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Presentation

by

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Institute for Defence Studies and Analyses (IDSA)

at

Geo Intelligence Asia

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June12, 2015

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Geospatial Technologies, Disaster Management and Armed Forces

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Era of Disasters

- A natural disaster results from natural processes of the Earth; examples include floods, volcanic eruptions, earthquakes, tsunamis, and other geologic processes
- Many disasters that are caused or influenced by meteorological processes
- In recent times increase in weather related disasters has been observed….climate change, unplanned urbanization…..
- India’s unique topography and terrain features at times accentuates in impact of weather

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Japan Tsunami

Mumbai Rains

Image Temporary diversion of Mithi River course for construction of box culvert under proposed taxi-bay extension (north of runway) as revealed by the QuickBird satellite image of 8 April 2005 (before flood situation)

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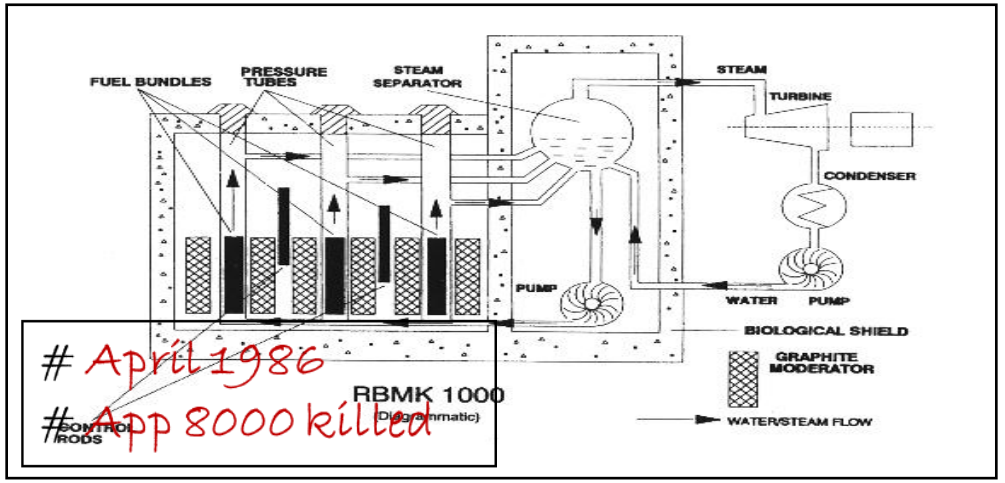
Manmade Disasters

Chernobyl Disaster



Deepwater Horizon Drilling Rig Explosion

April 20, 2010

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Weather related Challenges

- Air/Water pollution
- Heat/Cold wave
- Floods/Drought
- Microburst/Cloudburst/ Landslides
- Snowfall/Frost
- Fog

- *Forest Fire spread*
- *Disease Spread*

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Natural Disasters & Response

- Striking change in the ways in which citizens perceive and respond to sudden, urgent, destructive events
- Citizen expectations of the government's capacity to anticipate and respond to such events
- Natural disasters pose a risk for inter and intra state conflicts

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Disasters & Armed Forces

- Armed forces alone cannot handle disasters
- Disaster management involves various agencies. However, many a times the armed forces are first respondents
- Armed forces have their own infrastructure to undertake various peacetime and wartime duties. They need to improve their preparedness level to fight disasters and assistance from Geospatial technologies could enhance their efficiency

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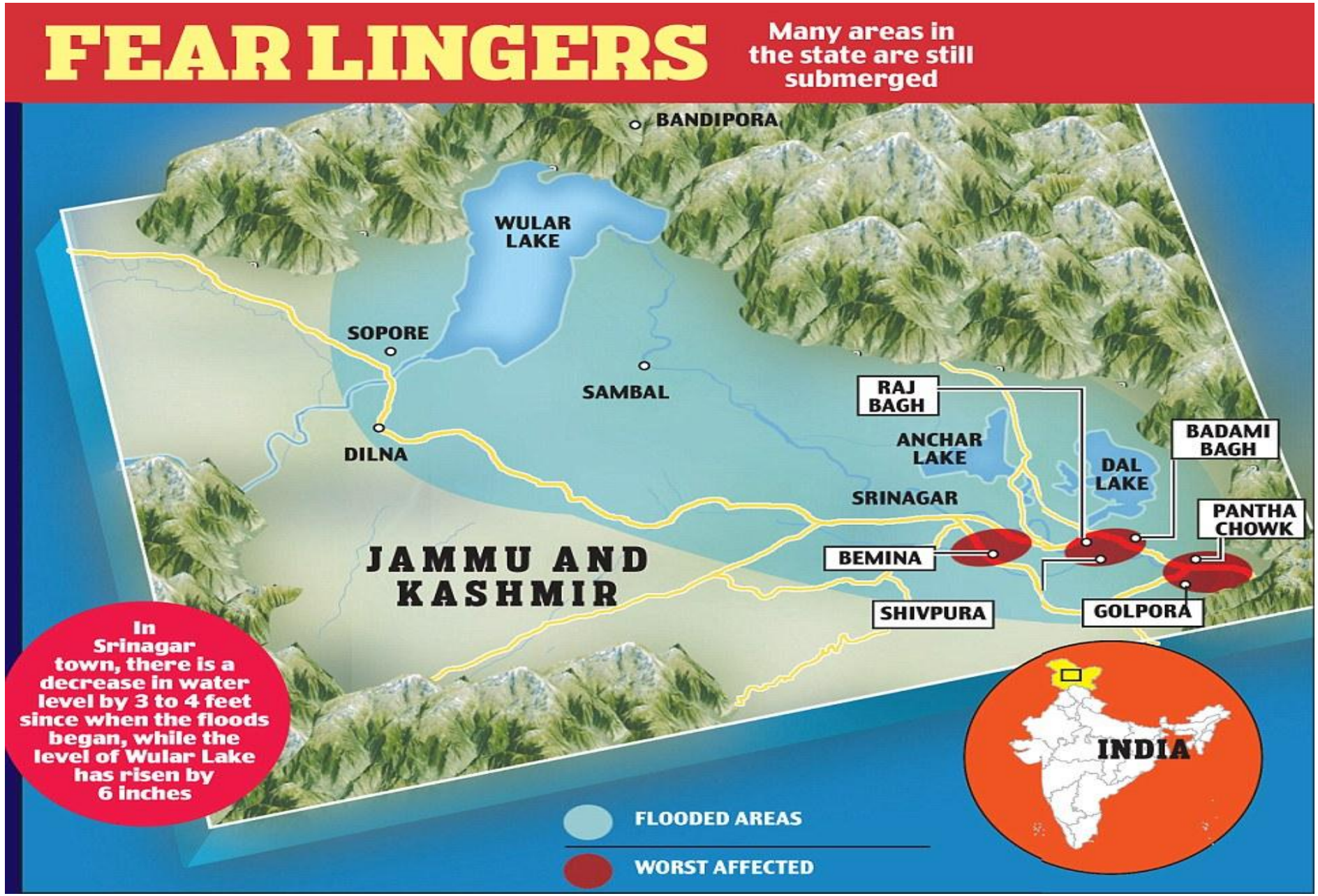
Kashmir Area Heavy Rain

2–26 September 2014

Heavy clouds over Jammu & Kashmir
4 September 2014

More than 500 deaths (India + Pakistan)

On September 8, in many parts of Srinagar's nhbd, the water was about 12 feet (3.7 m) deep, submerging entire houses


FEAR LINGERS
Many areas in the state are still submerged
BANDIPORA
WULAR LAKE
SOPORE
SAMBAL
DILNA
RAJ BAGH
ANCHAR LAKE
DAL LAKE
BADAMI BAGH
SRINAGAR
PANTHA CHOWK
BEMINA
JAMMU AND KASHMIR
SHIVPURA
GOLPORA
In Srinagar town, there is a decrease in water level by 3 to 4 feet since when the floods began, while the level of Wular Lake has risen by 6 inches
INDIA
FLOODED AREAS
WORST AFFECTED

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Mission Sahayata

- Army, police, civil defence, NDMA, common people….
- Initially Search and Rescue operation were hindered by shortage of boats and bad weather
- The Armed Forces rescued 1,10,000 persons, and airlifted and distributed 2,24,000 liters of water, 31,500 food packets and ready to eat meals, 375 tonne cooked food, 2.6 tonne of biscuit, 7 tonnes baby food, water purifying tablets, 8,200 blankets, 650 tents, to the affected civilian population

Role of Armed Forces

- Over 80 aircraft were deployed (IAF and Chetak & Advance Light Helicopters of the Army Aviation Corps)
- The IAF deployed its heavy duty MI-26, the largest helicopter in IAF inventory with a carrying capacity of 30 tonnes
- Transport aircrafts put in use were AN-32, IL-76 etc
- The Indian Navy Marine Commandos rescued 200 personnel

Gigantic Task

- In the first seven days till the 10 September, the army and IAF flew 1081 sorties, 100 to 120 sorties every day, moving 1411 tonnes of relief materials
- Delivery of six large water filtration plants with a capacity to filter 1,20,000 bottles per day
- Engineering stores like suction and submersible pumps, generator sets with mobile charging stations
- Communication equipment

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Medical Relief

- The Army established 19 relief camps, where the rescued persons were provided food, shelter, and medical assistance
- The armed forces have deployed 80 medical teams. In addition it has set up four field hospitals
- Various civilian agencies were involved too..

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Geospatial Technology/Geomatics

Is a multidisciplinary field that includes disciplines such as:

- ✓Surveying
- ✓Photogrammetry
- ✓Remote Sensing
- ✓Mapping
- ✓Geographic Information Systems (GIS),
- ✓Geodesy

and

- ✓Global Navigation Satellite System (GNSS)

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Tools for Disaster Management

- GIS, GPS and Remote Sensing Imagery
- Geo-spatial technology provide maps for decision-making and planning (pre and post disaster)
- GIS could be used for identifying hazard trends and to evaluate the consequences of potential emergencies or disasters
- Compare hazards map data with other data such as buildings, rivers and waterways, streets, energy and power infrastructure etc to formulate mitigation strategies

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Geospatial Engineering

- A specialist branch……..necessity for modern militaries
- Development, dissemination, and analysis of terrain information
- Mission-tailored data, tactical decision aids and visualization projects to describe area of operation
- Superimpose weather inputs

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Threats…

- Traditional security thinking focuses on the nation-state and is linked with 'actor' related threats. However, nature (weather) could also challenge the concept of security
- Non-military threats like natural disasters have potential to contest the “capability of state”
- To some extent these threats could be handled effectively by using military, political, diplomatic, technological and economic measures
- Much to learn from Srinagar example

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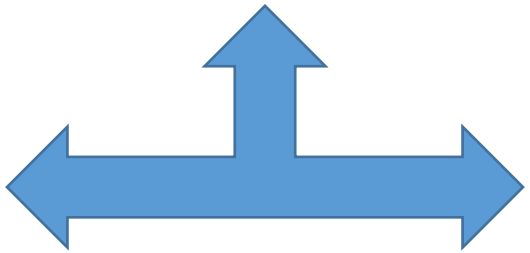
Natural Disasters



Intra State

- Katrina
- Mumbai Floods

Inter State

- Tsunami
- Earthquake

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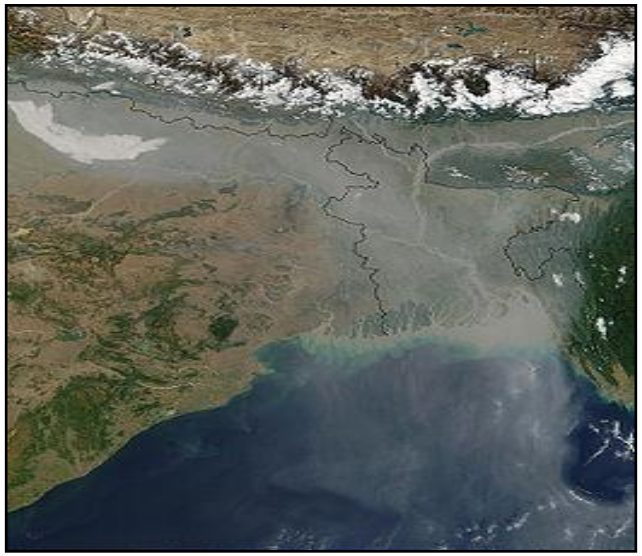
Aerosols



- Tiny particles suspended in the air.
- Naturally occurring: Originating from volcanoes, dust storms, forest and grassland fires, sea spray etc.
- Human activities: Burning of fossil fuels, pollution, weapons used during wars etc.
- Haze sparked by Indonesia fires: pollution soars in Malaysia- Singapore region

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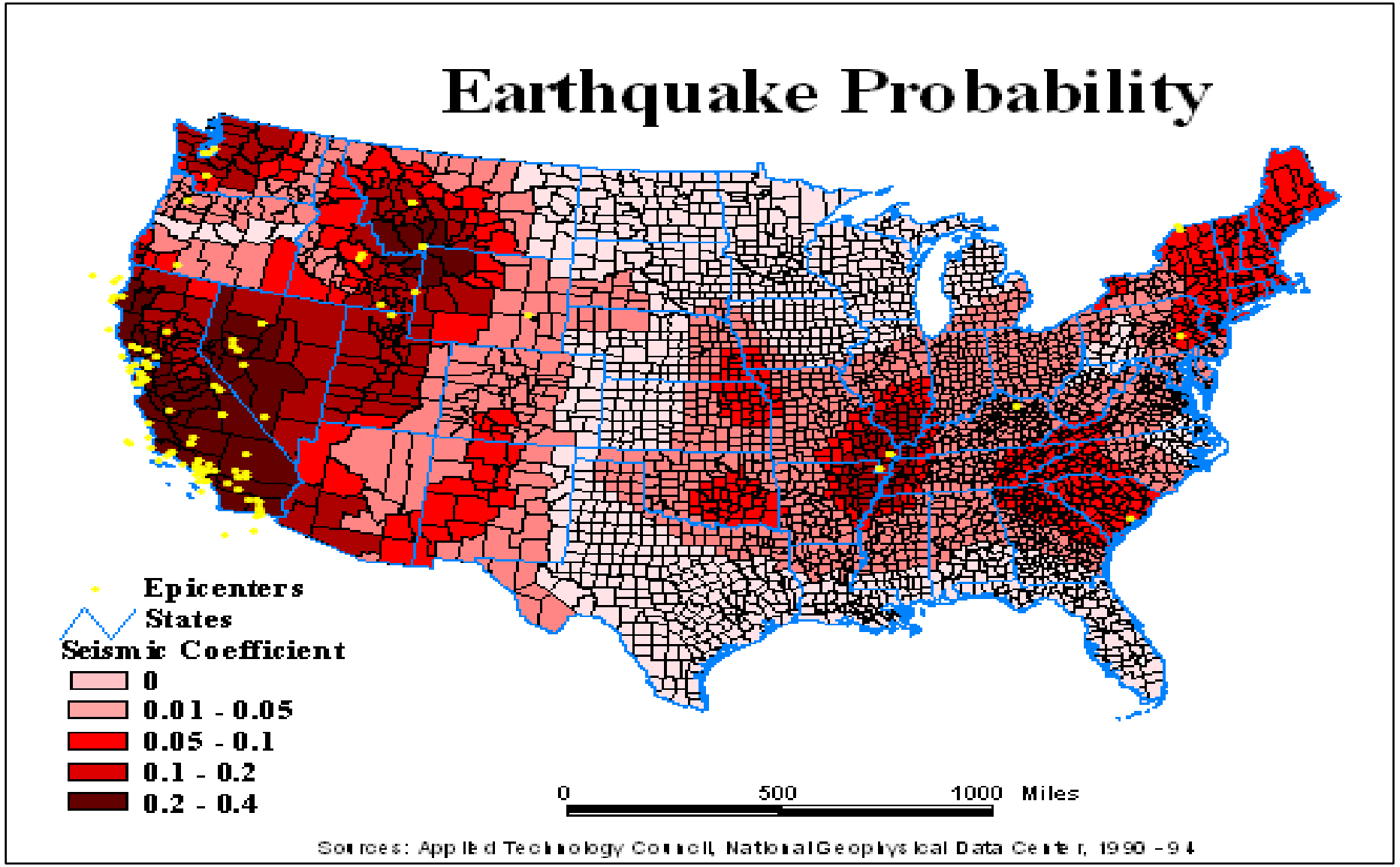
Earthquake Probability
Epicenters
States
Seismic Coefficient
0
0.01 - 0.05
0.05 - 0.1
0.1 - 0.2
0.2 - 0.4
0
500
1000 Miles
Sources: Applied Technology Council, National Geophysical Data Center, 1990 - 94

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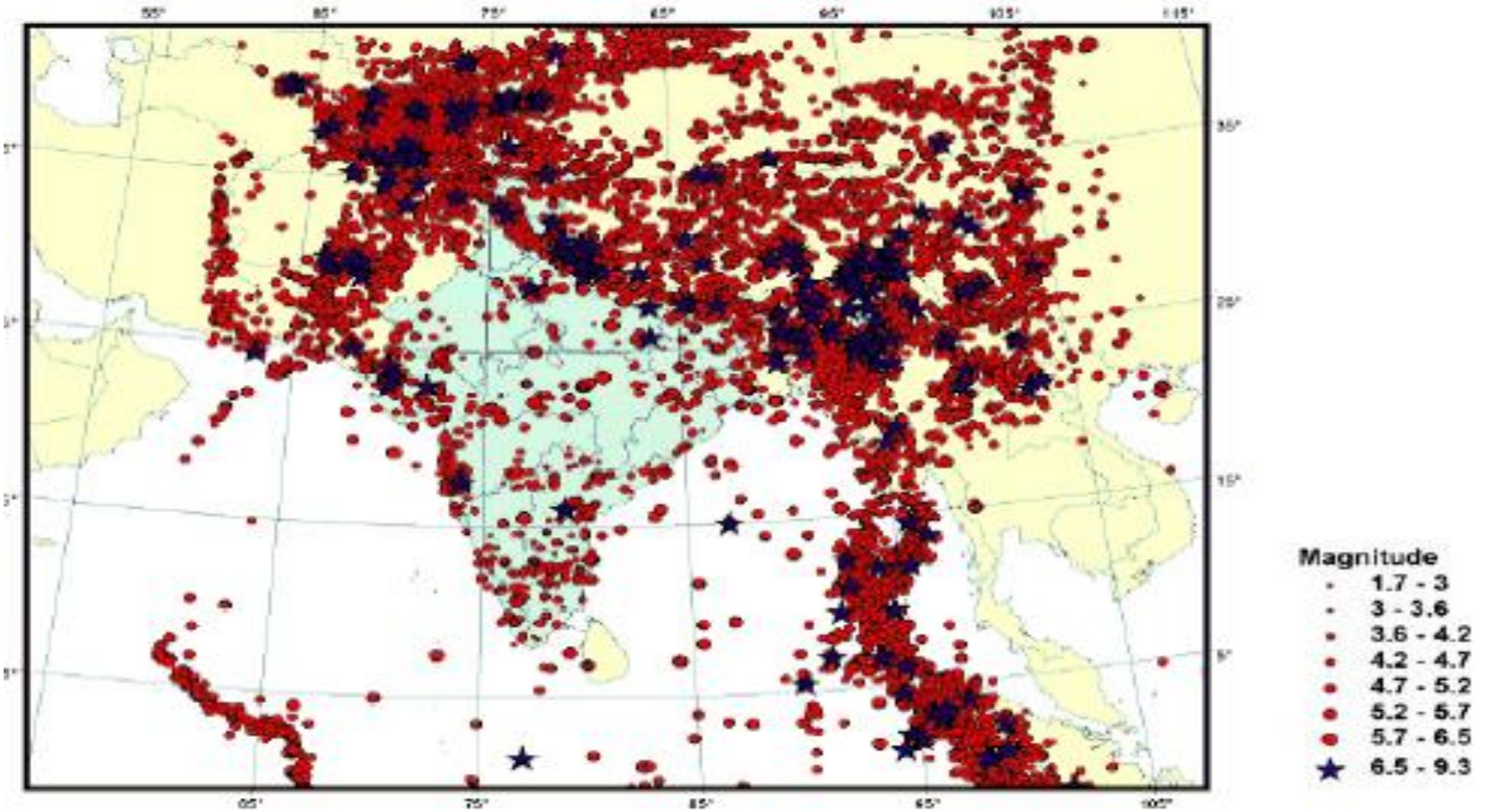
Seismic Activity in India
180 AD - 2004



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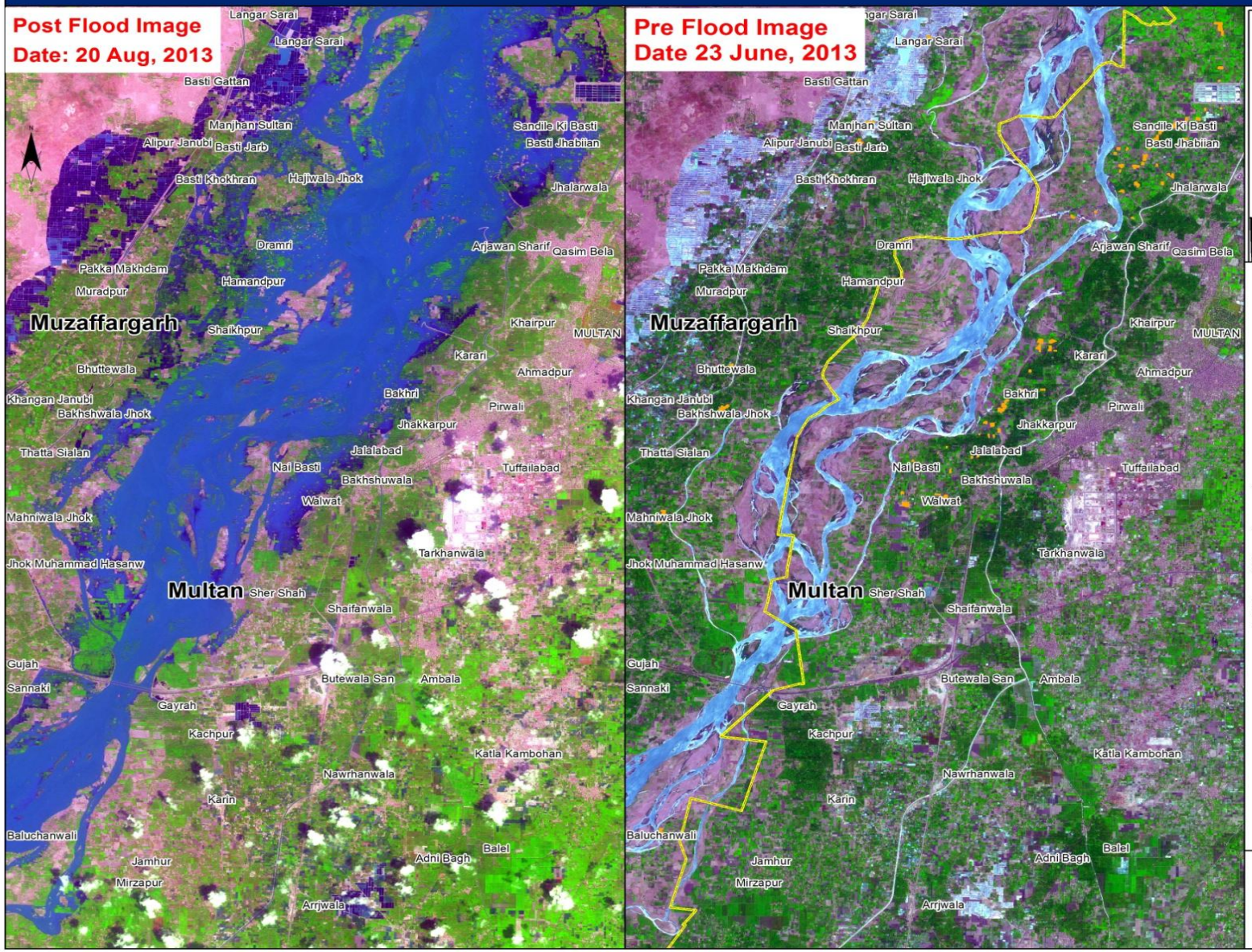
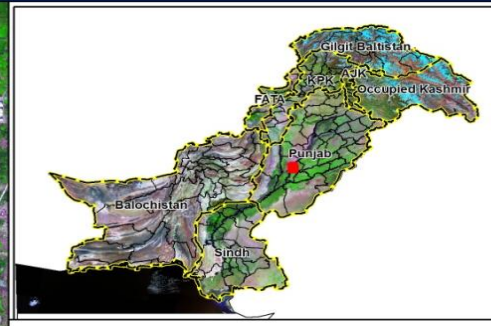
Satellite Images Before & After Typhoon Haiyan, Philippines

EXTENT OF RIVER CHENAB AS ON AUGUST 20,2013





District Boundary

Affected Settlement 89

Rice Fields in Pre Flood Images

Inundated Area

This map shows extent of River Chenab on August 20, 2013 as compared to June 23, 2013

This analysis is based on pre & post disaster satellite imagery collected by SPOT sensors at Satellite Ground Station,SUPARCO Islamabad. This analysis has yet to be validated in the field.

Projection: UTM Zone 42 N
Datum: WGS84

SUPARCO is host to UN-SPIDER Regional Support Office in Pakistan

0 1.5 3 6
Km

SUPARCO

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For Managing Floods…

- Remote sensing can effectively be used for mapping the flood-damaged areas
- For zoning the flood affected area
- To identify the shifting of river course
- Create a detailed geographic extent of the crisis area

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Nuclear Accidents & Weather

Chernobyl Disaster

- Contamination from the accident was scattered irregularly depending on weather conditions
- Belarus received about 60% of the contamination
- < Half of the volatile particles had landed outside Ukraine, Belarus and Russia

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Spread of Agent in Air.....

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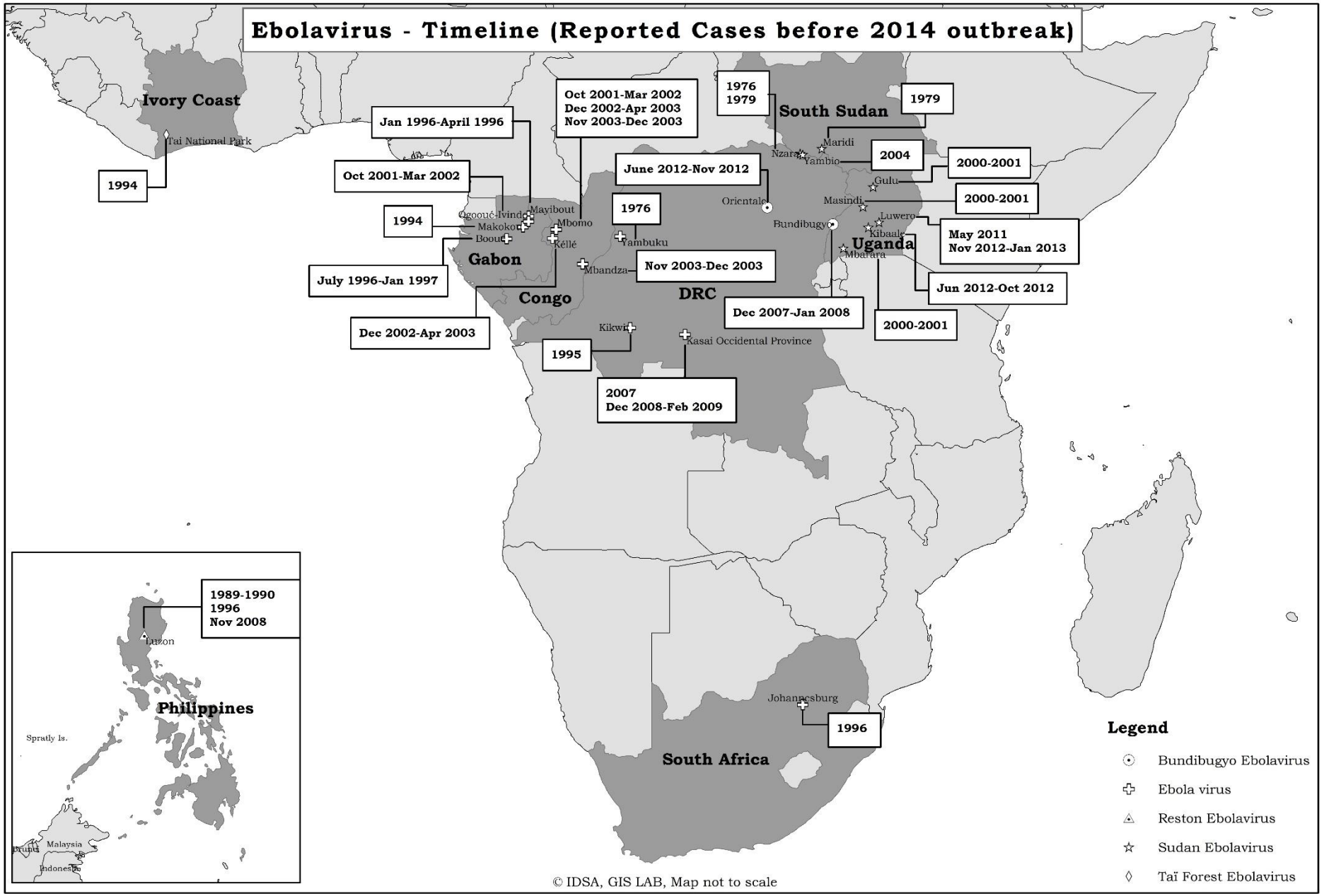
Ebolavirus - Timeline (Reported Cases before 2014 outbreak)
Ivory Coast
Taï National Park
1994
Jan 1996-April 1996
Oct 2001-Mar 2002
1994
July 1996-Jan 1997
Dec 2002-Apr 2003
Oct 2001-Mar 2002
Dec 2002-Apr 2003
Nov 2003-Dec 2003
Ogooué-Ivindo
Mayibout
Makokou
Mbomo
Booué
Kéllé
Gabon
Congo
1976
Tambuku
Mbandza
Nov 2003-Dec 2003
DRC
1995
Kikwit
Kasai Occidental Province
2007
Dec 2008-Feb 2009
1976
1979
South Sudan
1979
Maridi
Nzara
Yambio
2004
2000-2001
Gulu
2000-2001
June 2012-Nov 2012
Oriental
Masindi
Luwero
Bundibugyo
Kibaale
May 2011
Nov 2012-Jan 2013
Uganda
Mbarara
Jun 2012-Oct 2012
Dec 2007-Jan 2008
2000-2001
Johannesburg
1996
South Africa
1989-1990
1996
Nov 2008
Luzon
Philippines
Spratly Is.
Malaysia
Brunei
Indonesia
Legend
Bundibugyo Ebolavirus
Ebola virus
Reston Ebolavirus
Sudan Ebolavirus
Taï Forest Ebolavirus
© IDSA, GIS LAB, Map not to scale

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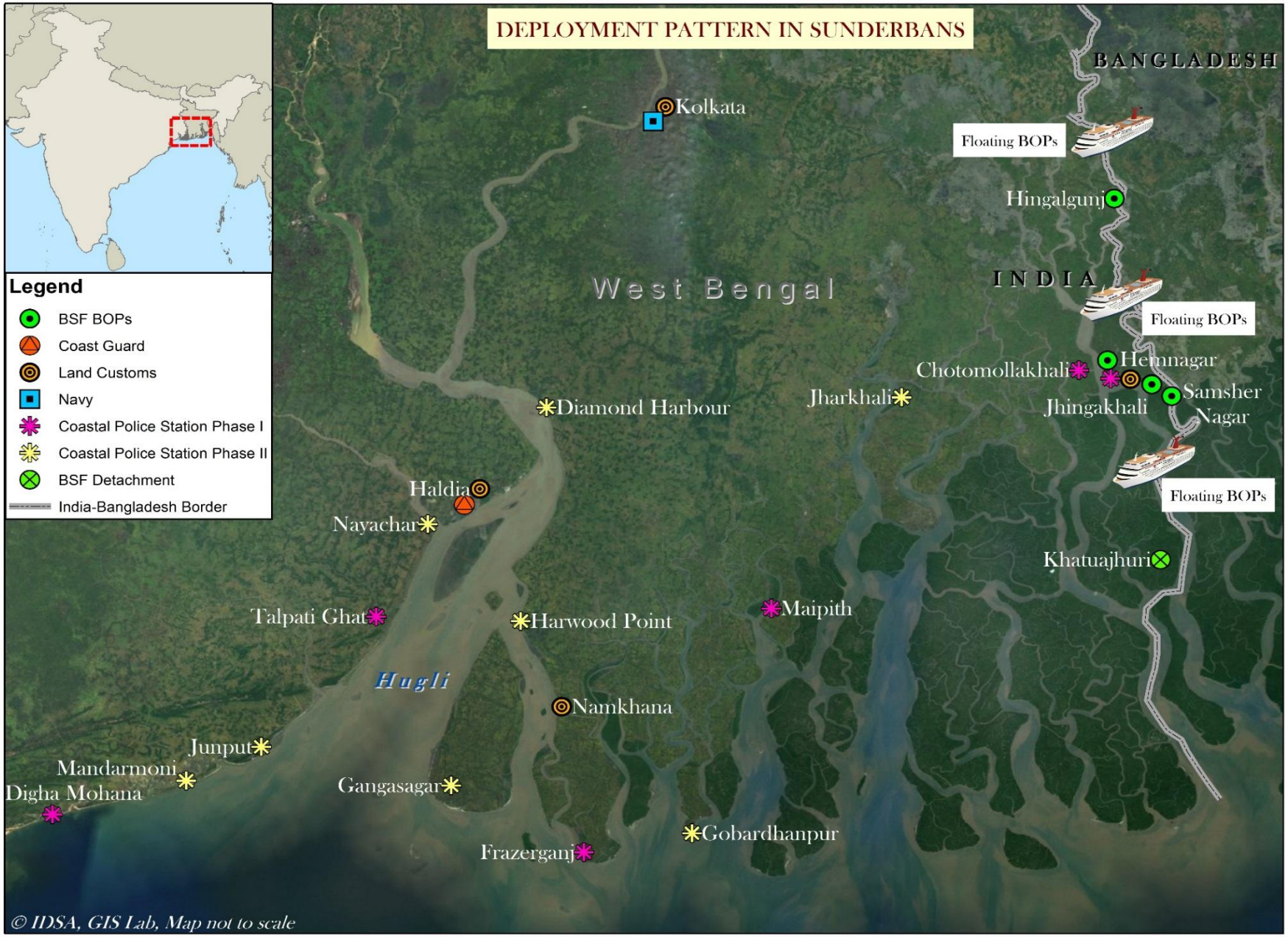
DEPLOYMENT PATTERN IN SUNDERBANS
BANGLADESH
INDIA
West Bengal
Kolkata
Floating BOPs
Hingalgunj
Floating BOPs
Hemnagar
Chotomollakhali
Samsher Nagar
Jhingakhali
Jharkhali
Diamond Harbour
Floating BOPs
Haldia
Nayachar
Khatuajhuri
Maipith
Talpati Ghat
Harwood Point
Hugli
Namkhana
Junput
Mandarmoni
Digha Mohana
Gangasagar
Gobardhanpur
Frazerganj
Legend
BSF BOPs
Coast Guard
Land Customs
Navy
Coastal Police Station Phase I
Coastal Police Station Phase II
BSF Detachment
India-Bangladesh Border
© IDSA, GIS Lab, Map not to scale

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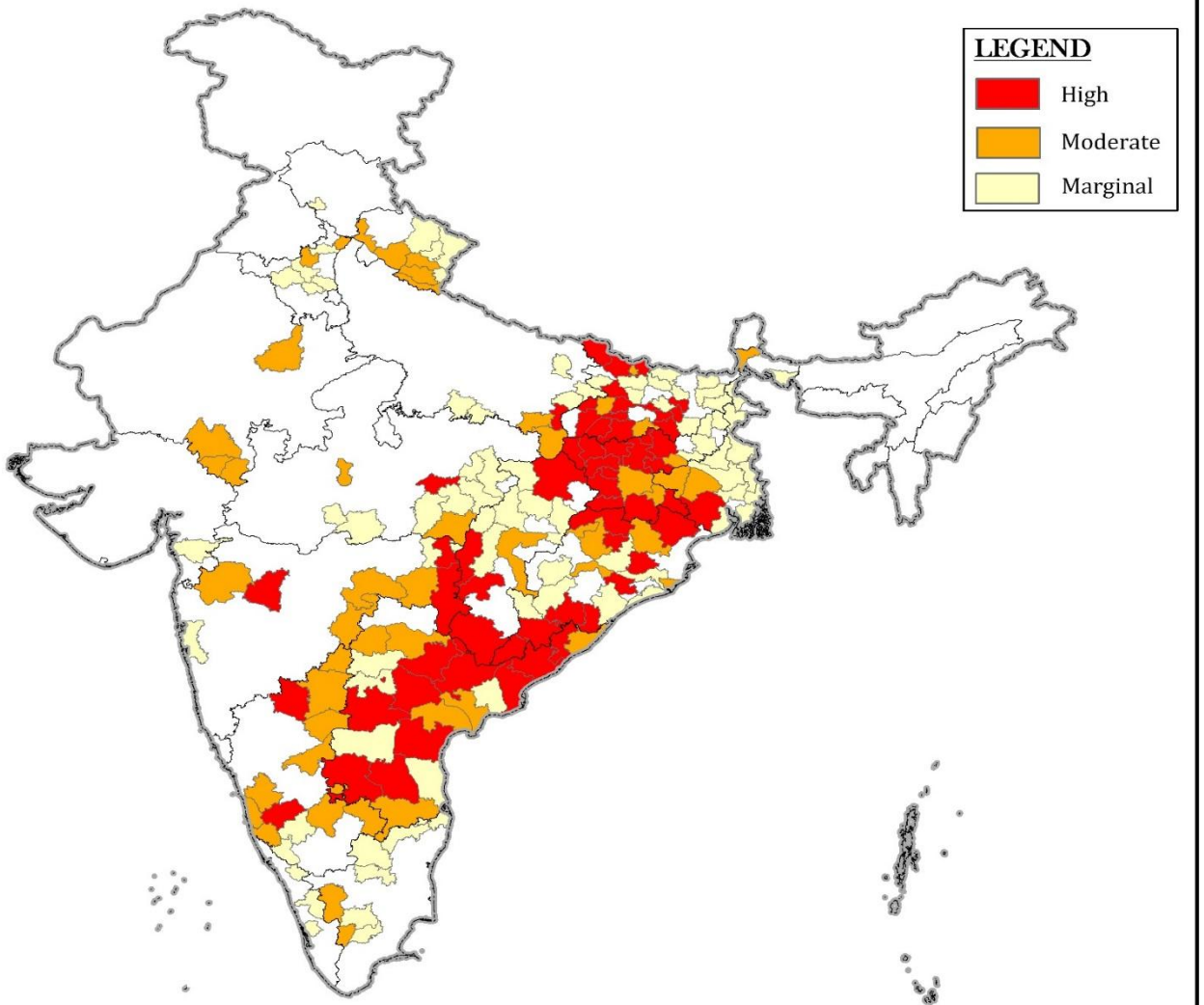
Naxal Affected Districts in India



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Geospatial Technologies for Security Agencies

- Enhanced understanding of the terrain and topography, both at tactical and strategic levels
- Navy/Coastguard could understand more about possible sea level rise….owing to global warming
- For forecasting… some geospatial technologies based studies are available
- Combine geographic information systems with satellite data
- Greater investment into terrain analysing technologies

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Geospatial Technology: Best Decision Making Tool

- Easy to understand the geography of new region
- Assists fast response
- Coordination becomes easy. This helps to avoid confusion if multiple agencies are involved to the disaster management
- The development of data base, chronology of events, graphic representation, satellite derived inputs
- Short term and long-term advantages

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Way Forward

- We are a ‘risk society' and there is a need to undertake a detailed analysis of natural and urban topography and terrain of entire country and neighborhood
- Disasters bring social unrest and militaries need to factor them
- Disasters of severe intensity may change the security calculus
- Armed forces play a major role towards managing disasters, in the process they have various practical challenges (social, technical, weather related and even foreign policy related) and geospatial technologies could be of great help

Thank you