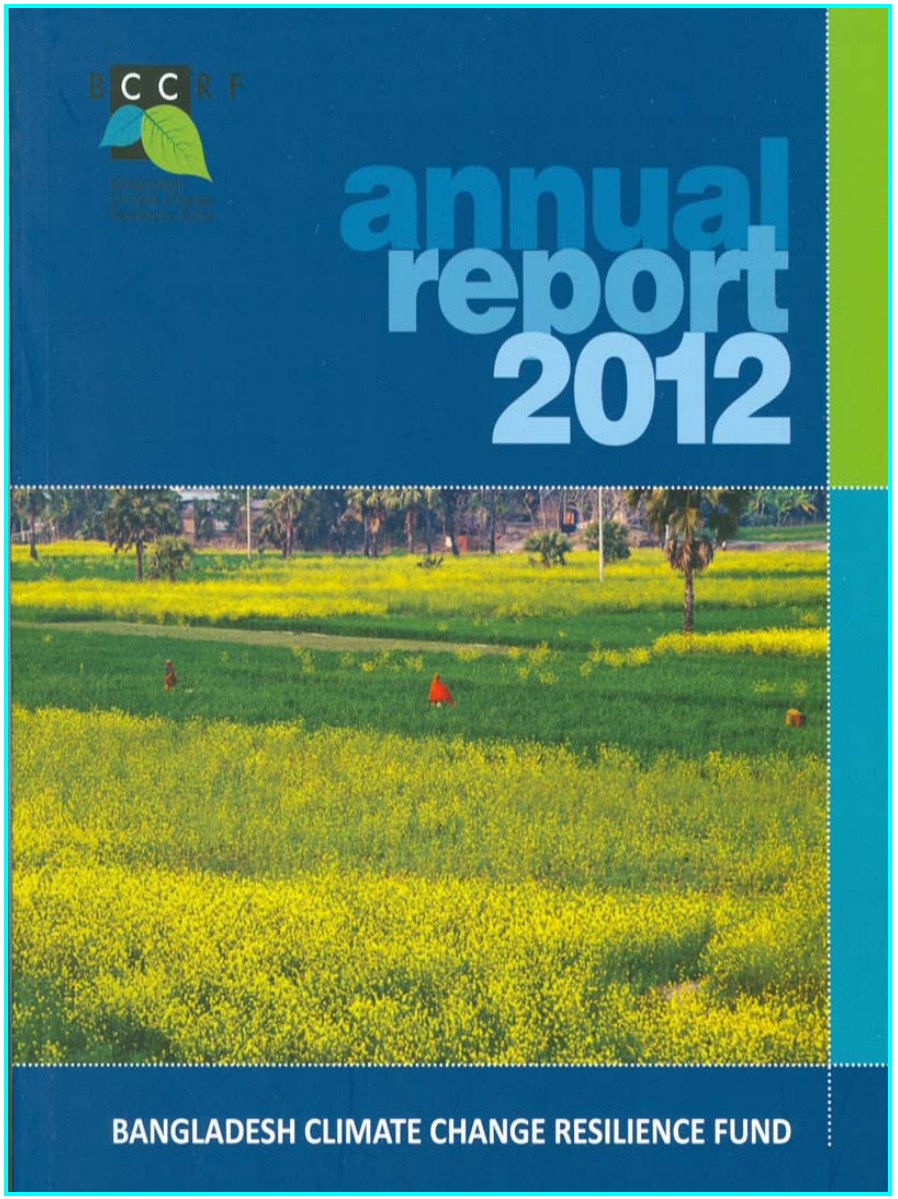
Adaptation Programme in Bangladesh-2



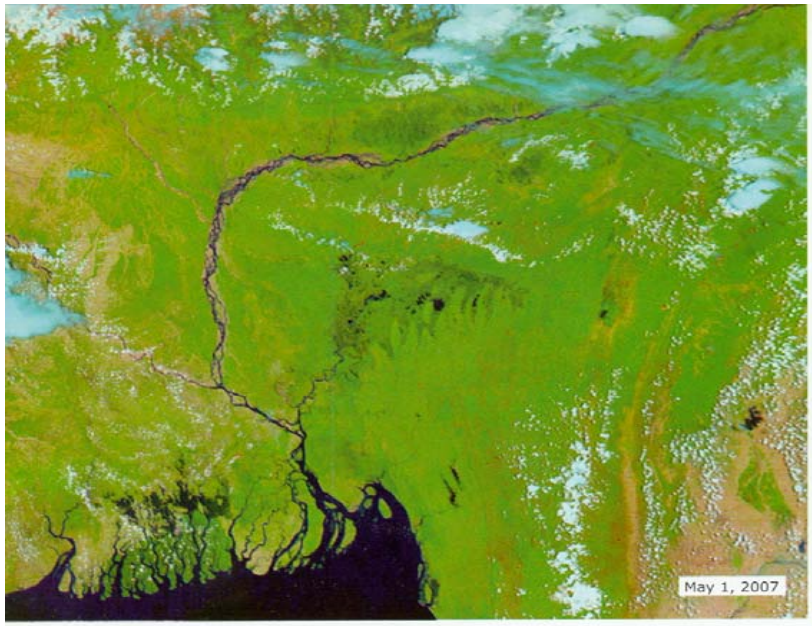


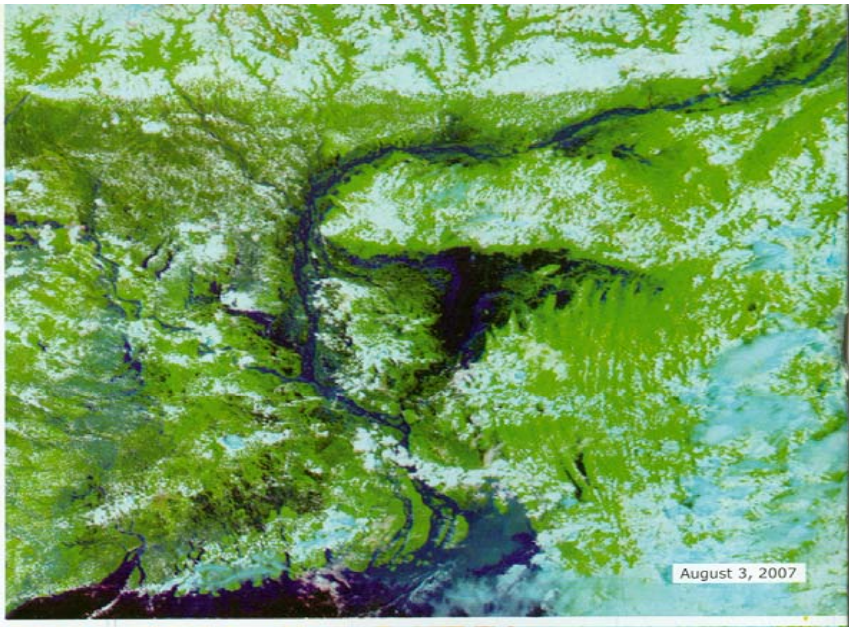
Adaptation Programme in Bangladesh-3

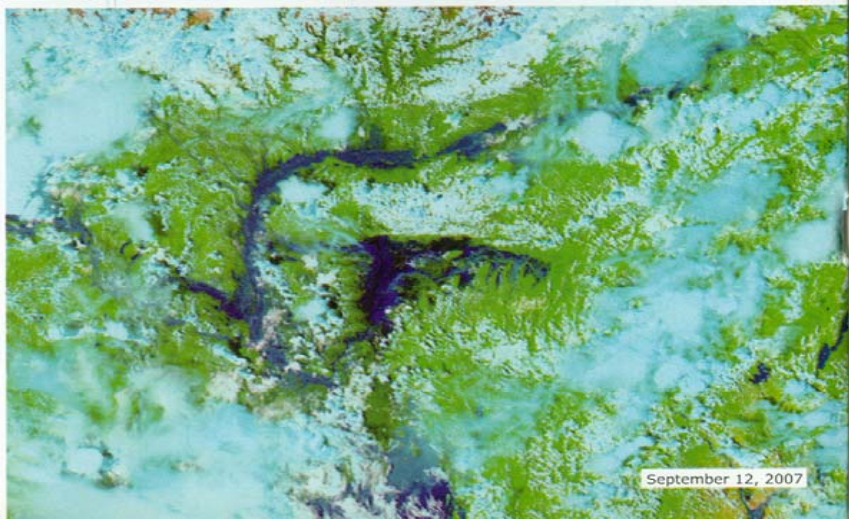




Use of satellite images in detection flood





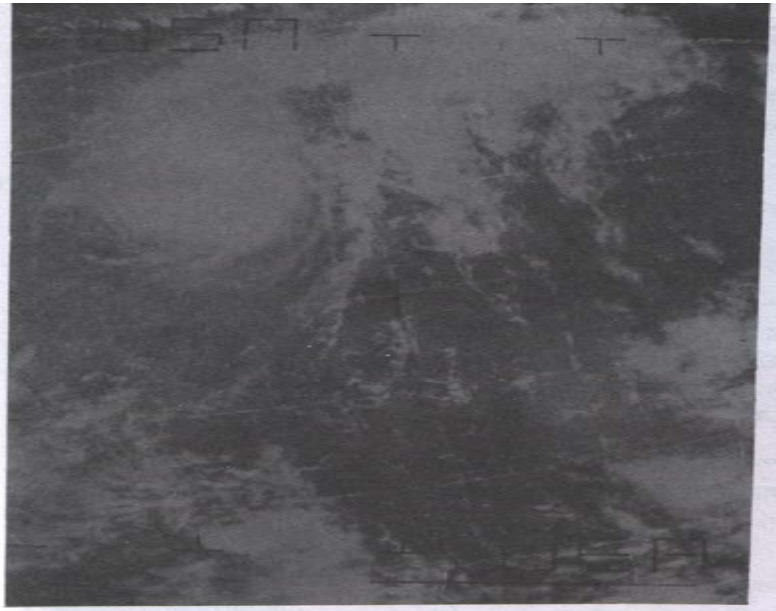


Floods maroon millions in Bangladesh

A large part of Bangladesh is an alluvial delta and therefore is extremely prone to flooding. In 2007, the monsoon in the upstream basin was particularly heavy, leading to a series of floods. Scientists have predicted more severe, extreme and recurring floods for the region which includes Bangladesh in the coming decades. This is alarming for a country already vulnerable due to population density, agriculture dependent livelihoods and human settlements along its coast and mighty rivers.

India's Brahmaputra river was already flooded in early August (top right image), but those floods turned out to be small compared to the floods that hit the river in early September (bottom image). The river flooded for the third time in 2007 when monsoon rain pounded northeastern India, Bhutan, and Bangladesh in early September. As these images illustrate, the September floods were the worst of the year, forcing 500,000 people to be evacuated in Bangladesh. The floods damaged crops that had been replanted after the August floods.

Image Source: NASA, 2007, courtesy the MODIS Rapid Response Team, NASA GSFC

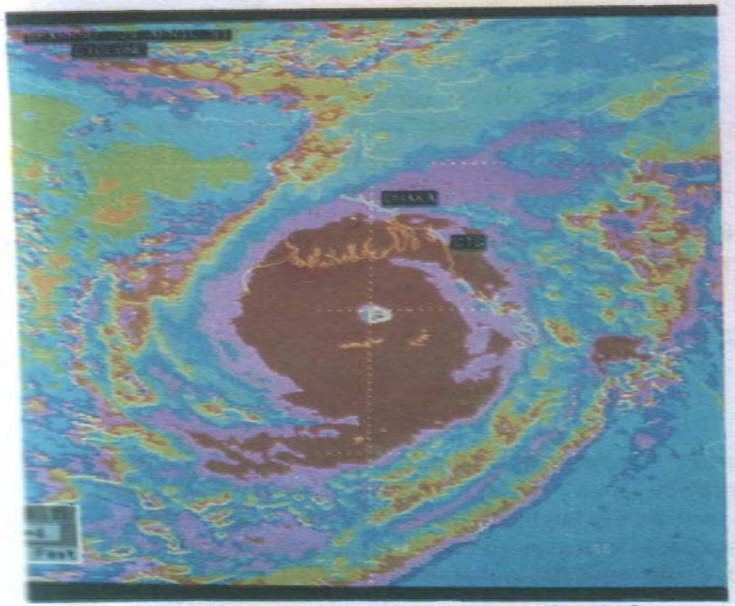


নোয়া উপগ্রহ থেকে প্রাপ্ত ১৯৭০ সালের ঘূর্ণিঝড়ের ছবি।

Cyclone 1970 NOAA

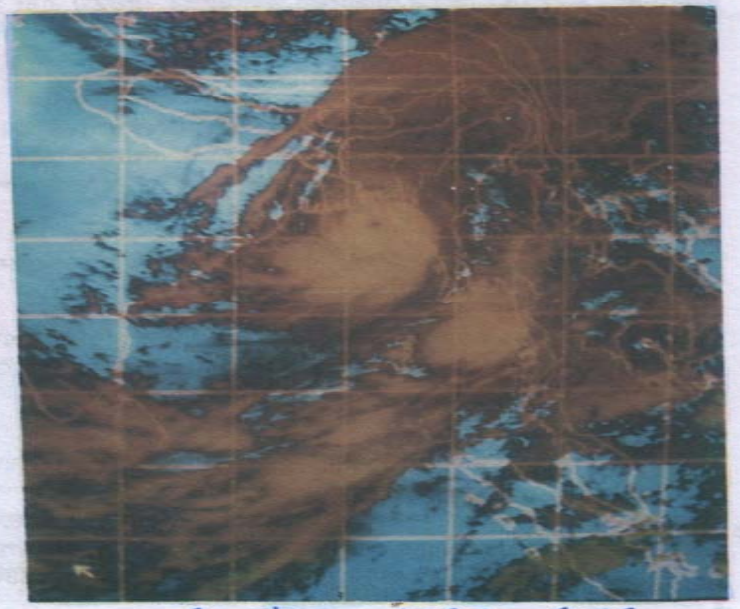
নোয়া উপগ্রহ থেকে প্রাপ্ত ১৯৮৫ সালের ঘূর্ণিঝড়ের ছবি।

Cyclone - 1985 NOAA



Cyclone 1991 GMS

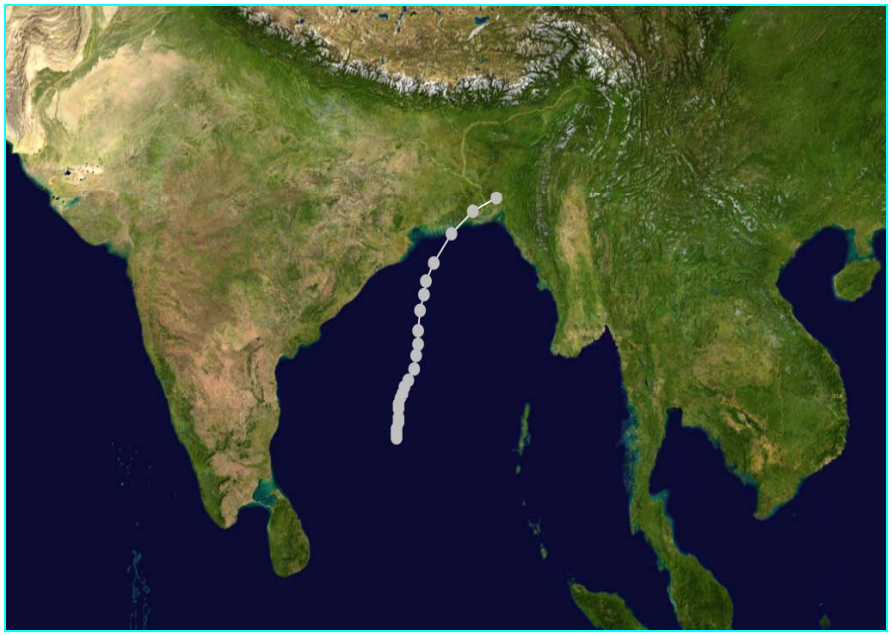
জিএমএস উপগ্রহ থেকে প্রাপ্ত ১৯৯১ সালের ঘূর্ণিঝড়ের ছবি।



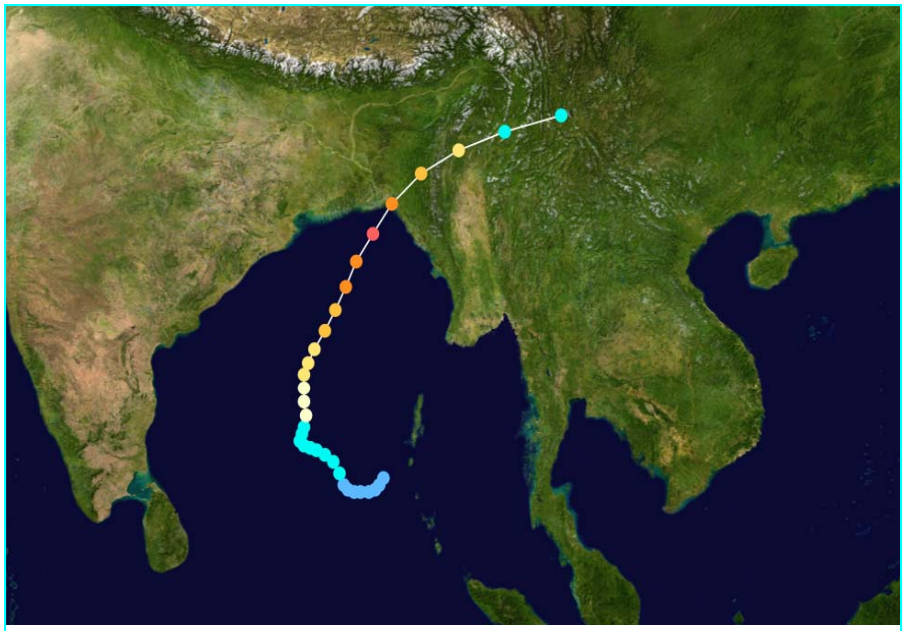
Cyclone - 1997 GMS

জিএমএস উপগ্রহ থেকে প্রাপ্ত ১৯৯৭ সালের ঘূর্ণিঝড়ের ছবি।

Cyclone Track, November 12, 1970



Cyclone Track, April 29, 1991



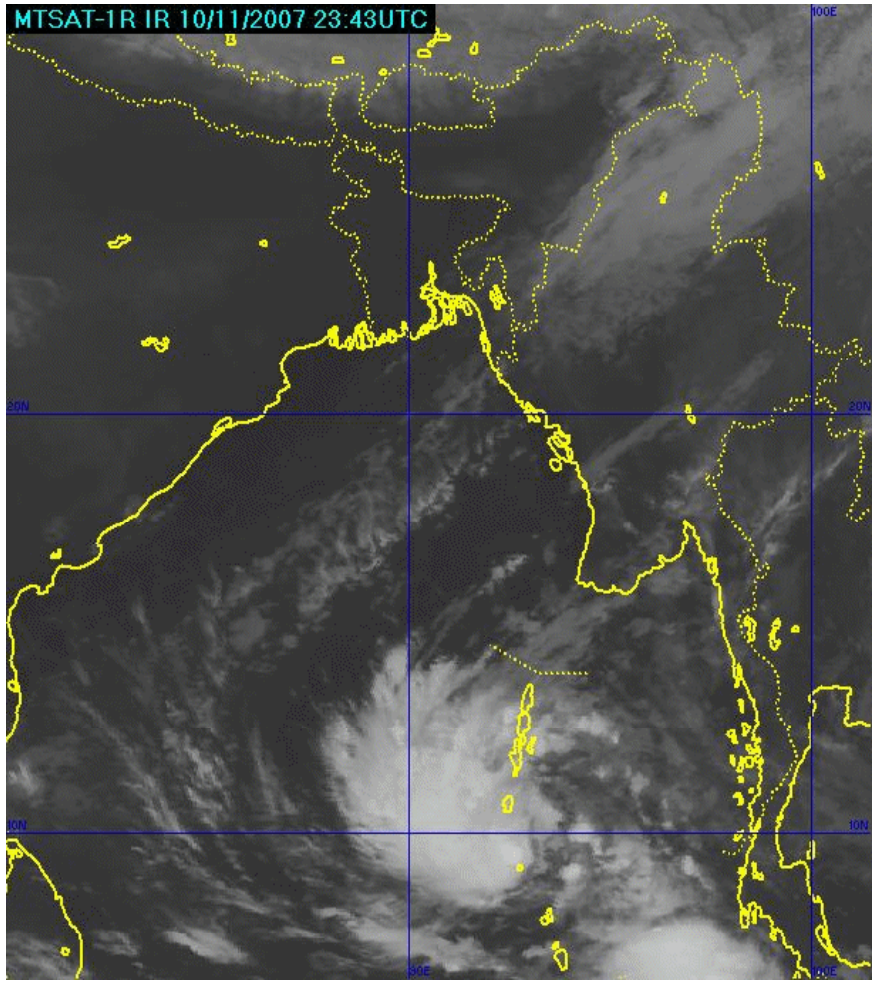
Bhola Cyclone, 1970

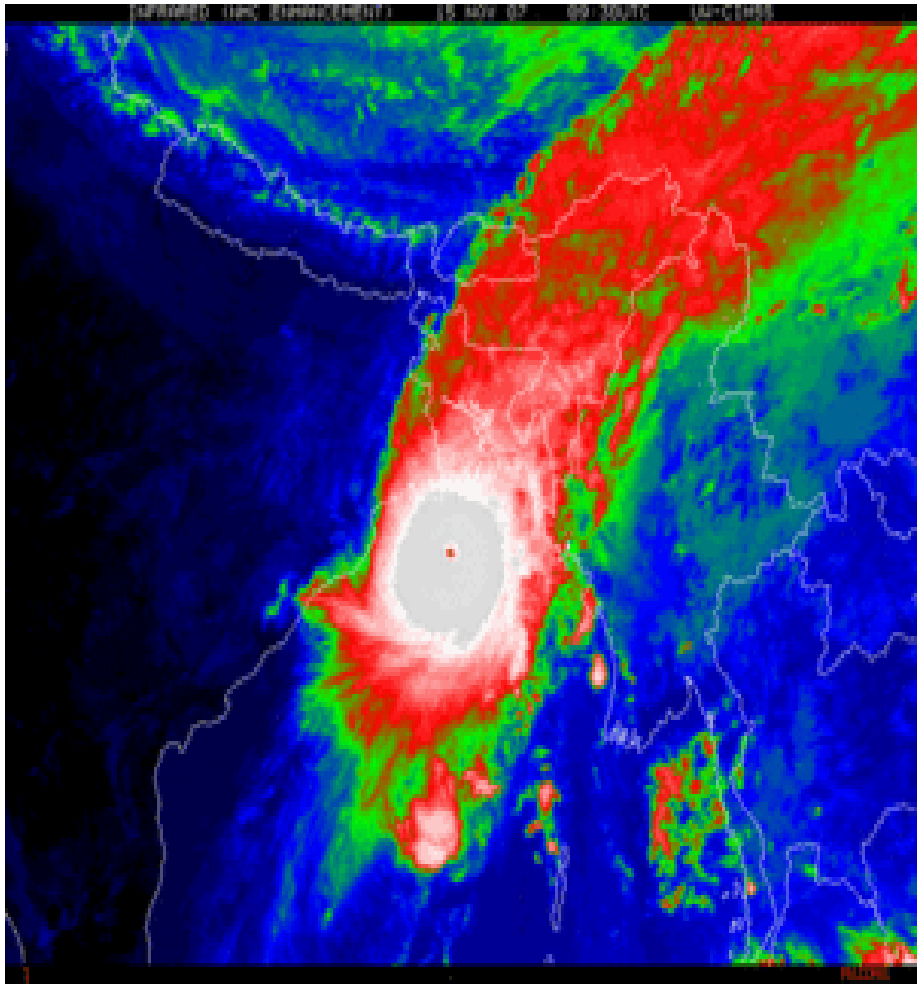
- Formed: November 7, 1970
- Dissipated: November 13, 1970
- Highest Winds (10 min sustained):185 KPH
- Highest winds (1 min sustained): 222 KPH
- Lowest Pressure: 966 hPa
- Fatalities: 300,000-500,000
- Damage: 86.4 Million USD
- Affected areas: India & East Pakistan

Bangladesh Cyclone, 1991

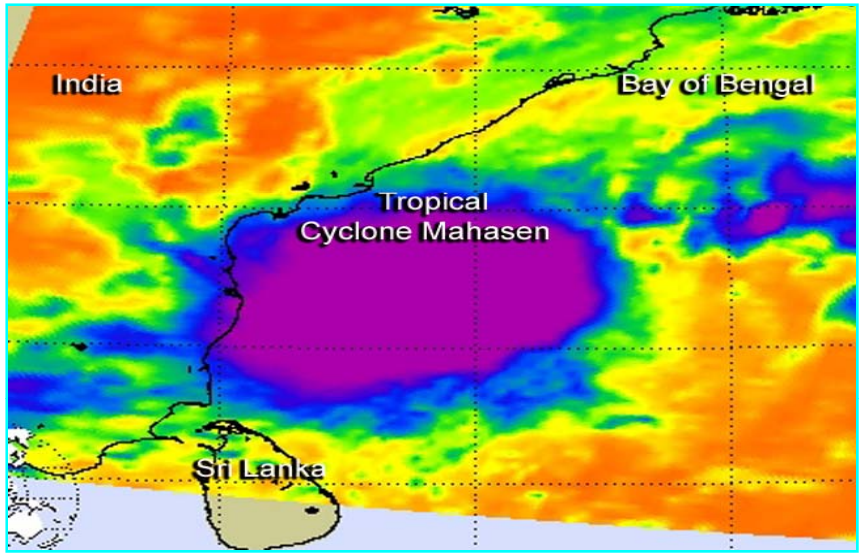
- Formed: April 22, 1991
- Dissipated: April 30, 1991
- Highest winds (1 min sustained): 225 KPH
- Lowest Pressure: 898 hPa
- Fatalities: 138, 000
- Damage: 1.5 billion USD
- Affected areas: Bangladesh

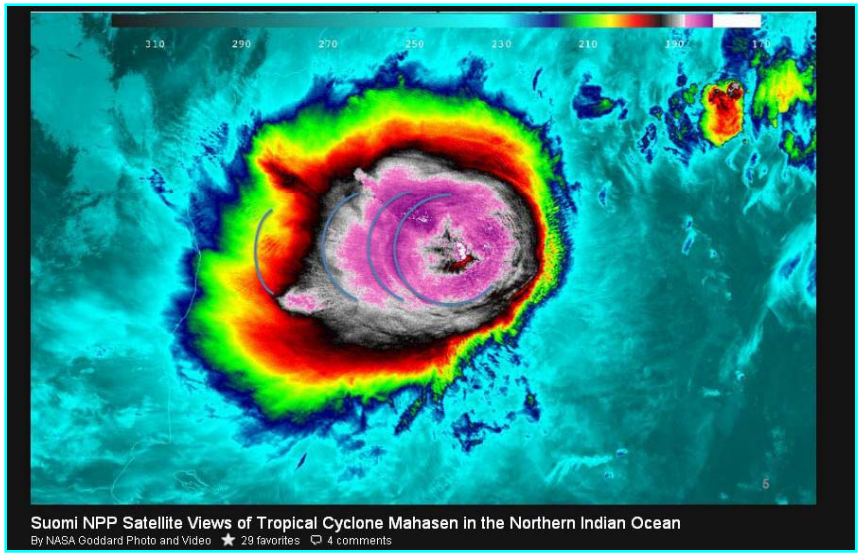
Cyclone SIDR- 15 November 2007

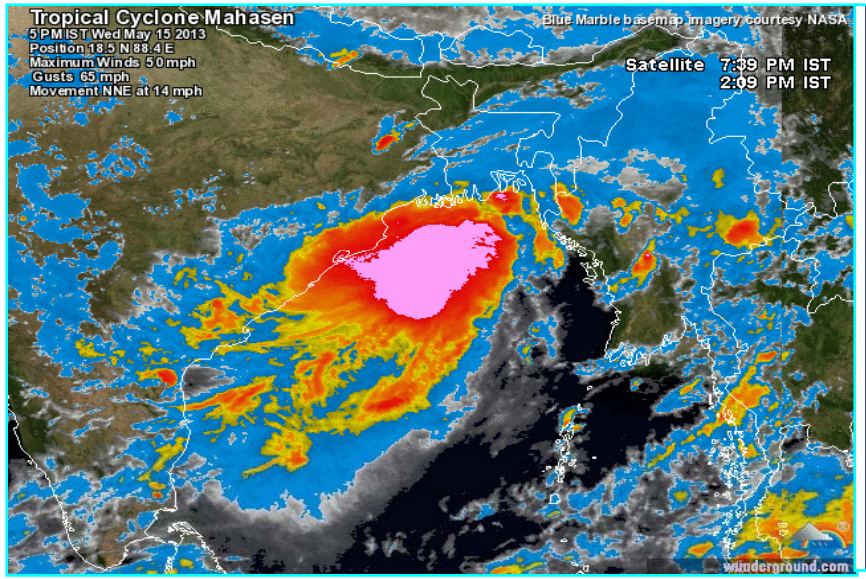


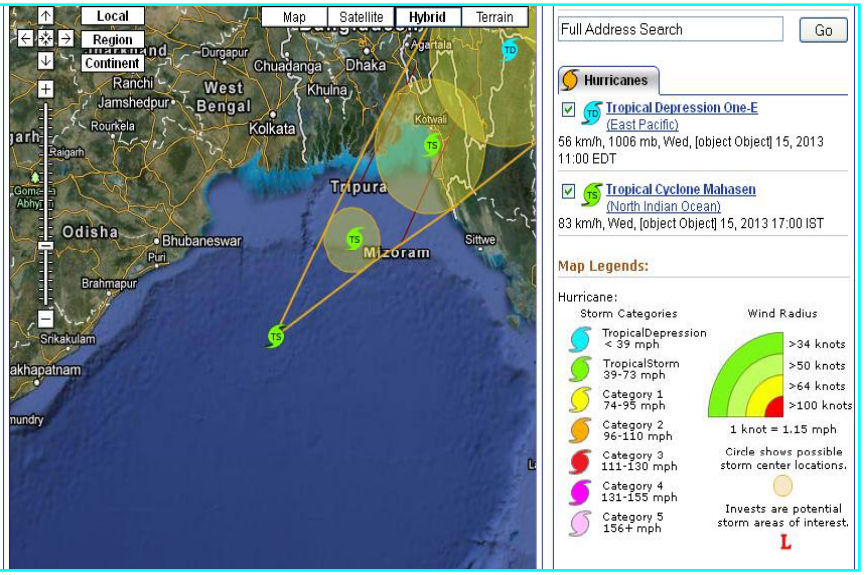


Cyclone Mahasen May 16, 2013 (people died 24)









Satellite Technology in Detection of disasters

- Storm Warning Center is now using satellite pictures/imageries
- Satellite pictures are useful for detecting, tracking cyclones
- Improvements in warning at 48-72 hours track forecast accurately
- Better coverage and accurate of wind observations
- Higher resolution in space and time
- Cloud-drift winds and the new water vapor winds help
- Used in analysis of meteorological data, measurement of land, cyclone core (eye) temperature
- Useful for disaster bulletin / warnings

Remote Sensing Data in Reduction of Disasters

- Quickly assessing the severity of disaster damages
- Planning for disaster preparedness, evacuation, rescue and post disaster activities, monitoring disaster situation
- Placing / sheltering victims or refugees
- Calculating population density in disaster prone areas
- Preparing disaster maps for planning and preparedness

Uses of Space-based Information
The Success story

Recent disaster casualties shows the successful overcoming the risk situations using space based data

- **Cyclone-SIDR Nov 15, 2007 (people died 4000)**
- **Cyclone Nargis 02 May 2008 (people died 04)**
- **Cyclone-AILA May 25, 2009 (people died 100)**
- **Cyclone Oct 11, 2012 (people died 40)**
- **Cyclone Mahasen May 16, 2013 (people died 24)**

compare to previous cyclones

- **1970 cyclone - people died 5,00,000**
- **1991 cyclone - people died 1,40,000**

Major Cyclone –Death History

Date	Death Person
1822	40,000
1876	200,000
1897	175,000
1912	40,000
1919	40,000
1941	7,500
9-10 October 1960	3,000
31 October 1960	5149
9 May 1961	11,466
28 May 1963	19,520
11 May 1965	19,299
12 November 1970	5,00,000
29 April 1991	1,40,161

Cyclone – Recent Death: Success Story

Date	Death Person
02 May 1994	188
25 November 1995	6
19 May 1997	155
27 September 1997	78
20 May 1998	35
28 October 2000	03
12 November 2002	02
Cyclone- SIDR 15 November 2007	4000
Cyclone Nargis 02 May 2008	04
Cyclone - AILA 25 May 2009	100
Cyclone -11 Oct 11, 2012	40
Cyclone Mahasen 16 May, 2013	24

Use of space based technology - success story

Cyclone	Wind speed	Death
1994	200 km/hr	170
1995	100 km/hr	06
1997	225 km/hr	127
1998	185 km/hr	35
Cyclone SIDR- 15 Nov 2007	220 km/hr	4,000
Cyclone Nargis 02 May 2008	150 km/hr	04
Cyclone AILA- 25 May 2009	190 km/hr	100
Cyclone -11 Oct 11, 2012	150 km/hr	40
Cyclone Mahasen 16 May, 2013	100 km/hr	24

Cyclone	Wind speed	Death
1970	196 km/hr	5,00,000
1985	190 km/hr	11,069
1991	225 km/hr	1,40,161
Nargis, Myanmar 02 May 2008	215 km/hr	1,48,000

সমকাল বৃহস্পতিবার ১৬ মে ২০১৩ ২ জ্যৈষ্ঠ ১৪২০

দেশজুড়ে উ

মহাসেন দুপুরে আঘাত হানতে পারে

চট্টগ্রাম-কক্সবাজারে ৭ ও মংলায় ৫ নম্বর বিপদ সংকেত ● জলোচ্ছ্বাসের আশঙ্কায় উপকূলজুড়ে সর্বোচ্চ সতর্কতা

■ আলতাব হোসেন/রাজীব আহাম্মদ

বঙ্গোপসাগরে অবস্থানরত ঘূর্ণিঝড় 'মহাসেন' কক্সবাজার ও চট্টগ্রামের দিকে ধেয়ে আসছে। মহাসেনের প্রভাবে উপকূলীয় বিস্তীর্ণ এলাকায় জলোচ্ছ্বাসের আশঙ্কা করছে আবহাওয়া অধিদফতর। আজ বৃহস্পতিবার দুপুর নাগাদ ১০০ কিলোমিটার গতিবেগে ঘূর্ণিঝড় মহাসেন চট্টগ্রামের কাছ দিয়ে খেপুপাড়া-টেকনাফ উপকূল অতিক্রম করতে পারে। চট্টগ্রাম-কক্সবাজার ও বরিশাল অঞ্চলে ৭ নম্বর বিপদ সংকেত এবং মংলায় ৫ নম্বর বিপদ সংকেত দেখিয়ে যেতে বলা হয়েছে। কক্সবাজার ও চট্টগ্রাম বিমানবন্দর বন্ধ ঘোষণা করা হয়েছে। বন্দরের সব ধরনের কার্যক্রম বন্ধ রাখা হয়েছে। বরিশাল থেকে ৩৮টি রুটে লঞ্চ চলাচল বন্ধ হয়ে গেছে। রাতেই নোয়াখালীর কয়েকটি উপজেলা বিদ্যুৎবিচ্ছিন্ন হয়ে পড়ে। উপকূলের লাখ লাখ মানুষকে আশ্রয়কেন্দ্রে সরিয়ে নেওয়া হচ্ছে। দেশজুড়ে উদ্বেগ-উৎকণ্ঠা ছড়িয়ে পড়েছে।

উপকূলের কাছাকাছি এলে সাধারণত ঘূর্ণিঝড়ের গতি বাড়লেও মহাসেনের ক্ষেত্রে এর ব্যতিক্রম দেখা যাচ্ছে। ঝড়টির গতিপ্রকৃতি দেখে আবহাওয়া বিভাগ জানিয়ে আসছিল, বৃহস্পতিবার সকালে এটি উপকূলে আঘাত হানবে। কিন্তু বৃহস্পতিবার প্রথম প্রহরে আবহাওয়া অধিদফতরের বিশেষ বুলেটিনে বলা হয়, ঝড়টি উপকূল অতিক্রম করতে পারে দুপুরে। এর আগে গতকাল রাত ১১টা পর্যন্ত ঘূর্ণিঝড়ের 'কেন্দ্র' কখন আঘাত হানবে, তা স্পষ্ট করে বলতে পারেনি আবহাওয়া বিভাগ। তবে আবহাওয়া অধিদফতরসহ কয়েকটি আন্তর্জাতিক ঘূর্ণিঝড় গবেষণাকেন্দ্র সকালে আঘাত হানার তথ্য দেয়। তবে রাত পৌনে ১টায় আবহাওয়া অধিদফতরের ■ পৃষ্ঠা ১৭ : কলাম ১

● কক্সবাজারের উপকূল প্লাবিত ● মহাসেনের তথ্য জানতে নিয়ন্ত্রণ কক্ষ ● শ্রীলংকায় বৃষ্টি ও ভূমিধসে নিহত ৮ ‖ পৃষ্ঠা-৩
● আশ্রয়কেন্দ্রের তীব্র সংকট ‖ পৃষ্ঠা-২০
‖ উপকূলের আরও ছবি : পৃষ্ঠা-৩

সমকাল বৃহস্পতিবার ১৬ মে ২০১৩ ২ জ্যৈষ্ঠ ১৪২০

ধেয়ে আসছে ঘূর্ণিঝড় মহাসেন

১. কুয়াকাটা সৈকতে সতর্কতামূলক প্রচারের অংশ হিসেবে বিপজ্জনক পতাকা তুলে মাইকিং করে সবাইকে নিরাপদ আশ্রয়ে যাওয়ার আহ্বান
২. কক্সবাজার সদরের পদনার ডেইলে আশ্রয়কেন্দ্রে নেওয়া হচ্ছে এক বৃদ্ধকে
৩. বরগুনার খাজুরতলায় নিরাপদ আশ্রয়ের খোঁজে ঘর ছাড়ছেন বাসিন্দারা
৪. পতেঙ্গায় সহায়-সম্বল নিয়ে নিরাপদ আশ্রয়ে ছুটছে মানুষ
৫. খুলনার কয়রা উপজেলায় আশ্রয়ের সন্ধানে নারী-পুরুষ
৬. পটুয়াখালীতে জনসাধারণকে নিরাপদ আশ্রয়ে যাওয়ার জন্য মাইকিং করছেন সিপিপির স্বেচ্ছাসেবক

■ সমকাল

UNOOSA and Bangladesh

Visited Bangladesh by

UN-SPIDER Technical Advisory Team

19-23 June 2011

To access disasters, risk reduction activities, policies, and plans with regard to the use of space-based technologies, to facilitate access of national institutions to support of DM.

Mission Report + Recommendations-

Valuable Guideline, helpful and effective for DM in Bangladesh

Recommendations

- **The space based data is useful and applicable for Bangladesh climate environment.**
- **Further applications of satellite technology will benefit Bangladesh in adapting climate change effects.**
- **Cooperation of regional countries.**
- **technical support and assistances by International organizations.**
- **recommended for space based technology transfer to sustainable disaster reduction.**


আমরা সবাই
সেনা

Thank You