

# Potential and Opportunities of the use of space Based Technologies for DRR

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Geoinformatics Center  
Established in 1999



# Content

- Sendai Framework
- Space Technology for DRR
- IDC, Copernicus and Sentinel Asia
- Sentinel Asia related opportunities
- Summary

# Summary from ISDR- Sendai Framework (2015-2030)

Sendai DRR Framework agreed globally provides guidance to local/national institutions and stakeholders on key priorities for action;

*To prevent and reduce disaster “risk” through the implementation of integrated and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political, and institutional measures that prevent and reduce hazard exposure and vulnerability to disaster, increase preparedness for response and recovery and thus strengthen resilience.*

The Sendai Framework builds on the successes of the former HFA, and places greater emphasis on **disaster risk management** efforts through an improved understanding of disaster risk in all its dimensions

# Chart of the Sendai Framework for Disaster Risk Reduction 2015-2030

## Scope and purpose

The present framework will apply to the risk of small-scale and large-scale, frequent and infrequent, sudden and slow-onset disasters, caused by natural or manmade hazards as well as related environmental, technological and biological hazards and risks. It aims to guide the multi-hazard management of disaster risk in development at all levels as well as within and across all sectors.

## Expected outcome

The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries

## Goal

Prevent new and reduce existing disaster risk through the implementation of integrated and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures that prevent and reduce hazard exposure and vulnerability to disaster, increase preparedness for response and recovery, and thus strengthen resilience

## Targets

Substantially reduce global disaster mortality by 2030, aiming to lower average per 100,000 global mortality between 2020-2030 compared to 2005-2015

Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 between 2020-2030 compared to 2005-2015

Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030

Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030

Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020

Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of this framework by 2030

Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030, through adequate and sustainable support to complement their national actions for implementation of this framework by 2030

## Priorities for Action

There is a need for focused action within and across sectors by States at local, national, regional and global levels in the following four priority areas.

Priority 1  
Understanding disaster risk

Priority 2  
Strengthening disaster risk governance  
to manage disaster risk

Priority 3  
Investing in disaster risk reduction for  
resilience

Priority 4  
Enhancing disaster preparedness for effective  
response, and to «Build Back Better» in recovery,  
rehabilitation and reconstruction

**1. Understand the Risk**

**2. Strengthen Governance**

**3. Invest on risk reduction**

**4. Prepare for effective Response**

# Priorities for Action: Needs to focus within and across sectors by local, national, regional and global levels

**1. Understanding Disaster Risk; 2. Strengthen Disaster Risk Governance; 3. Investing in Risk Reduction 4. Enhancing preparedness for response, recovery, rehabilitation, reconstruction**

**1. Understand the Risk:** Policies and practices should be based on proper analysis of disaster risks: vulnerability, capacity, exposure of life and assets, hazards, and the locality. This knowledge is helpful in pre-disaster risk assessment, mitigation, prevention, and preparedness plans.

Key Words:

- ✓ Collection, management, analysis of data and *location based* risk information
- ✓ periodically assess risk (monitoring), **Risk mapping**,
- ✓ **Geospatial/information technology, GIS**,
- ✓ Build knowledge of officers, civil society, communities,
- ✓ Improve dialog among scientific and technological communities, stake-holders and policy makers
- ✓ incorporation in formal/non-formal education,
- ✓ Use information for implementing disaster risk reduction policies
- ✓ In-situ, remote sensing and climate observations

# Priorities for Action: Needs to focus within and across sectors by local, national, regional and global levels

## 2. Strengthen Disaster Risk Governance to manage risks:

Key Words:

- ✓ Establish Disaster risk governance at the national, regional and global levels
- ✓ Ensure the coherence of national and local frameworks of laws, regulations and public policies
- ✓ Involve public and private sectors defining goals and responsibilities addressing DRR
- ✓ Incentivize the public and private sectors to take action and address disaster risk

# Priorities for Action: Needs to focus within and across sectors by local, national, regional and global levels

## 3. Investing in Risk Reduction for Resilience:

Key Words:

- ✓ Public and private investment in disaster risk prevention
- ✓ Investments on Structural and non-structural measures ,
- ✓ Investments to enhance the economic, social, health and cultural resilience of persons, communities, countries and their assets, as well as the environment
- ✓ **Innovative investments for economic growth and job creation**
- ✓ Investments of cost effective measures to save lives, prevent and reduce losses and ensure effective recovery and rehabilitation



# Priorities for Action: Needs to focus within and across sectors by local, national, regional and global levels

## 4. Enhancing preparedness for response, recovery, rehabilitation, reconstruction:

Key Words:

- ✓ Invest and Develop Multi-hazard disaster risk information and accessibility
- ✓ **Multisectoral Forecasting and early warning systems,**
- ✓ Disaster risk and emergency communication mechanism
- ✓ Periodically **update disaster preparedness policies,** plans, and programs with the involvement of all stakeholders and taking into account **climate variability**
- ✓ Study the impact of climate change on disasters risks

# Potential of Geoinformatics to Address Priority Issues

Risk Mapping (elements) for Preparedness & Mitigation

Emergency Mapping & Response

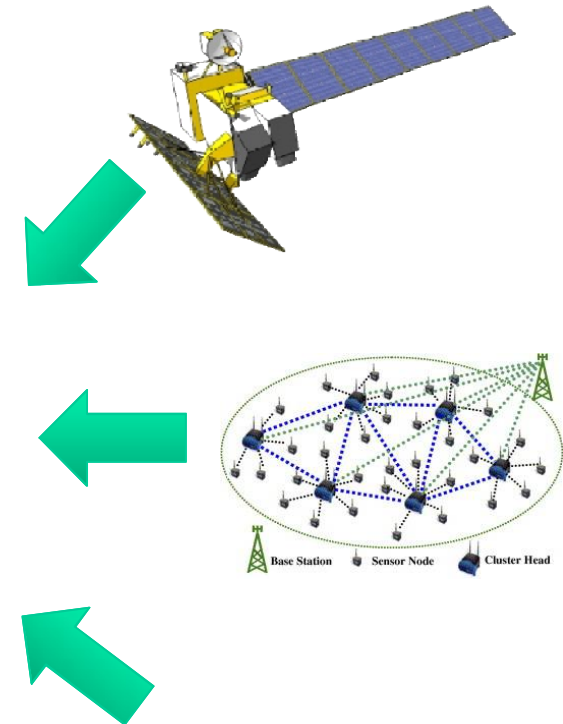
Periodical Monitoring

Climate Change Impact

**Evidence based rationalizing**



Location Based Information



GIS

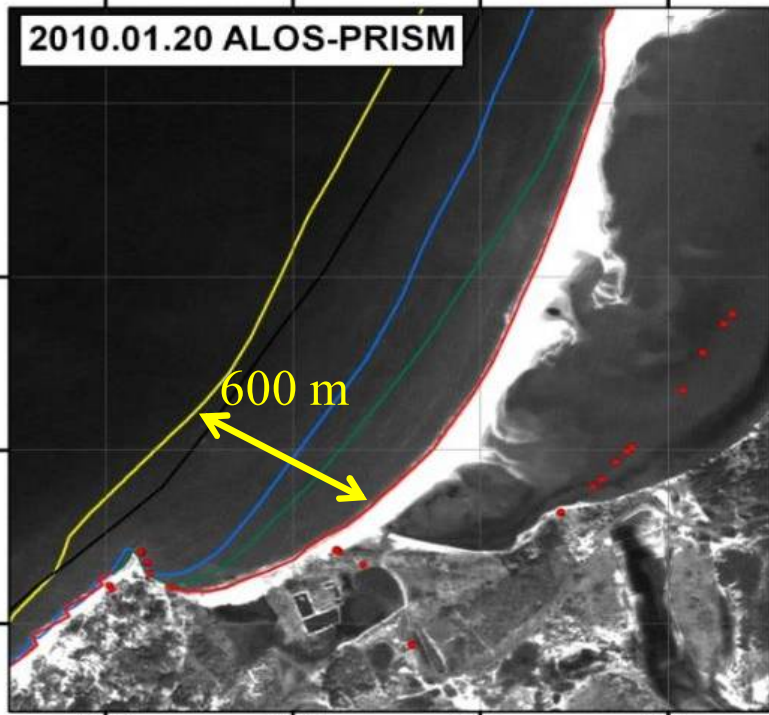
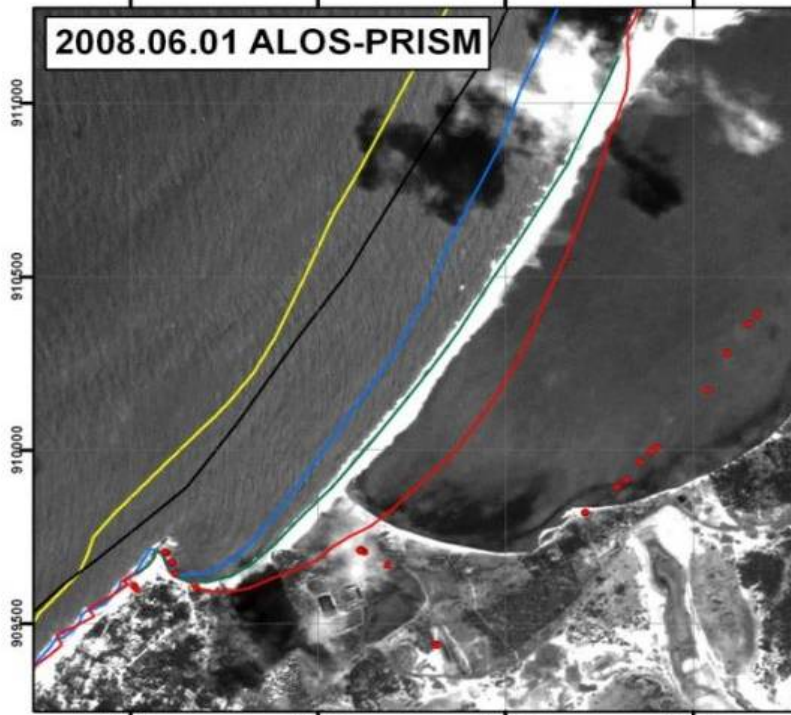
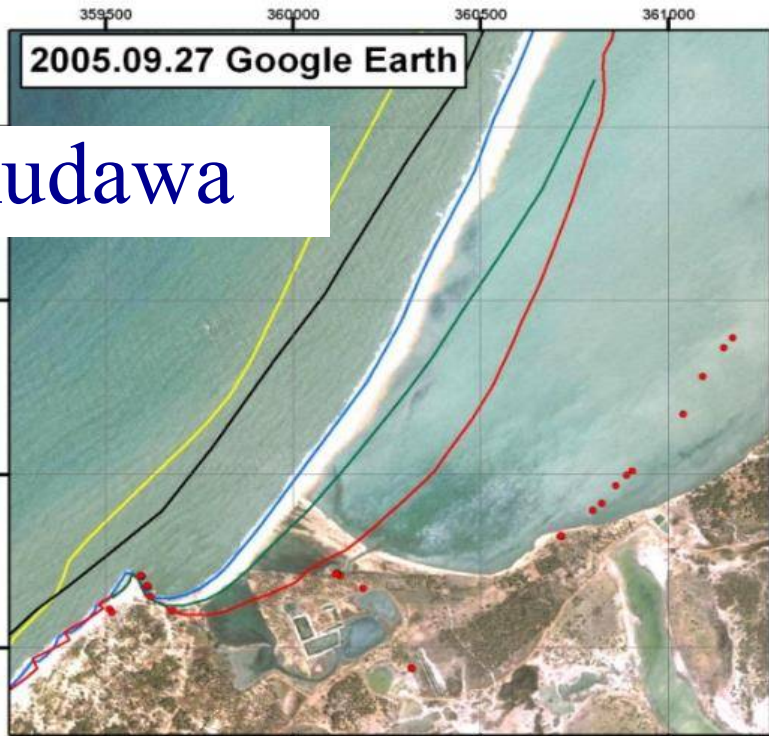
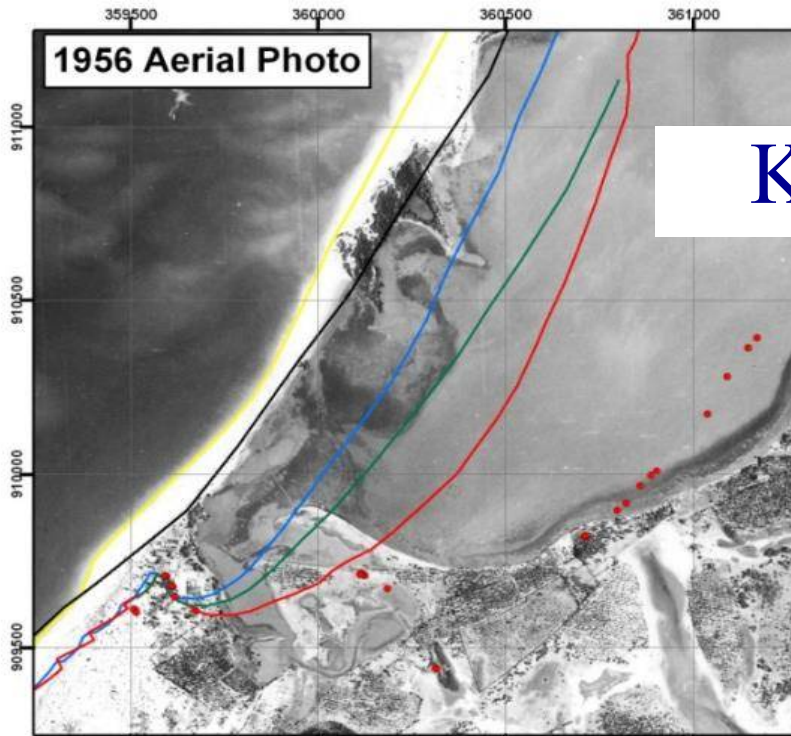
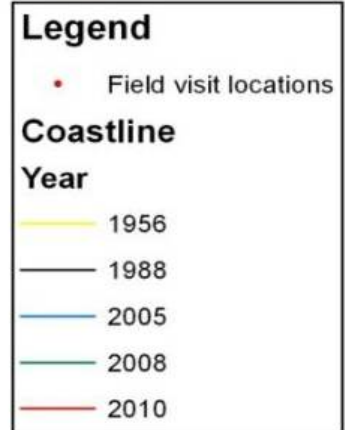
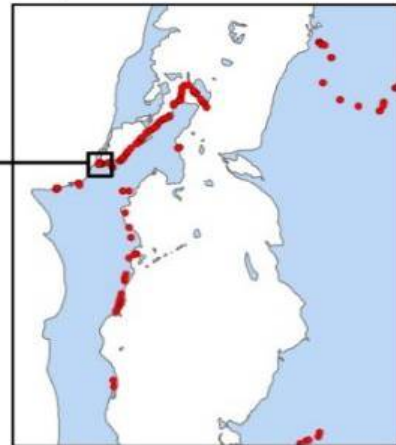
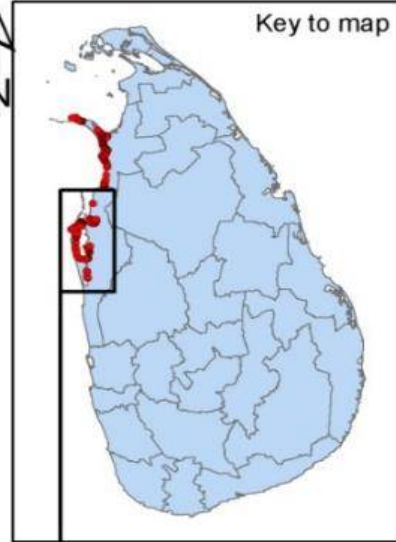
# Kudawa

1956 Aerial Photo

2005.09.27 Google Earth

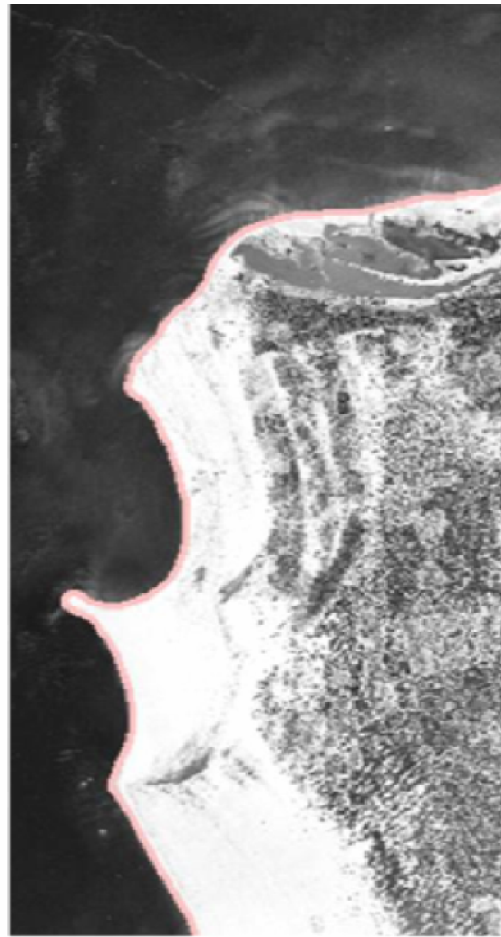
2008.06.01 ALOS-PRISM

2010.01.20 ALOS-PRISM

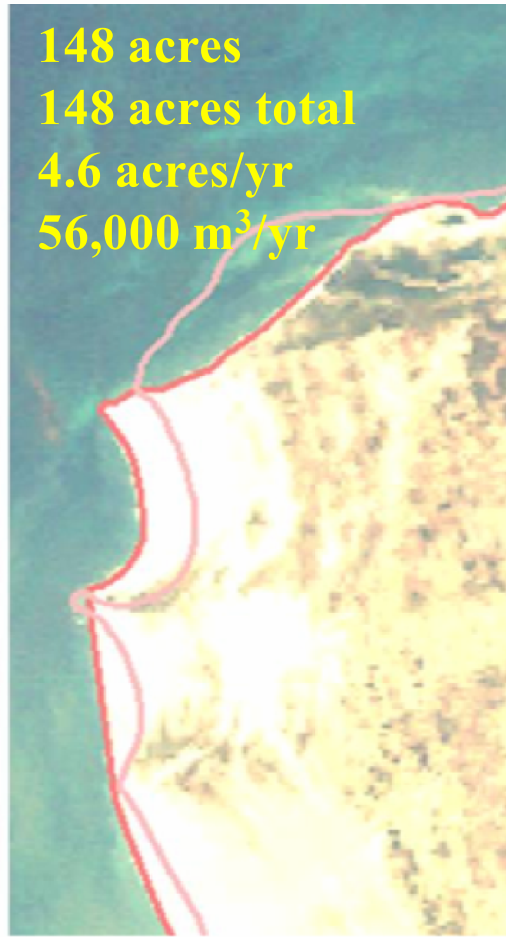


# Kandakuliya

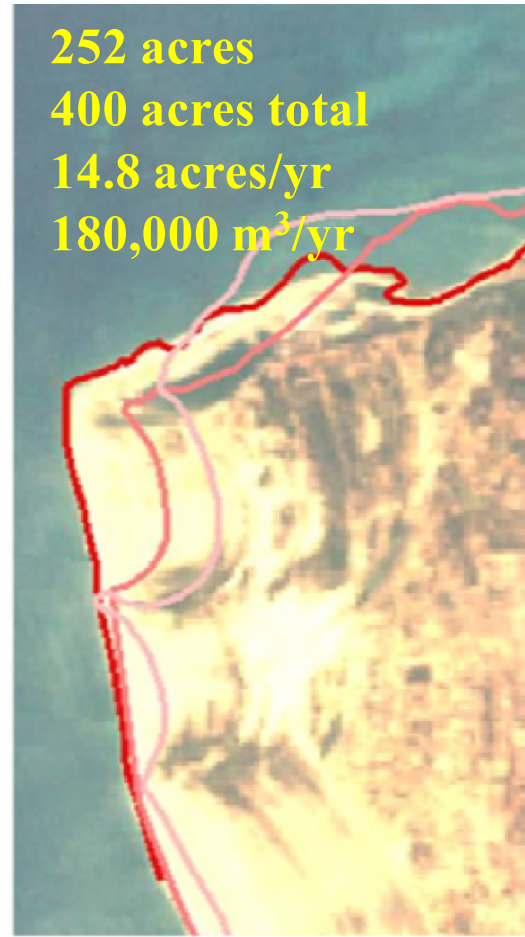
3 km



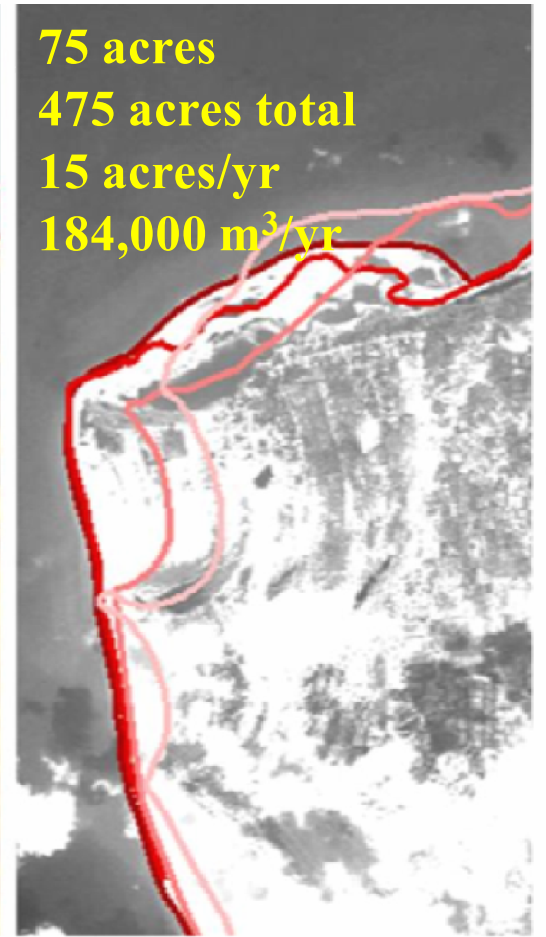
1956



1988



2005



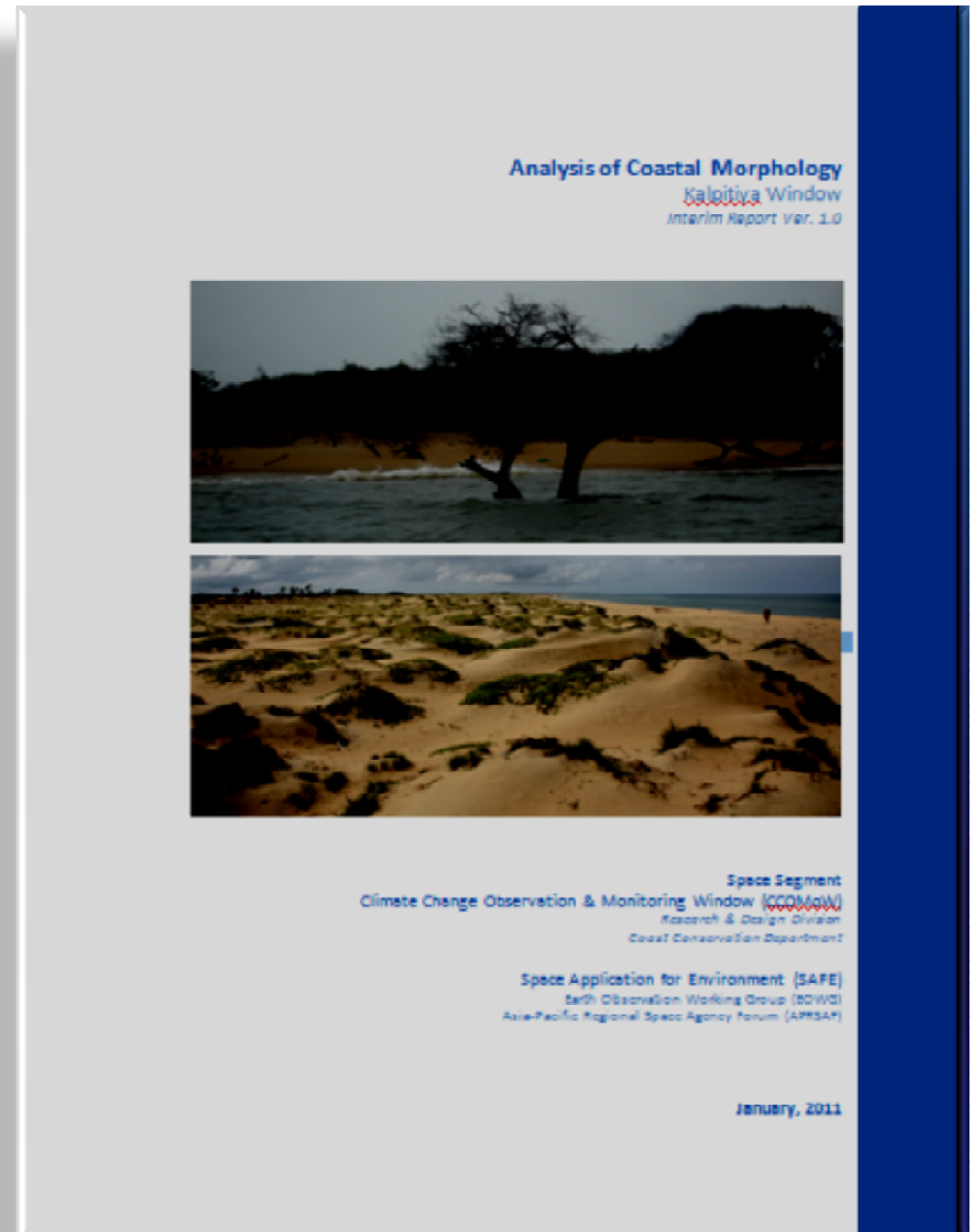
2010

# Investor Guideline

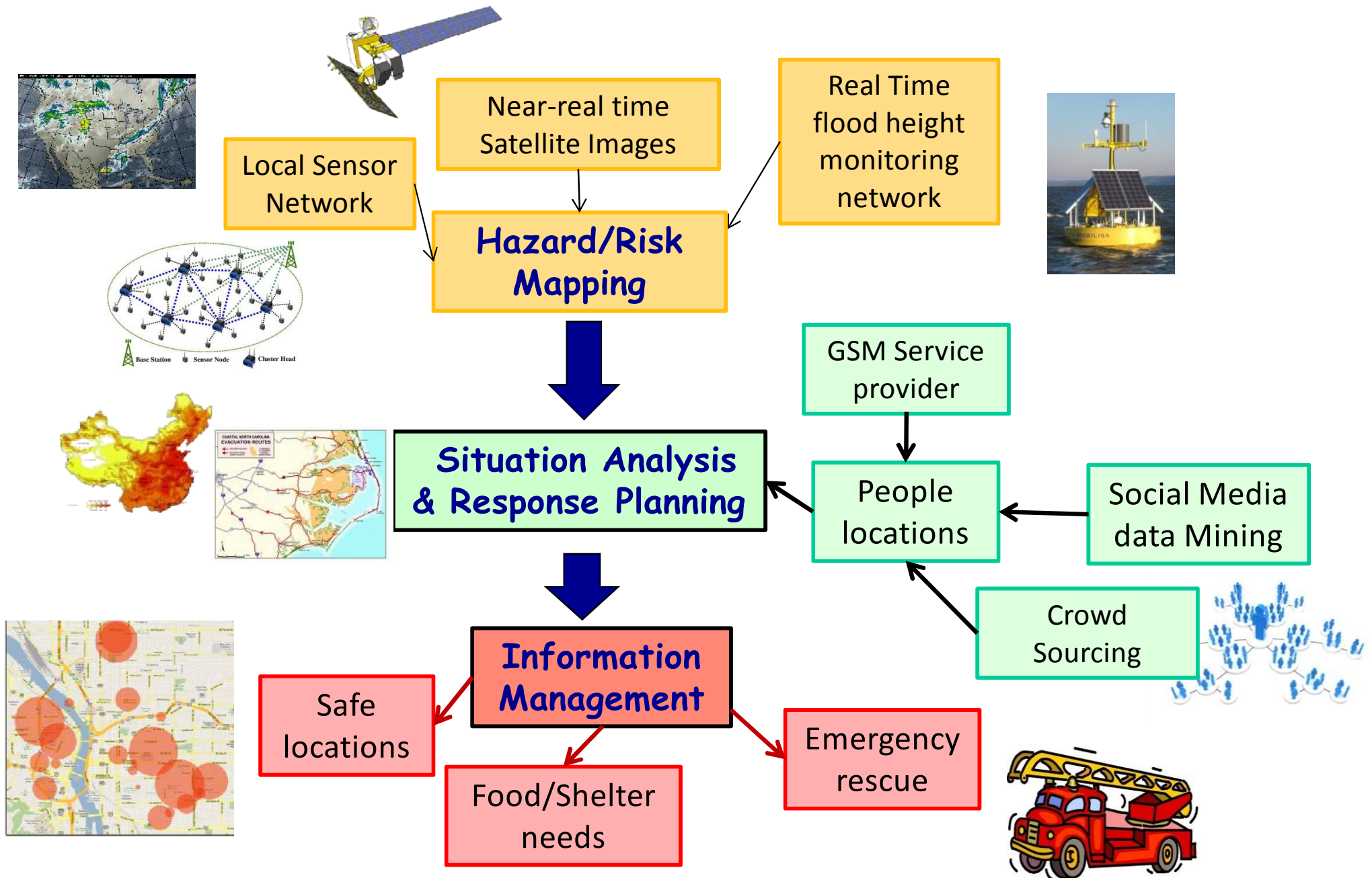
For the urgent decision making,  
Interim Report of the Project was  
released on the request of the Sri  
Lanka Government

Investors in the project area are  
officially instructed to follow the  
report for investment planning & EIA  
studies

©Coast Conservation Department, Sri Lanka



# In case of comprehensive Flood Risk Management



# Risk Mapping.... Benefit to DRR

Data Collection/ Data basing

Hazard

Vulnerability

Flood Hazard  
Rainfall Forecasting  
Runoff Modeling  
Inundation Modeling

Database

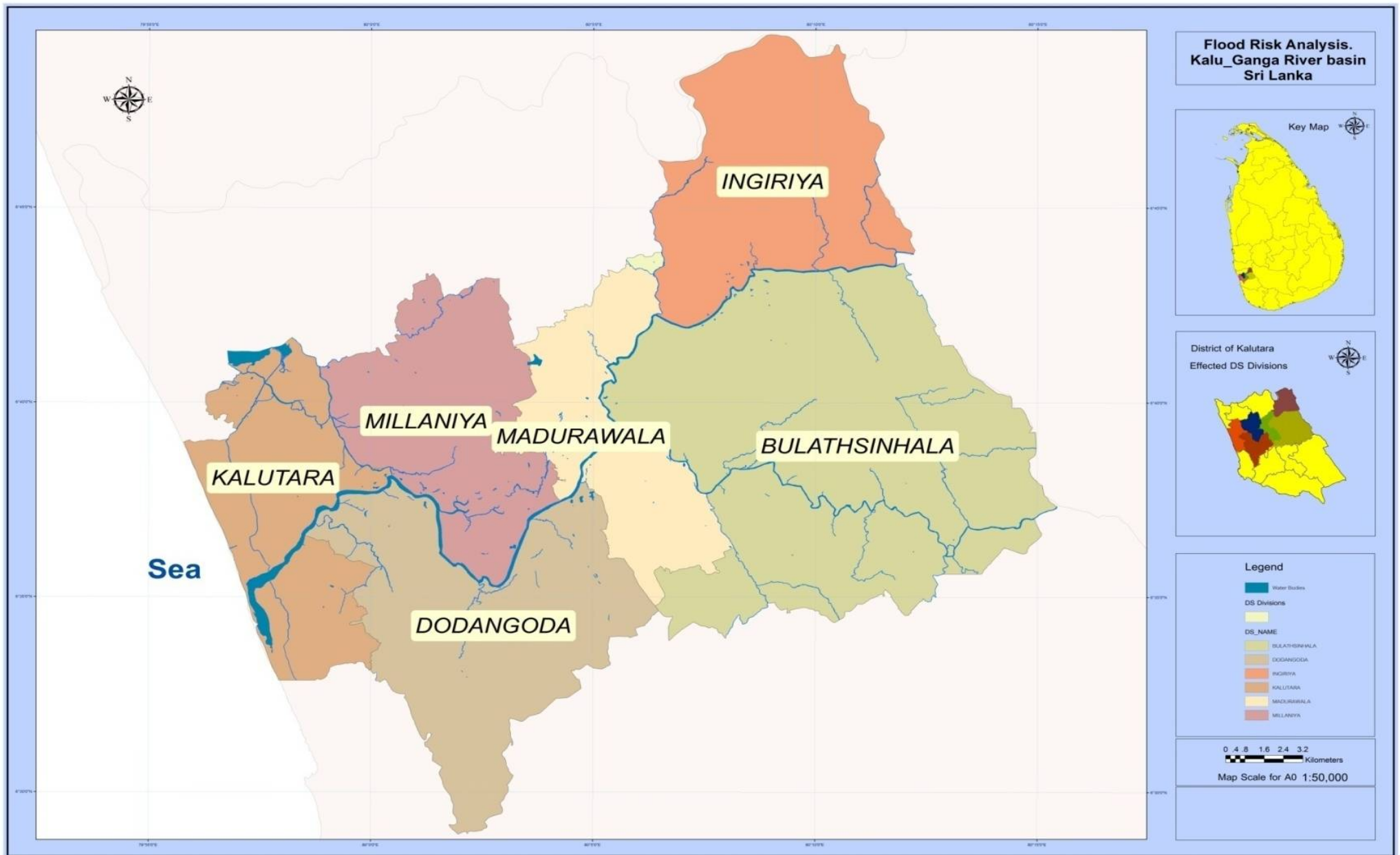
Social, Physical  
*Satellite Data*

*Elements at risk*  
*In different scales*

Risk Mapping

*Satellite Data*  
*Satellite Rainfall*  
*DEM*  
*Land use*

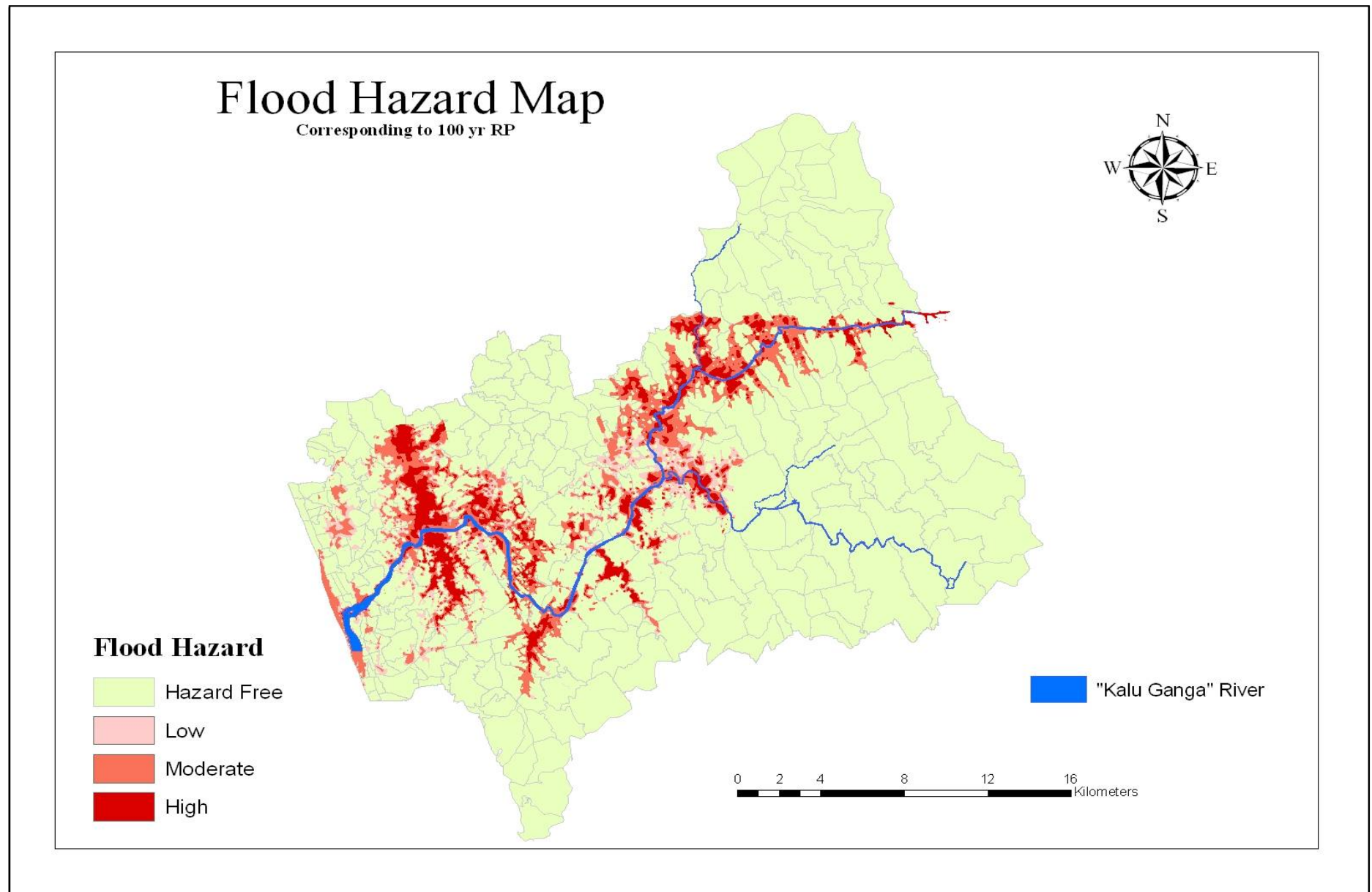
Share the Information



## Mini-Project: Flood Risk Mapping Irrigation Dept and Survey Dept of Sri Lanka

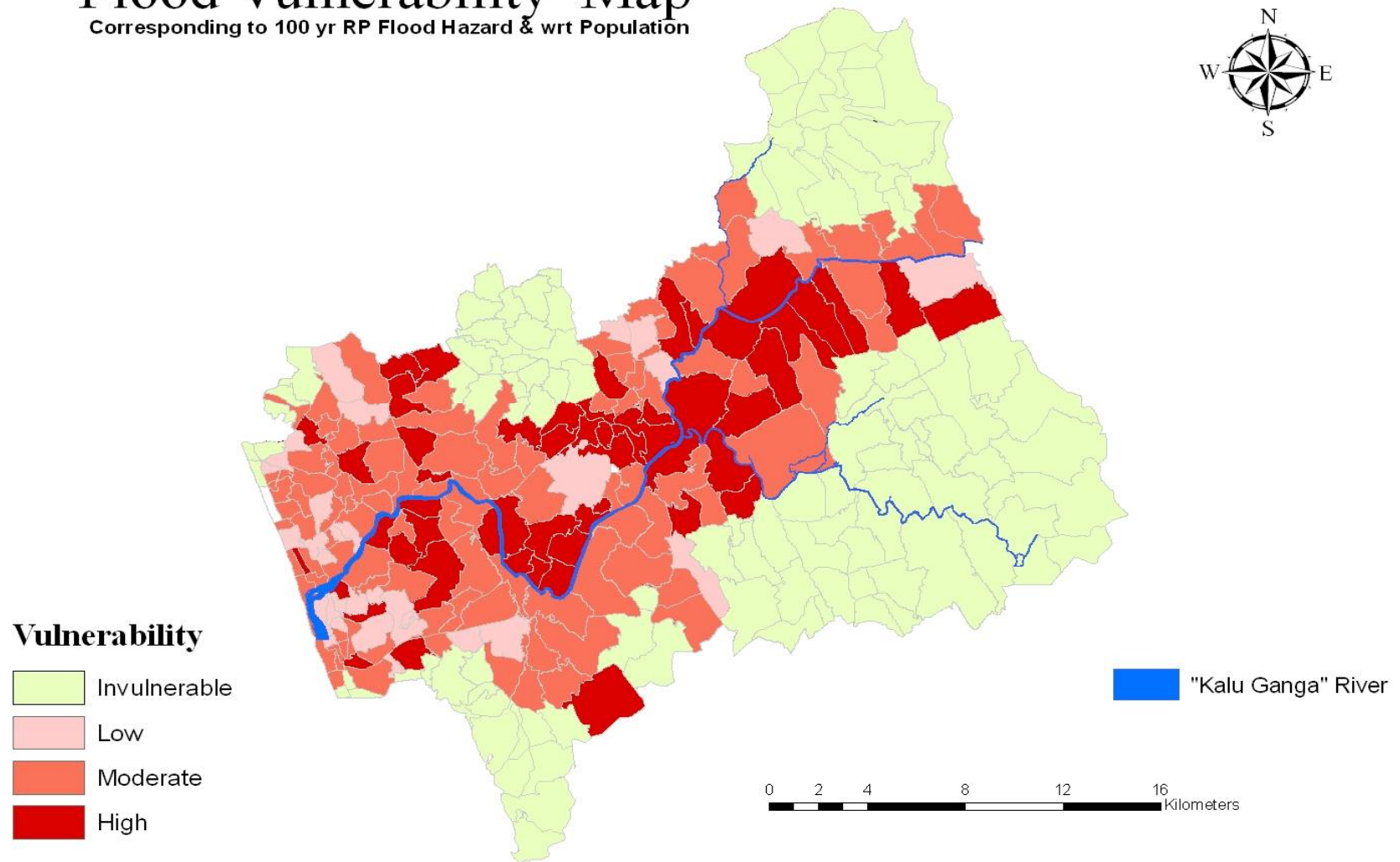


# Hazard Mapping: based on Modeling

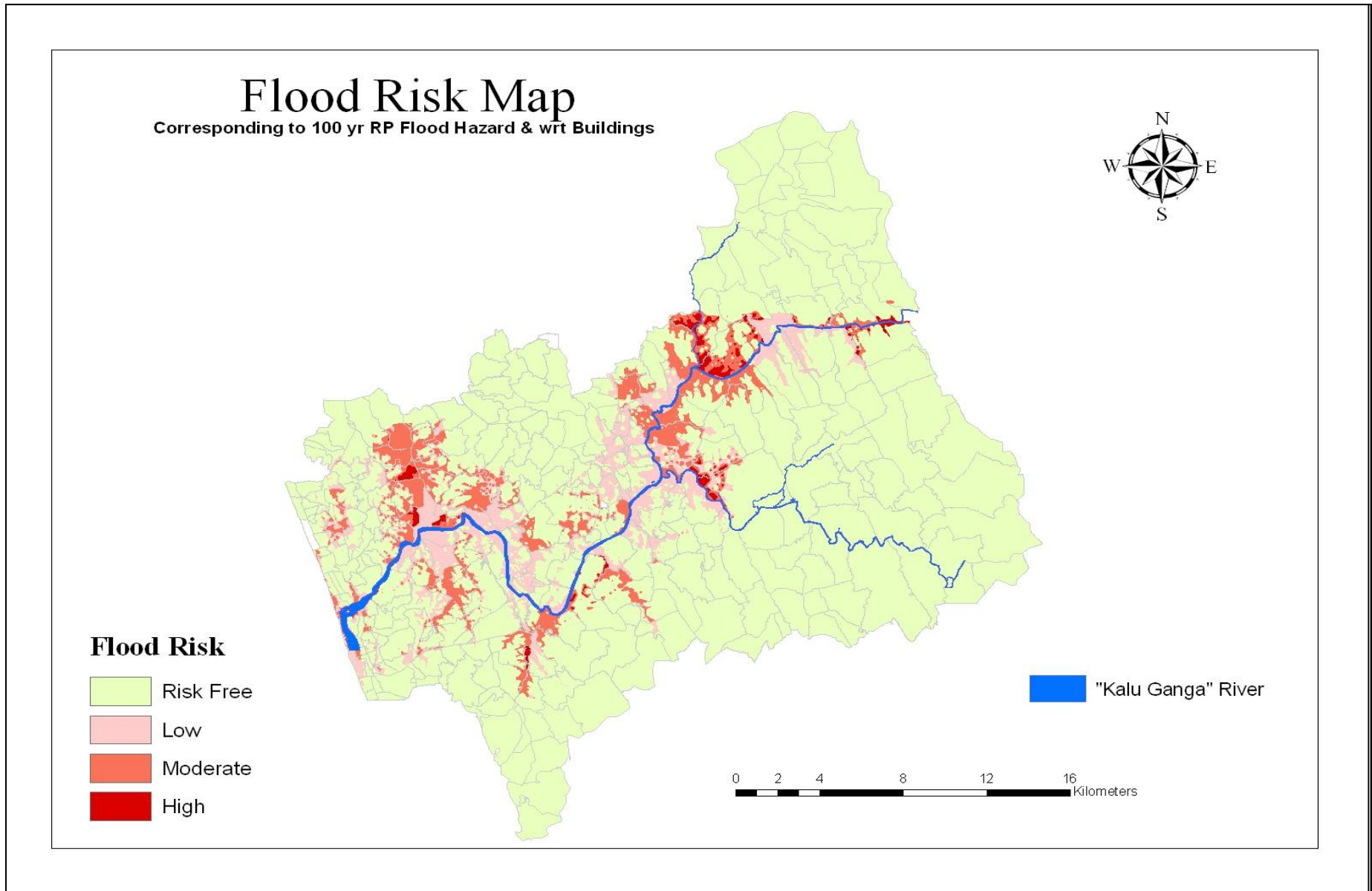


# Vulnerability Identification

## Flood Vulnerability Map Corresponding to 100 yr RP Flood Hazard & wrt Population

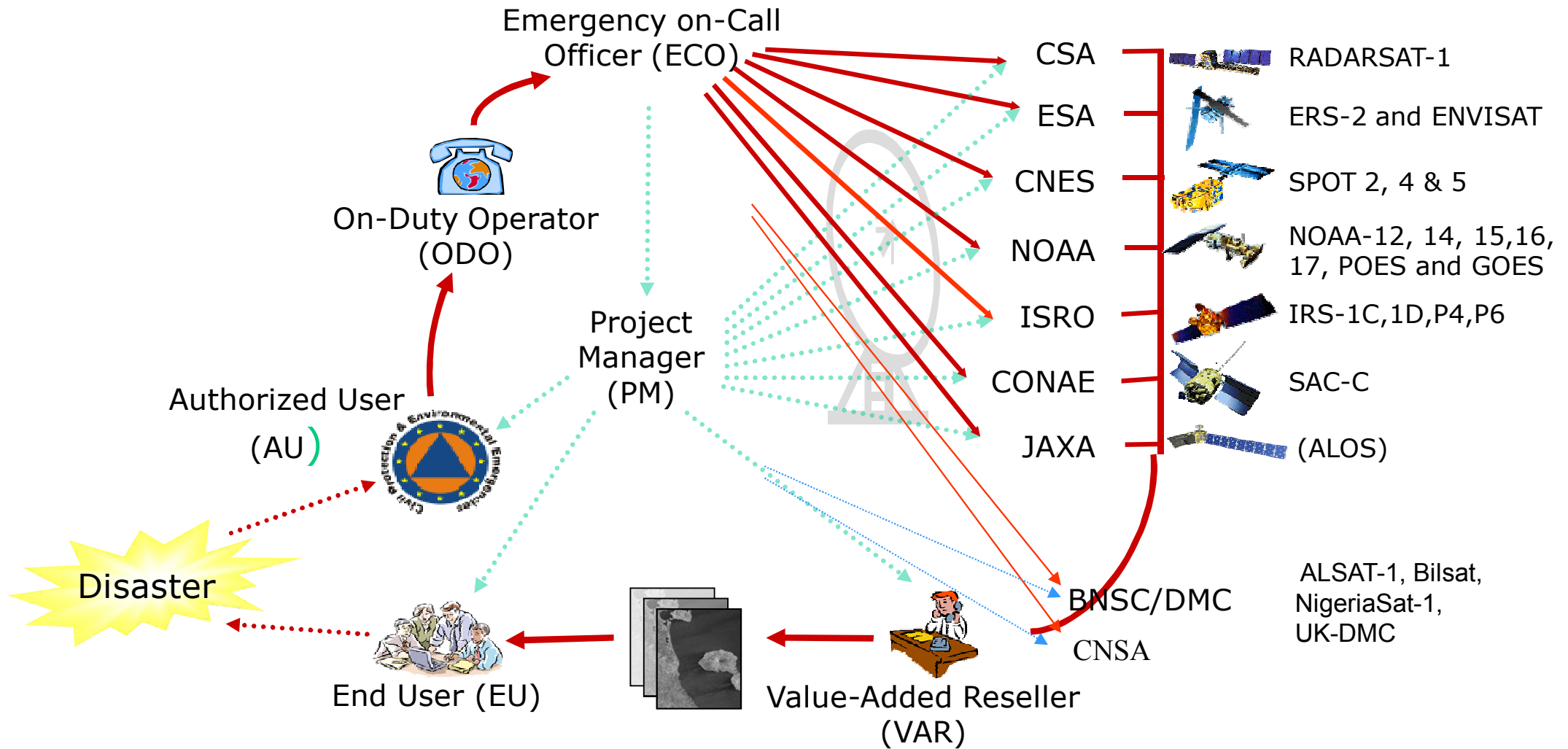


# Risk Profile of Buildings (Physical)



# **Space Technology for Emergency**

# International Disaster Charter



Overview

Services

Infrastructure

Applications

Projects

Library

Events

News

Newsletters

Publications

Links



Copernicus, previously known as GMES (Global Monitoring for Environment and Security), is the European Programme for the establishment of a European capacity for Earth Observation.

The views expressed on this website are those of the authors and do not necessarily represent those of the European Commission.



## WHAT'S NEW

22 Aug 2013 :  
**Carbon Storage**

European forests may be reaching their limits as carbon sinks

20 Aug 2013 :  
**Vegetation Monitoring**

New method to study the long-term effects of climate change on vegetation

20 Aug 2013 :  
**Flood Risk**

Future Flood Losses in Major Coastal Cities: Costly Projections

14 Aug 2013 :  
**Forest Fires**

Fire Report 2012 released

## FOCUS EVENT

**European Space Expo**  
30 August 2013 - 06 September 2013  
Rome, Italy

 **Newsletter Subscription**



# Sentinel Asia



# Sentinel Asia Framework

(As of Jan 1, 2016)

## Space Community

APRSAF

Satellite Image

Promotion of Utilization

Capacity Building

## SENTINEL ASIA

**83** organizations from **25** countries & regions and **15** international organizations  
**In total: 98\*** organizations

\*Three members are increased from last meeting

*Joint Project Team (JPT)*

## Disaster Reduction Community

ADRC

Member Countries  
(30 member countries)

Disaster Information

Utilization (User)

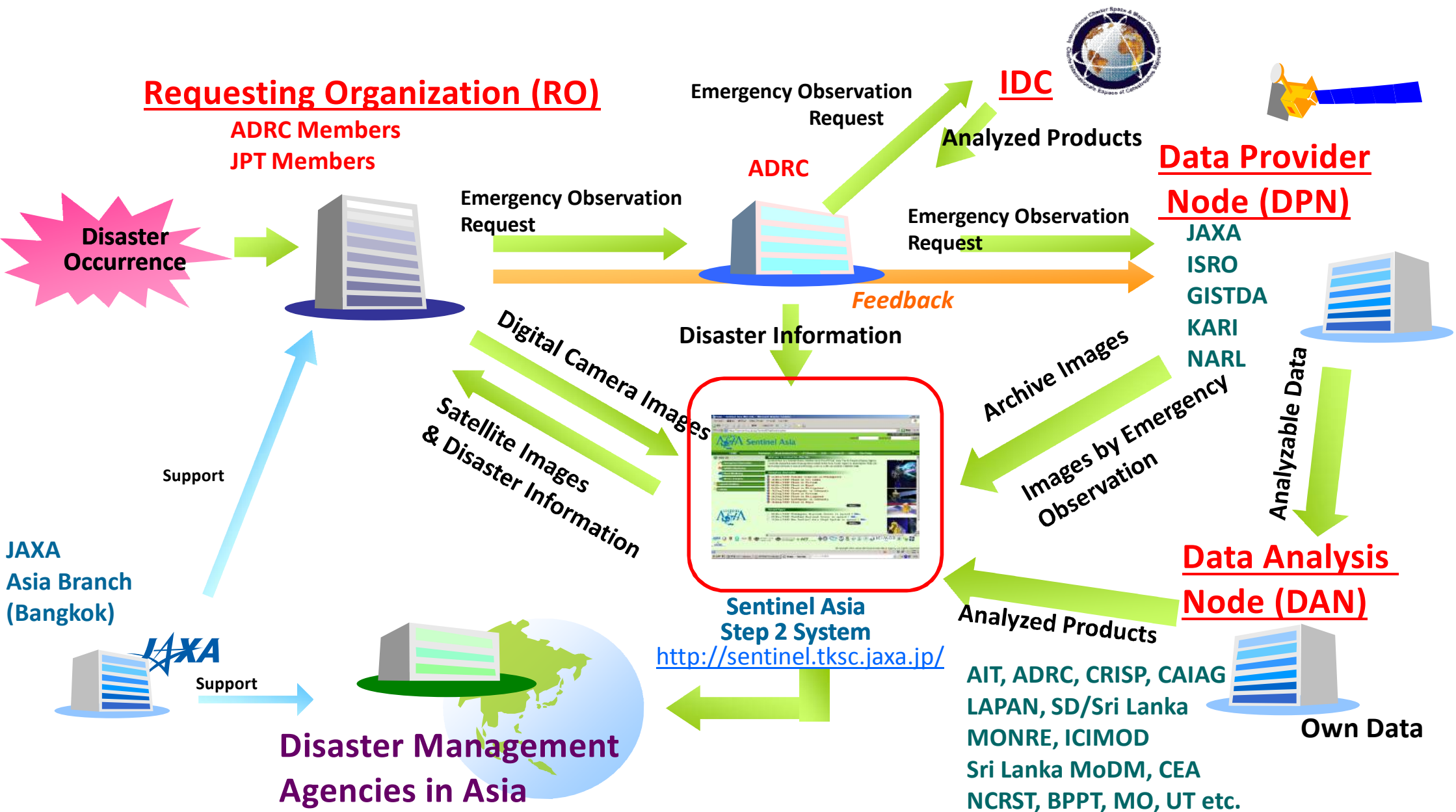
## International Community

UNESCAP, UNOOSA  
ASEAN, AIT and  
International Disaster Charter  
etc.

International Cooperation



# Emergency Observation Flow



# Data Provider Node (DPN) Sentinel Asia Constellation

ISRO

RESOURCESAT, OCEANSAT-2 OCM,  
IMS-1, CARTOSAT-1&2, RISAT-1

IRS

LISS-4: 5.8m Pan  
LISS-3: 23.5m Multi  
AWiFS: 56m Multi

*Sentinel Asia  
Constellation*

GISTDA



JAXA

ALOS-2 & 3



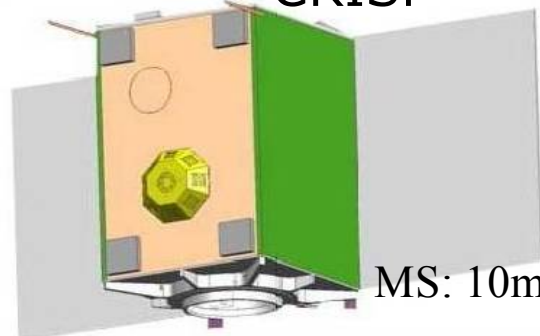
NARL

PAN: 2m  
MS: 8m



**FORMOSAT-2**

CRISP



**XSAT**

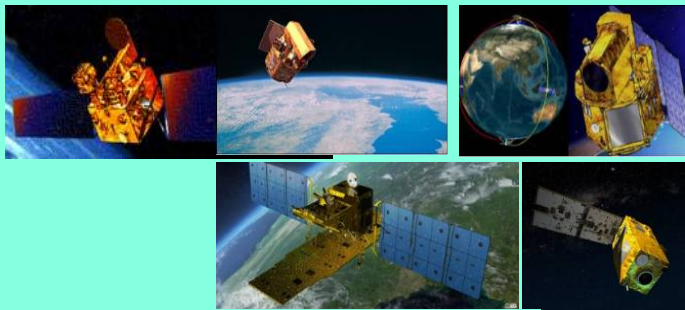
KARI

**KOMPSAT-1**



**Sentinel Asia step 3 is the platform on which SGO and DMO collaborate to utilize space technology and GIS to contribute to disaster risk and damage reduction with the pursuit of win-win relationship**

**Space and GIS relevant organizations (SGO)**



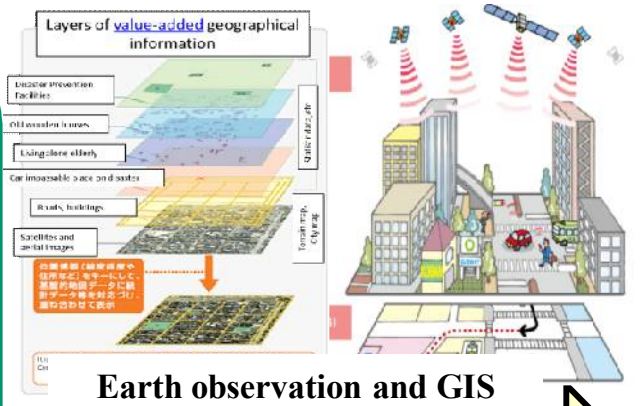
Space Agencies



Academy and research institutes



GIS Organizations



**Space technology & Geospatial Information to contribute to disaster management (DM)**



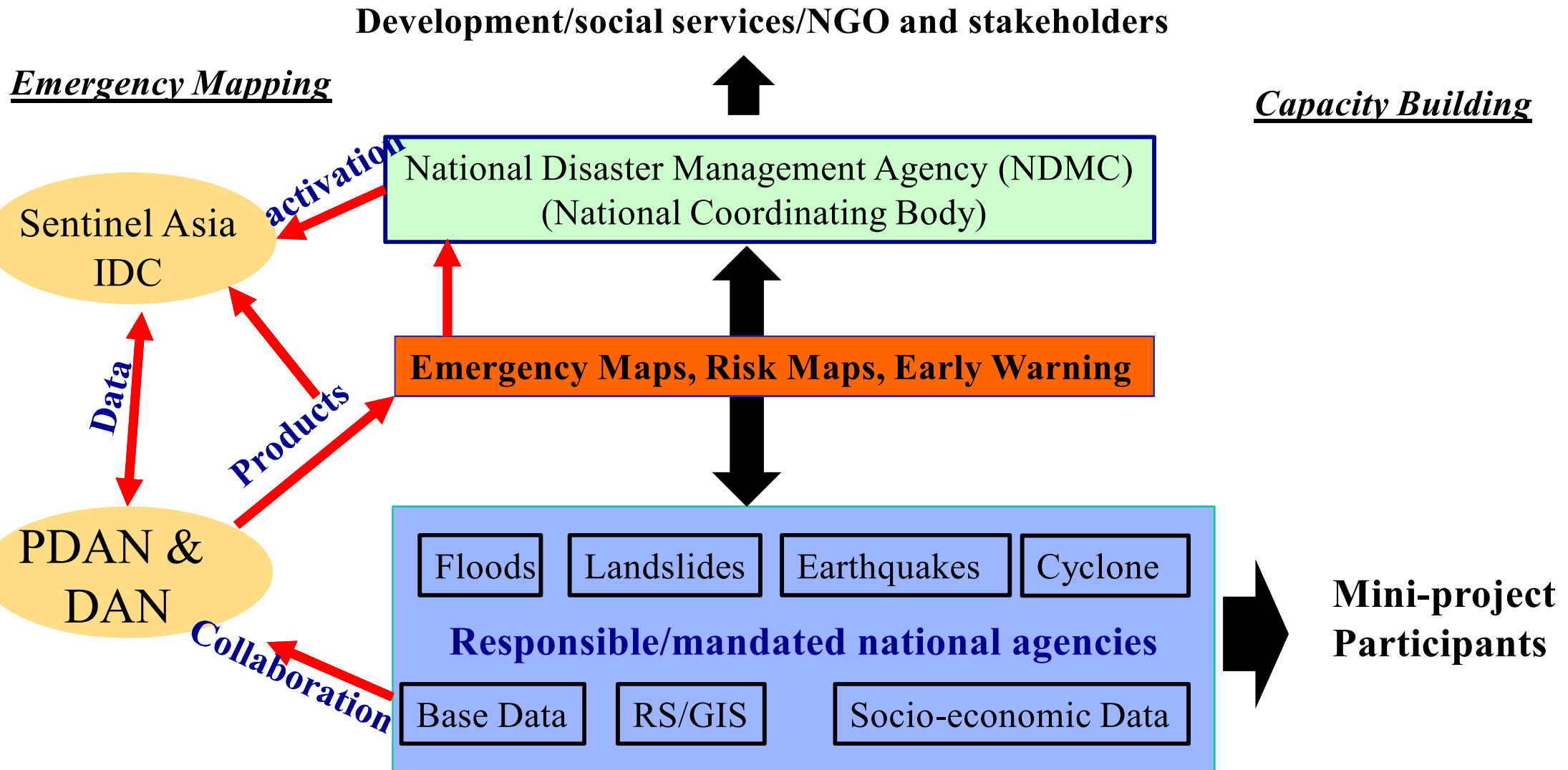
**Opportunity of social demonstration and validation of advanced technology for DM**

**Asia-Pacific countries and their Disaster Management Organizations (DMO)**



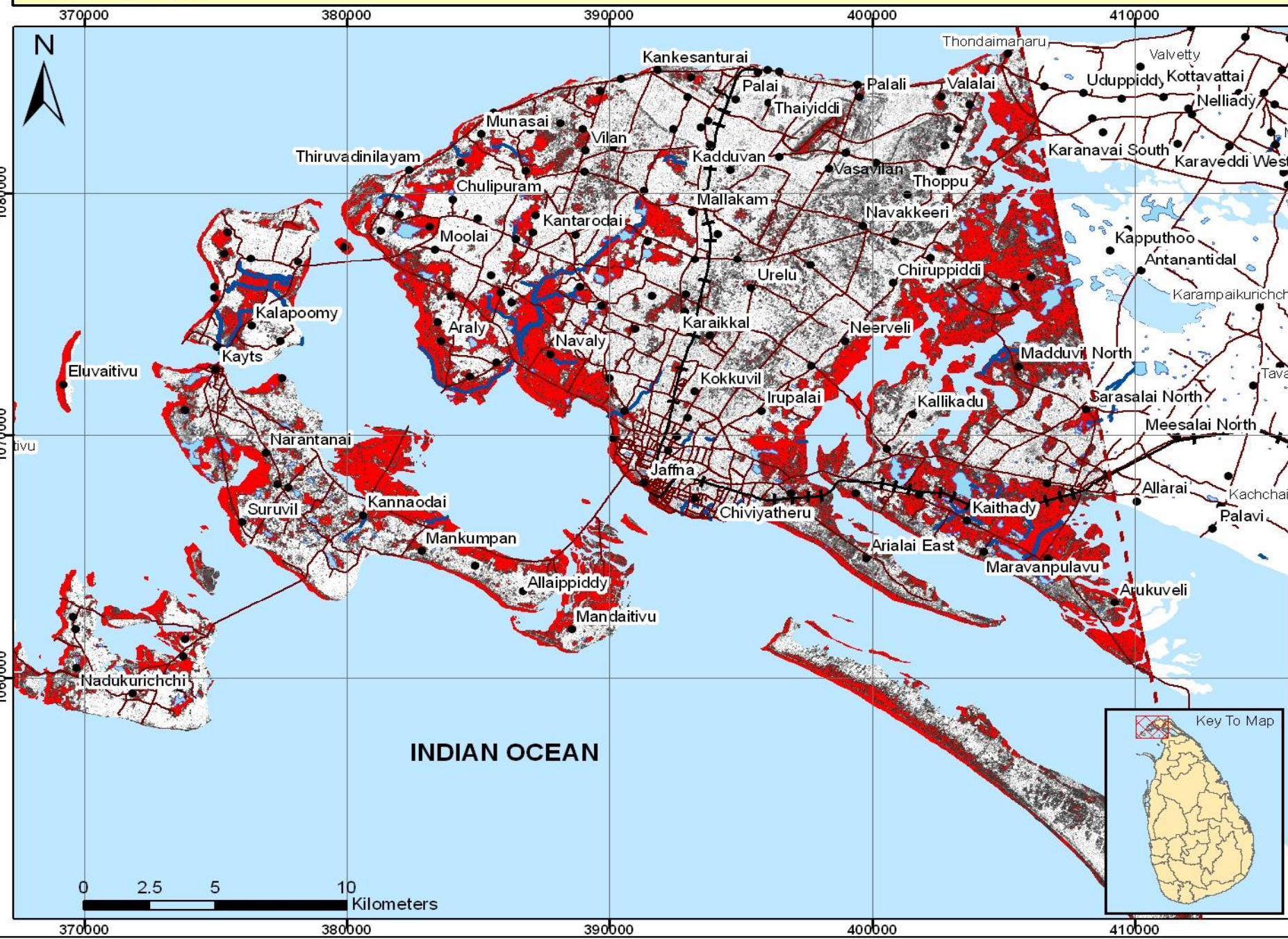
**SENTINEL ASIA Step 3 (Platform)**

# Capacity Building: Geoinformatics use for DRR



# FLOOD IN JAFFNA, SRI LANKA - 2008.11.27

Flood Analysis with ALOS - PALSAR Imageries  
© JAXA, METI



**Legend**

- Village/ Town
- ++ Railroad
- Road
- Stream
- - - Image Extent
- Sea and Lagoon
- Water Bodies

**Flood - Affected Area**

Satellite Data: Sentinel Asia  
Disaster Management  
Support System in the  
Asia-Pacific Region

Satellite: ALOS  
Sensor: PALSAR  
© JAXA, METI

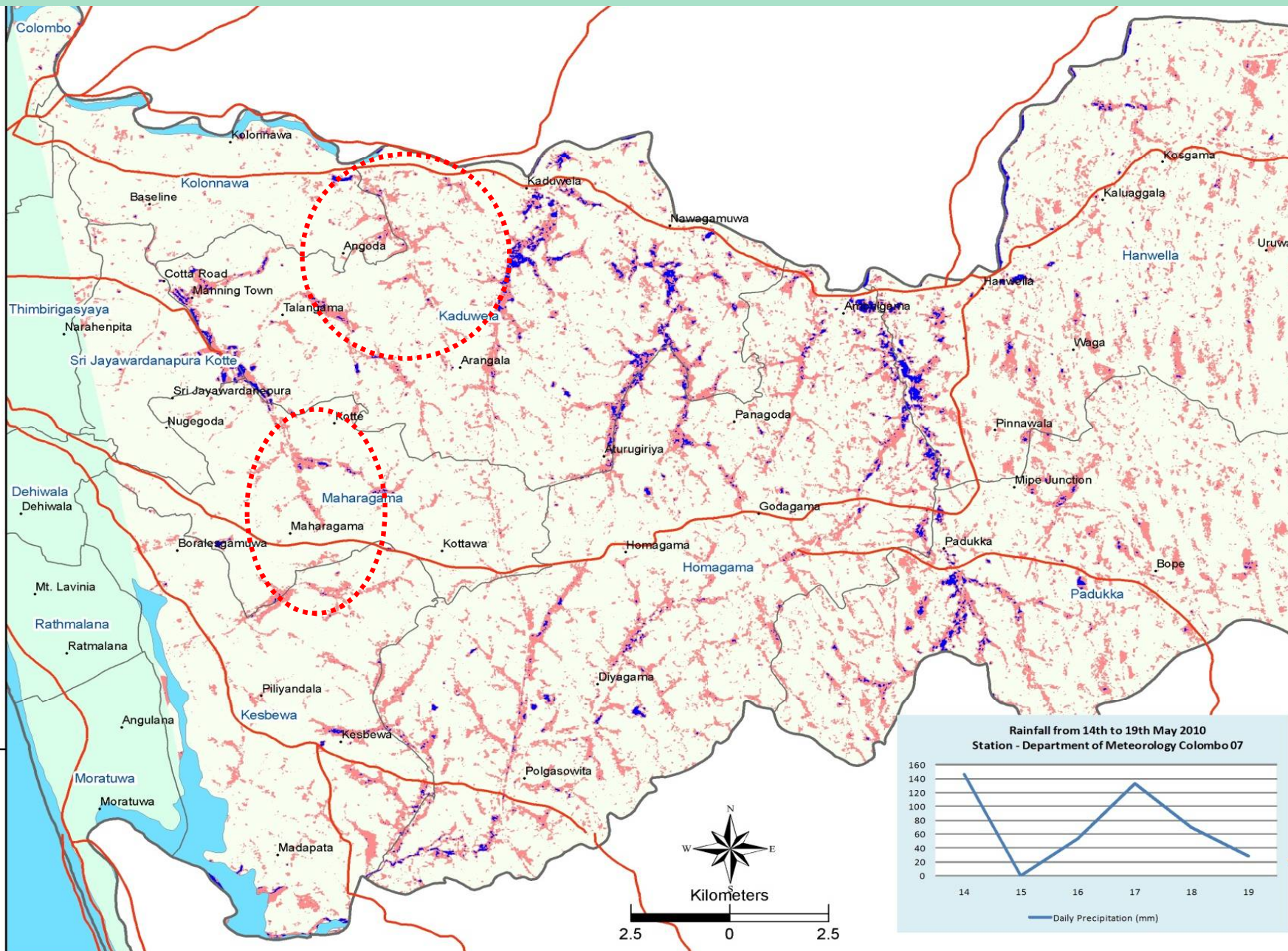
Observation  
Date: 2008.11.27  
Resolution: 6.25m  
Other Data: SDSL

Projection: UTM Zone 44N  
Datum: WGS84

Map Scale: 1 : 200,000



# Flood May 2010 Western Province



## Legend

- Main Roads
- DS Boundary
- Paddy Fields

## Inundation

- Pre Flood Standing Water
- Flood Inundation
- No data

Data Source:  
ALOS Palsar 1.5 data products, by Japanese Aerospace Exploration Agency (JAXA) and Ministry of Economic, Trade & Industry (METI), Japan.

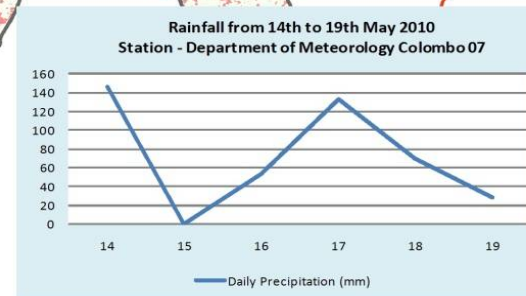
Resolution:  
6.3 m ground resolution

Observation Dates :  
Flood Event - 19th May 2010  
Pre Flood - 09th March 2010

Satellite Activation by:  
Sentinel Asia Secretariat with cooperation of Asian Disaster Reduction Centre (ADRC)

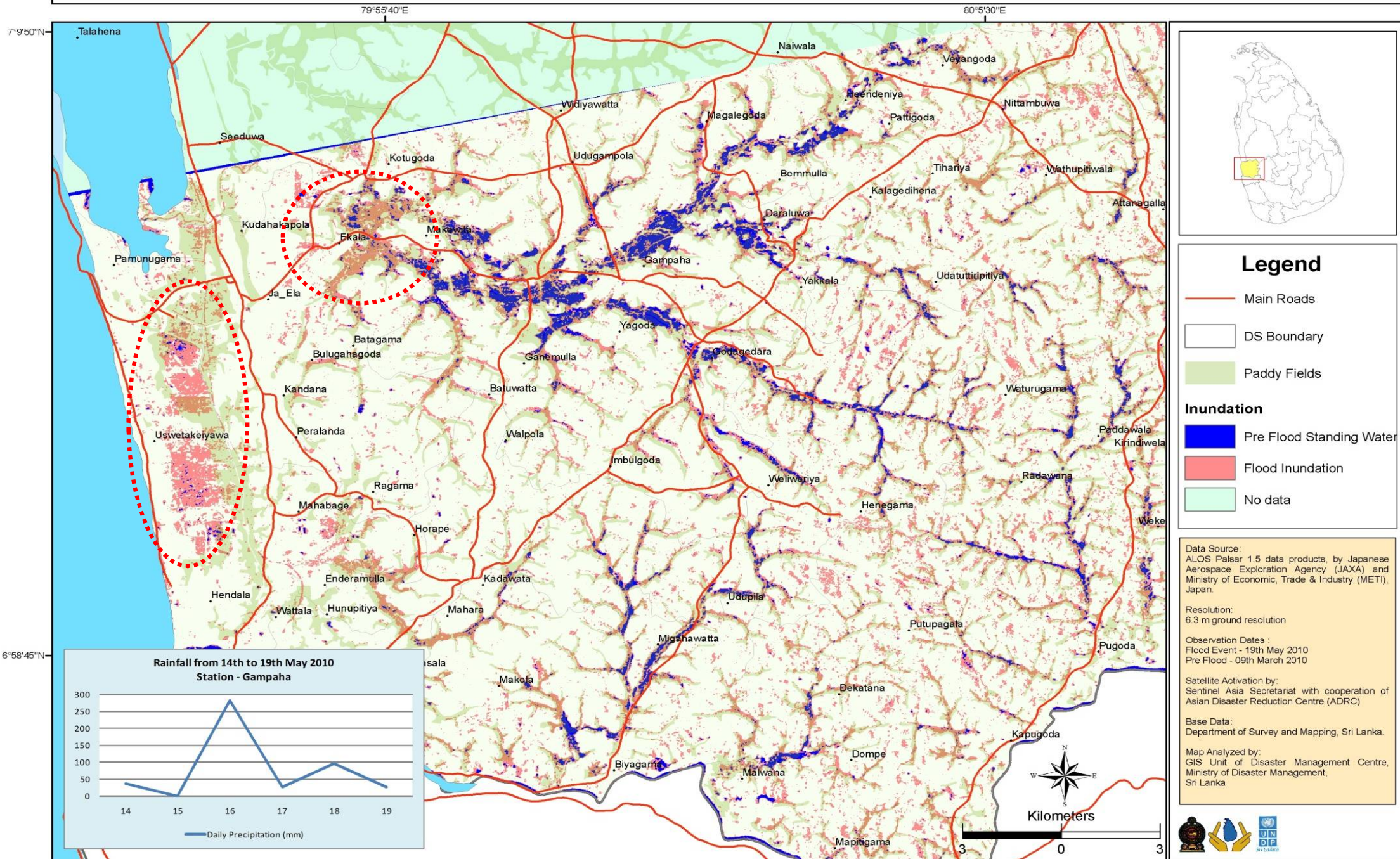
Base Data:  
Department of Survey and Mapping, Sri Lanka.

Map Analyzed by:  
GIS Unit of Disaster Management Centre, Ministry of Disaster Management, Sri Lanka



# Flood Inundation Mapping, Gampaha District, Sri Lanka

Flood Inundation as at 19th May 2010

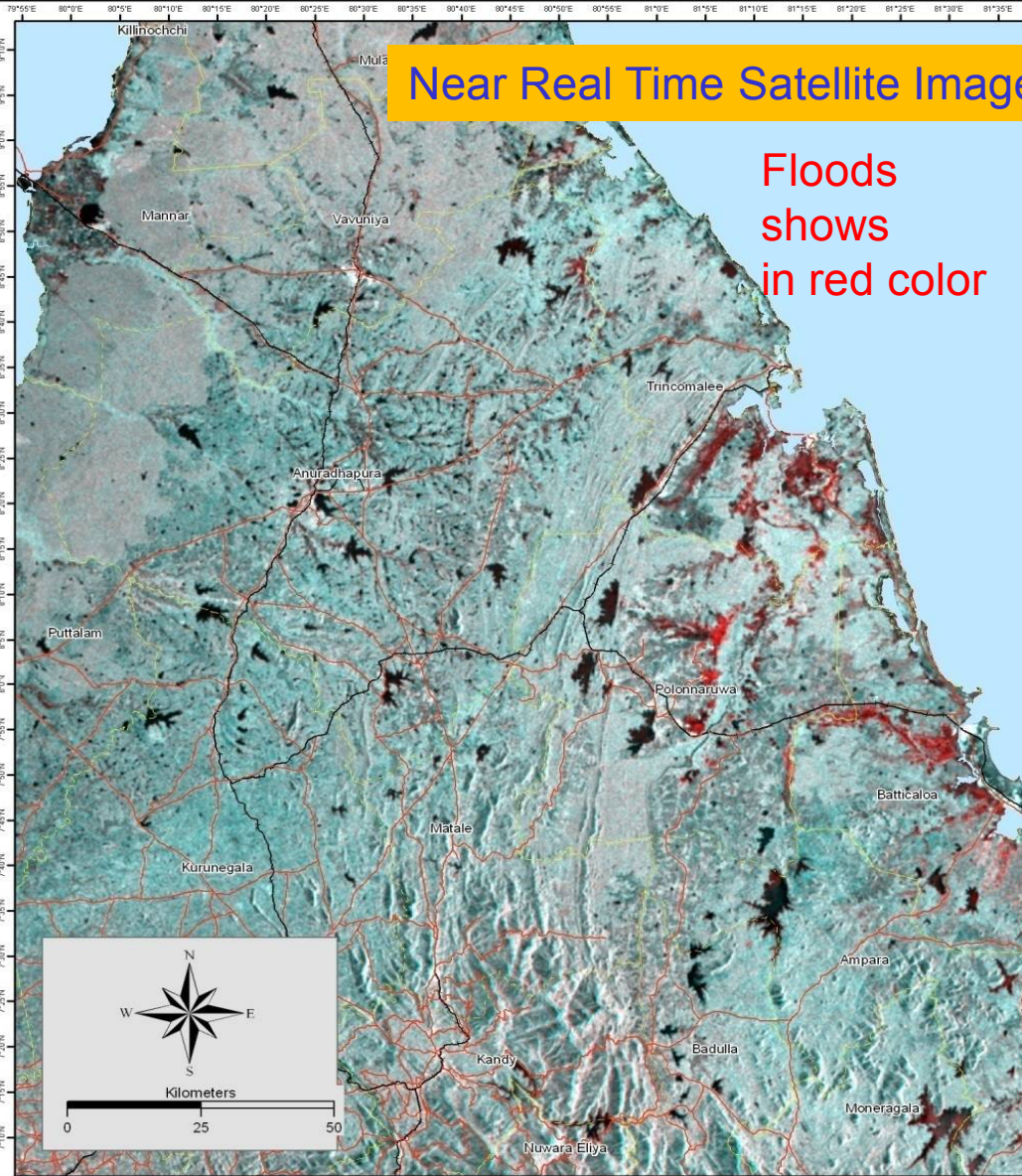


# Flood Inundation Mapping, East and North Central Provinces

Flood Inundation as at 06th Feb

Near Real Time Satellite Images from JAXA, Analyzed by DMC

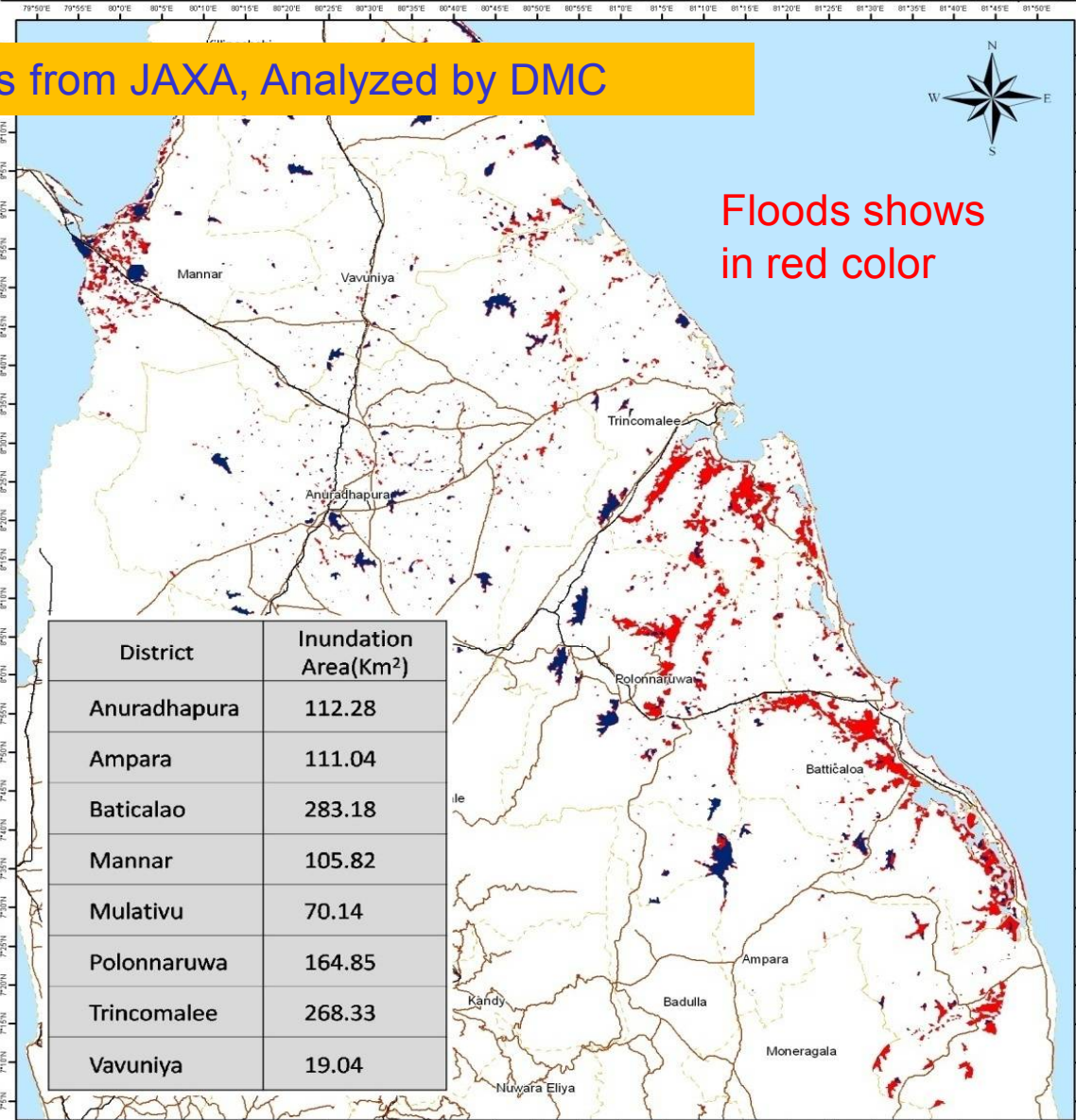
Floods shows in red color



# Flood Inundation Mapping, East and North Central Provinces

Flood Inundation as at 06th February 2011

Floods shows in red color



District	Inundation Area(Km <sup>2</sup> )
Anuradhapura	112.28
Ampara	111.04
Batticalao	283.18
Mannar	105.82
Mulativu	70.14
Polonnaruwa	164.85
Trincomalee	268.33
Vavuniya	19.04

## Legend

- Flood Inundation
- Sea
- Main Road
- Rail Road
- District Boundary

## Data Source:

ALOS Palsar 1.5 data products, by Japanese Aerospace Exploration Agency (JAXA)

Resolution: 100m ground resolution

Observation Dates :  
Flood Event - 06th February 2011  
Pre Flood - 01st January 2009

Satellite Activation by:  
Sentinel Asia Secretariat with cooperation of Asian Disaster Reduction Centre (ADRC)

Base Data: Department of Survey and Mapping, Sri Lanka.

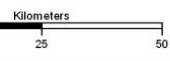
Map Analyzed by: GIS Unit of Disaster Management Centre, Ministry of Disaster Management, Sri Lanka

Version 1.0 - February 2011



## Legend

- Flood Inundation
- Internal Water
- Sea
- Main Road
- Rail Road
- District Boundary



## Data Source:

ALOS Palsar 1.5 data products, by Japanese Aerospace Exploration Agency (JAXA)

Resolution: 6.25m ground resolution

Observation Dates :  
Flood Event - 06th February 2011  
Pre Flood - 04th March 2010

Satellite Activation by:  
Sentinel Asia Secretariat with cooperation of Asian Disaster Reduction Centre (ADRC)

Base Data: Department of Survey and Mapping, Sri Lanka.

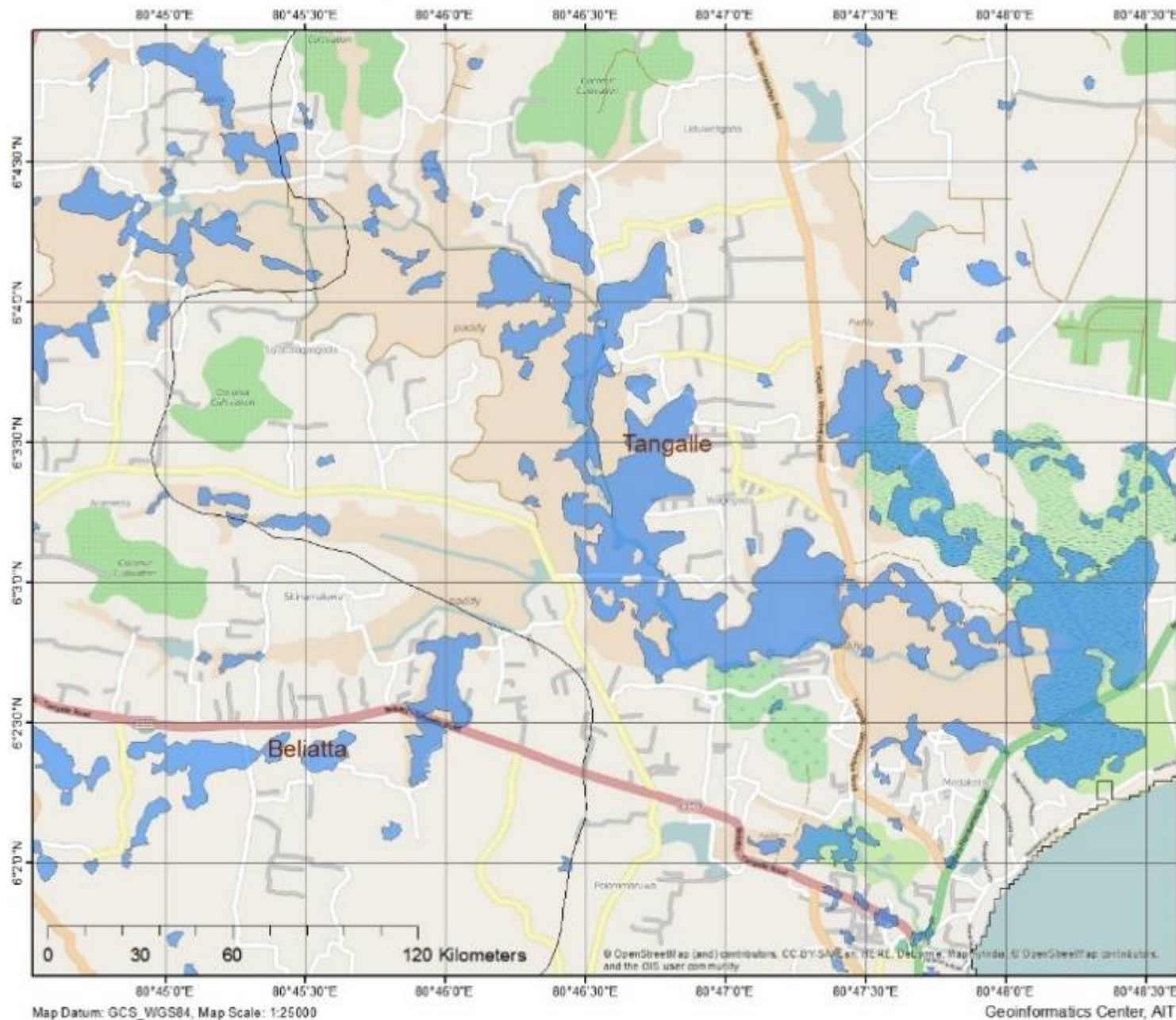
Map Analyzed by: GIS Unit of Disaster Management Centre, Ministry of Disaster Management, Sri Lanka

Version 1.0 - February 2011





# Flood water extent in Tangalle, Southern Province of Sri Lanka on 30 September 2015



**Description:**  
This map shows the flood water extent on the 30th of September 2015, in Tangalle area due to heavy rains in the Southern Province of Sri Lanka.

This analyses were done on JAXA's ALOS/PALSAR data provided by Sentinel Asia.


**Detected water:**  
Contains only the flood water

**Data source:**  
ALOS-2 (PALSAR-2) - ©JAXA

**Images acquired on:**  
30 Sep. 2015 (post event)  
18 Feb. 2015 (pre-event)

**Note:**  
The accuracy of the flood extent is to be validated.

## Legend

 Flood detected areas



# **Strengthen Disaster Risk Governance**

1. Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation
2. Increase public awareness to recognize and address risk, coupled with the political will to set policy and allocate appropriate resources.
3. Establish institution with sufficient managerial and coordination capacity to and manage and integrate the efforts of relevant sectors
4. Integration of DRR concerns into all relevant development spheres.
5. Set-up a mechanism to develop resilient communities addressing education, health and environment in the process of sustainable development

## To realize the benefit of Geoinformatics for DRR ...

1. Develop knowledge of officers and awareness among public and decision makers,
2. Institutionalize and mainstream the use of space based technologies in DRR,
3. Sufficient allocation for appropriate resources; human and infrastructure,
4. Regulate a data/information sharing mechanism for DRR services. Scattered but Sharing mechanism.

# THANK YOU

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[www.geoinfo.ait.ac.th](http://www.geoinfo.ait.ac.th)