Current Use of Digital Technology in DRR in Sri Lanka

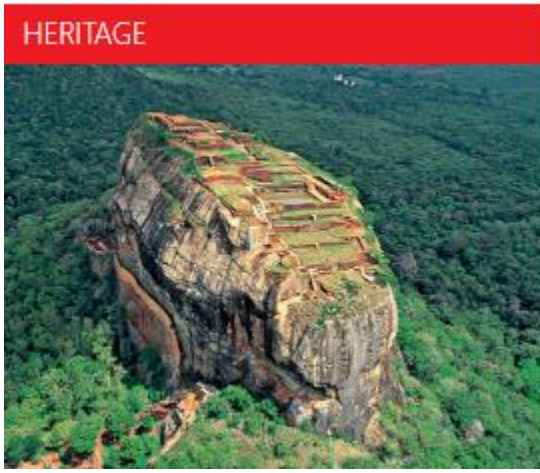
MITIGATION RESEARCH AND DEVELOPMENT DIVISION
DISASTER MANAGEMENT CENTRE

CONTENTS

1. Disaster Management in Sri Lanka
2. Past Disaster Occurrence Inventory
3. National Hazard and Risk Assessment
4. Earth Observation in Disasters
5. OSM Based Exposure Mapping 02 Case Studies
6. Spatial Data Sharing in DM

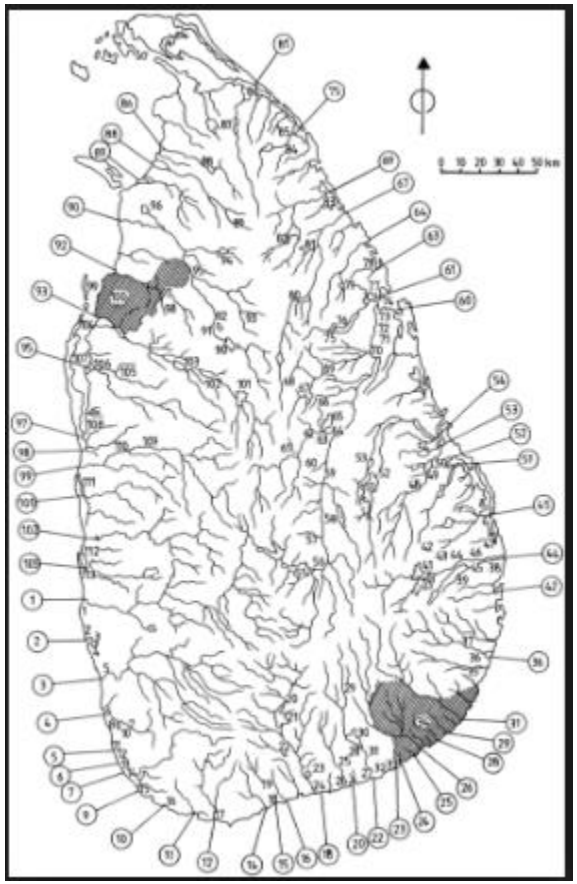
1 OVERVIEW

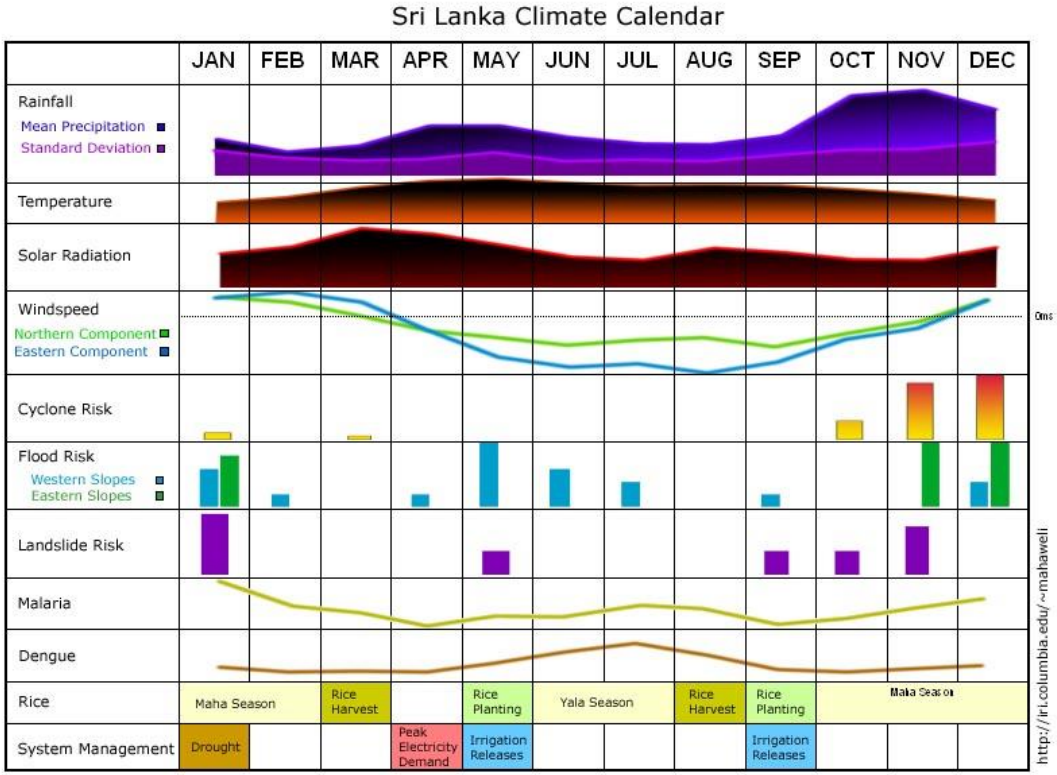
Area – 65,000 sqkm
Population – 21 Million



Sri Lanka

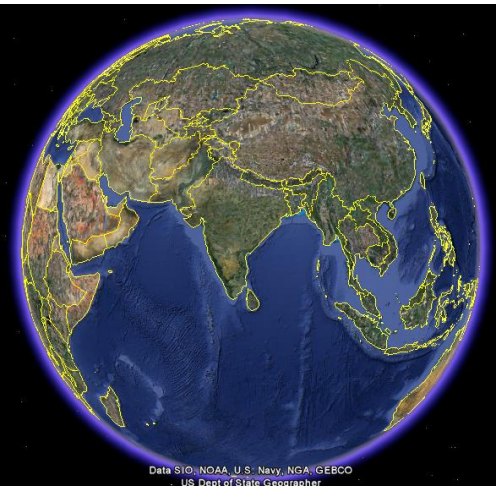
Population – 21 Million
Area – 65,000 sqkm
103 rivers
2 Monsoons
2 Inter Monsoons





Source: Dr. Lareef, Columbia University

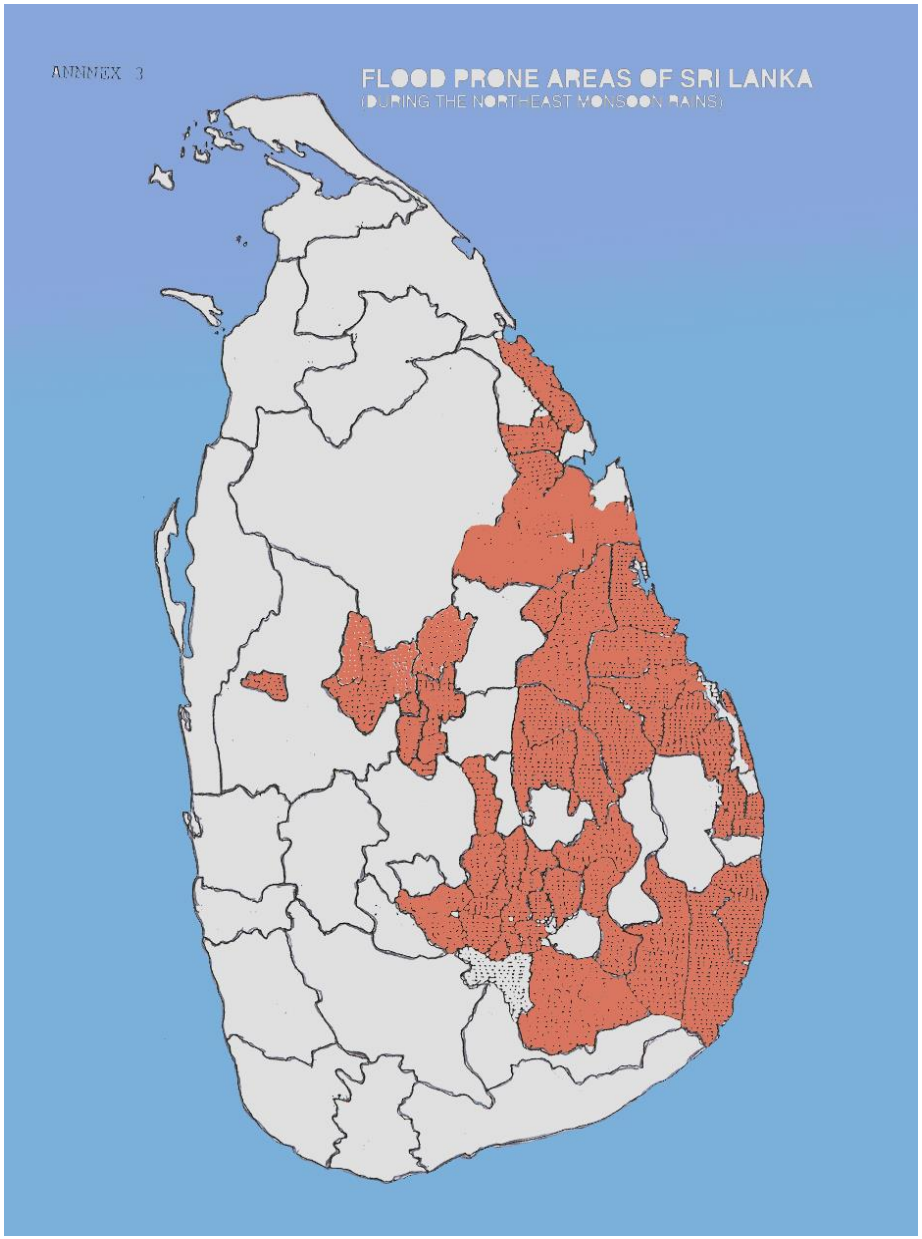
Rainfall


Data SIO, NOAA, U.S. Navy, NGA, GEBCO
US Dept of State Geographer

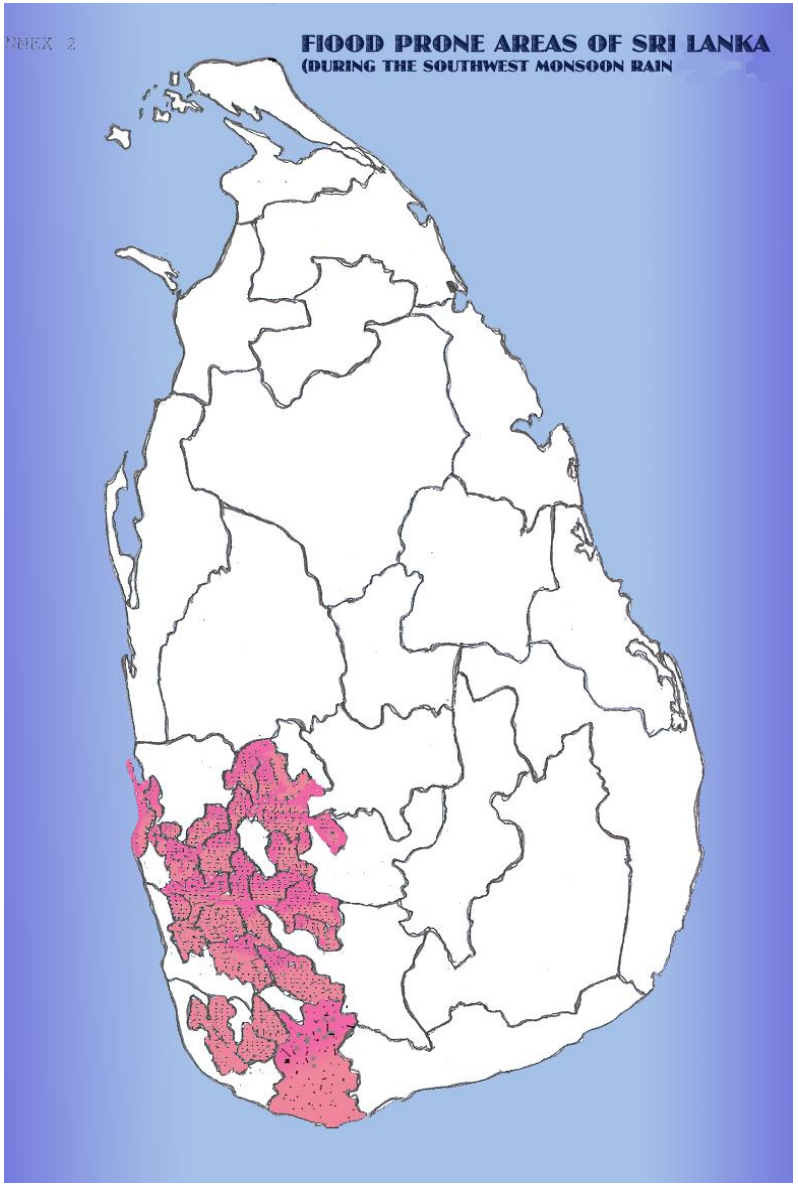

Rainfall-mm
>5000
4000-5000
3000-4000
2500-3000
2000-2500
1500-2000
1000-1500
<1000
Deduru Oya
Maha Oya
Kelani Ganga
Kalu Ganga
Walawe Ganga
Kirindi Oya
Menik Ganga
Malala Oya


Kelani Ganga
Kalu Ganga

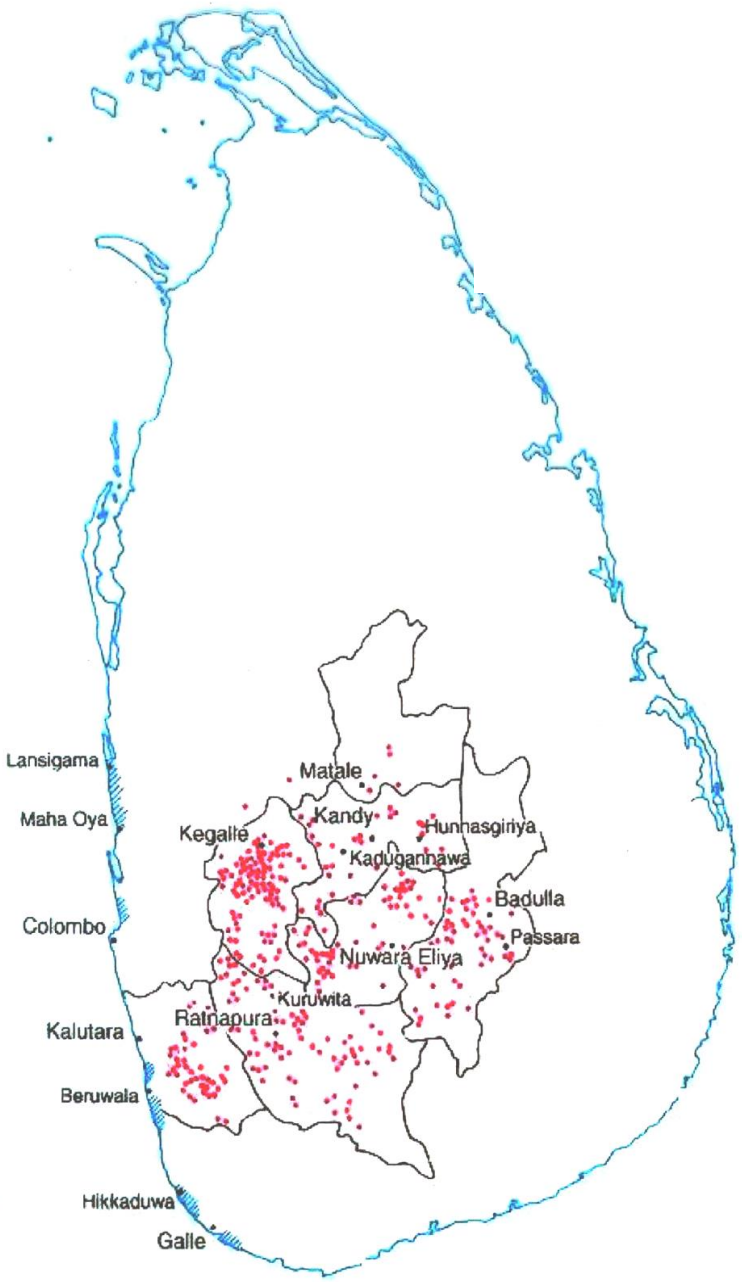
FLOODS DURING THE NORTH EAST MONSOON



FLOODS DURING THE SOUTH WEST MONSOON



LANDSLIDES


Lansigama
Maha Oya
Colombo
Kalutara
Beruwala
Hikkaduwa
Galle
Matale
Kandy
Kegalle
Hunnasgiriya
Kadugannawa
Badulla
Passara
Nuwara Eliya
Kuruwita
Ratnapura

Legal and Institutional Setting

Disaster Management Act No 13 of 2005 establishes National Council for Disaster Management

Disaster Management Centre establishes to implement the directives given by NCDM

Disaster Management Centre

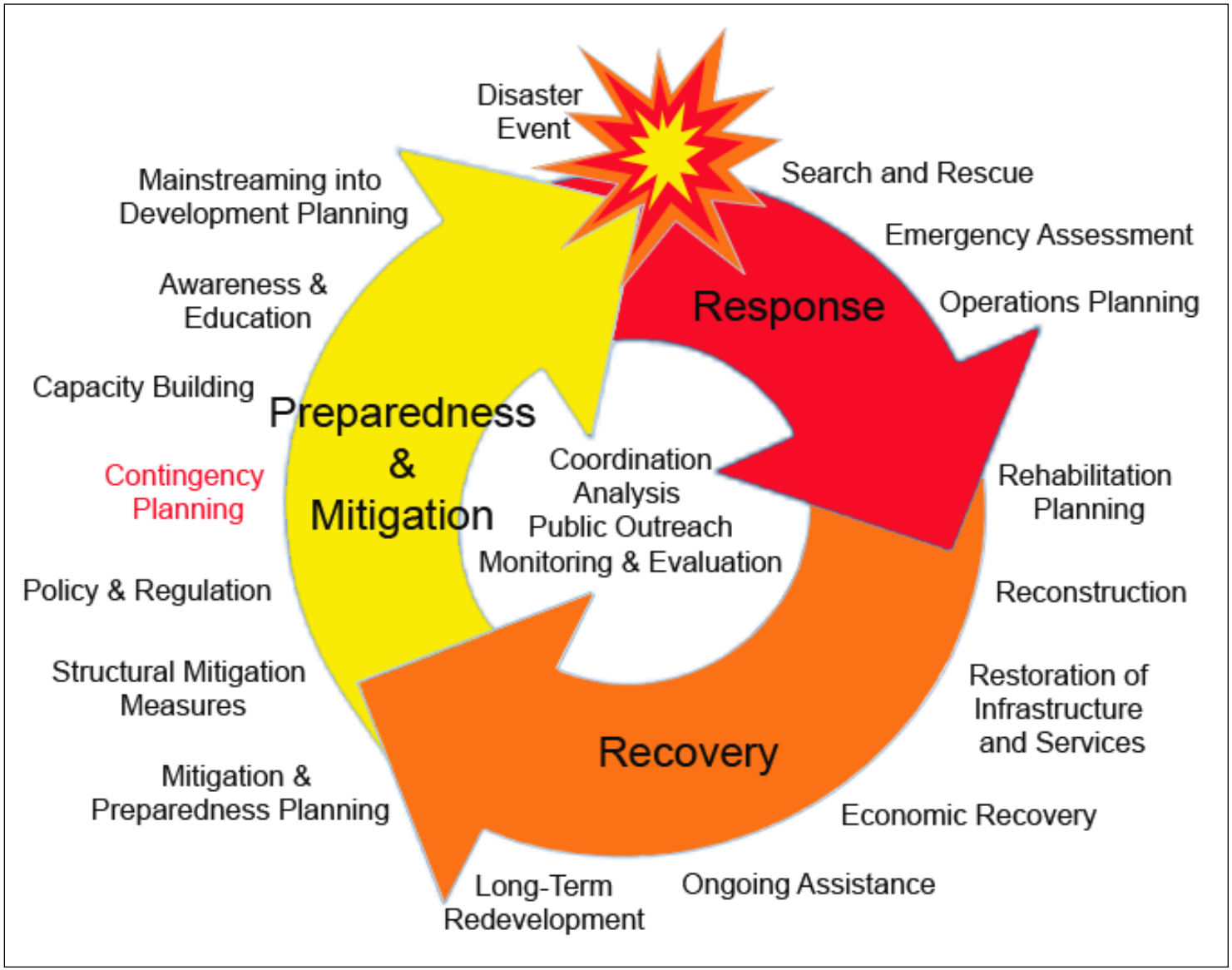
OVERVIEW – Disaster Management in Sri Lanka

- Disaster Management Act No. 13 of 2005 – Establishes National Council for Disaster Management
- Composition – Chair – HE the President, Vice Chair - Pri-Minister, Leader of Opposition, 20 Ministers of selected subjects, 09 Chief Ministers, 05 Members of Opposition

Functions

- ✓ to formulate a national policy and program on the management of disasters
- ✓ to prepare and formulate the National Disaster Management Plan and the National Emergency Operation Plan based on the national policy
- ✓ to monitor the implementation of the National Disaster Management Plan and the National Emergency Operation Plan
- ✓ to facilitate emergency response, recovery, relief, rehabilitation and reconstruction in the event of any disaster
- ✓ to direct, co-ordinate and monitor the activities of the Disaster Management Centre

- In 2005 – Establishment of Disaster Management Centre and Ministry of Disaster Management
- 2006 – 2016 Disaster Management Road Map in parallel to the Hugo Framework for the Action
- 2010 – Disaster Management Policy
- 2014 – 2018 – Sri Lanka Comprehensive Disaster Management Program (SL-CDMP)
- 2015 – 2030 – Sendai Framework for Disaster Risk Reduction


Disaster
Event
Search and Rescue
Emergency Assessment
Response
Operations Planning
Rehabilitation
Planning
Reconstruction
Restoration of
Infrastructure
and Services
Economic Recovery
Ongoing Assistance
Recovery
Long-Term
Redevelopment
Mitigation &
Preparedness Planning
Structural Mitigation
Measures
Policy & Regulation
Contingency
Planning
Capacity Building
Awareness &
Education
Mainstreaming into
Development Planning
Preparedness
&
Mitigation
Coordination
Analysis
Public Outreach
Monitoring & Evaluation

Past Disaster Occurrences Database Sri Lanka

2

www.desinventar.lk

DISASTER MANAGEMENT CENTRE

SITUATION REPORT - 12th January 2011 at 0900 hrs

Secretary to H.E. the President
Secretary, Ministry of Defence
Secretary to the Treasury
Secretary, Ministry of Disaster Management
Private Secretary to the Hon. Minister of Disaster Management
Private Secretary to the Hon. Dy Minister of Disaster Management

District	Disaster	Date	D S Division	Affected		Deaths Reported	Injured People	Missing People	Houses Damaged		IDP Camp			Remarks
				Families	People				Fully	Partially	Nos.	Families	Persons	
Batticaloa	Flood	09.01.2011	Eravurpattu	18490	70326	1			92	138	35	5288	20432	
			Koralaipattu South,	7512	28358				83	76	19	2787	10130	
			Eravur town	9177	35782				19	42	15	975	3855	
			Koralaipattu Central	8103	31634				512	253	7	1292	5198	
			Koralaipattu North	6752	23124	1			109	801	14	3263	11137	
			Koralaipattu West	7430	28575				45	117	8	1132	3944	
			Manmunai South West	6800	24476				163	426	4	466	1692	
			Manmunai North	19854	77611	1				12	32	3301	12411	
			Manmunai Patthu	6528	24004			1	7	55	7	1955	7684	
			Manmunai West	8283	29612				8	1060	20	3445	12887	
			Koralaipattu	6330	22176	3			83	110	10	1281	4555	
			Kattankudy	11123	42733				1		11	1249	5005	
			Manmunai South & Eruvil Pattu	14216	49376	1			163	426	25	3753	13945	
			Porativu Pattu	12754	46050				56	121	18	2454	9172	
Sub Total				**143352**	**533837**	**7**	**0**	**1**	**1341**	**3637**	**225**	**32641**	**122047**	
Polonnaruwa	Flood	09.01.2011	Dimbulagala	191	681						12	191	681	
			Elehera	88	404						10	88	404	12 sluice gates of Kaudulla tanka, 10
			Hinguraka goda	312	941						9	312	941	Parakrama Samudraya, 08 sluice gates of
			Lankapura	533	2942						10	533	2942	Wewa opened. Gallella area in Manampitiya - Gallella
			Medirigiriya	634	2052						13	634	2052	road inundated and road impassable. Giritale wewa is
			Tamankaduwa	859	3418						13	859	3418	over flowing.
			Welikanda	88	404						10	88	404	
Sub Total				**2705**	**10842**	**0**	**0**	**0**	**0**	**0**	**77**	**2705**	**10842**	
Monaragala	Heavy Rain & High Wind	09.01.2011	Badalkumbura				1		4	80				Due to tree fallen on to the house.
			Maddulla							1				06 sluice gates opened at Weheragala Tank.
			Medagama							2				
			Wellawaya	3	10					2				

Collect Daily data from DMC Sitreps and other sources

Check data for incident basis

Provisional entry of the records

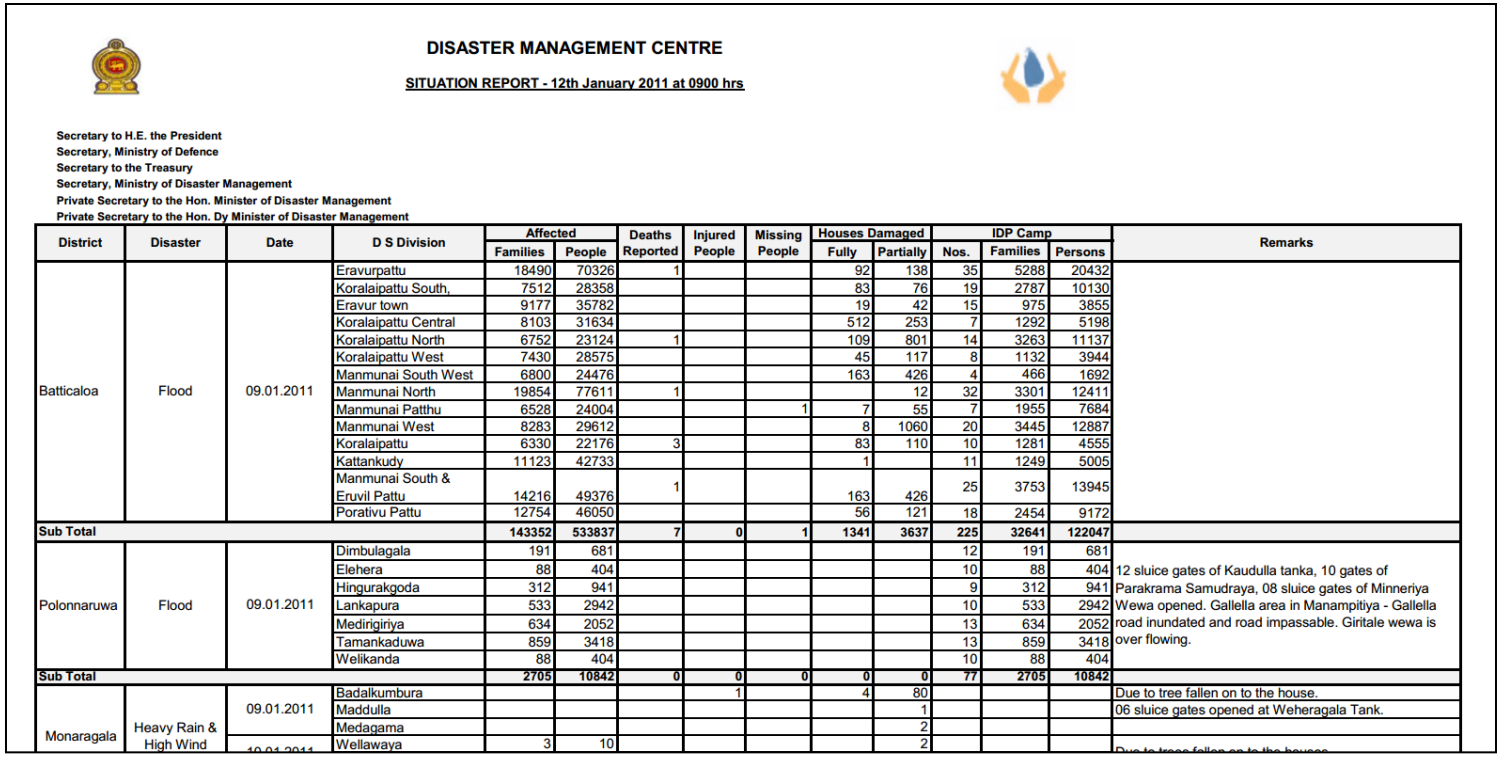
Record Validation

And updates

Update the online server

Data Sources

- Daily Situation Reports (EOC published Situation Reports)
- News Papers and other media reports
- Stakeholder organizations (Wildlife, Forest, Central Environment Authority etc)



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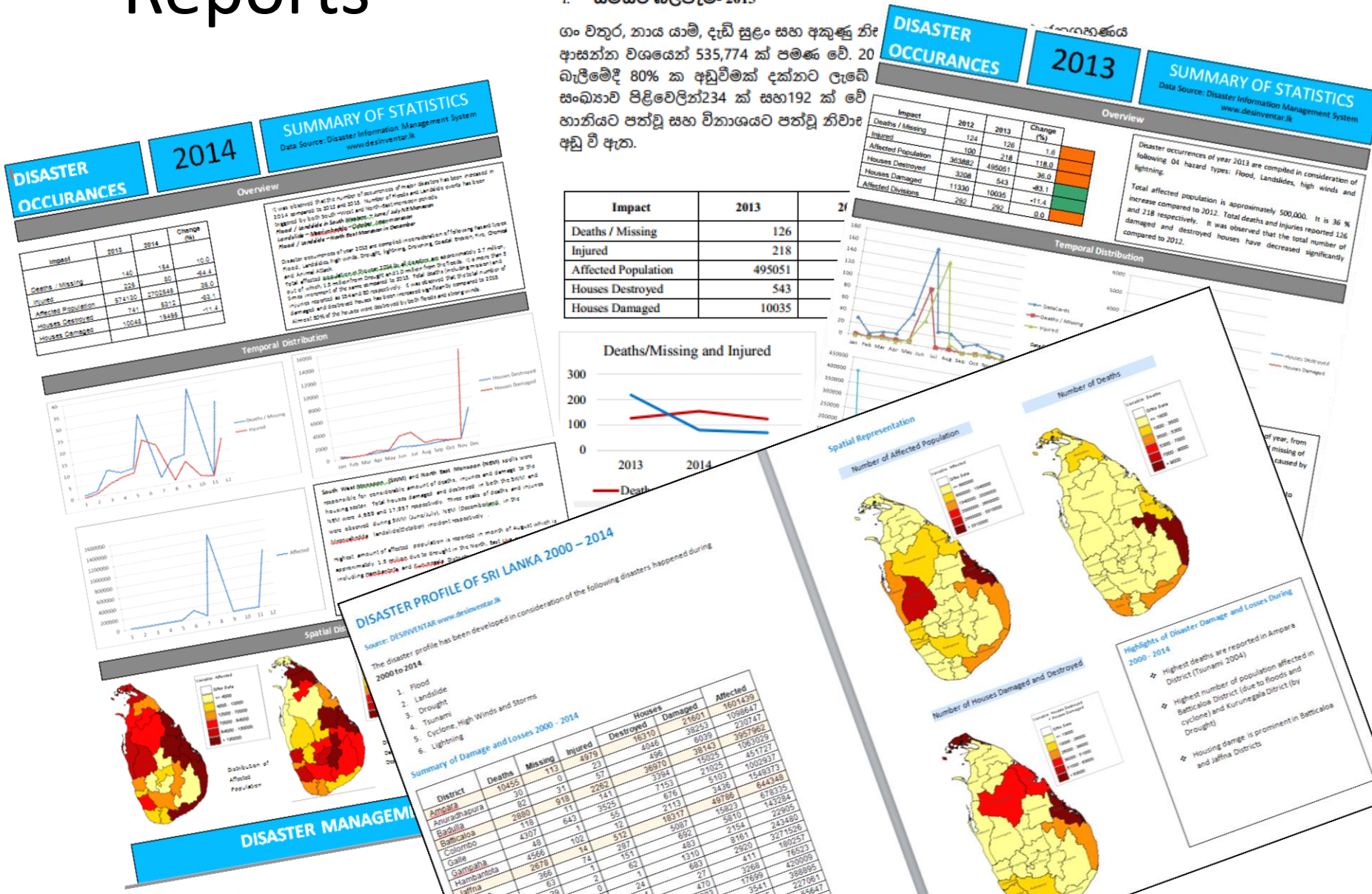
			Medagama							2				
		10.01.2011	Wellawaya	3	10					2				Due to trees fallen on to the houses

Reports



Impact	2013
Deaths / Missing	126
Injured	218
Affected Population	495051
Houses Destroyed	543
Houses Damaged	10035

Summary of Damage and Losses 2000 - 2014

District	Deaths	Missing	Injured	Houses Destroyed	Houses Damaged	Affected
Ampara	10455	113	4979	16310	21601	1601439
Anuradhapura	30	0	57	4046	38253	1009647
Badulla	82	31	2262	36970	38143	2307147
Batticaloa	2880	918	141	3394	15025	3957962
Colombo	116	643	3525	7153	21025	1063029
Galle	4307	11	55	676	5103	451727
Gampaha	48	1	12	2113	3436	1009377
Hambantota	4566	102	512	18317	49786	1549373
Jaffna	2678	14	287	5087	15823	644348
Kalutara	366	74	151	692	5810	678335
Kandy	63	1	62	483	2154	142284
Kegalle	39	2	1	1310	8161	743480
Kilinochchi	566	0	24	27	2920	321526
Kurunegala	28	0	4	683	411	180257
Mannar	1	0	35	7283	3266	76523
Matale	18	7	1945	249	17699	420009
Matara	1449	1	57	29	3541	388995
Monaragala	43	0	5	646	4385	227061
Mullaitivu	3008	4	231	1383	9449	55647
Nuwara Eliya	71	0	72	913	5440	485774
Polonnaruwa	27	2	44	2344	9549	1389929
Puttalam	31	0	164	7515	3477	800920
Ratnapura	6409	18	559	1256	11532	711114
Trincomalee	119148	328195	20789654		37958	94816
Vavuniya					1256	

Summary of Damage and Losses 2000 - 2014

District	Deaths	Missing	Injured	Houses		Affected
				Destroyed	Damaged	
Ampara	10455	113	4979	16310	21601	1601439
Anuradhapura	30	0	23	4046	38253	1098647
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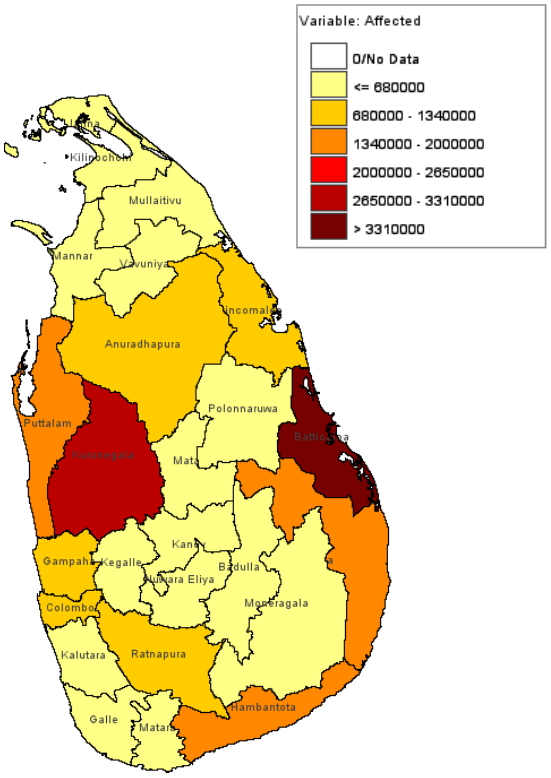
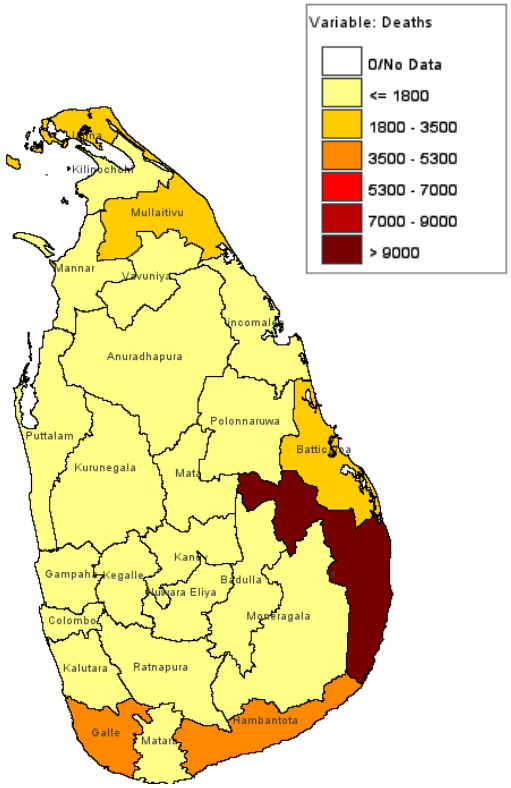
Ratnapura	295	34	164	2344	11532	800920
Trincomalee	1084	38	6409	7515	33958	711114
Vavuniya	8	0	18	559	1256	94816
TOTAL	**32261**	**2044**	**21075**	**119148**	**328195**	**20789684**

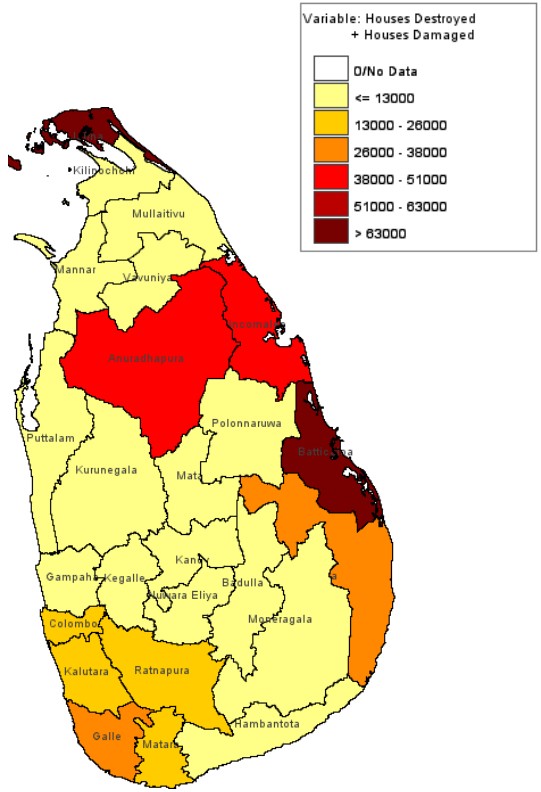
Distribution of Damage & Losses



Number of Affected Population



Number of Deaths



Number of Houses Damaged and Destroyed

Highlights of Disaster Damage and Losses During 2000 - 2014

- ❖Highest deaths are reported in Ampara District (Tsunami 2004)
- ❖Highest number of population affected in Batticaloa District (due to floods and cyclone) and Kurunegala Ditrict (by Drought)
- ❖Housing damge is prominent in Batticaloa and Jaffna Districts

3

HAZARD PROFILES DEVELOPMENT FOR SRI LANKA

2008 - 2012

Floods	Department of Irrigation
Landslides	NBRO
Drought	Department of Agriculture
Cyclone	Department of Meteorology
Lightning	
Tsunami	Coast Conservation Department
Sea Level Rise	
Storm Surge	
Coastal Erosion	

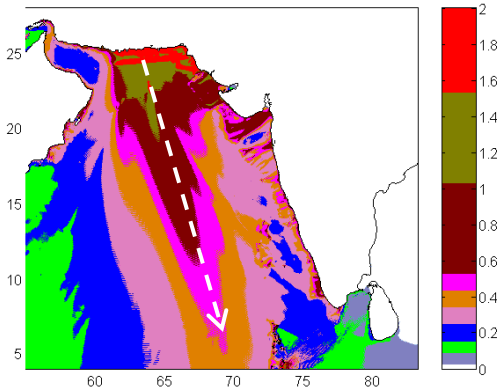
Launched on 26th December 2012

www.dmc.gov.lk

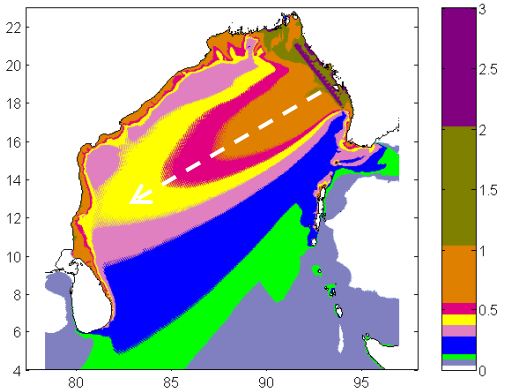
Tsunami Scenario Modeling

Tsunami Scenarios…

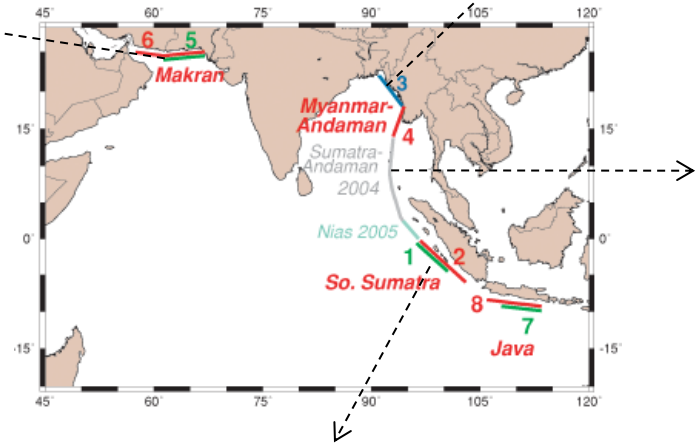
Max. Tsunami Amplitude

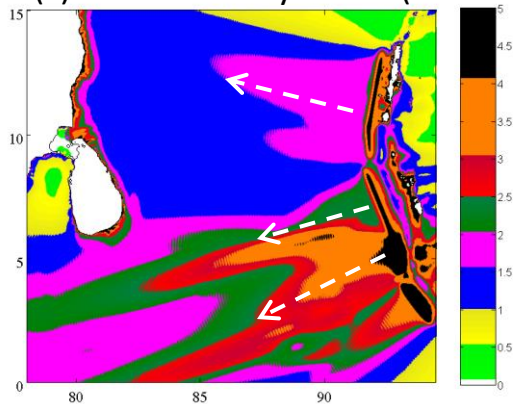


(*c*) Makran off Iran & Pakistan (Mw=8.8)

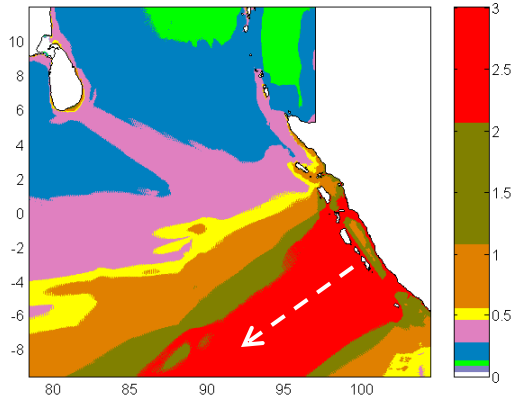


(*c*) Arakan off Myanmar (Mw=8.8)





(*a*) Northern Andaman - Sumatra (Mw=9.3)



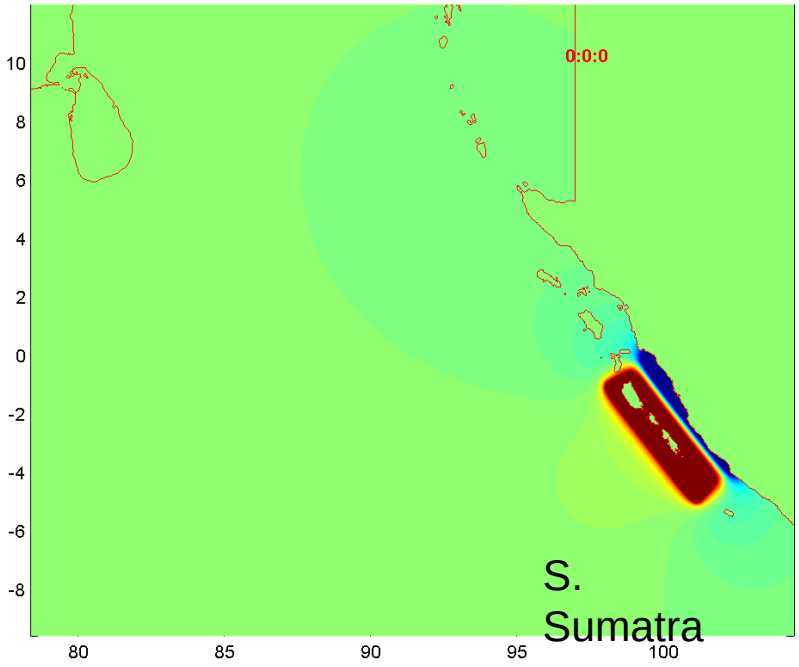
(*b*) Southern Sumatra (Mw=9.3)

‘Maximum-Credible’ Tsunami Scenarios in the Indian Ocean Basin

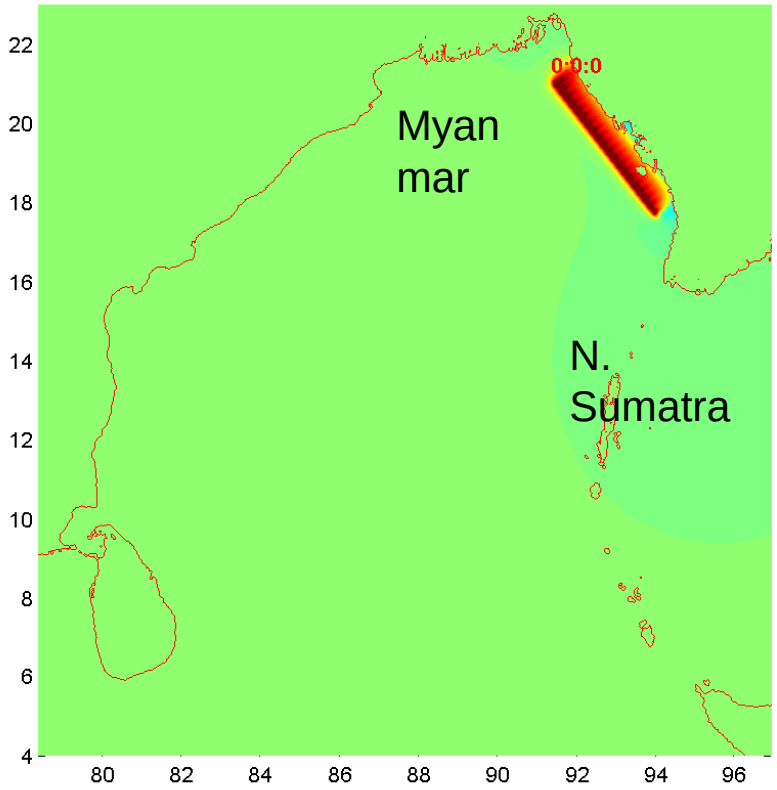
Maximum ‘Tsunami Heights’

Source: Dr. Janaka Wijetunga
University of Peradeniya

Tsunami due to an Earthquake of Mw = 9.3 in Southern Sumatra Seismic Zone

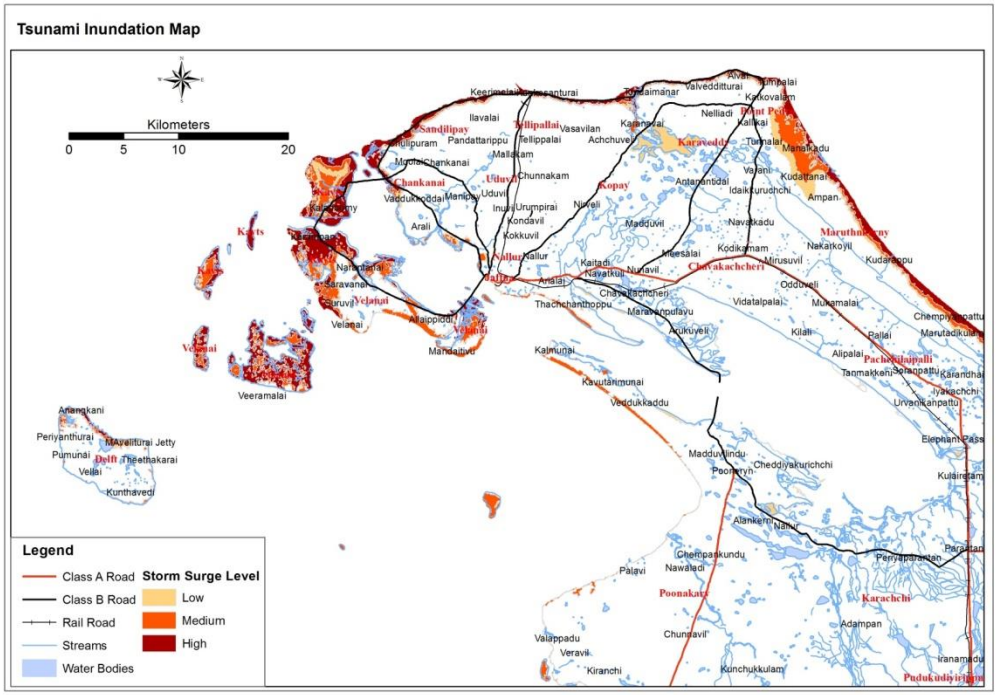


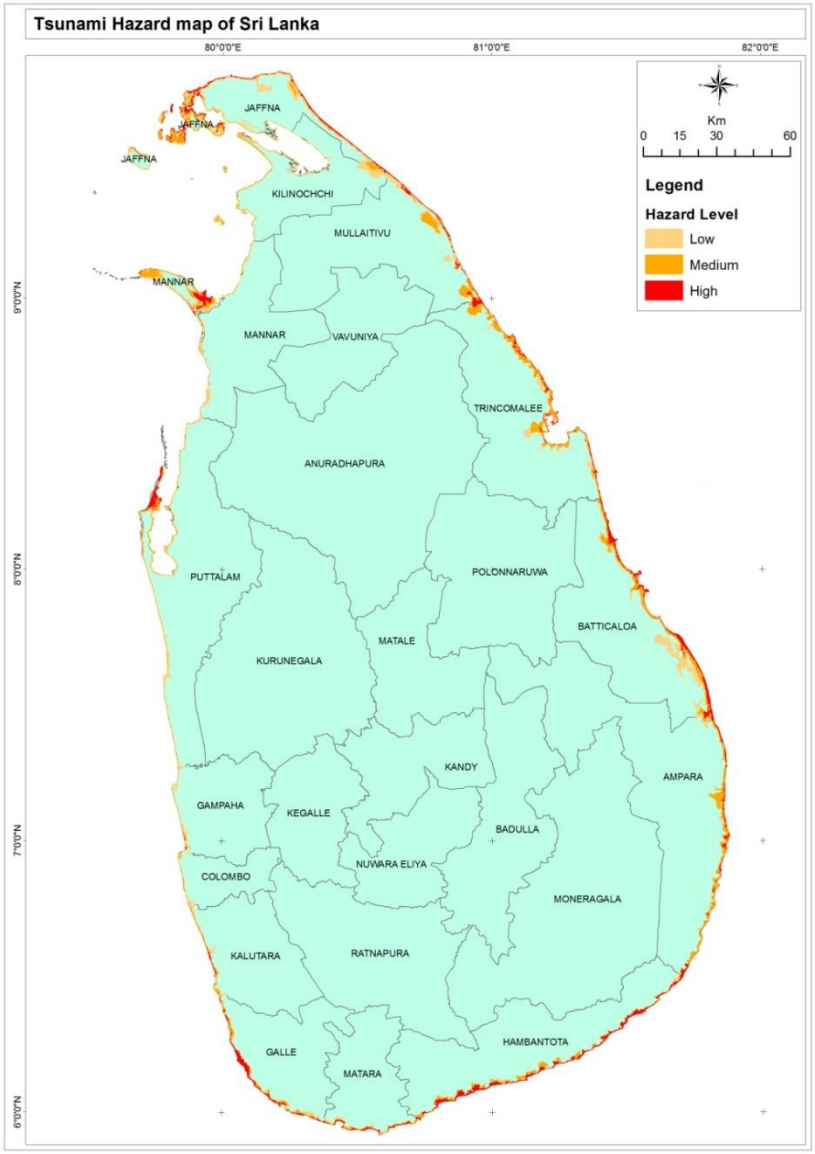
Tsunami due to an Earthquake of Mw = 8.8 in Arakan Seismic Zone off Myanmar

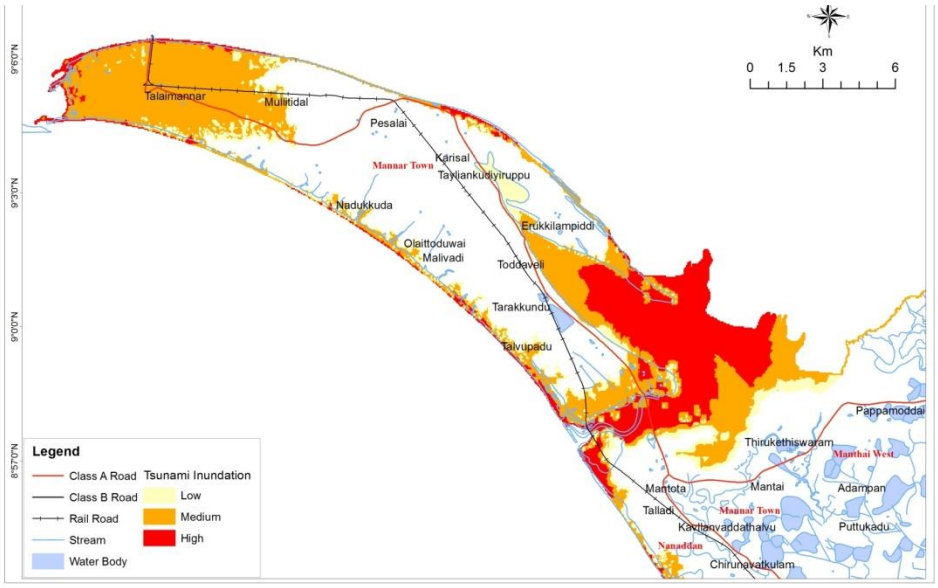


Source: Dr. Janaka Wijetunga
University of Peradeniya

Tsunami Hazard Map

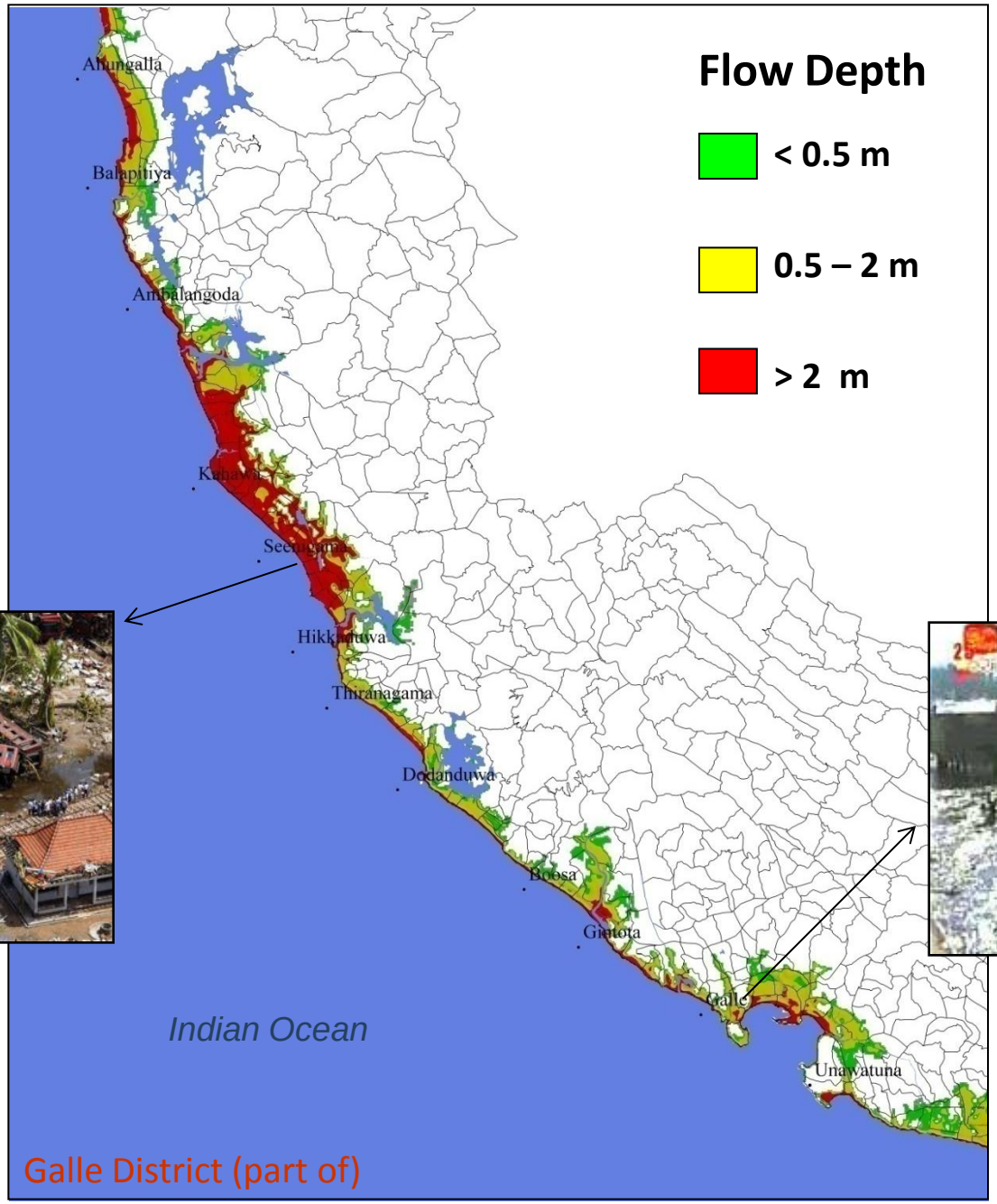






Tsunami Inundation Map – District Level (Galle)

Computed inundation distribution due to an event similar to 2004 tsunami

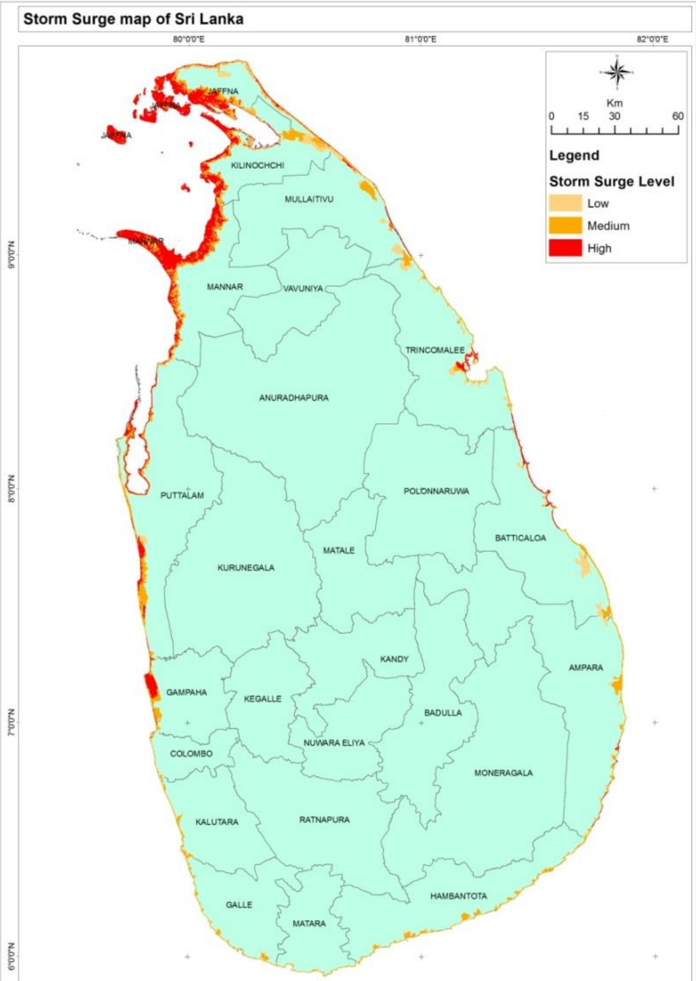


MAP LOCATION

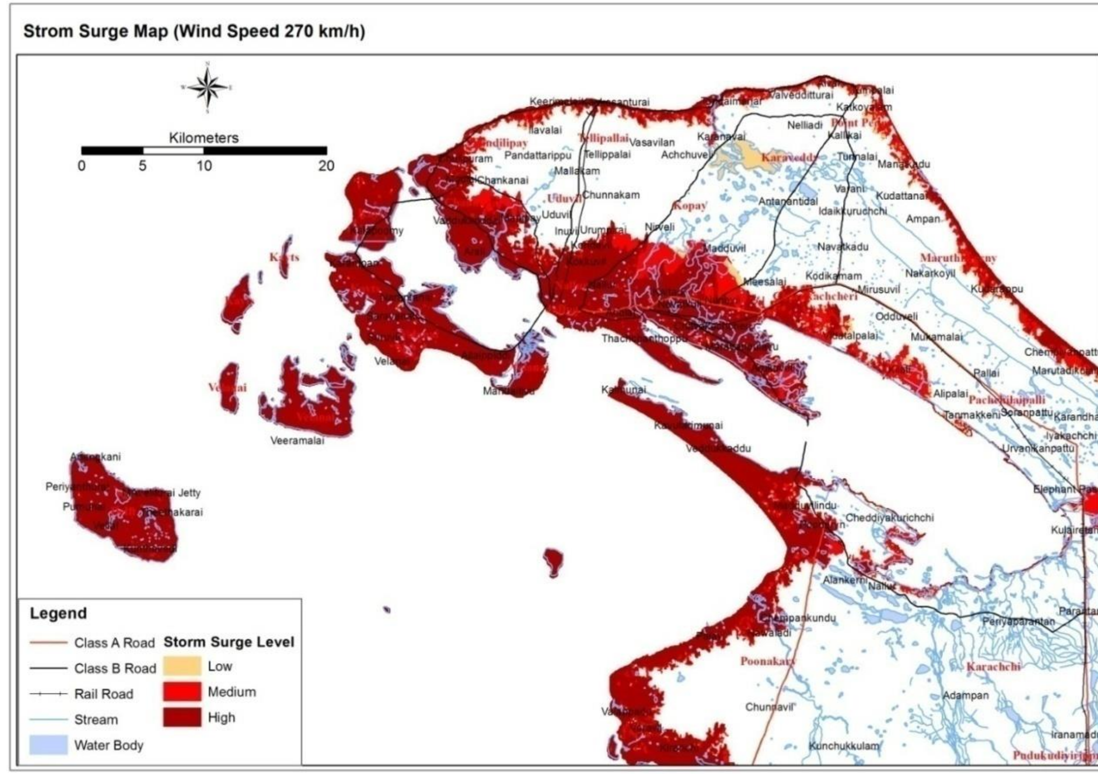
Peraliya - Train Tragedy

Galle - Bus Station

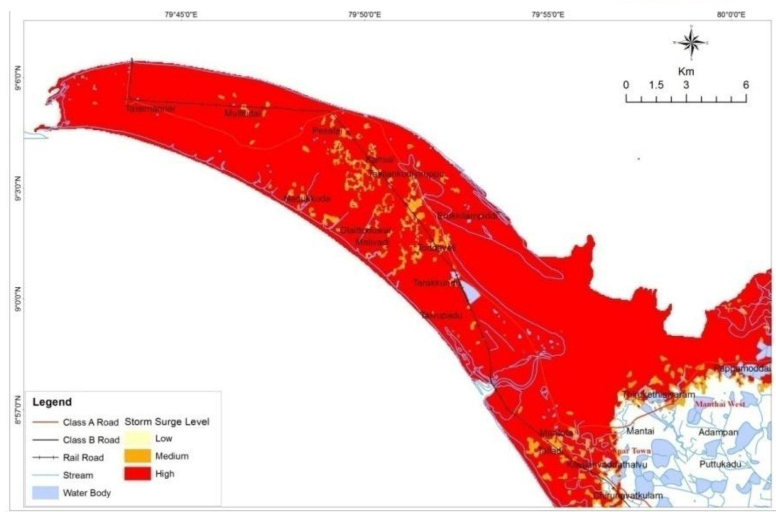
Storm Surge



Storm Surge map of Sri Lanka
80°0'0"E
81°0'0"E
82°0'0"E
Km
0 15 30 60
Legend
Storm Surge Level
Low
Medium
High
JAFFNA
KILINOCHCHI
MULLAITIVU
MANNAR
VAVUNIYA
TRINCOMALEE
ANURADHAPURA
PUTTALAM
POLONNARUWA
BATTICALOA
MATALE
KURUNEGALA
KANDY
AMPARA
GAMPAHA
KEGALLE
BADULLA
COLOMBO
NUWARA ELIYA
MONERAGALA
KALUTARA
RATNAPURA
HAMBANTOTA
GALLE
MATARA

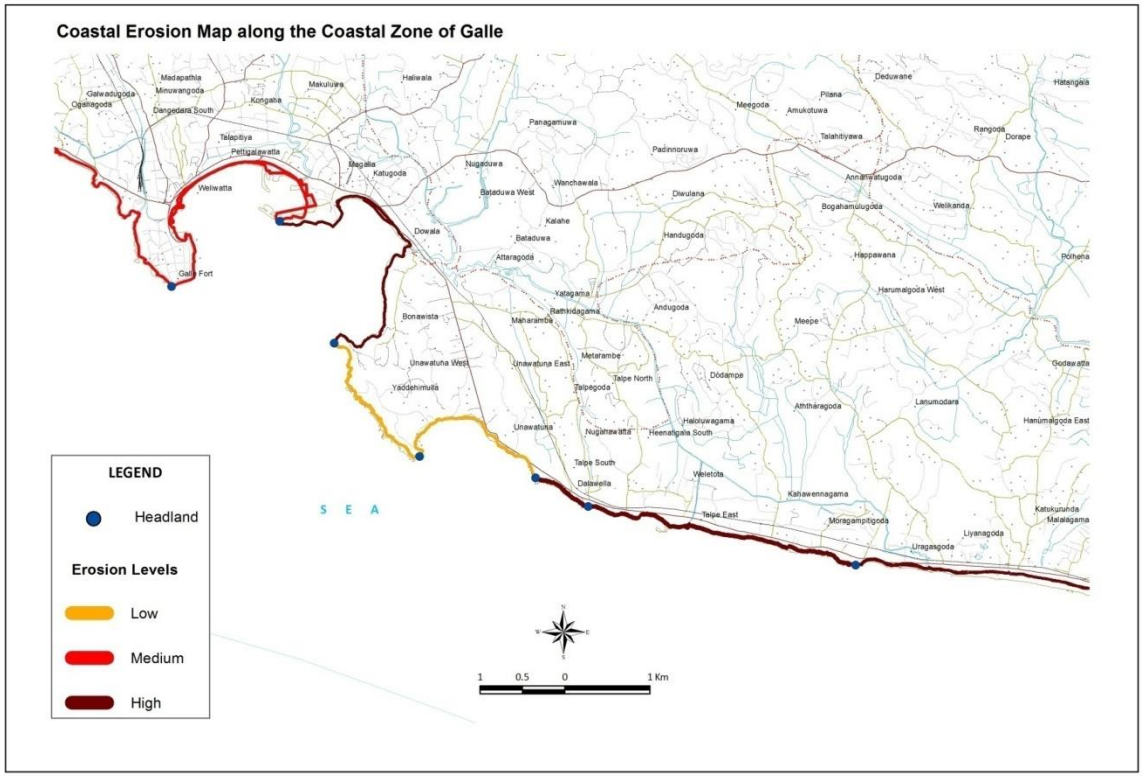


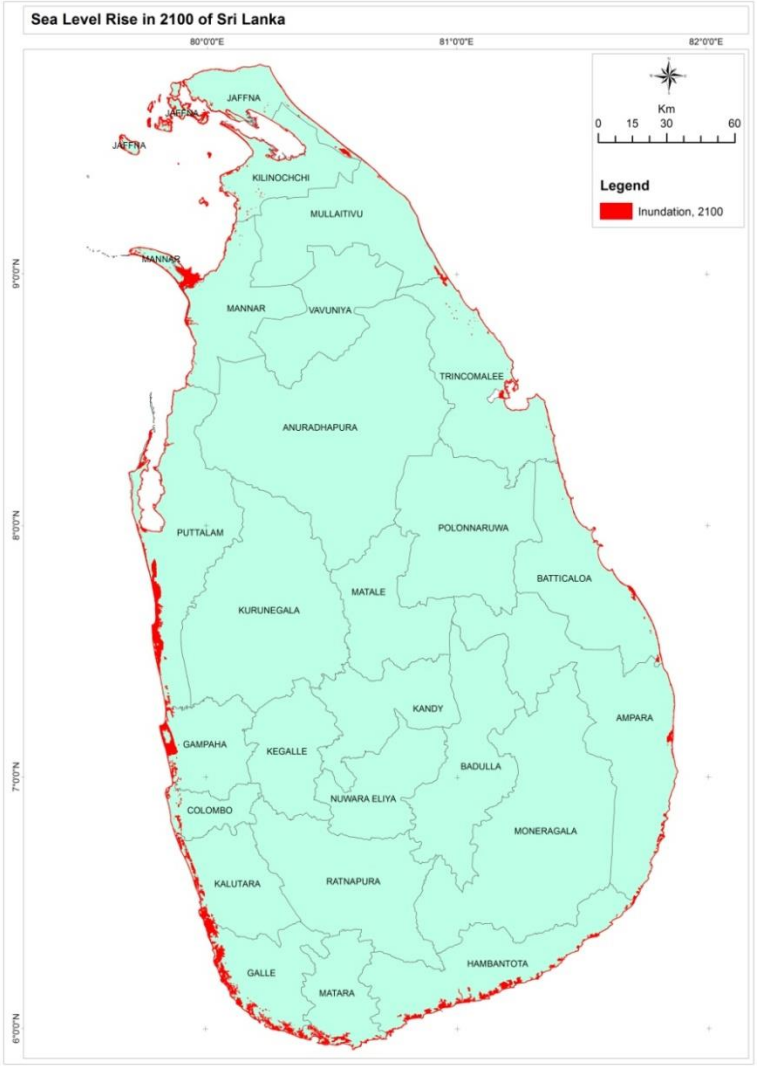
Strom Surge Map (Wind Speed 270 km/h)
Kilometers
0 5 10 20
Legend
Class A Road
Class B Road
Rail Road
Stream
Water Body
Storm Surge Level
Low
Medium
High
Veeramalai
Cheddiyakurichchi
Kunchukkulam
Adampan
Chunnakam



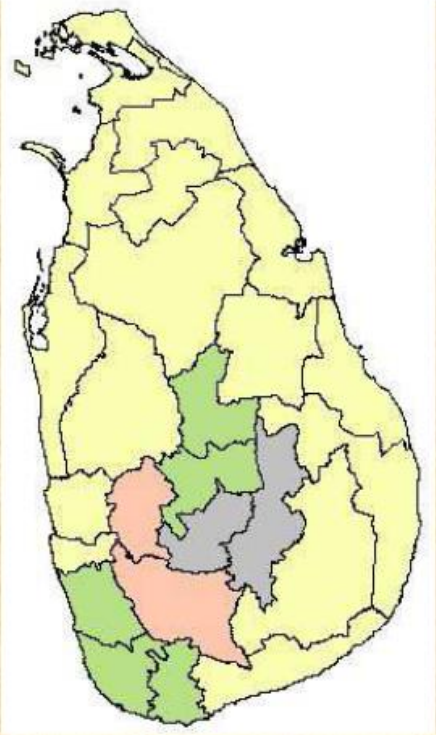
79°45'0"E
79°50'0"E
79°55'0"E
80°0'0"E
Km
0 1.5 3 6
Legend
Class A Road
Class B Road
Rail Road
Stream
Water Body
Storm Surge Level
Low
Medium
High
Mantai
Adampan

Coastal Erosion / Sea Level Rise

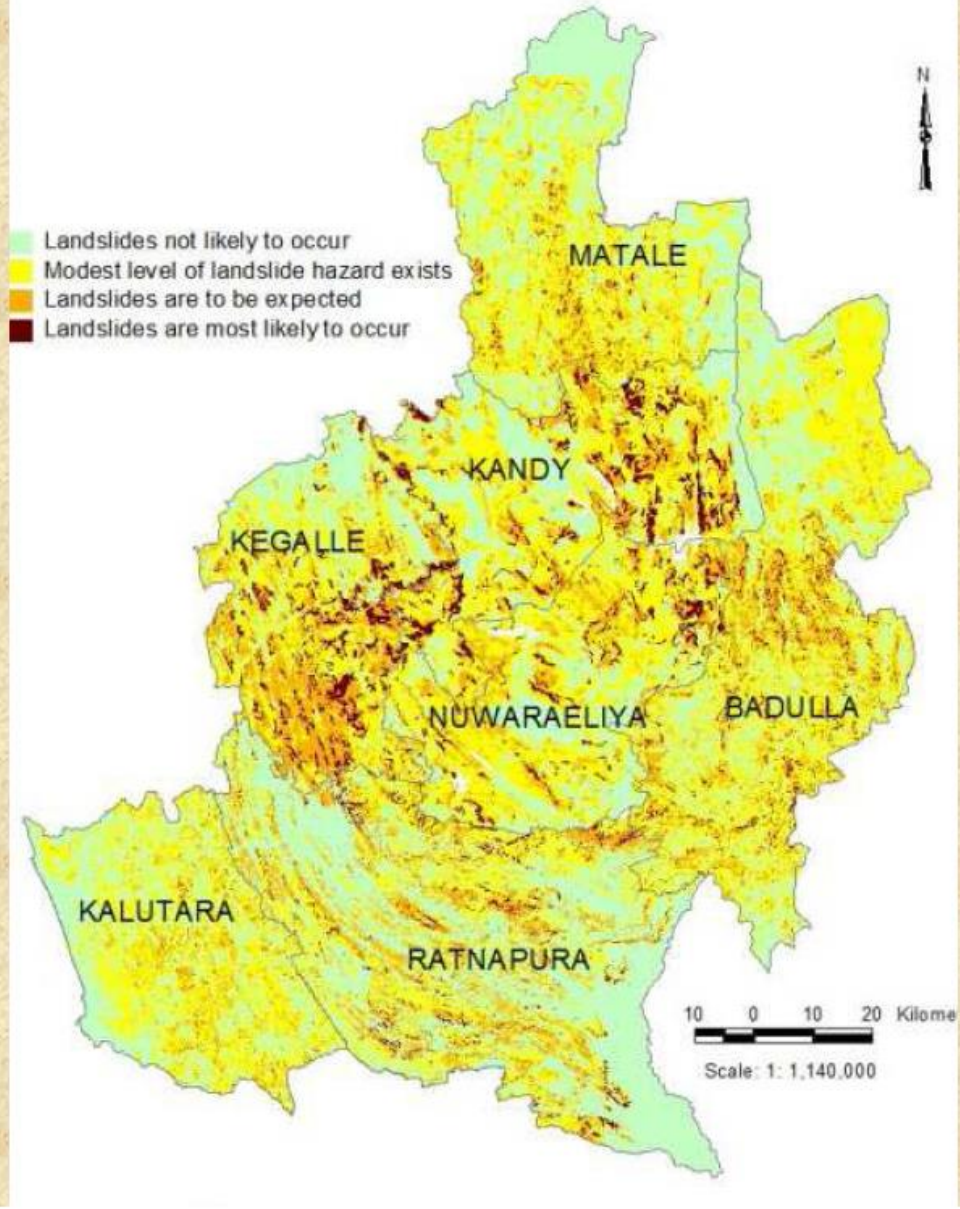




Landslide Hazard Mapping

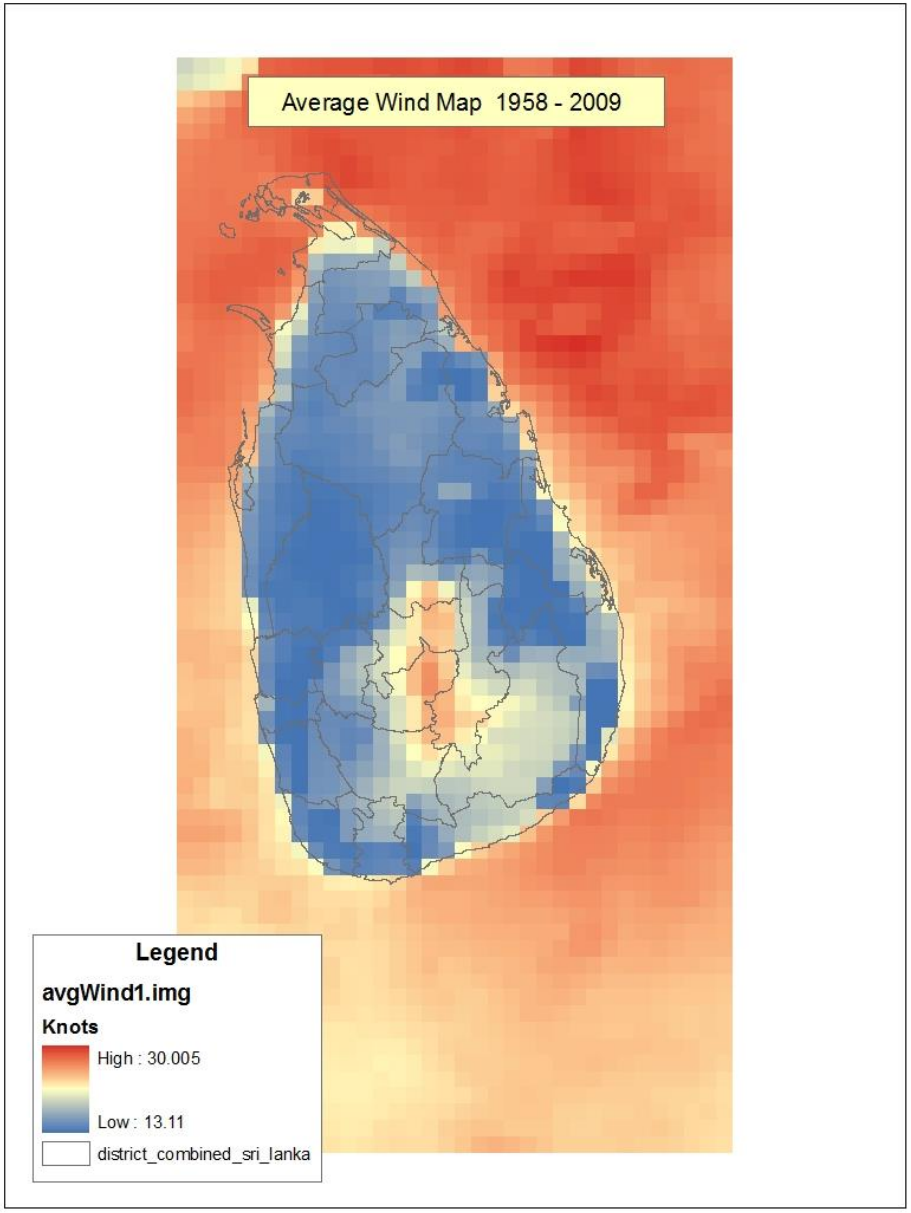


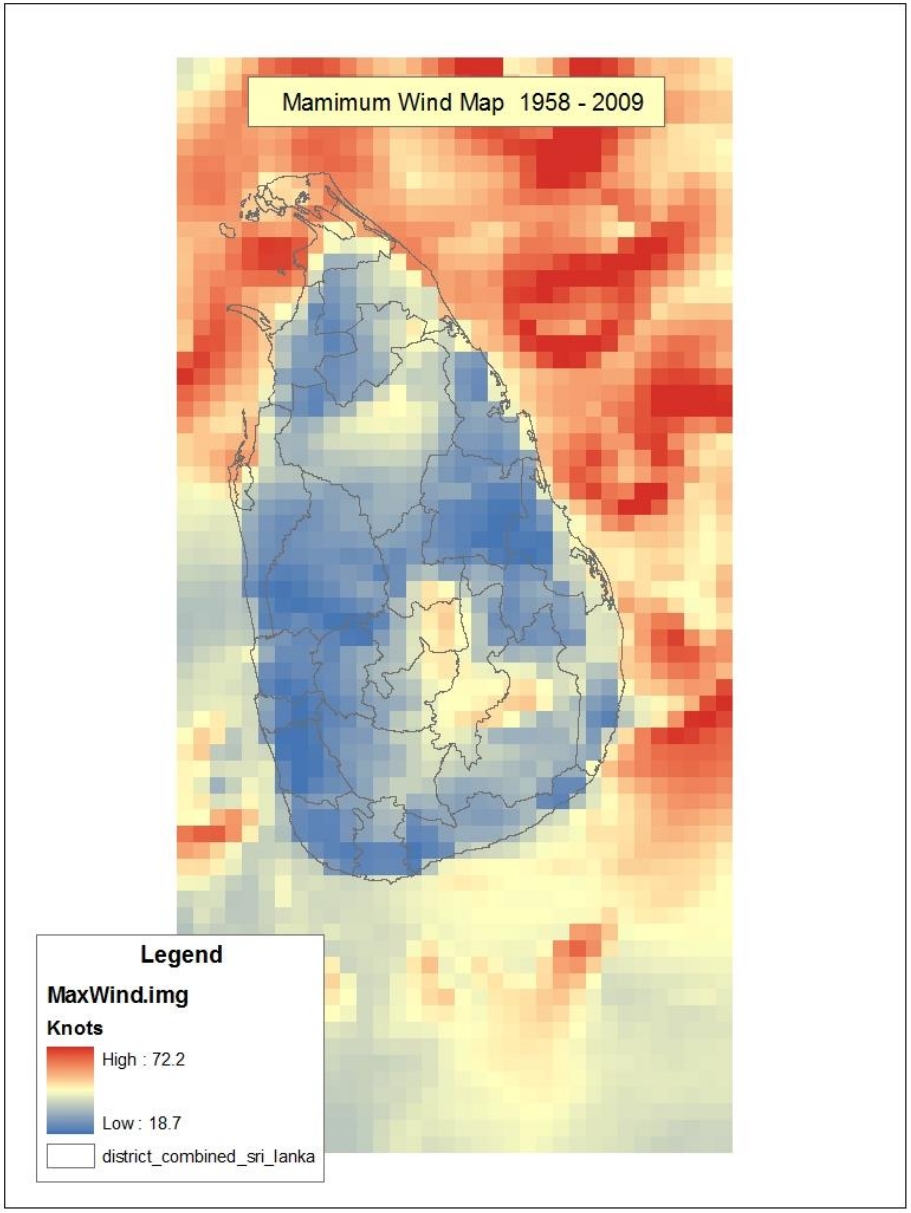
Scale
1:50000



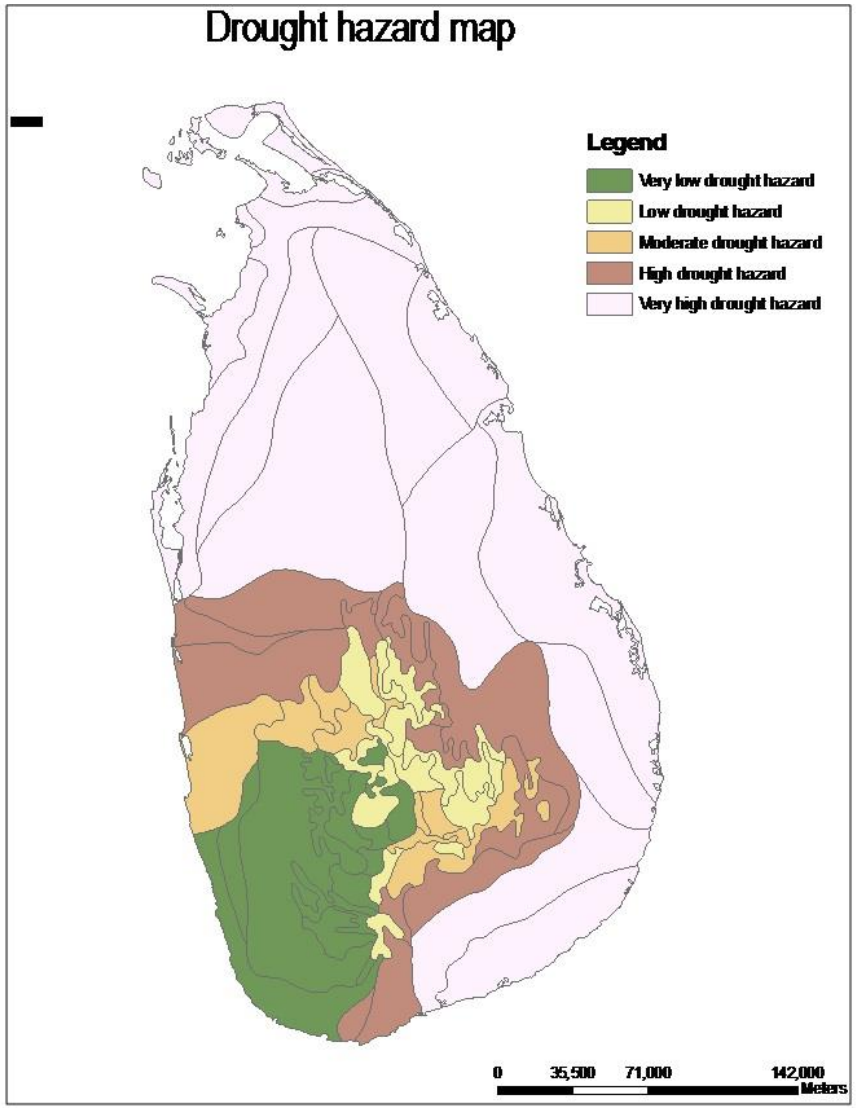
Source: NBRO

Cyclone & High Wind Hazard

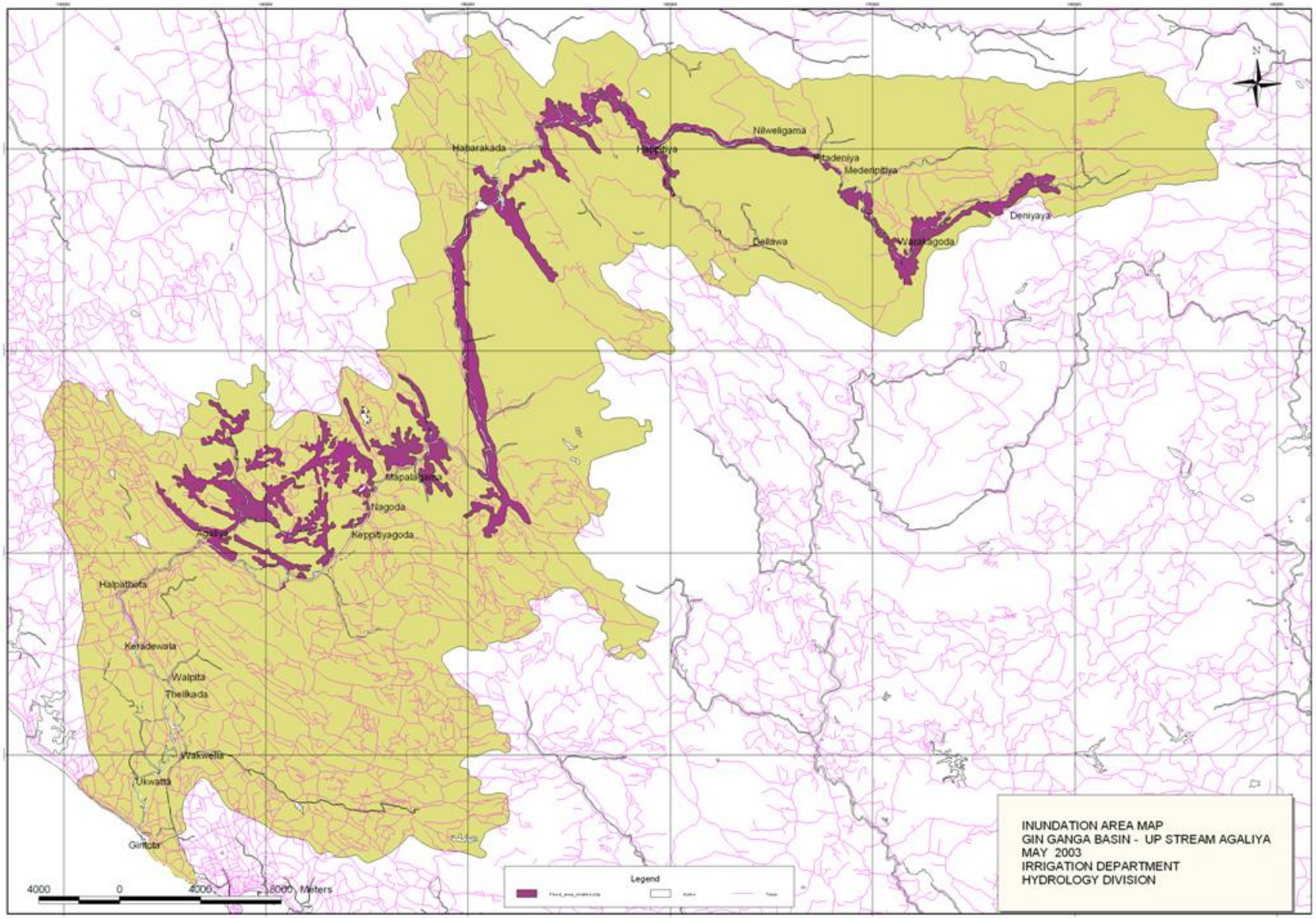


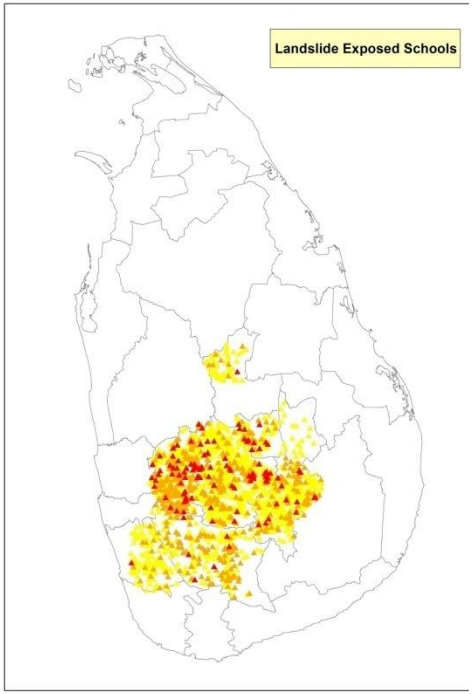


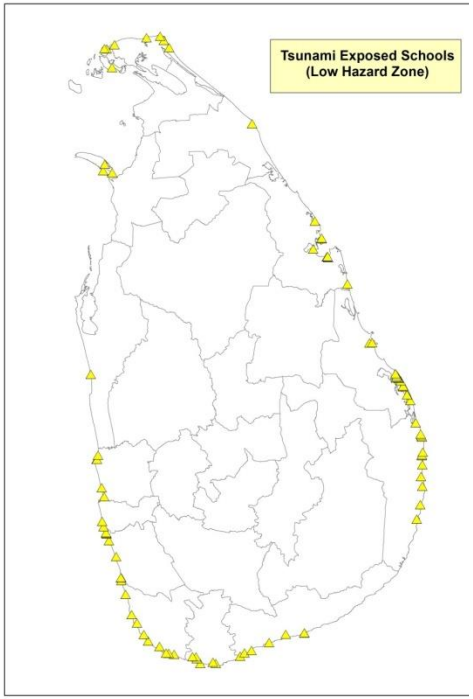
Drought Map

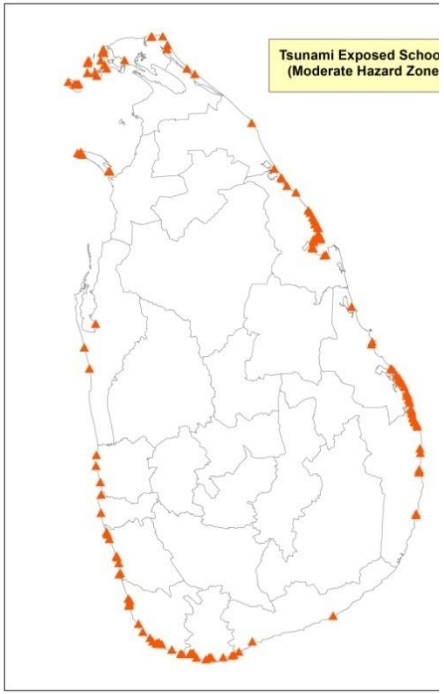

Drought hazard map
Legend
Very low drought hazard
Low drought hazard
Moderate drought hazard
High drought hazard
Very high drought hazard
0
35,500
71,000
142,000
Meters

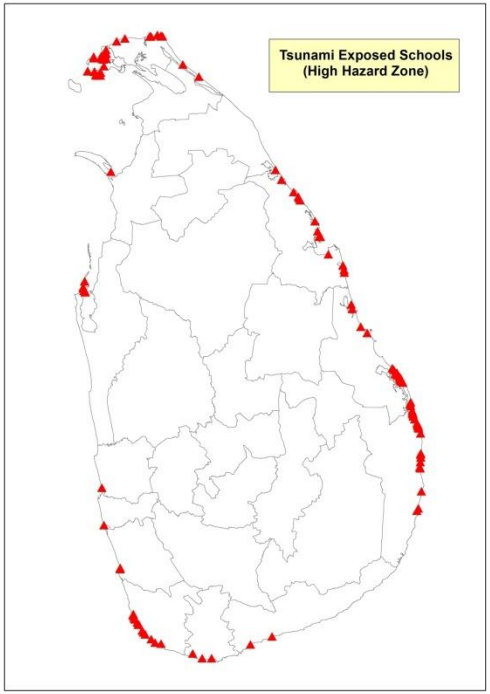
Flood Inundation Map - Gin Ganga





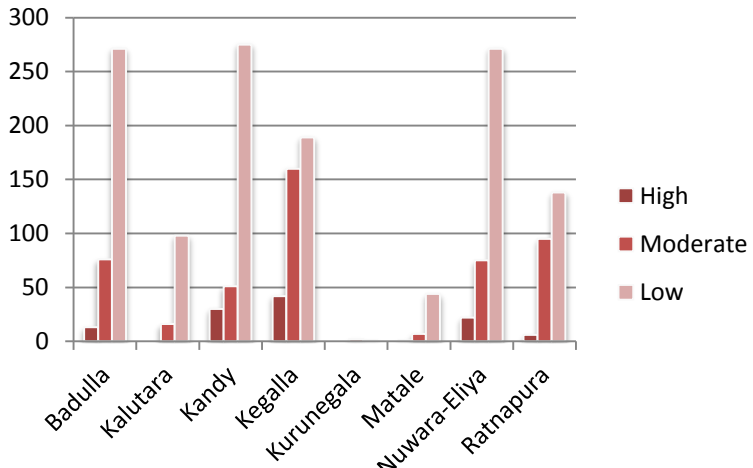




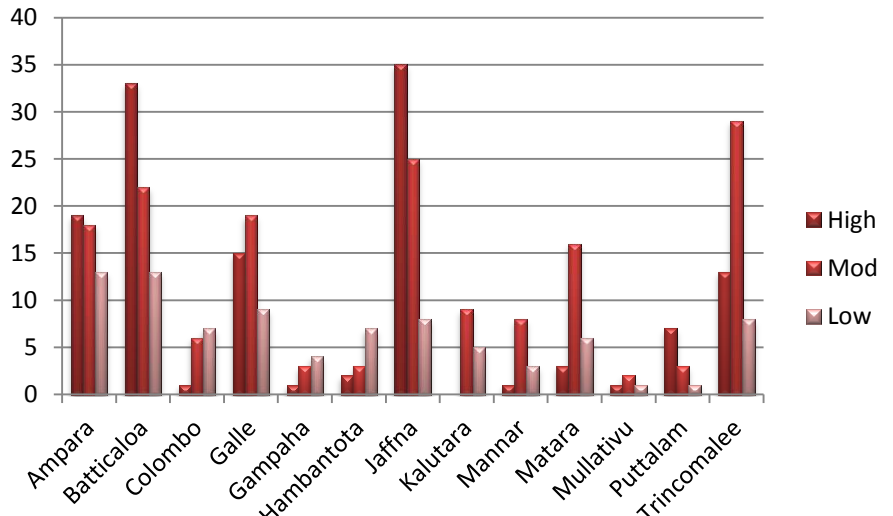


SECTOR LEVEL EXPOSURE MAPPING - Schools

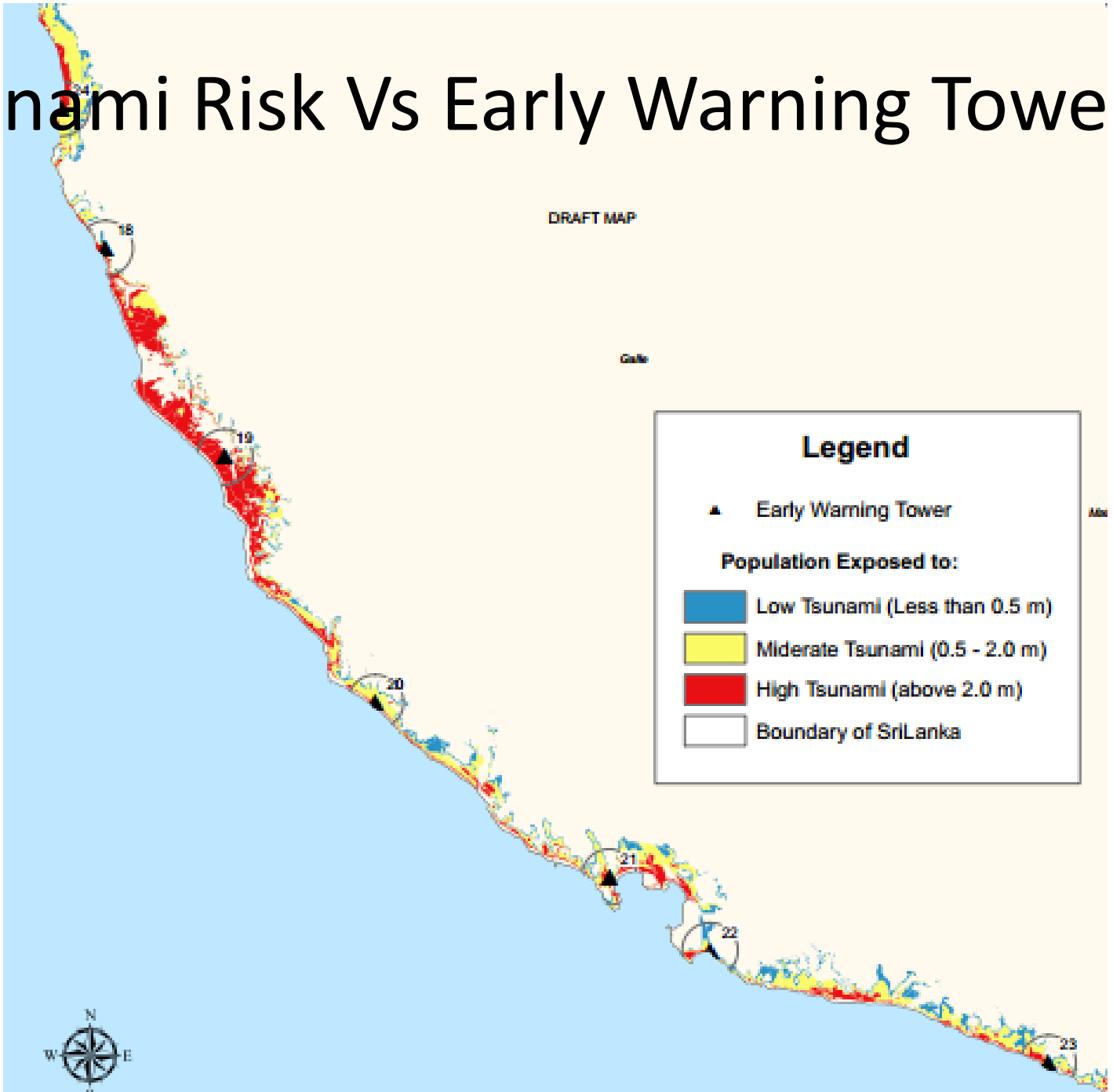
District Profile of Tsunami Exposed Schools

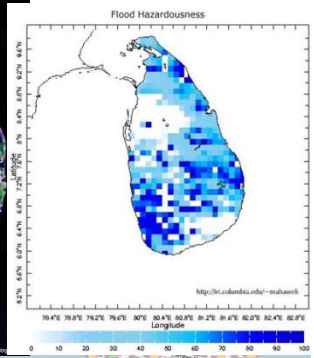


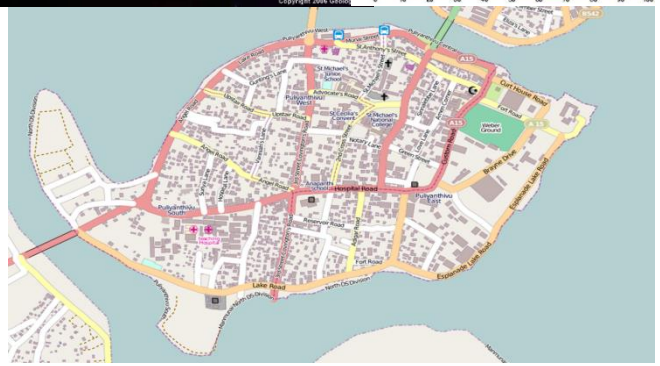
District Profile of Tsunami Exposed Schools



Tsunami Risk Vs Early Warning Towers







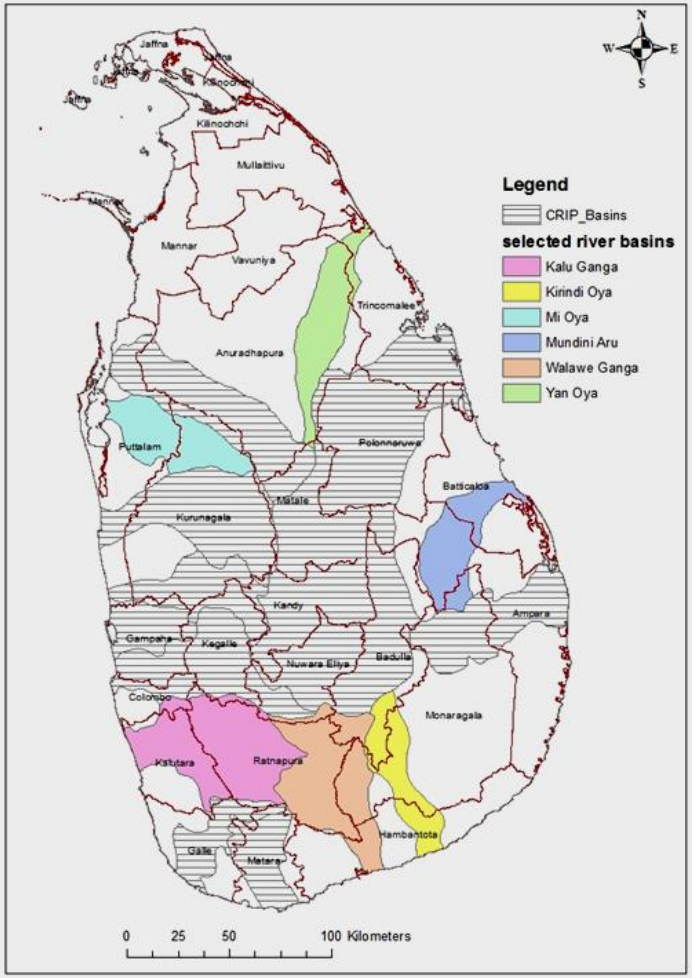
PHASE II
Development of Multi-Hazard Risk Profile for Sri Lanka 2016 - 19

Scope of Work

Risk Map Development for

- **Riverine Floods - 7 River basins**
- **Urban Floods - 23 Urban Cities**
- **Tsunami - (Northern Coast)**
- **Storm Surge - (Entire Coast)**
- **Drought – (Entire Country)**
- **Strong Winds / Cyclone – (Entire Country)**

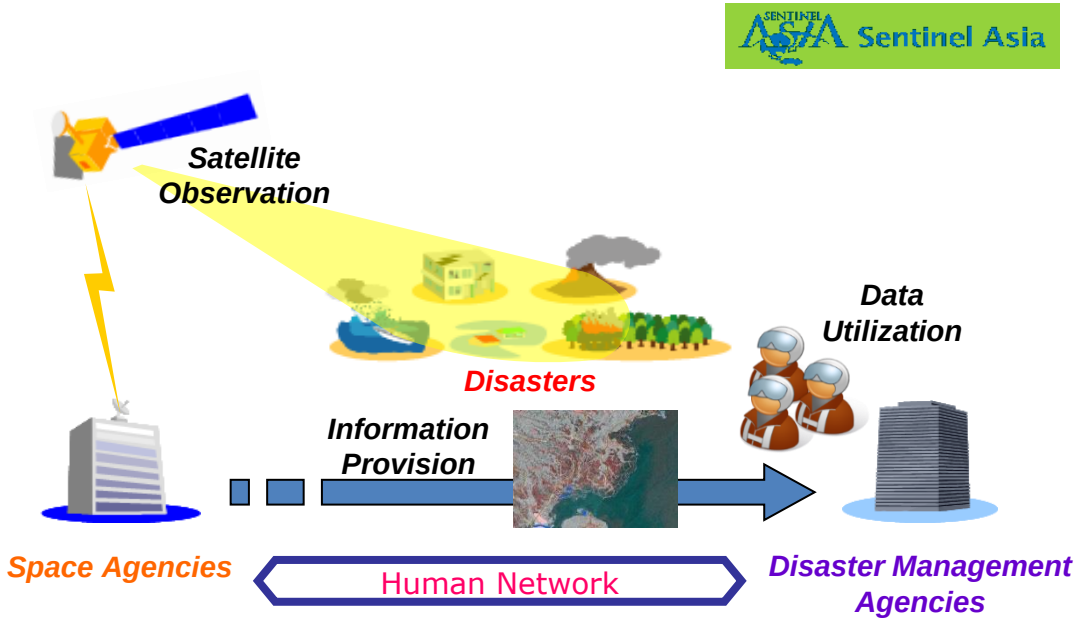
07 River Basins



Mundeni Aru Basin (1475 sqkm)
Kirindi (1230 sqkm)
Mi Oya (1113 sqkm)
Yan Oya Basin (1782 sqkm)
Walawe Ganga Basin (2596 sqkm)
Kalu Ganga (2976 sqkm)
Bolgoda Oya (366 sqkm)

4

Earth Observation in Disaster Monitoring
SENTINEL ASIA / INTERNATIONAL CHARTER



- **Disaster Management Centre** officially started SAS Operations since **February 2009**
- 08 emergency successful activations
- Became Data Analysis Node (DAN) in 2010
- WINDS receiver has been established in 2011

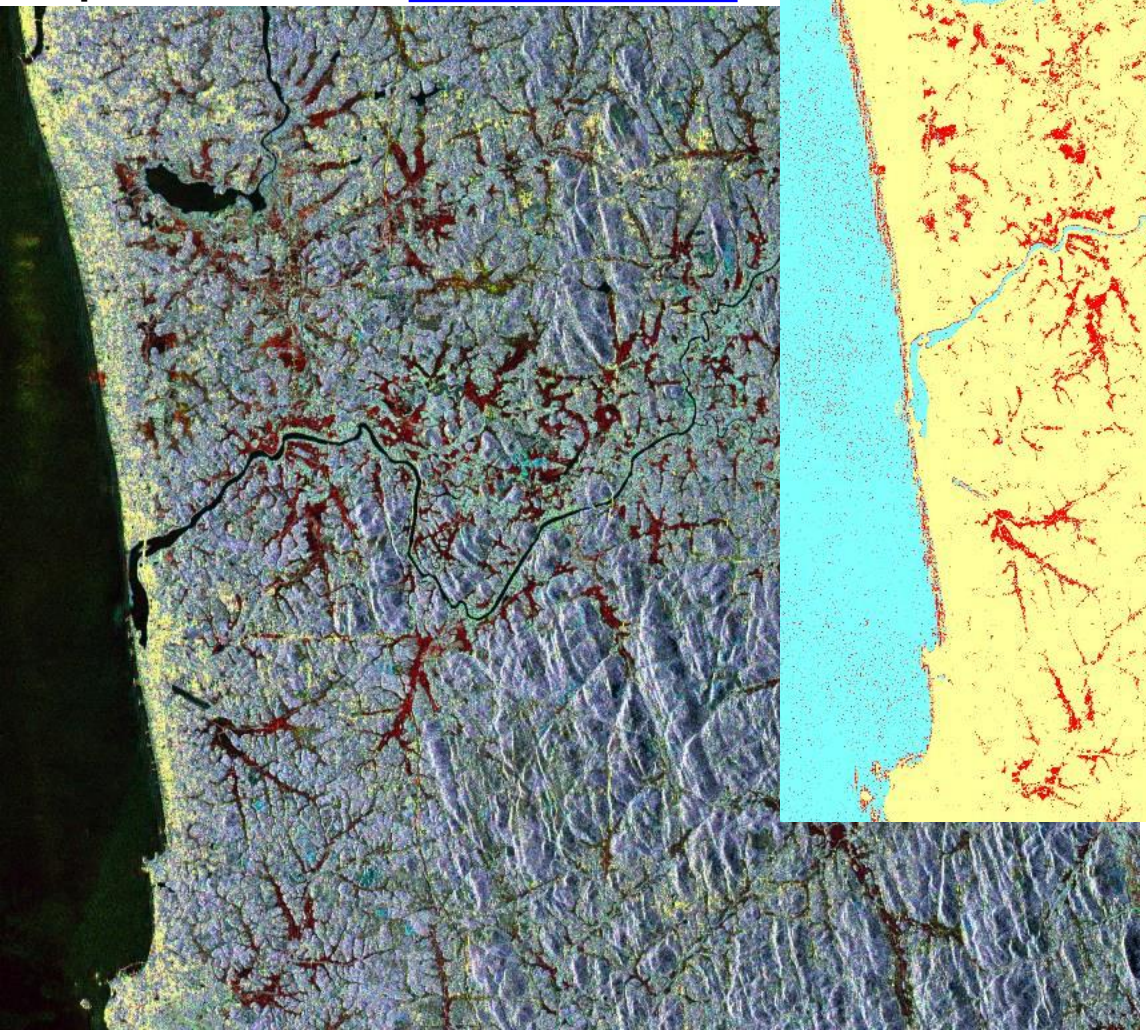
Summary of Earth Observation by Sentinel Asia / Intnl Charter

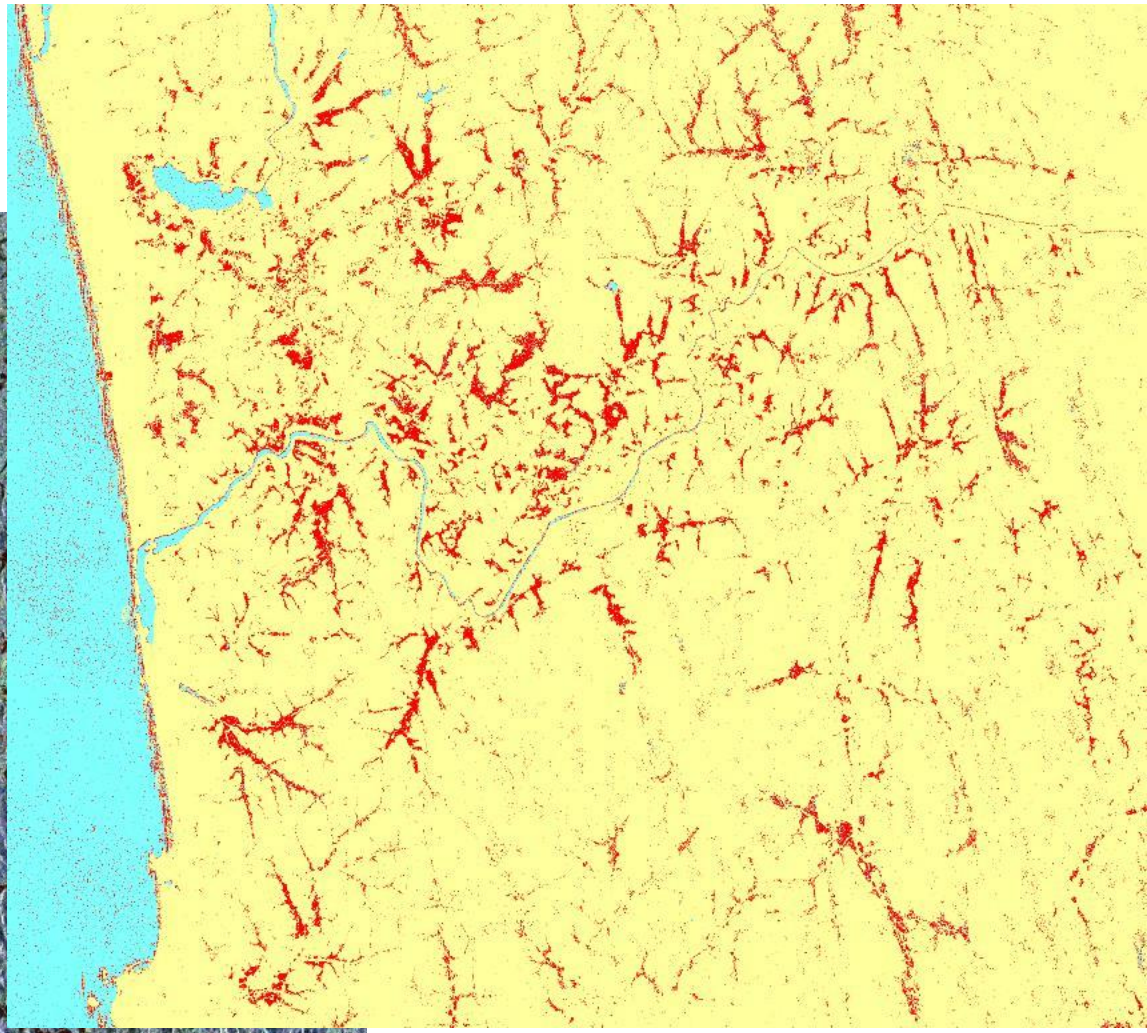
	Disaster Type	Activation Requested	Observation Conducted	Map Disseminated	Peak Time of Disaster	Data	Result
1	Floods	17th Dec 2009	18 Dec 2009	No map generated	16 Dec 2009	ALOS Prism	Un successful due to cloud
2	Floods	17 May 2010	19 May 2010	20 May 2010	18 May 2010	ALOS Palsar	Successful
3	Floods	08 Dec 2010	09 Dec 2010	10 Dec 2010	8-10 Dec 2010	ALOS Palsar	Successful
4	Floods	11 Jan 2011	13 Jan 2011	14 Jan 2011	10-12 Jan 2011	ALOS Palsar	Successful
5	Floods	04 Feb 2011	06 Feb 2011	07 Feb 2011	03-05 Feb 2011	ALOS Palsar	Successful
6	Landslide	01 Nov 2014	02 Nov 2014	Not generated	30 Oct 2014	ALOS 2	Observation was Successful Results was **not Successful**
7	Floods	29 Sep 2015	01 Oct 2015	02 Oct 2015	30 Sep 2016	ALOS 2	Successful
8	Floods Landslide	1st observation 14 May 2016	16 May 2016	18 May 2016	30 Oct 2014	ALOS 2	Successful
9	Floods Landslide	1st observation 26 May 2017	28 May 2017	29 May 2017	26 May 2017	TerraSARx / Intnl Charter	Successful

Emergency Earth Observation

Use of Near Real Time Earth Observation for Emergencies

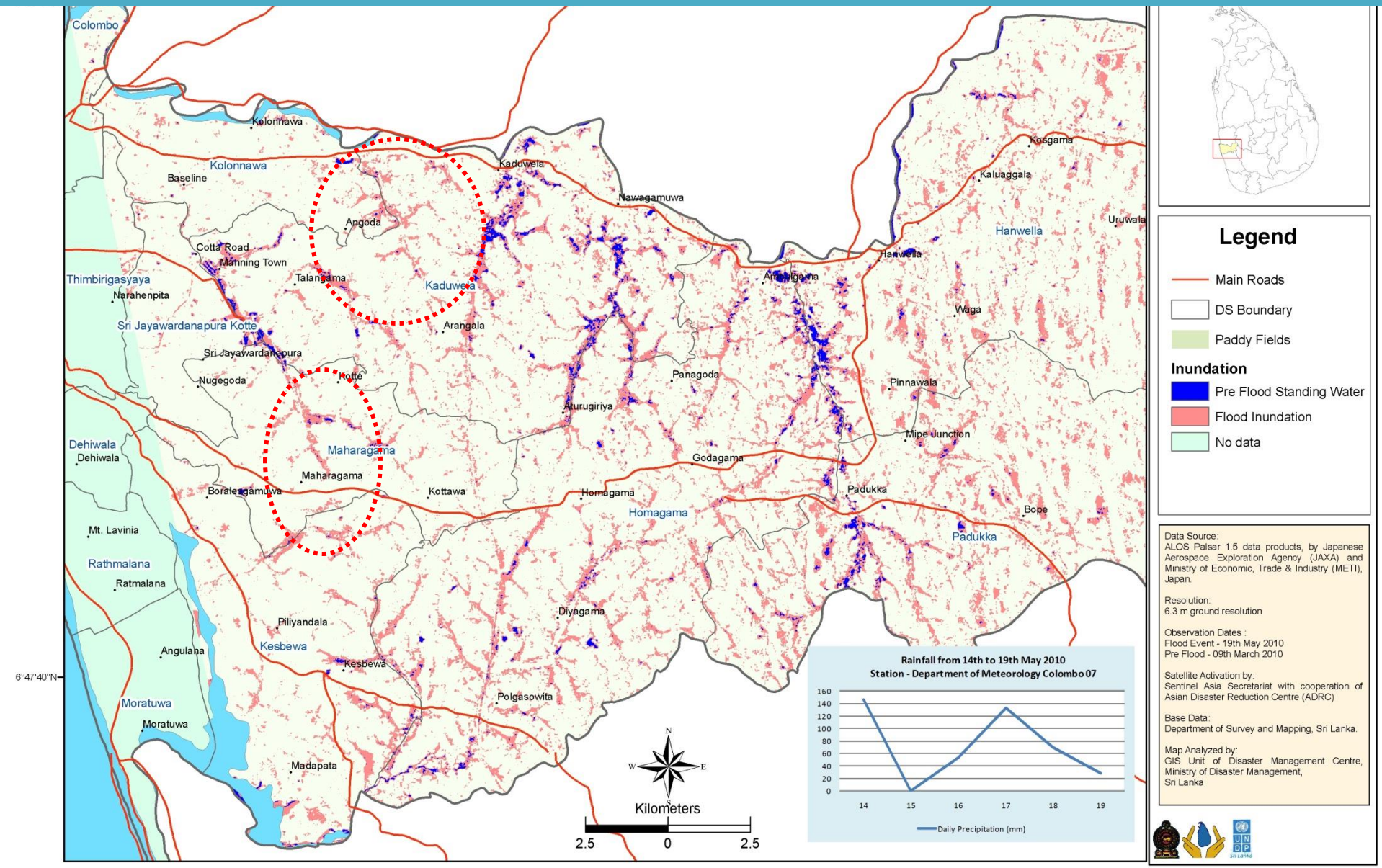
Maps are available www.dmc.gov.lk





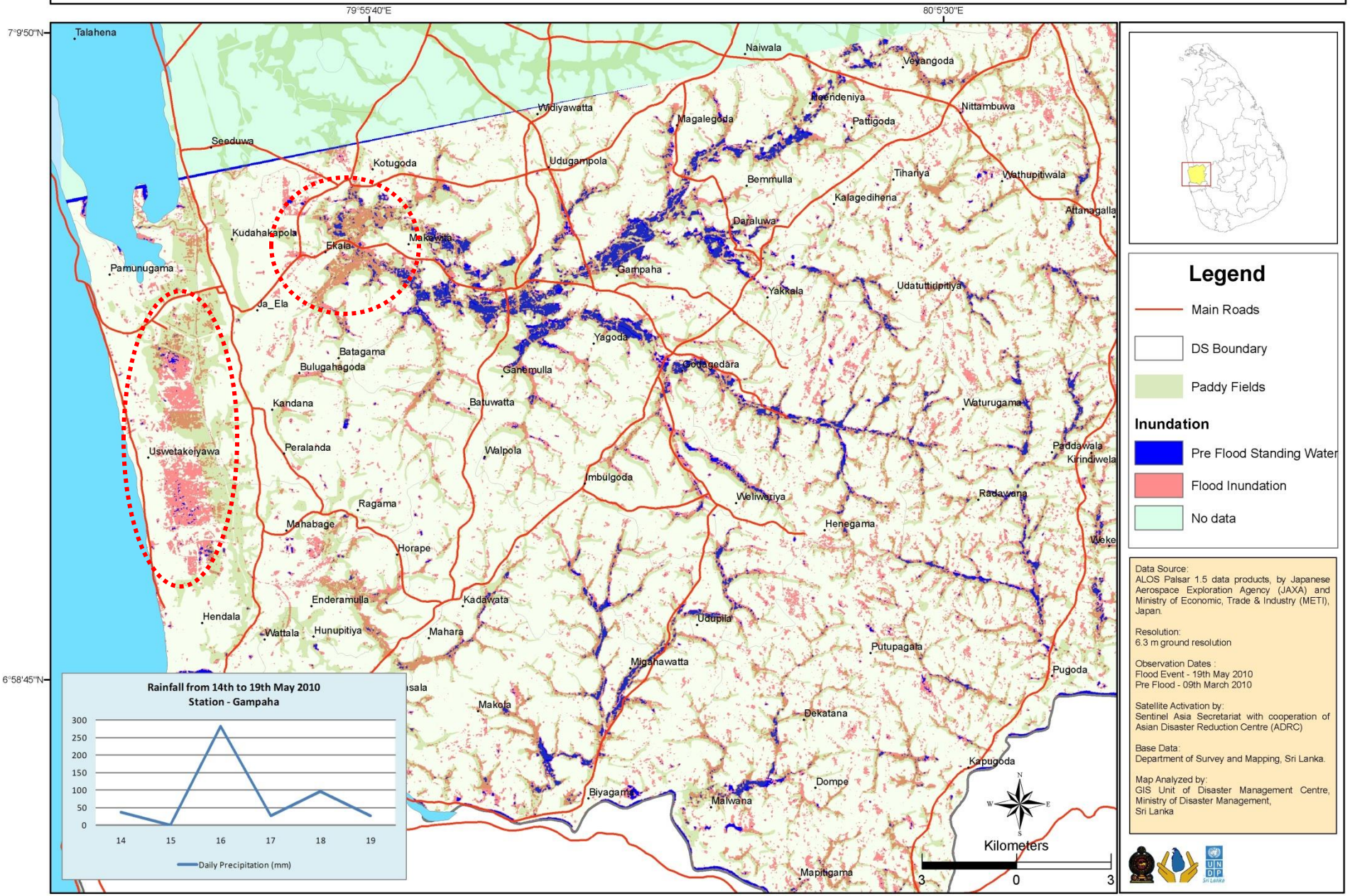
Kalutara District - Floods
2008/06/03 ALOS Data

Flood May 2010 Western Province



Flood Inundation Mapping, Gampaha District, Sri Lanka

Flood Inundation as at 19th May 2010



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

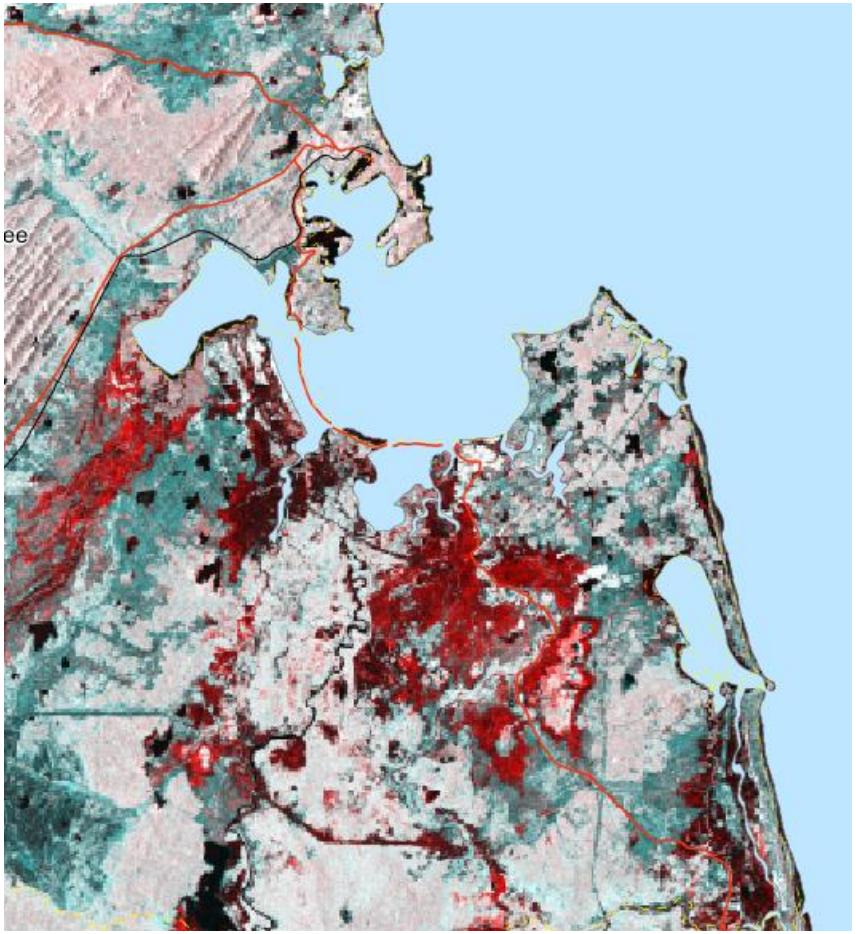
Observation Dates :
Flood Event - 19th May 2010
Pre Flood - 09th March 2010

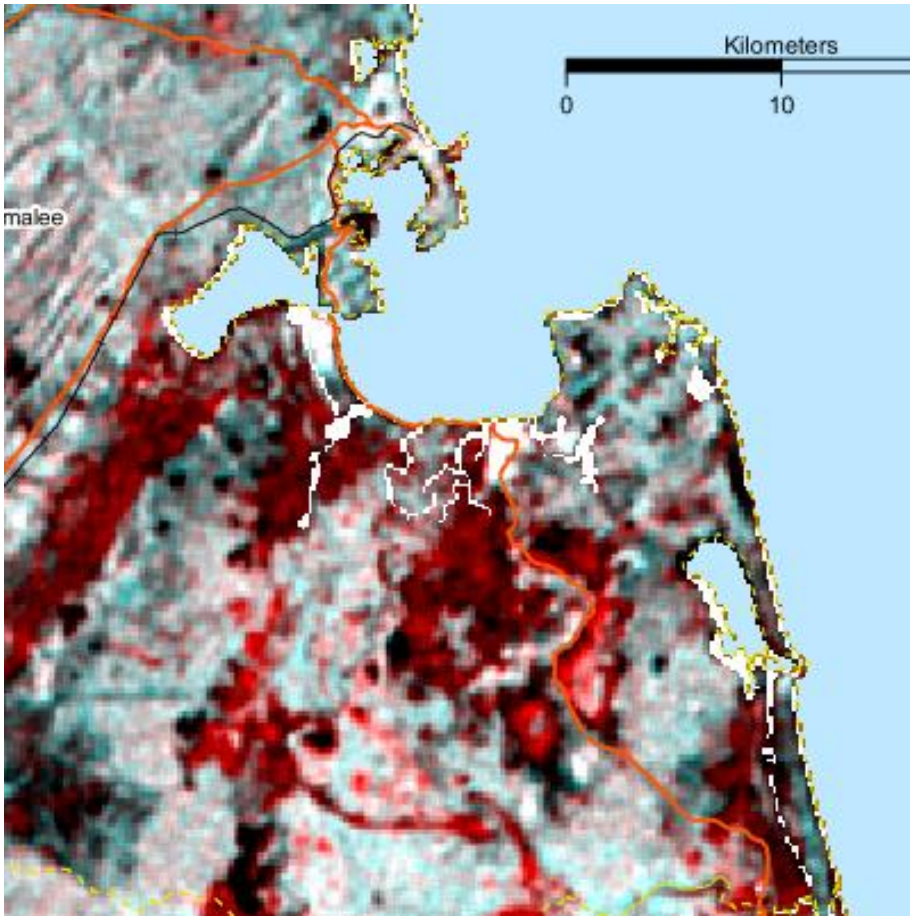
Satellite Activation by:
Sentinel Asia Secretariat with cooperation of Asian Disaster Reduction Centre (ADRC)

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 January & February 2011
Eastern Province Sri Lanka

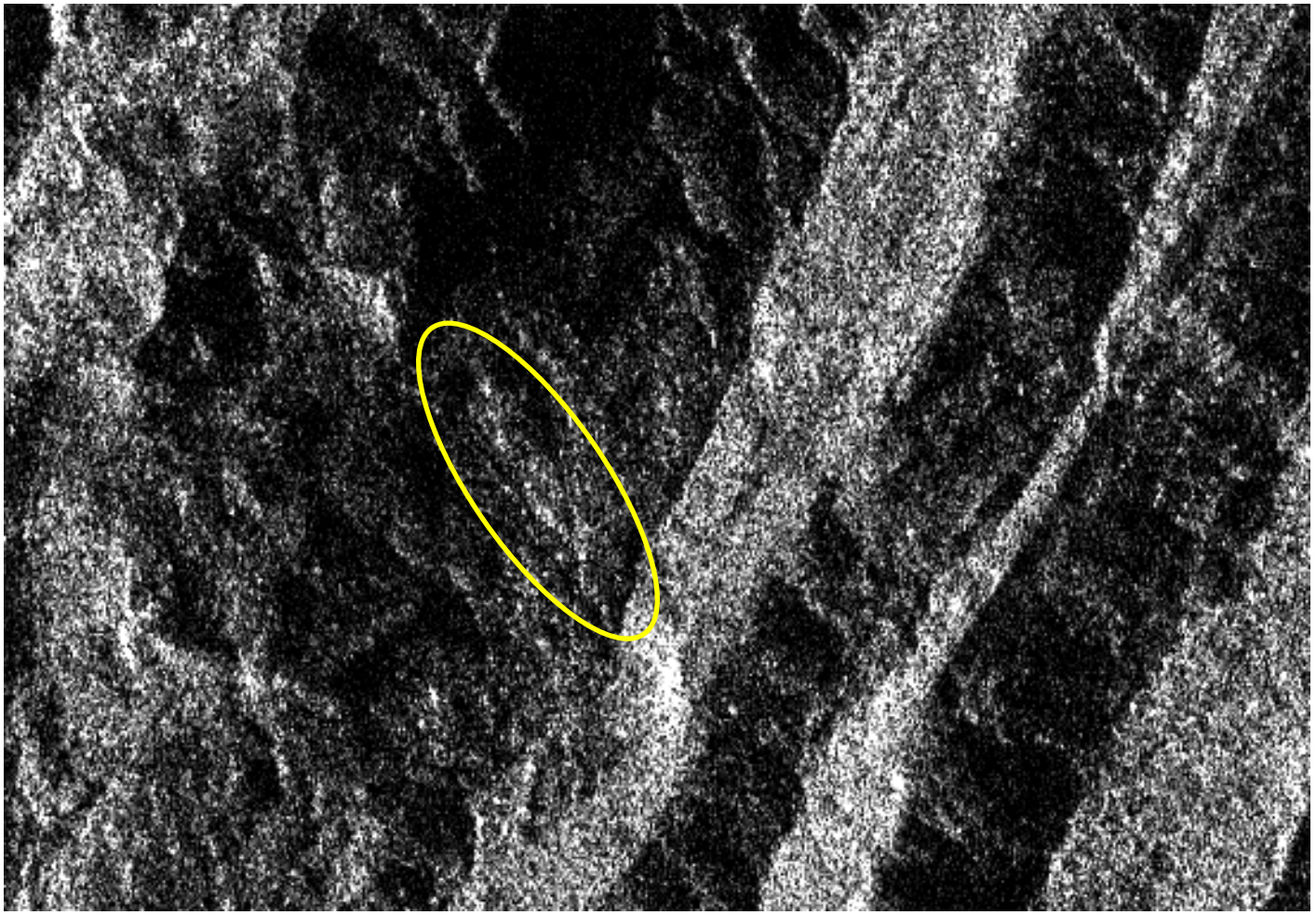




10.30 am 06th Feb. 2011 PALSAR 6m

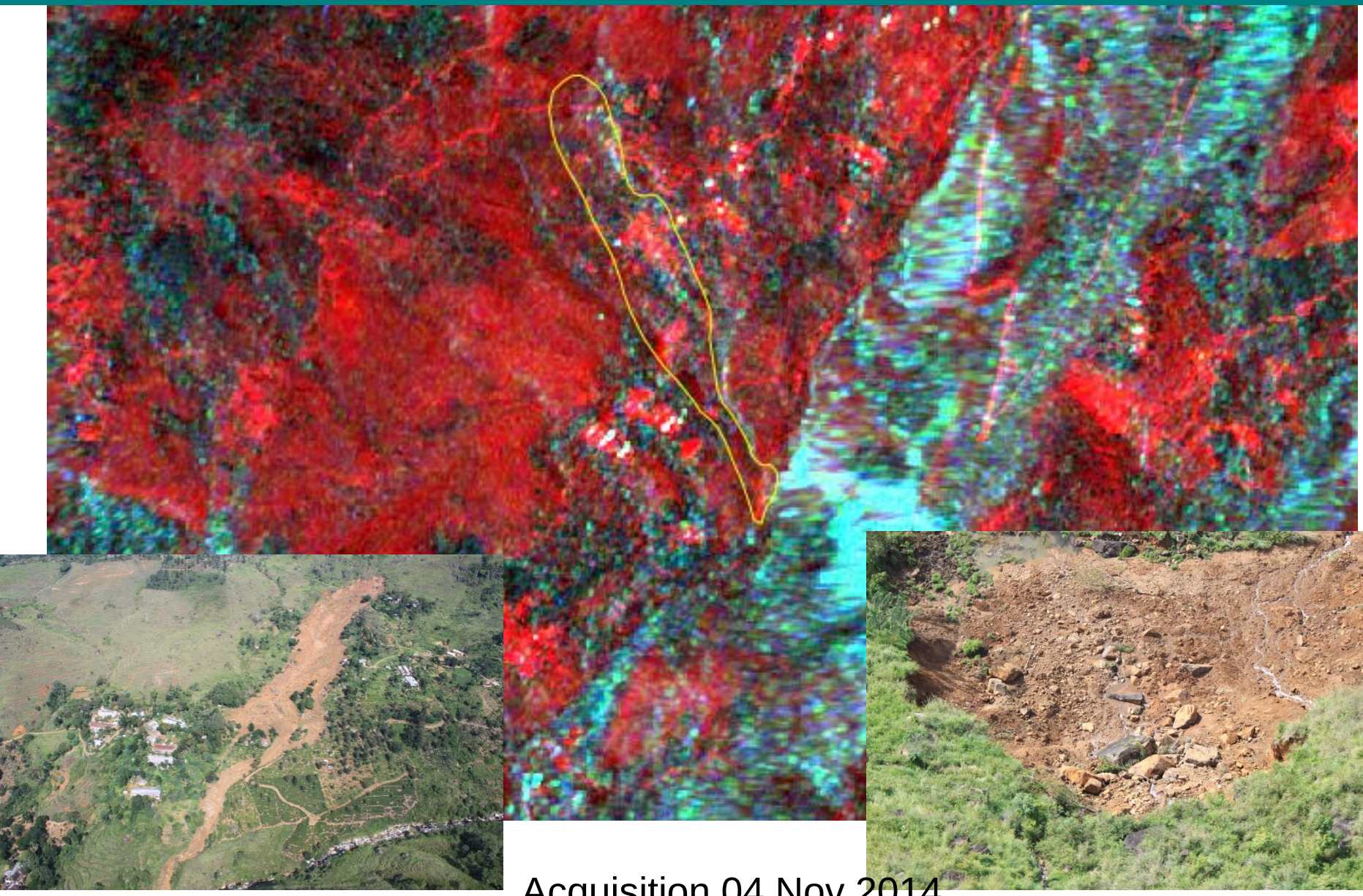
11.45 pm 06th Feb. 2011 PALSAR 100m

Meeriyabedda Landslide – Sentinel Asia (ALOS2)



Acquisition 31 Oct 2014

Meeriyabedda Landslide – Intnl Charter (Terra SAR X)

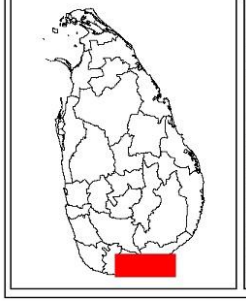


Acquisition 04 Nov 2014

Southern Province – September 30, 2015

Mapping Floods in Southern Provinces - Sri Lanka using ALOS-2 PALSAR-2 Satellite Images

02 October 2015 | FL-2015-0001-SL | Version 1.1



IWMI and DMC in close association with Sentinel Asia System (SAS) and JAXA activated the charter on October 1, 2015 to provide satellite images covering the Southern Provinces. SAS quickly provided images of 30 September 2015 and 1st October 2015 for its use in emergency response and relief operation. IWMI using the IFMAN tool processed the flood extent covering the districts of Hambantota, Galle, Matara, Monaragala and Ratnapura.

In total an area of 365 sq.km were inundated as viewed by ALOS PALSAR Satellite images taken on 30 September 2015. Approximately 150sq.km of paddy fields were flooded. The data sources from Survey Department of Sri Lanka was used for this analysis purpose. Major flooded affected divisions are Hambantota, Tanamalwila, Lunugamwehara, Tissamaharama, Wellawaya and Embilipitiya. In terms of major paddy field affected division's area Hambantota, Tanamalwila, Tissamaharama, Lunugamwehara and Tangalla. For the ALOS PALSAR-2 images taken on 1st October 2015, the affected districts are mainly the Matara and Galle. The divisions that includes Thihagoda, Kamburupitiya, Malimbada, Akuressa, Mulatiyana. In total 15 divisions were affected with a maximum inundation of 89sq.km of which paddy fields affected area is 47sq.km. The division with paddy field affected areas are Thihagoda, Malimbada, Kamburupitiya.

Legend

Before Disaster Image: ALOS-2 PALSAR 2
Date :18 Feb. 2015
After Disaster Image : ALOS-2 PALSAR 2
Date :01 October.2015

- Flood Extent (01 Oct 2015)
- Permanent Water bodies
- Division Map
- Cities/Town
- Road
- Streams

Map Prepared by: IWMI International Water Management Institute

Data Provided by: JAXA, SENTINEL ASIA

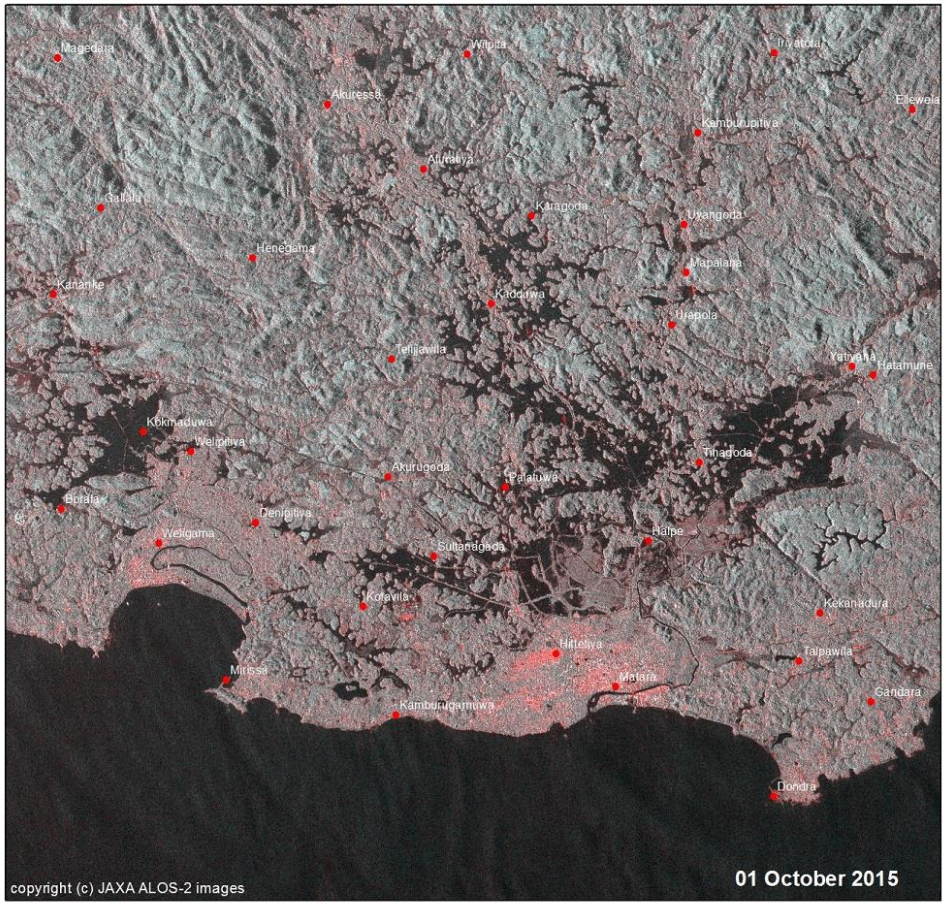
UNITED NATIONS Office for Outer Space Affairs UN-SPIDER

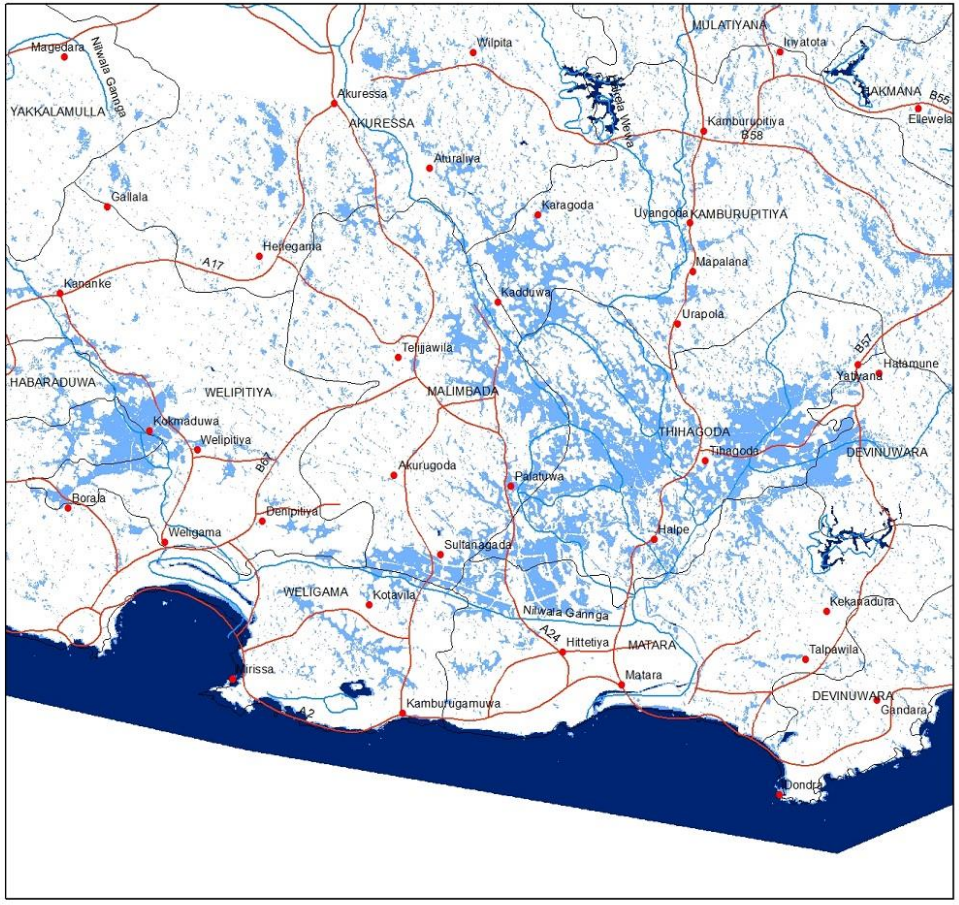
N

5 2.5 0 5 Kilometers

The analysis excluded permanent water bodies including reservoir, tanks and ponds and this reflects only the inundation extent. Please note the surface water extent mapped has not yet been validated in the field.

The depiction and use of boundaries, geographic names and related data shown in these maps are based on the sources they have been drawn from and quoted. These are neither error-free nor do they imply official endorsement or the position of IWMI.





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VæSSA

Historical Flood Mapping

Map historical flood events by Satellites

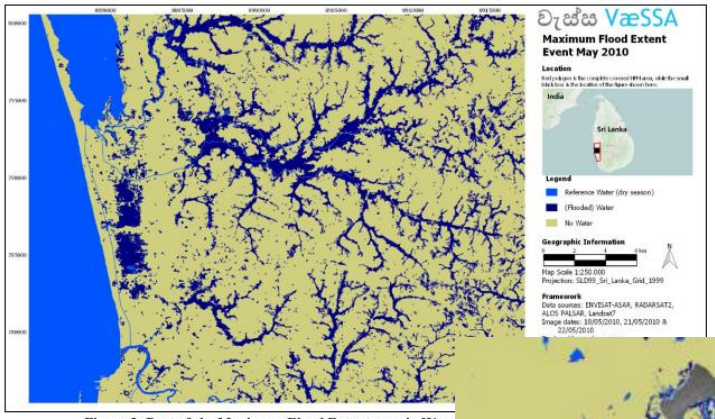
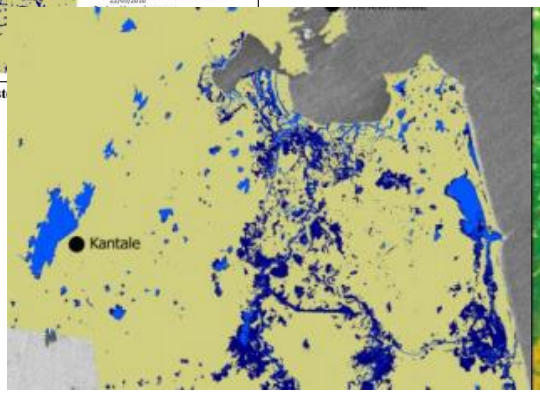
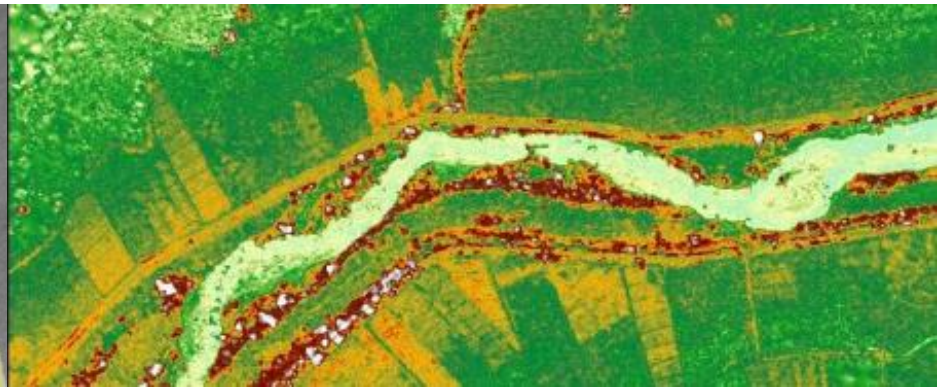


Figure 3: Part of the Maximum Flood Extent map in West





May 2003,
Dec 2007,
Nov/Dec 2008,
May 2010

DMC

esa
European Space Agency

CRiP
Climate Resilience Improvement Project

THE WORLD BANK
IBRD • IDA | WORLD BANK GROUP

GFDRR
Global Facility for Disaster Reduction and Recovery

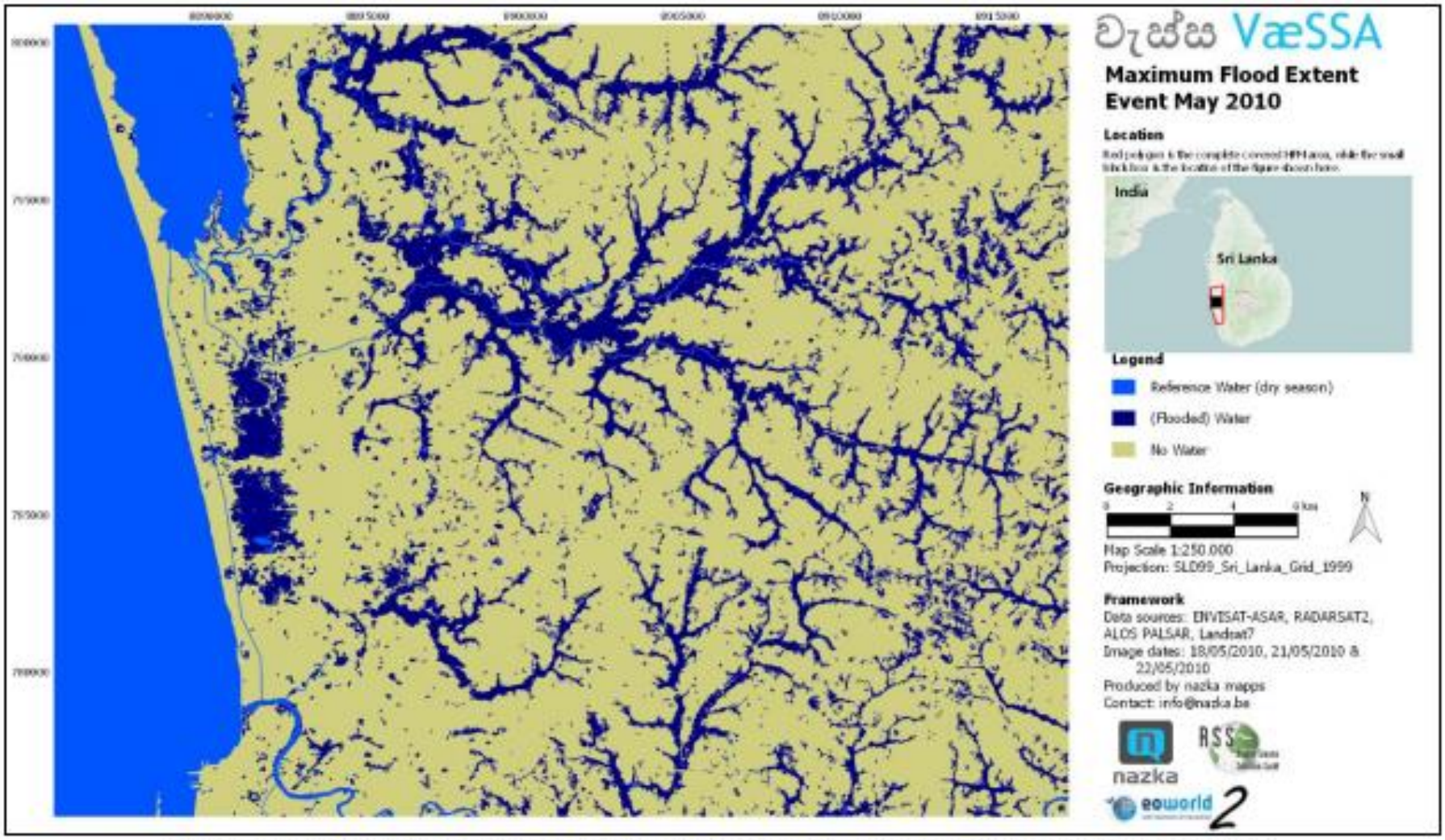
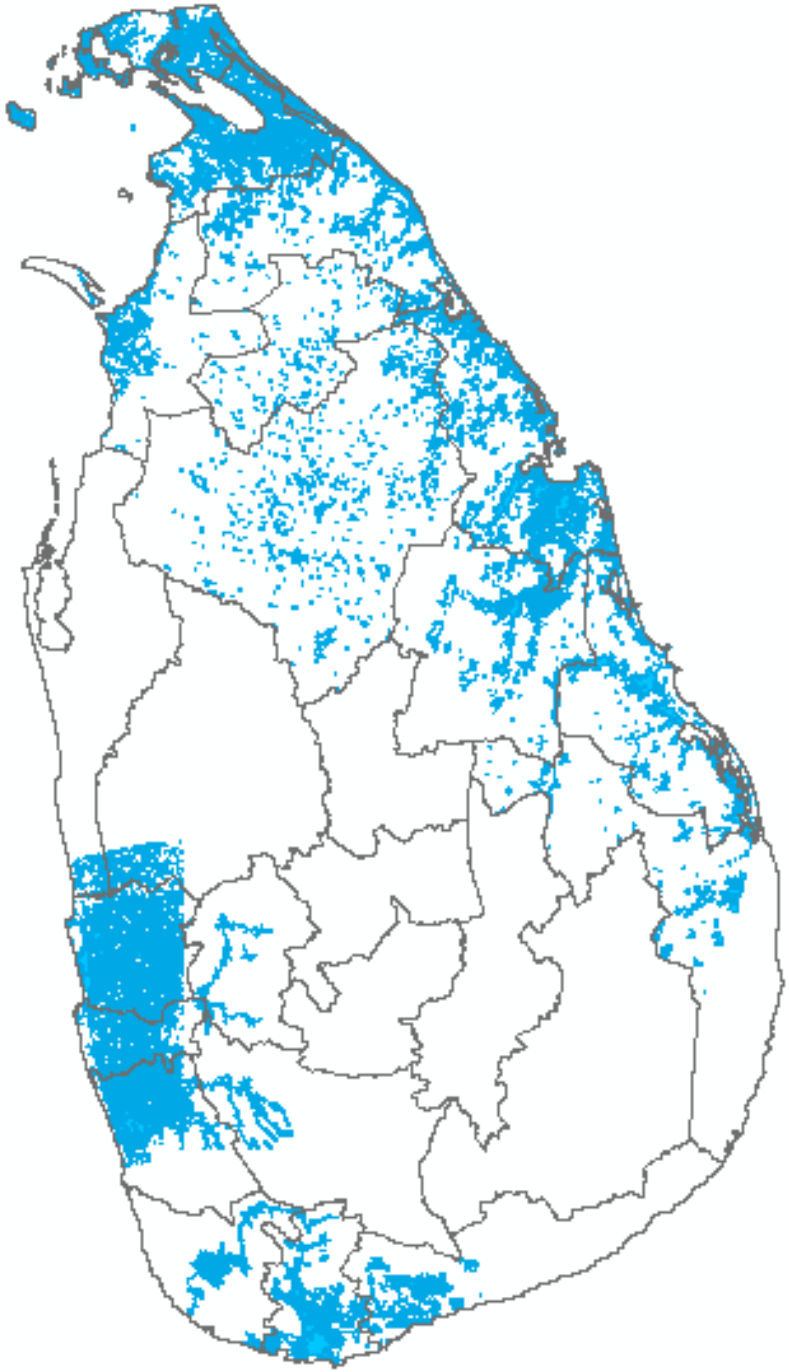


Figure 3: Part of the Maximum Flood Extent map in Western Sri Lanka in May 2010



Flood Map of Sri Lanka

Compiled based satellite and field observation

Experience from Flood and Landslide
May 2016

- ✓ Activated Sentinel Asia
- ✓ Activated International Disaster Charter
- ✓ Activated Humanitarian Openstreet Team (HOT)
- ✓ GFDRR provided post disaster images over Aranayake

- ✓ IWMI and OCHA Deployed at DMC
- ✓ Survey Department - Ground Mapping

Satellites Contributed Data

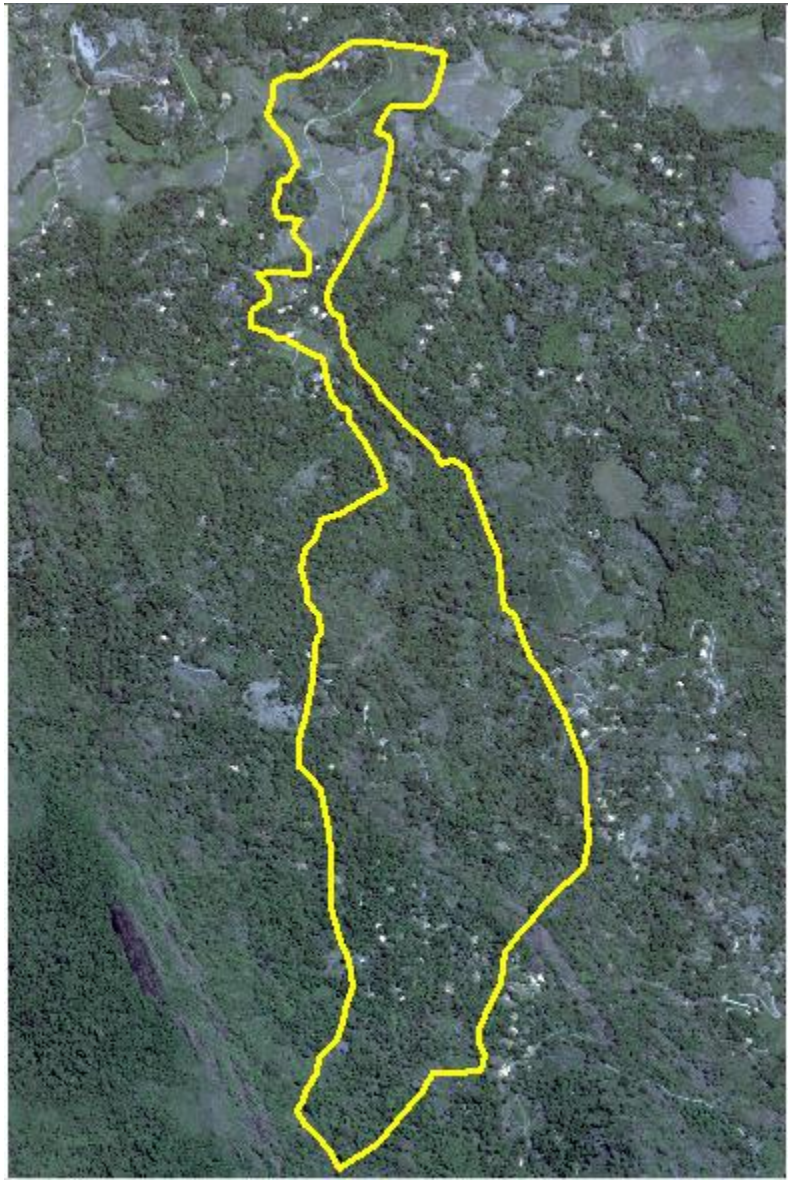
Radar Satellites

1. ALOS Palsar – Japan
2. RISAT – India
3. Radar Sat – Canada
4. Terra SAR X – Germany

Optical Satellites

1. Plaides – France (0.5 m)

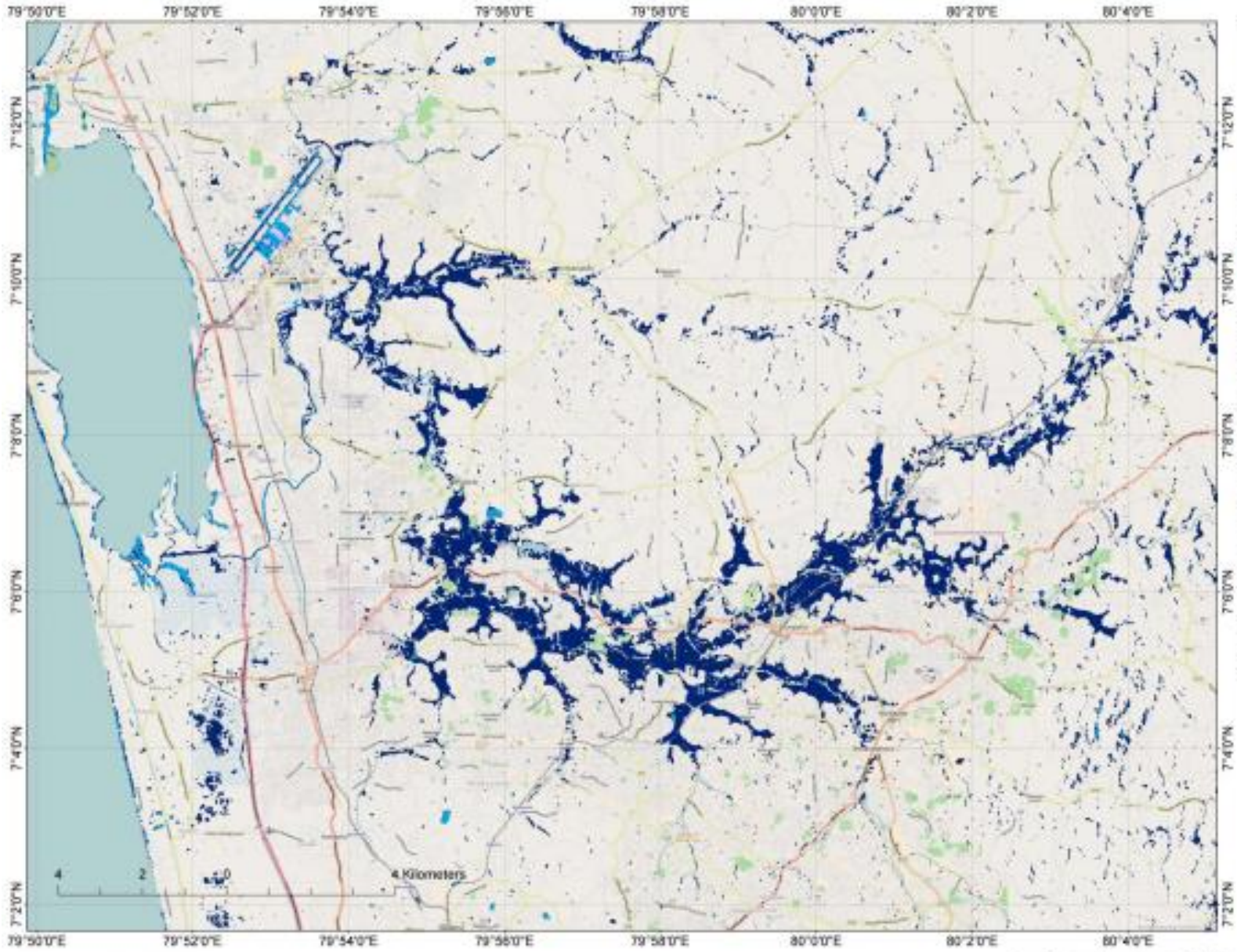
Aranayake – Landslide 16th May 2016



PRE IMAGE March 2016

POST IMAGE June 2016

FLOOD IN GAMPAHA, SRI LANKA - Detected by TerraSAR-X on 19.05.2016



Legend

Permanent Water (on 05.12.08)
Detected Flood (on 19.05.16)

Description:
This map shows the detected flood areas on the 19th of May 2016, in Gampaha Area

This analyses were done by TerraSAR-X satellite data provided by IDC.

Detected Water:
Contains the existing and accumulated water patches including flood water

Data Source:
TerraSAR-X © DLR e. V. 2016,
Distribution Airbus DS Geo GmbH

Background map © OpenStreetMap, CC-BY-SA

Images Acquired on:
Post Image - 19 May 2016
Pre Image - 05 Dec 2008

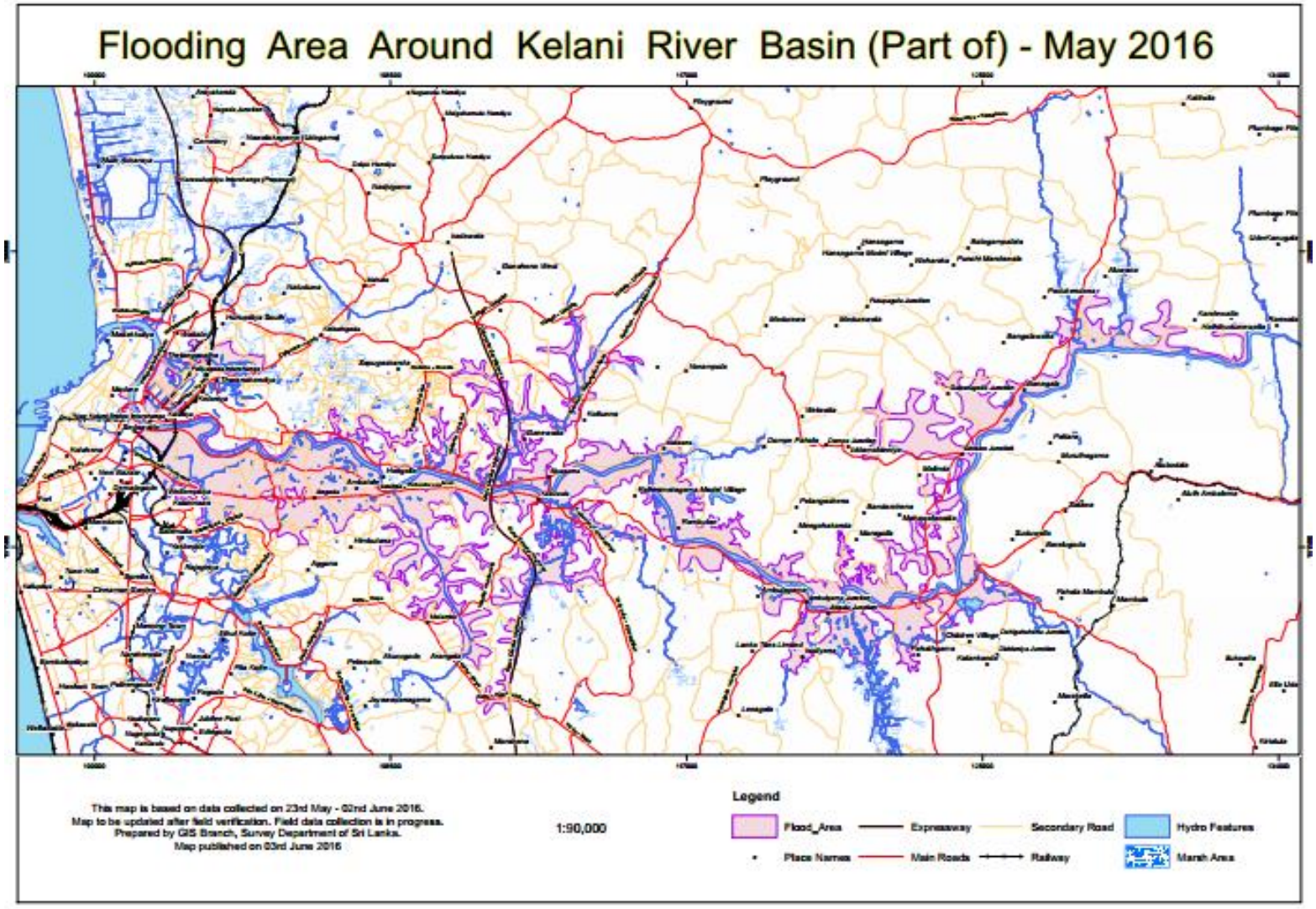
Note:
The accuracy of the flood extent is to be validated.

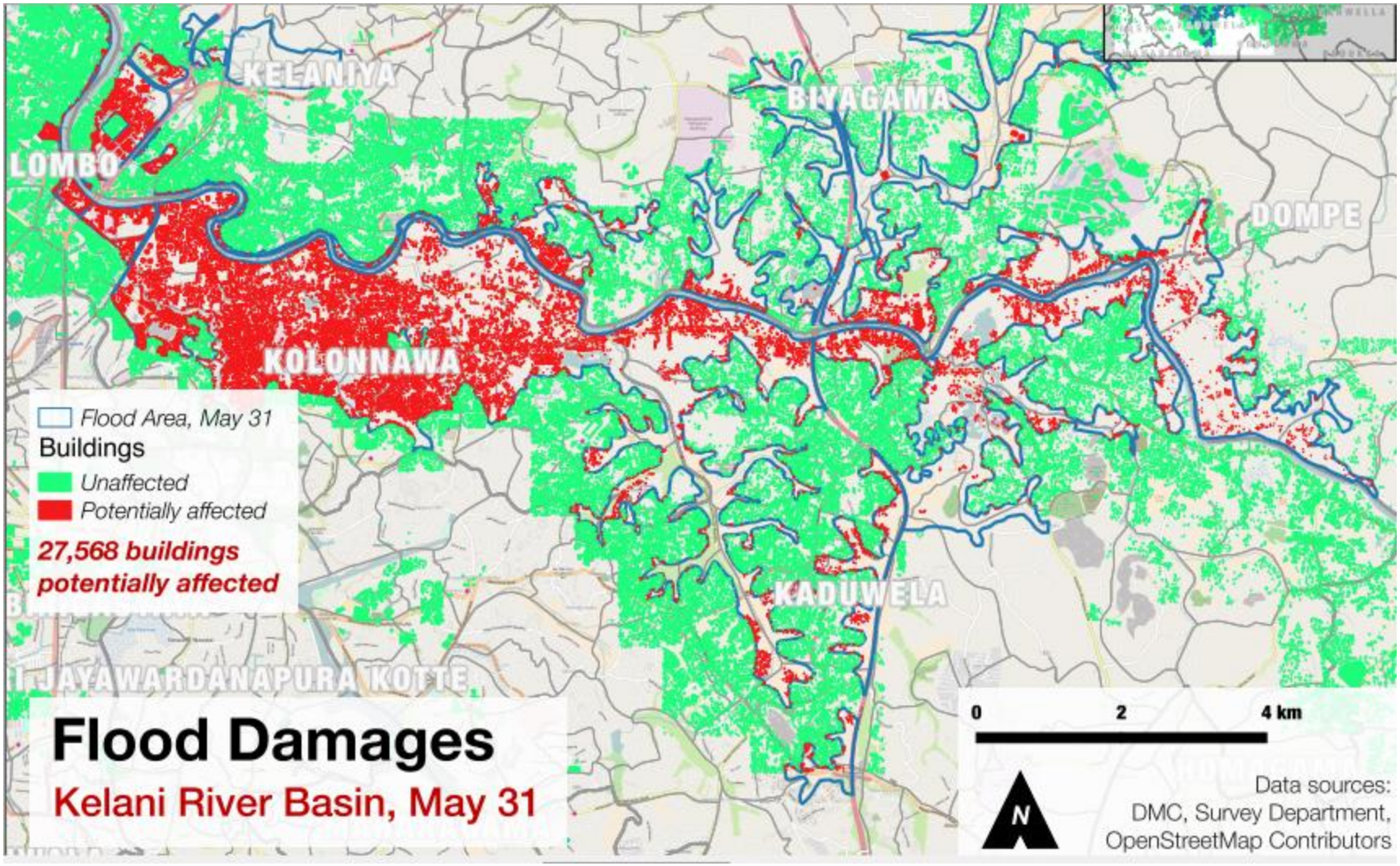
Map scale: 1:30 000

Datum: GCS_WGS84

Geoinformatics Center, AIT

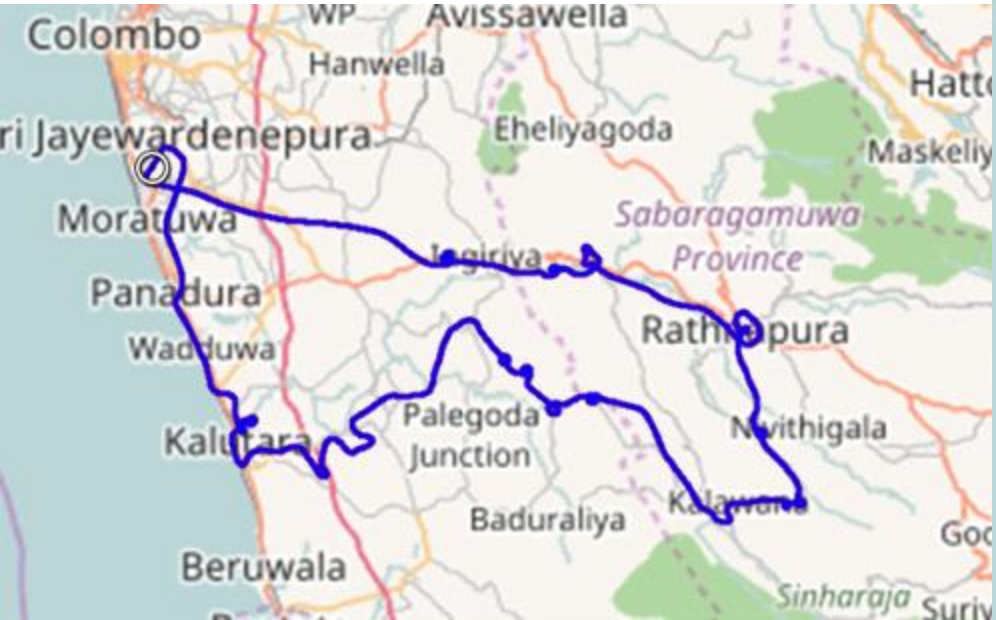
Field Mapping - Kelani

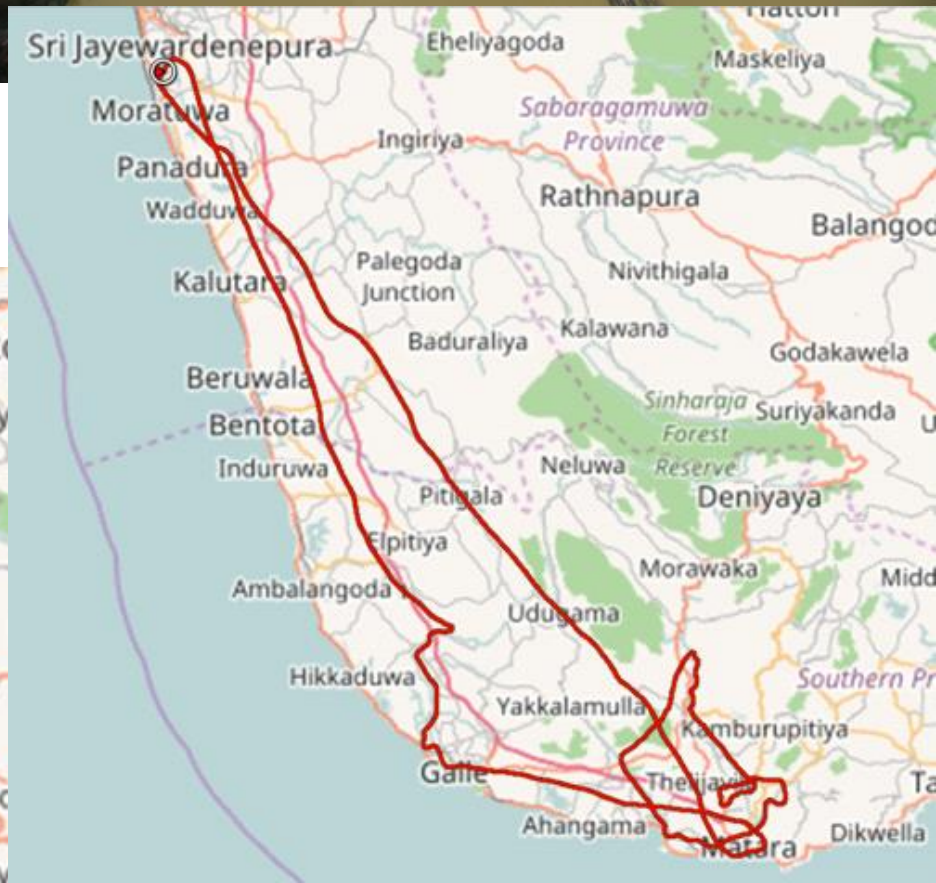



KELANIYA
BIYAGAMA
LOMBO
DOMPE
KOLONNAWA
KADUWELA
JAYAWARDANAPURA KOTTE
Flood Area, May 31
Buildings
Unaffected
Potentially affected
27,568 buildings potentially affected
Flood Damages
Kelani River Basin, May 31
0
2
4 km
N
Data sources:
DMC, Survey Department,
OpenStreetMap Contributors

Flood and Landslide

May 2017

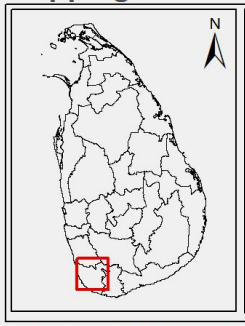

Colombo
WP
Avissawella
Hanwella
Eheliyagoda
Sri Jayewardenepura
Moratuwa
Sabaragamuwa
Province
Panadura
Wadduwa
Kalutara
Palegoda
Junction
Baduraliya
Beruwala
Sinharaja


Sri Jayewardenepura
Eheliyagoda
Maskeliya
Moratuwa
Sabaragamuwa
Province
Ingiriya
Panadura
Rathnapura
Wadduwa
Palegoda
Junction
Kalutara
Nivithigala
Baduraliya
Kalawana
Godakawela
Beruwala
Sinharaja
Forest
Reserve
Suriyakanda
Bentota
Induruwa
Neluwa
Deniyaya
Pitigala
Elpitiya
Morawaka
Ambalangoda
Udugama
Hikkaduwa
Yakkalamulla
Kamburupitiya
Galle
Ahangama
Dikwella

Satellite Activated

Satellite	Program	Observation Date
Resource Sat 2	Sentinel Asia	27 May 2017
TerraSAR x (Radar)	International Charter	28 May 2017
Sentinel 2	International Charter	28 May 2017
THEOS	Sentinel Asia	28 May 2017
RadarSat2 (Radar)	International Charter	29 May 2017
TerraSAR x (Radar)	International Charter	30 May 2017
ALOS Palsar (Radar)	Sentinel Asia	30 May 2017
Sentinel 1 (Radar)	International Charter	30 May 2017
Resource Sat 2	Sentinel Asia	30 May 2017
KOMPSAT5	Sentinel Asia	30 May 2017

Mapping Inundation extent for Galle District in Southern Province (Sri Lanka) using ESA Sentinel-1 Satellite Data (30 May 2017)



Due to heavy rains in past few days, landslides and floods in Sri Lanka killed 193 people, 95 people still missing, displacing 100,000 and directly affecting 500,000 people across many districts according to the initial estimates by state-run Disaster Management Center.

International Disaster Charter was activated by Disaster Management Centre (DMC) and coordinated by International Water Management Institute (IWMI)/CGIAR.

The initial satellite observations German Aerospace Centre (DLR) of TerraSAR X2 (28 May 2017) showed vast areas of standing flood waters along the Southern and South-Western Provinces. Initial estimates from satellite images indicate that Matara (49.3) and Kalutara with 31.6 sq.km flooded area, are the worst affected districts followed by Galle (20.2 sq.km), Rathnapura (14.9 sq.km), Colombo (5.6 sq.km) and Gampaha (4.5 sq.km). Detailed Divisional Secretariat wise flood affected area for these six districts are given in the attached excel file. Kalutara is reeling under worst flood since 2003.

The satellite image from Sentinel-1 taken on 30 May2017 showing considerable reduction in the inundation extent for Galle and reference to dark grey color in the agriculture fields.

Legend

Satellite Image : ESA Sentinel-1
30 May 2017

- SL GND
- SL DSD
- Flood extent (30 May 2017)
- Permanent water

31 May 2017 | FL-2017-0001-SL | Version 1

Map Prepared by

IWMI International Water Management Institute

Data Provider

esa

CGIAR Research Program on Water, Land and Ecosystems

UNITED NATIONS Office for Outer Space Affairs
UN-SPIDER

0 1 2 4 Km

The analysis excluded permanent water bodies including reservoir, tanks and ponds and this reflects only the inundation extent. Please note the surface water extent mapped has not yet been validated in the

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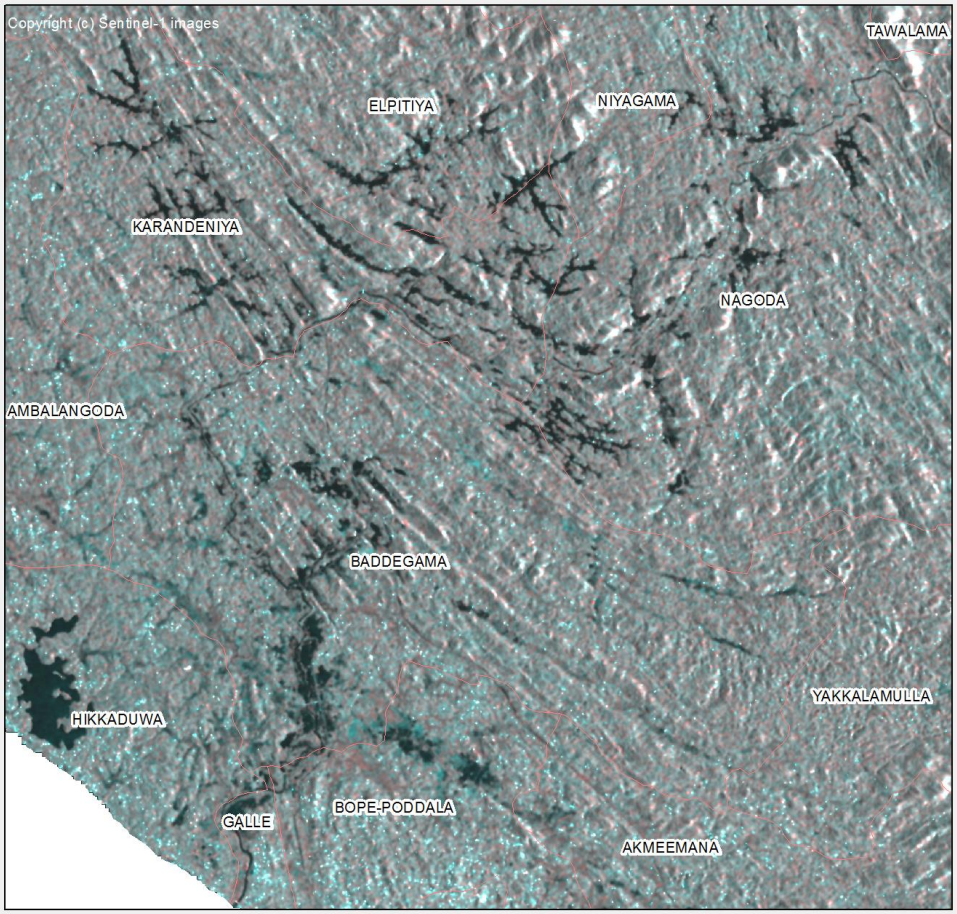
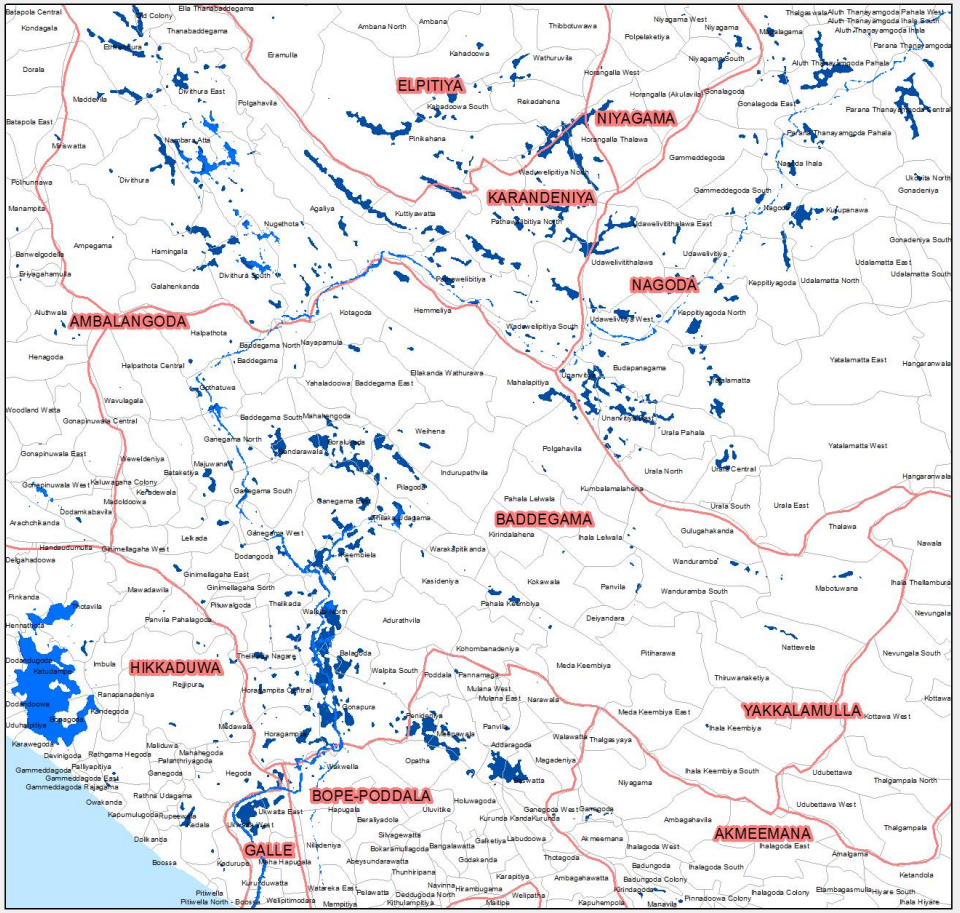
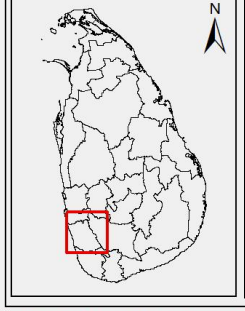




Mapping Inundation extent for Gin Ganga in Southern Province (Sri Lanka) using ESA Sentinel-1 Satellite Data (30 May 2017)



Due to heavy rains in past few days, landslides and floods in Sri Lanka killed 151 people, 111 people still missing, displacing 100,000 and directly affecting 500,000 people across many districts according to the initial estimates by state-run Disaster Management Center.

International Disaster Charter was activated by Disaster Management Centre (DMC) and coordinated by International Water Management Institute (IWMI)/CGIAR.

The initial satellite observations German Aerospace Centre (DLR) of TerraSAR X2 (28 May 2017) showed vast areas of standing flood waters along the Southern and South-Western Provinces. Initial estimates from satellite images indicate that Matara (49.3) and Kalutara with 31.6 sq.km flooded area, are the worst affected districts followed by Galle (20.2 sq.km), Rathnapura (14.9 sq.km), Colombo (5.6 sq.km) and Gampaha (4.5 sq.km). Detailed Divisional Secretariat wise flood affected area for these six districts are given in the attached excel file. Kalutara is reeling under worst flood since 2003.

The satellite image from Sentinel-1 taken on 30 May2017 showing considerable reduction in the inundation extent for Matara and reference to dark grey color in the agriculture fields.

Legend

Satellite Image : ESA Sentinel-1
30 May 2017

- SL GND
- SL DSD
- Flood extent (30 May 2017)
- Permanent water

31 May 2017 | FL-2017-0001-SL | Version 1

Map Prepared by

IWMI International Water Management Institute

Data Provider

esa

Research Program on Water, Land and Ecosystems

CGIAR

UNITED NATIONS Office for Outer Space Affairs
UN-SPIDER

0 1 2 4 Km

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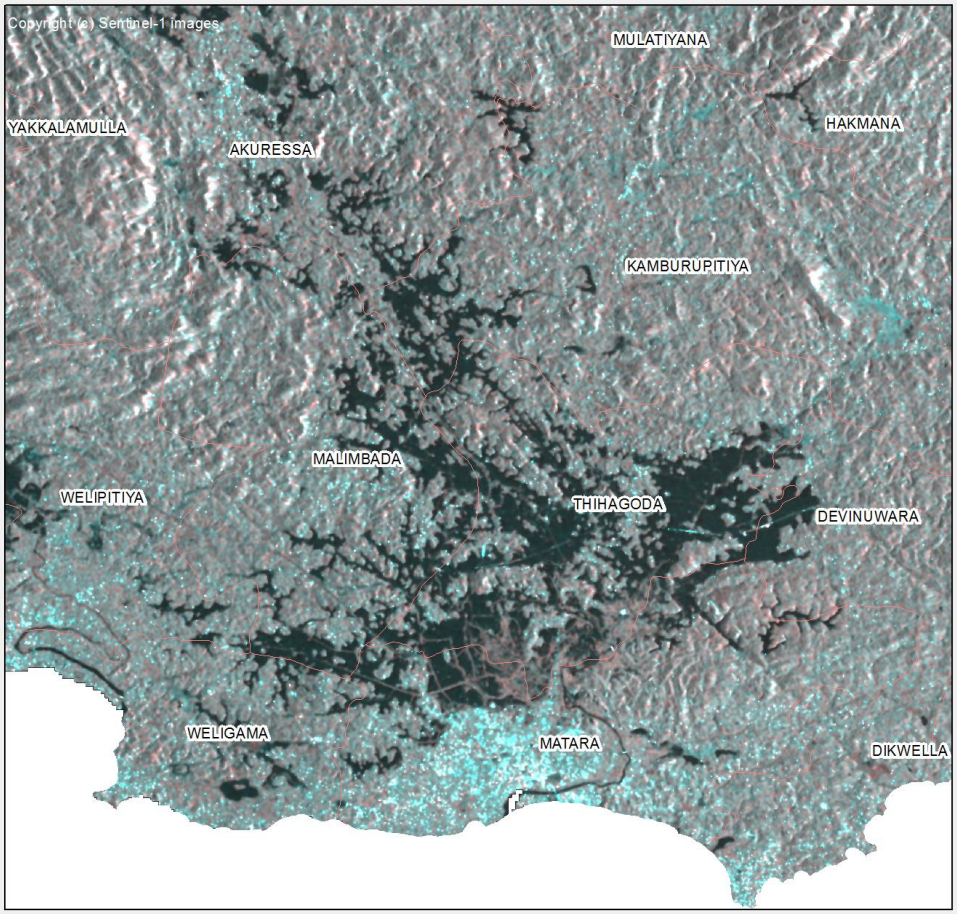
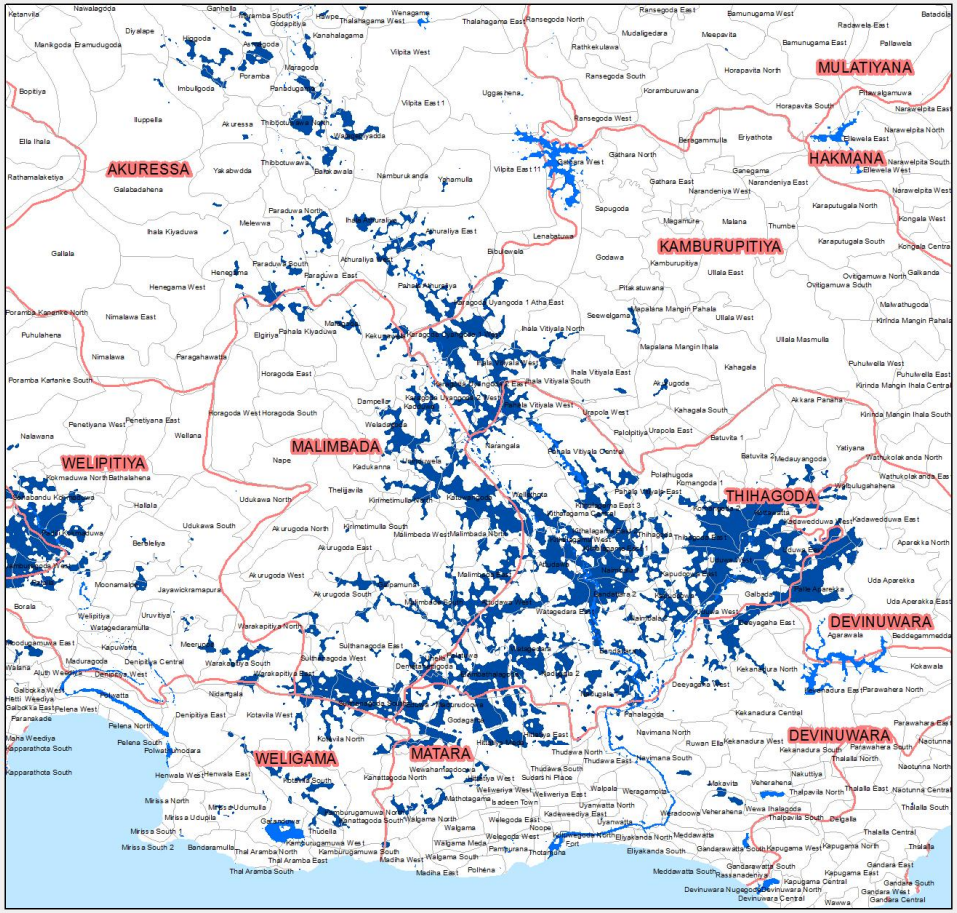
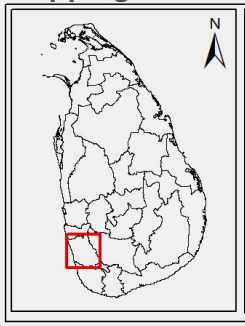




Mapping Inundation extent for Kalutara District in Western Province (Sri Lanka) using ESA Sentinel-1 Satellite Data (30 May 2017)



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The satellite image from Sentinel-1 taken on 30 May2017 showing considerable reduction in the inundation extent for Kalutara and reference to dark grey color in the agriculture fields.

Legend

Satellite Image : ESA Sentinel-1
30 May 2017

- SL GND
- SL DSD
- Flood extent (30 May 2017)
- Permanent water

31 May 2017 | FL-2017-0001-SL | Version 1

Map Prepared by

IWMI International Water Management Institute

UNITED NATIONS Office for Outer Space Affairs
UN-SPIDER

Data Provider

esa

CGIAR Research Program on Water, Land and Ecosystems

0 1 2 4 Km

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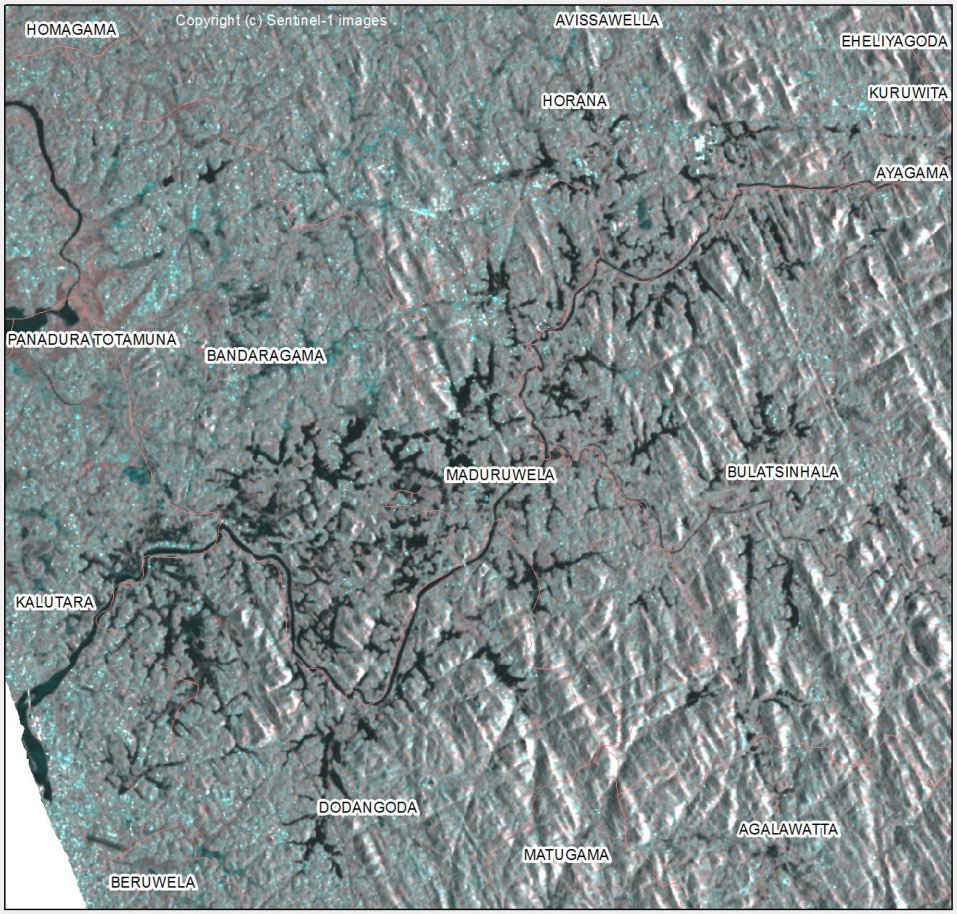
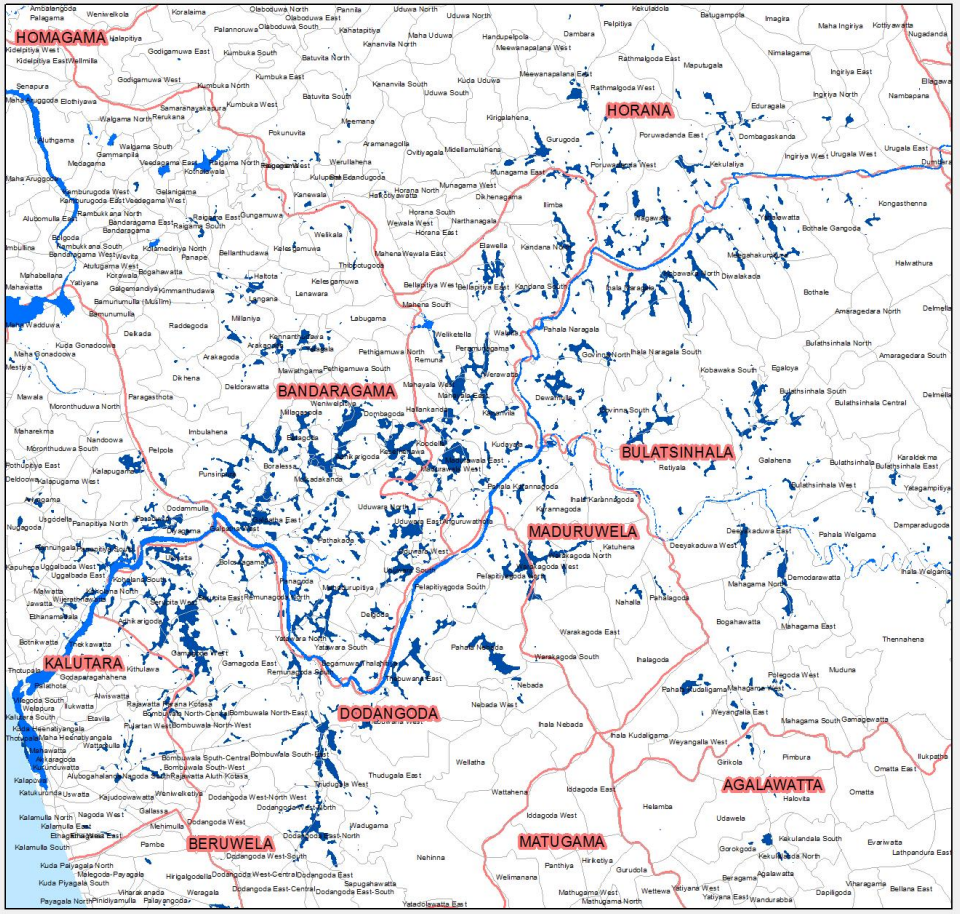
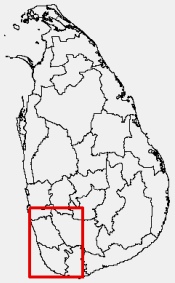




Mapping Inundation extent for Southern and parts of Western and Sabaragamuwa Provinces in Sri Lanka using TerraSAR-X Satellite Data



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Legend

Satellite Image : TerraSAR-X 28 May 2017

- Division Map
- Cities/Town
- Road
- Streams
- Flood extent (28 May 2017)

29 May 2017 | FL-2017-0001-SL | Version 1

Map Prepared by

IWMI International Water Management Institute

Data Provider

DLR

CGIAR Research Program on Water, Land and Ecosystems

UNITED NATIONS Office for Outer Space Affairs UN-SPIDER

N

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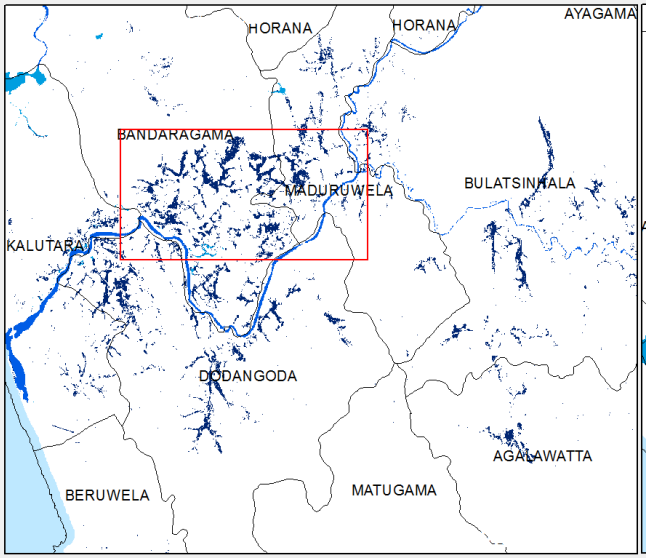
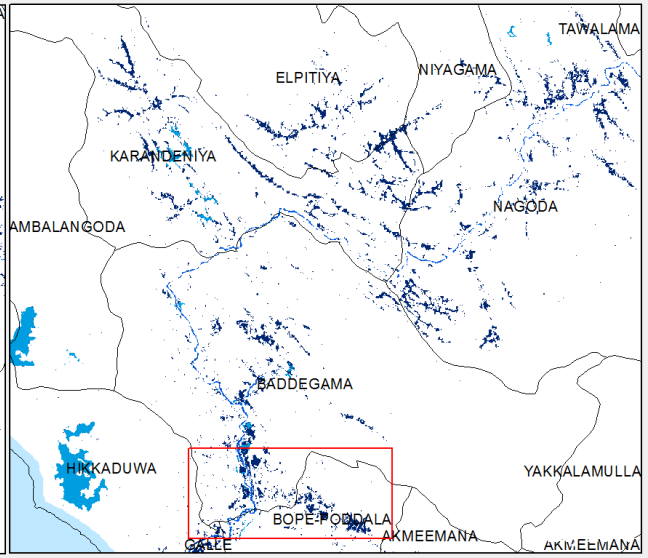
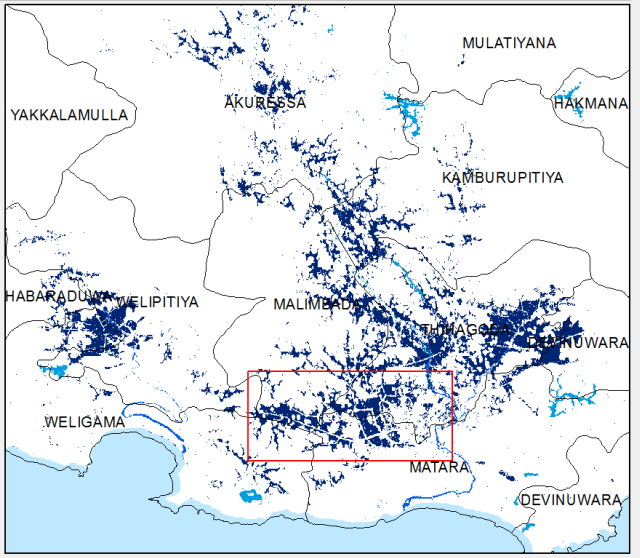
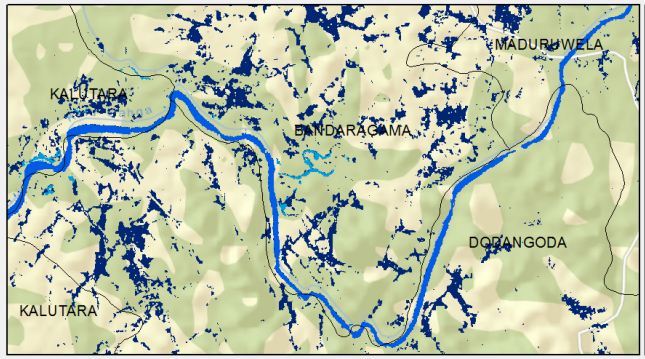
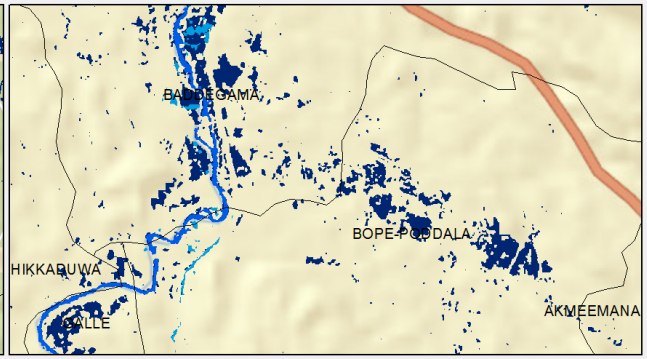
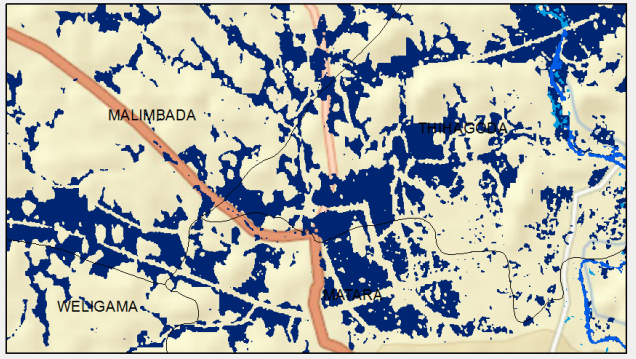




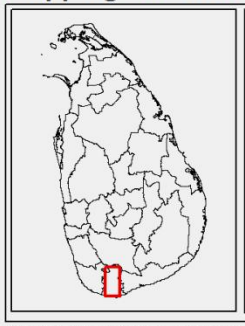








Mapping Inundation extent for Matara and its surroundings in Southern Province (Sri Lanka) using TerraSAR-X Satellite Data (28May2017)



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Legend

Satellite Image : TerraSAR-X 28 May 2017

Division Map

Cities/Town

Road — Streams

Flood extent (28 May 2017)

29 May 2017 | FL-2017-0001-SL | Version 1

Map Prepared by

IWMI International Water Management Institute

Data Provider

DLR

CGIAR Research Program on Water, Land and Ecosystems

UNITED NATIONS Office for Outer Space Affairs UN-SPIDER

N

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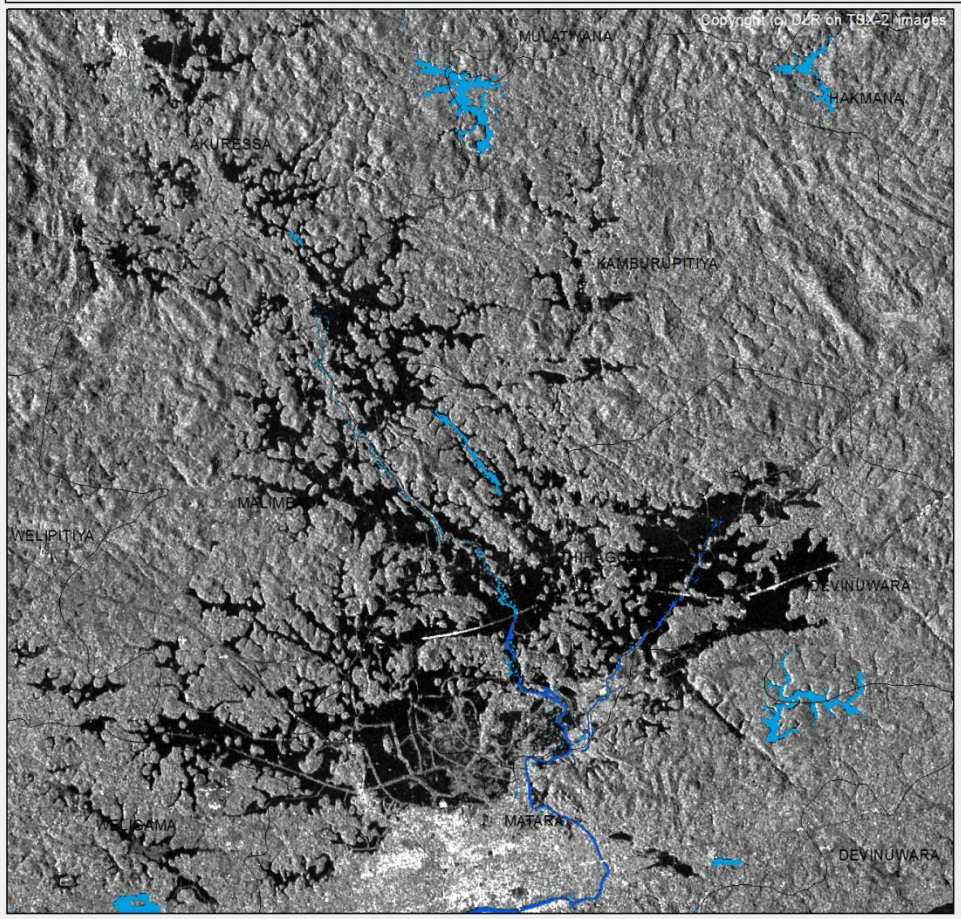
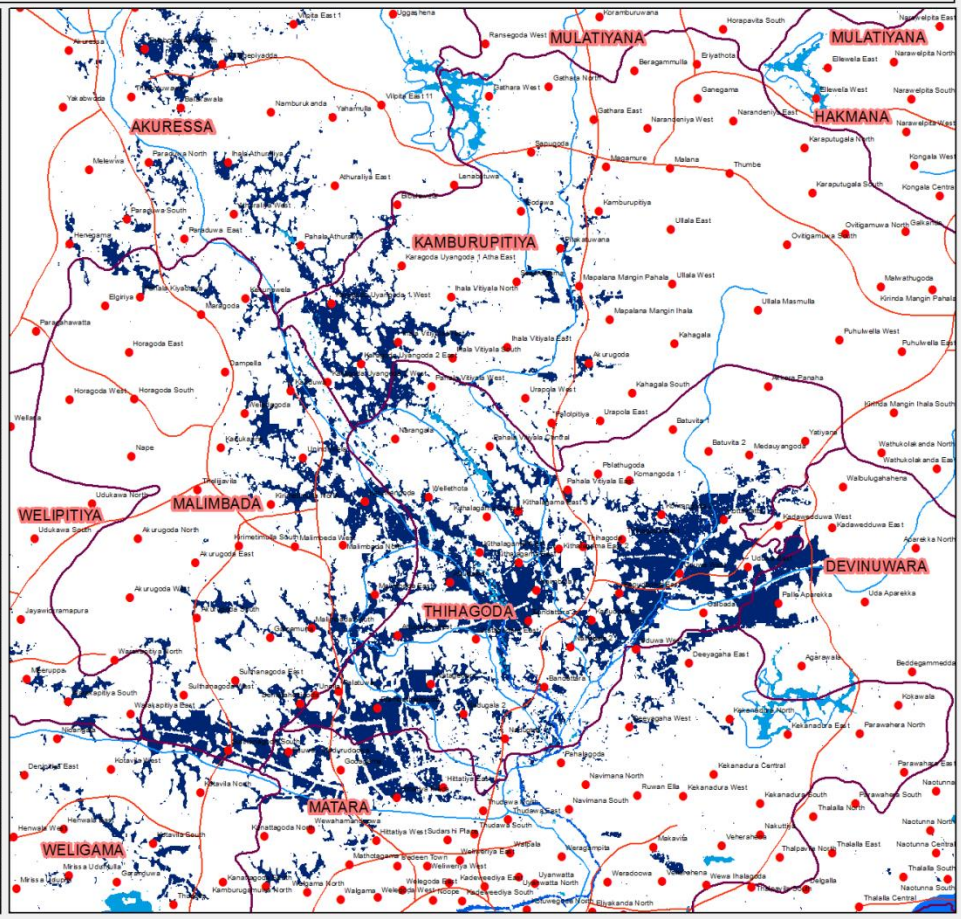
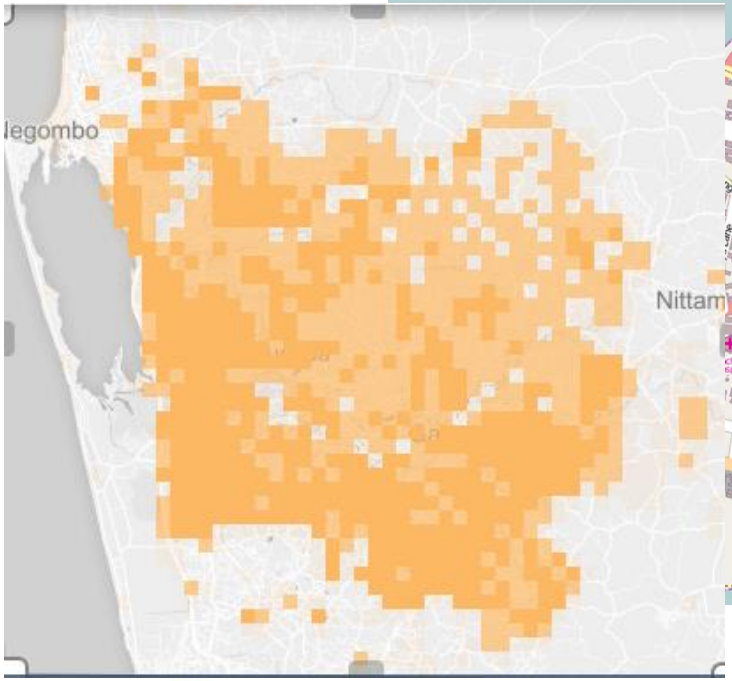


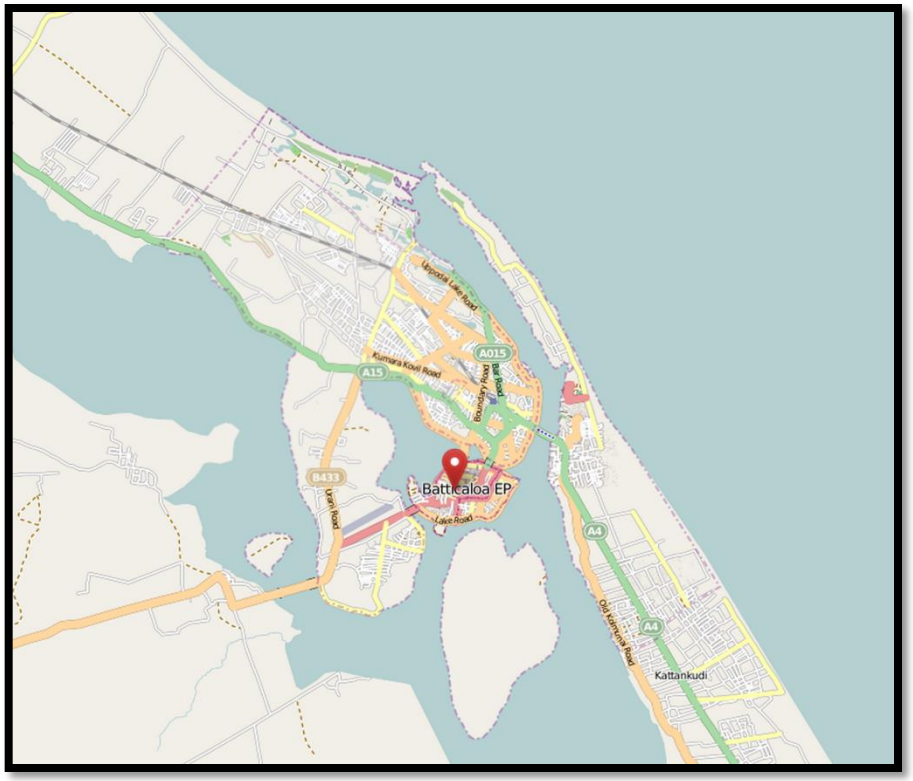


5 Disaster Exposure Mapping



STUDY AREA

Manmunai North DS Division, Batticaloa District



Approximately 30,000 buildings
24,928 Families

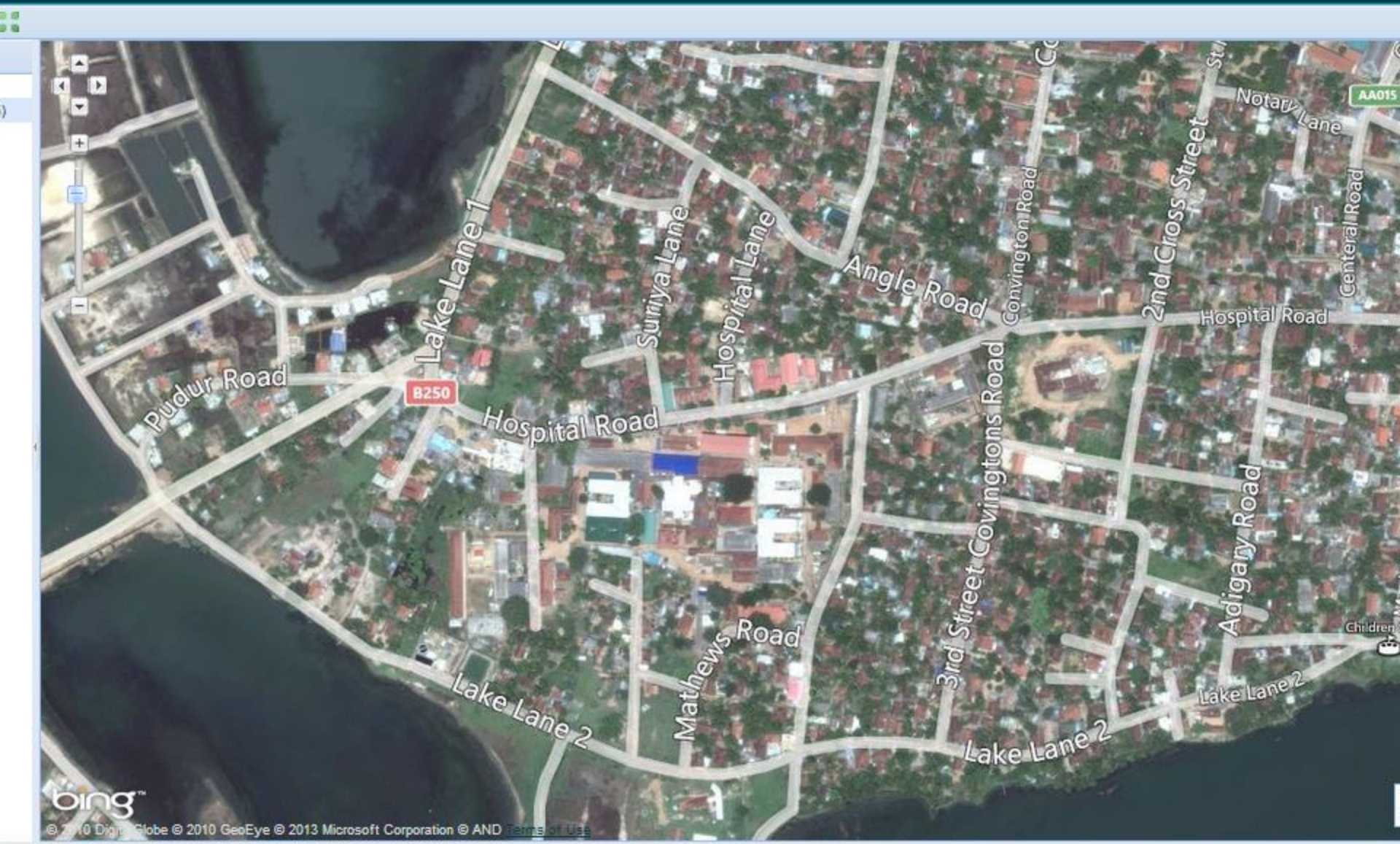
OSM Field Camp

OSM ToT – Sarvodaya, Sathurukondan, Batticaloa

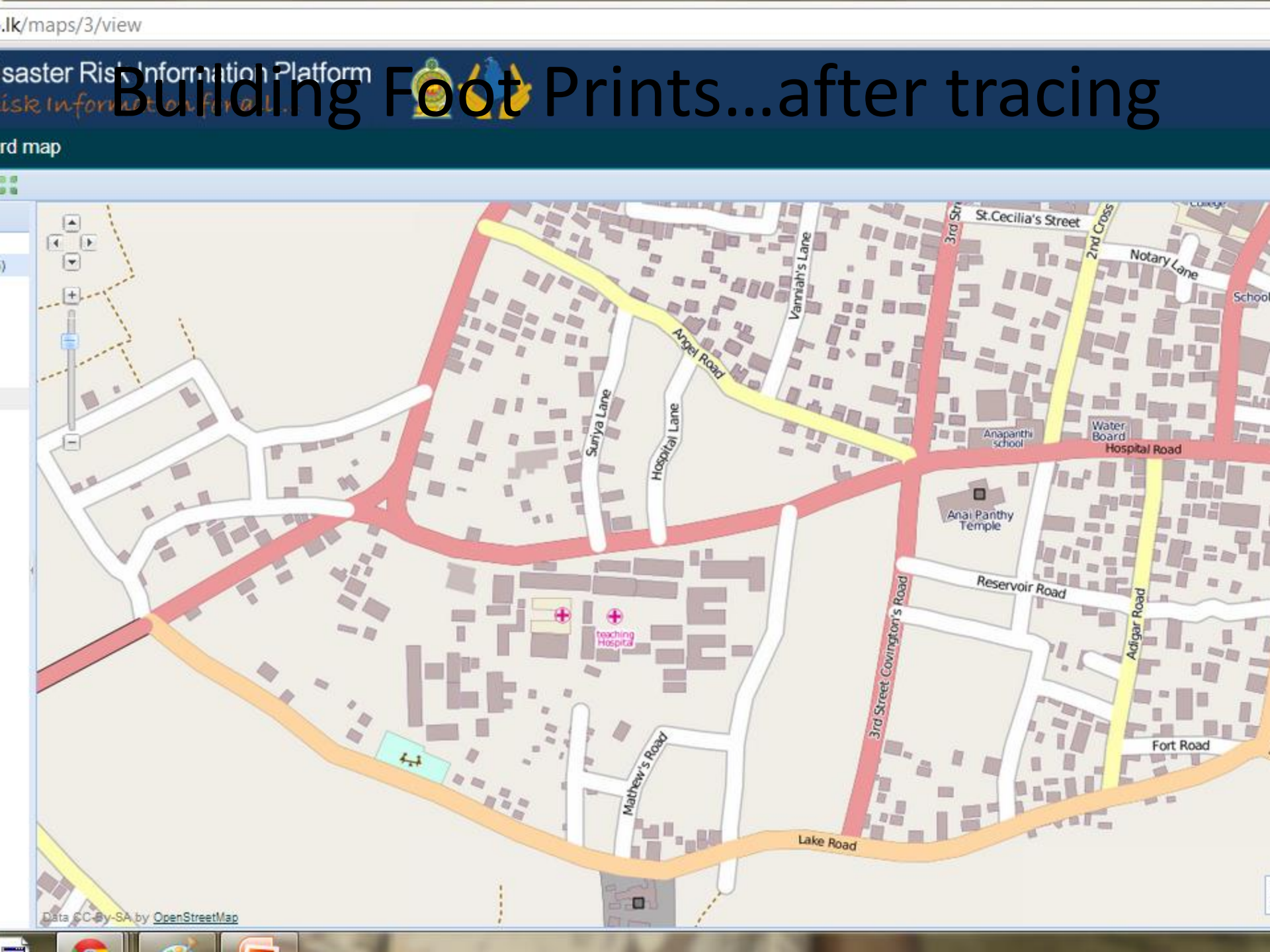
Field Data Collection – Puliyanthivu Central GN

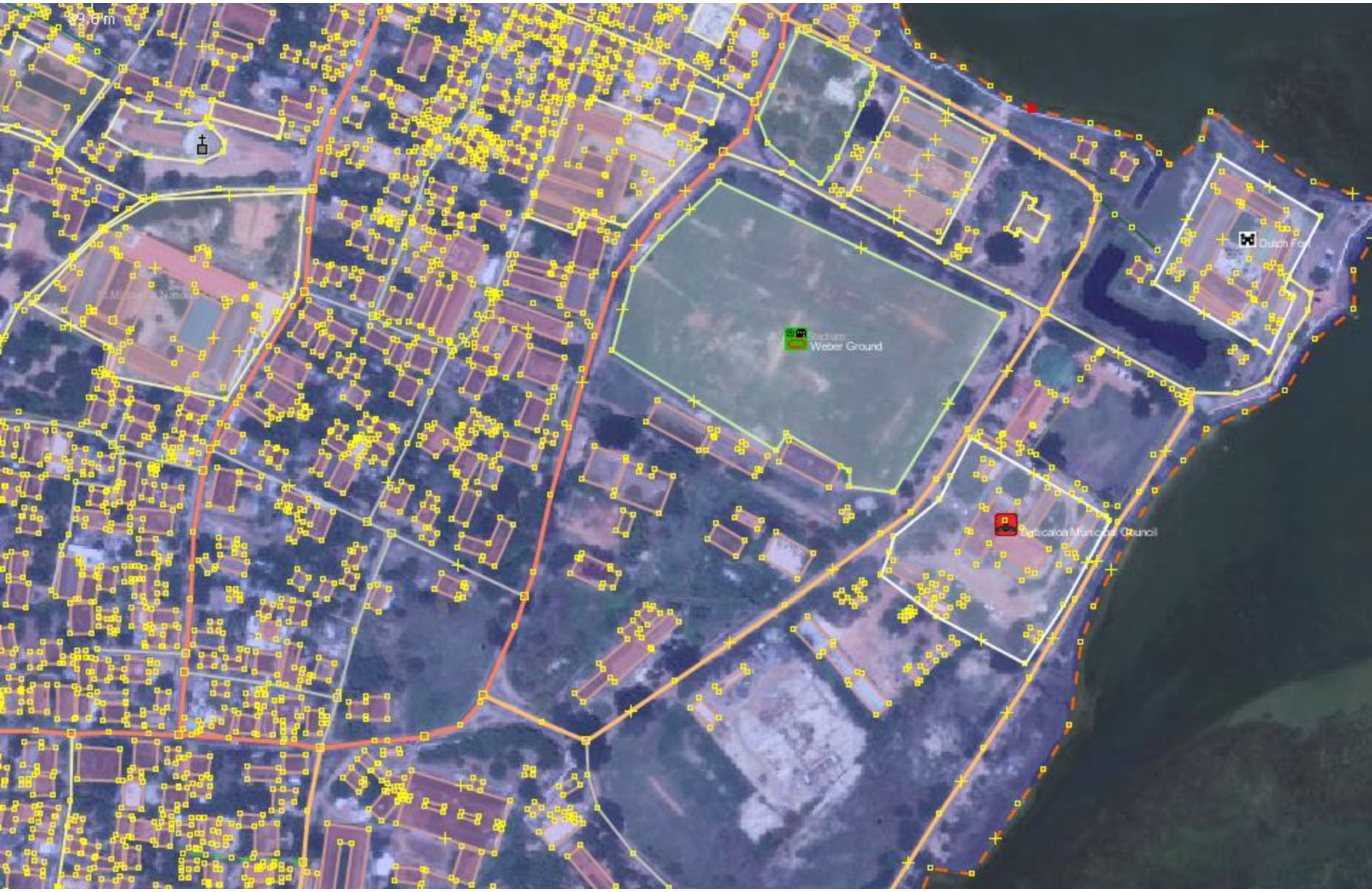
Discussion with Grama Niladari Palameenmadu

Building seen on Satellite Image

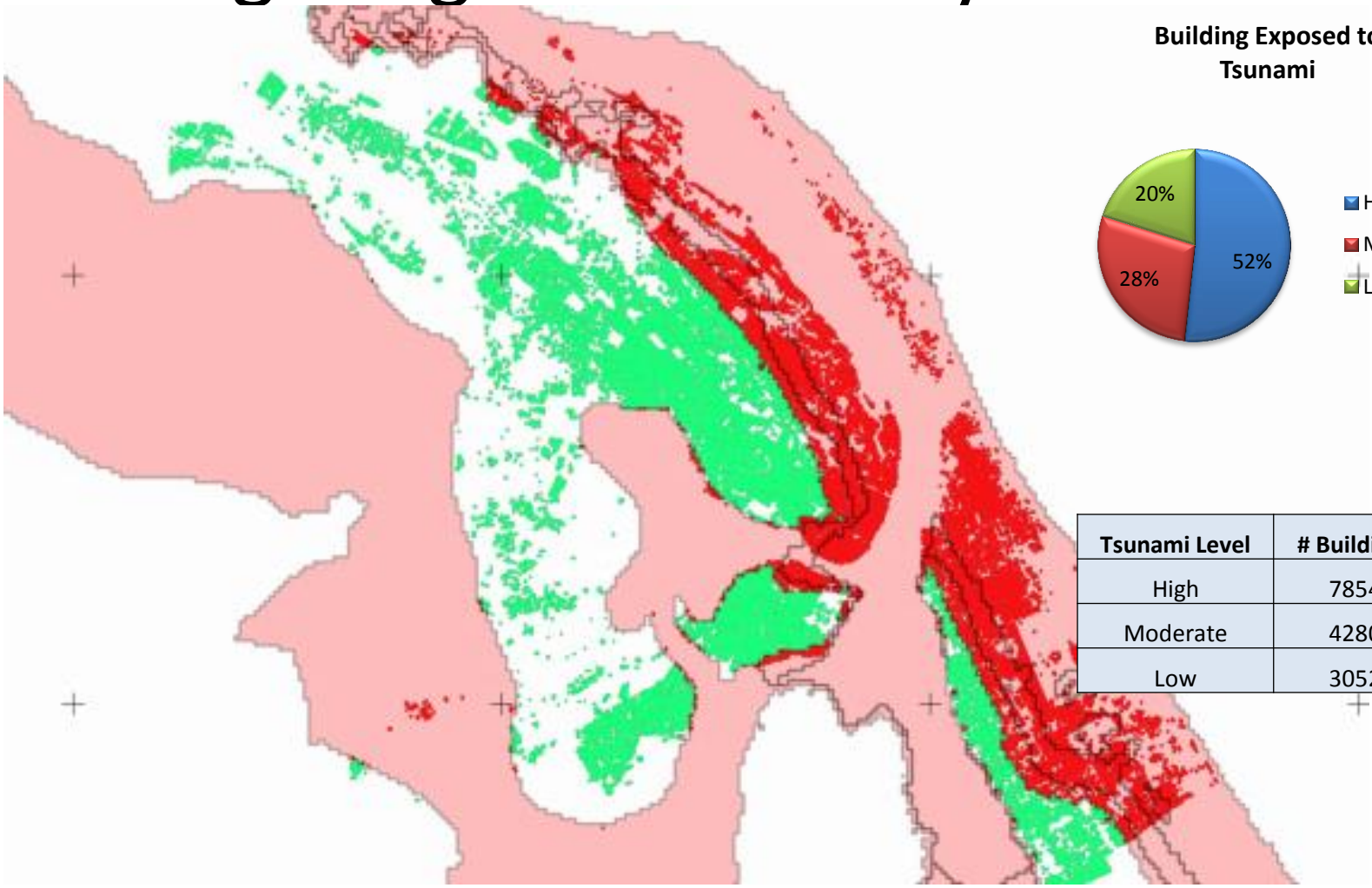


Building Foot Prints…after tracing




Weber Ground

Buildings might affected by Tsunami

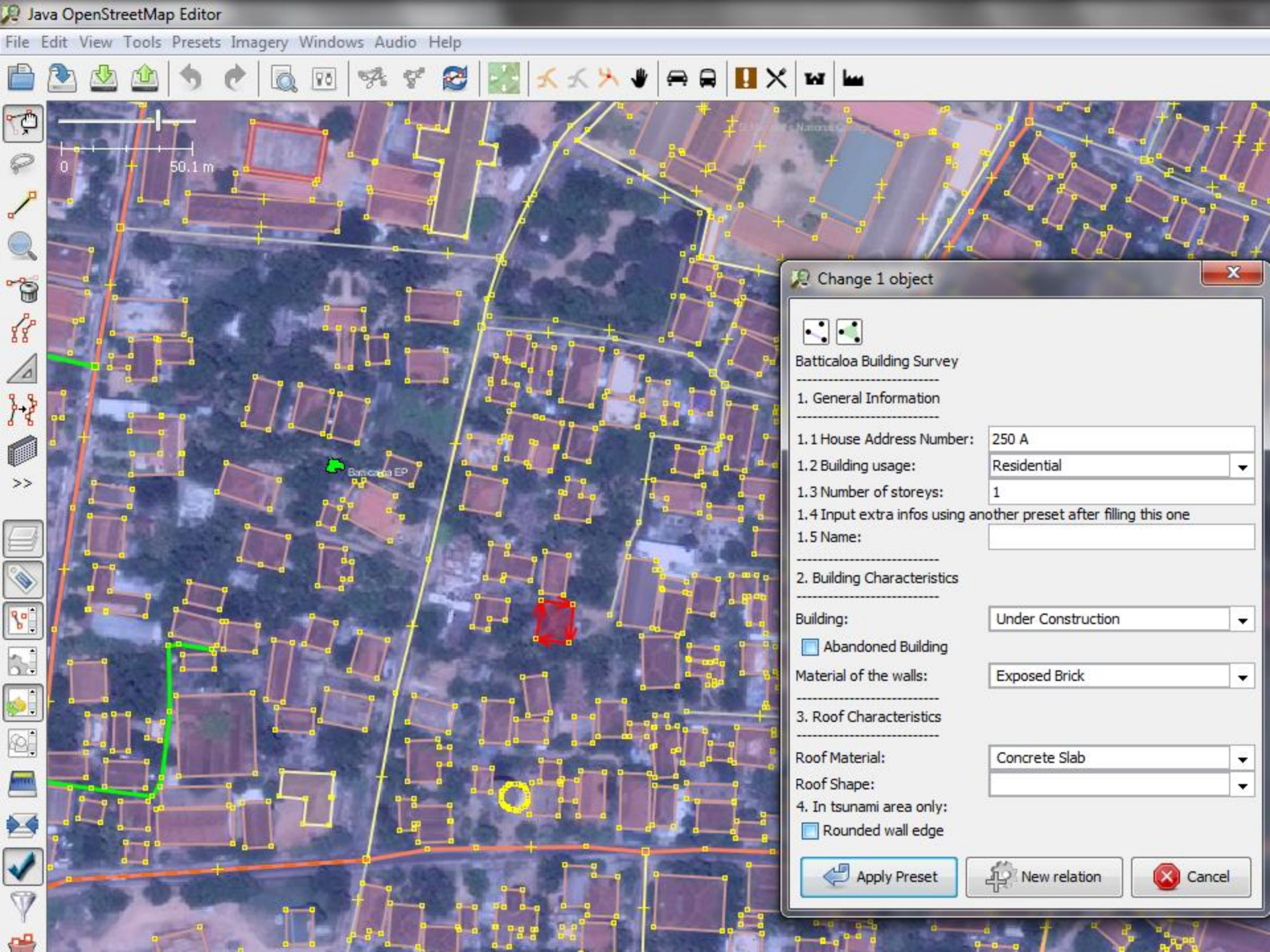


Building Exposed to Tsunami

Tsunami Level	# Buildings
High	7854
Moderate	4280
Low	3052

Total buildings – 32,000

Total tsunami affected buildings – 15,000


Java OpenStreetMap Editor
File Edit View Tools Presets Imagery Windows Audio Help
0
50.1 m
Change 1 object
Batticaloa Building Survey
1. General Information
1.1 House Address Number:
250 A
1.2 Building usage:
Residential
1.3 Number of storeys:
1
1.4 Input extra infos using another preset after filling this one
1.5 Name:
2. Building Characteristics
Building:
Under Construction
Abandoned Building
Material of the walls:
Exposed Brick
3. Roof Characteristics
Roof Material:
Concrete Slab
Roof Shape:
4. In tsunami area only:
Rounded wall edge
Apply Preset
New relation
Cancel

Determination of Relative Risk – Indicator Based

HAZARD

Hazard	High	10
	Mod	5
	Low	1

VULNERABILITY

Type Material	Score
Plastered	10
Brick	9
Cement	8
Clay mud	5
Tin	3
Cadjan/Palmyrah	1
net	1

Type Material	Score
Concrete	10
Tile	7
Asbestos	6
Zin	5
Tin	3
Cadjan/Palmyrah	1

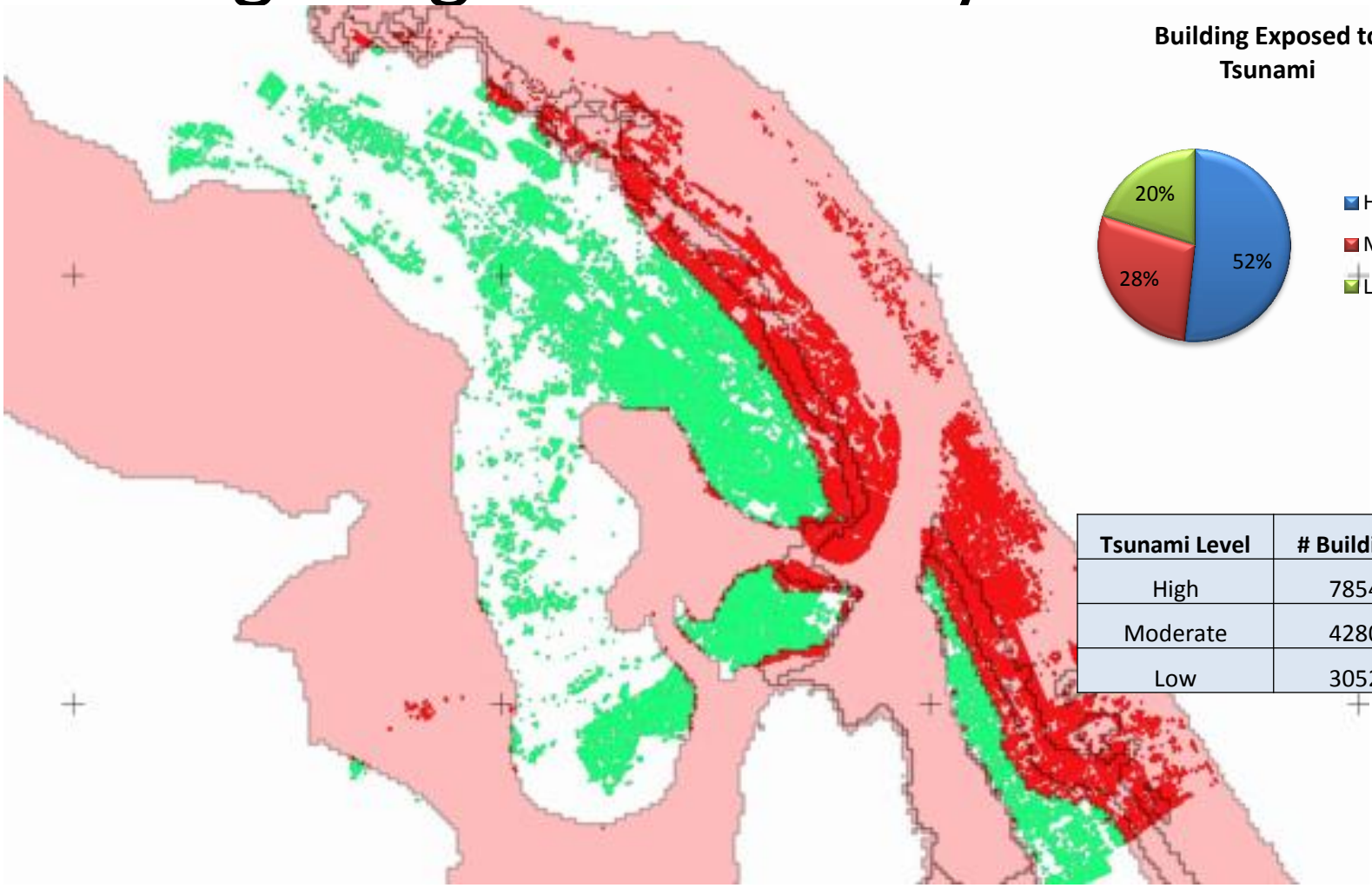
Floor Level	Score
above 3	10
3 feet	8
2 feet	5
1.5 feet	3
1 feet	1

RISK

Risk Level	Number of Buildings
High Risk	4569
Moderate Risk	5563
Low Risk	5054

TSUNAMI RISK PROFILE
Buildings – Manmunai North

Buildings might affected by Tsunami



Building Exposed to Tsunami

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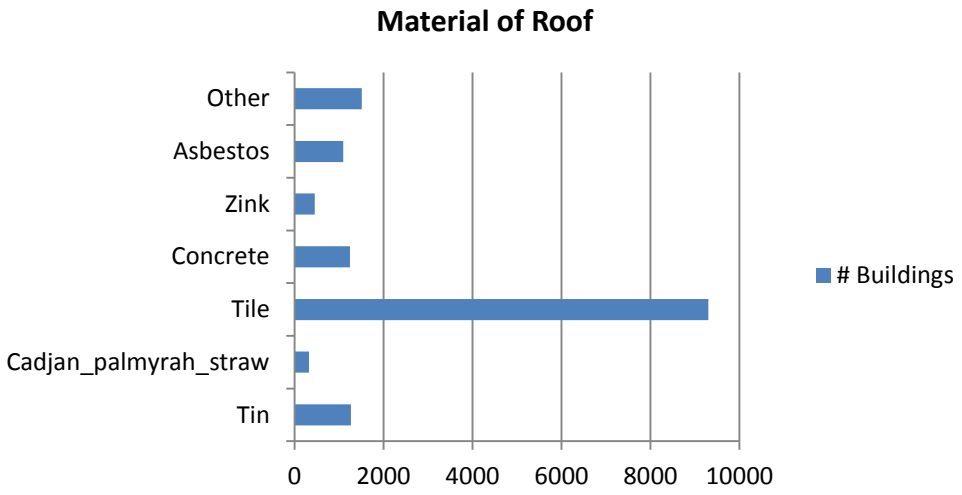
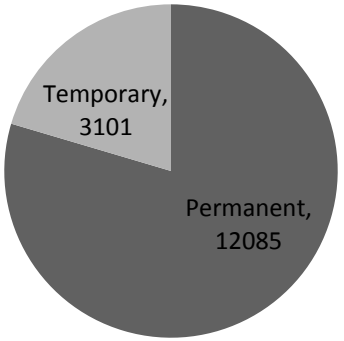
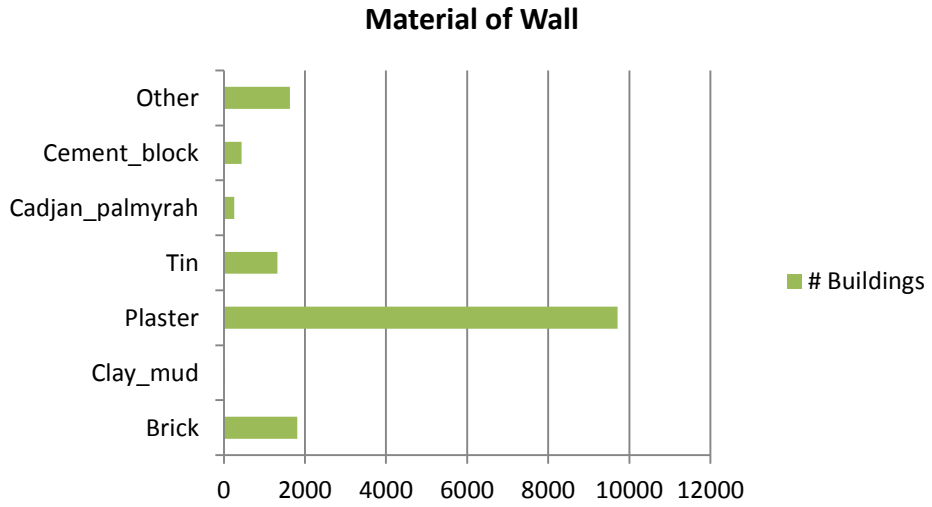
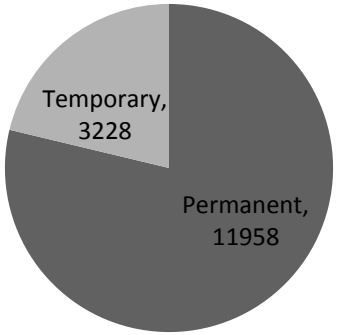
Building Profile of Tsunami Affected Area

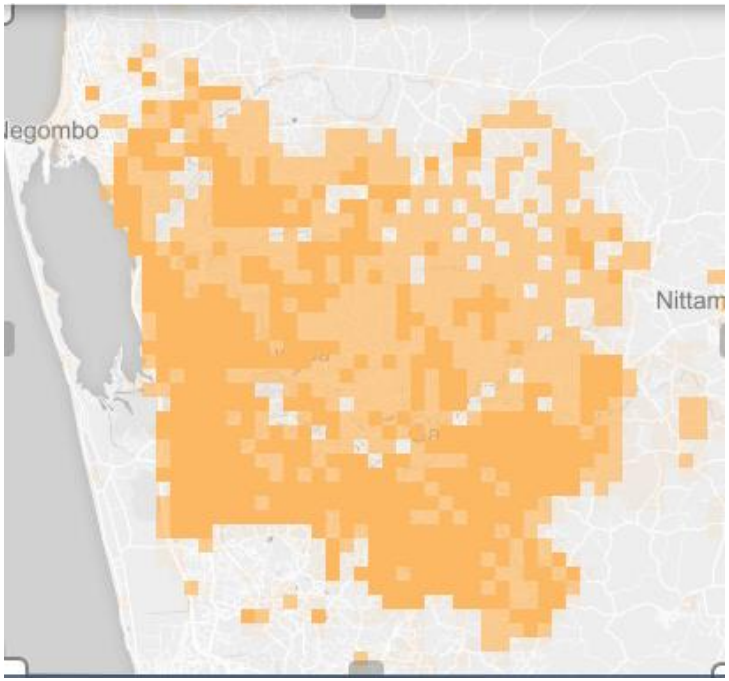








ATTANAGALU OYA DISASTER EXPOSURE MAPPING PROJECT



THE WORLD BANK
IBRD • IDA | WORLD BANK GROUP

GFDRR
Global Facility for Disaster Reduction and Recovery

Attanagalu Oya Exposure Mapping Project
Scope of the Works

- Map buildings, roads and land use of Attanagalu oya lower basin area (Gampaha, Katana, Ja-Ela and Minuwangoda DS Divisions)
- Conduct field survey and obtain characteristics buildings and update the building database
- Capacity Building - Promote OpenstreetMap tool among Government Organizations and Universities

Methodology

Define Study Area

Analyze Population Density and Past FLoods

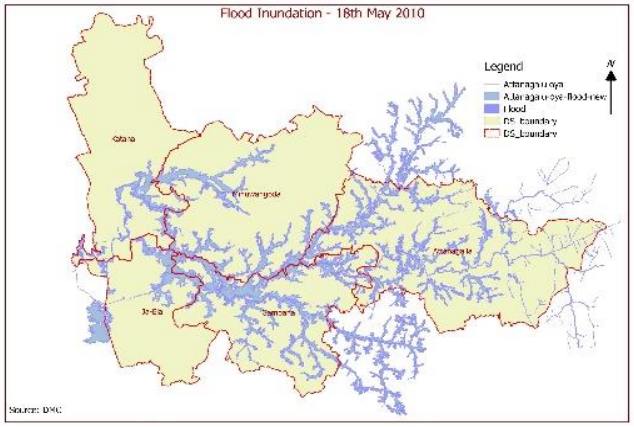
Digitize on Satellite Image

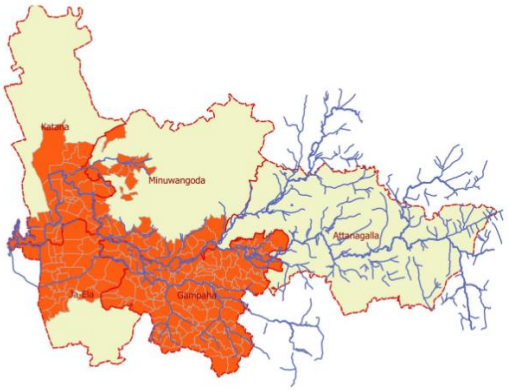
Openstreetmap

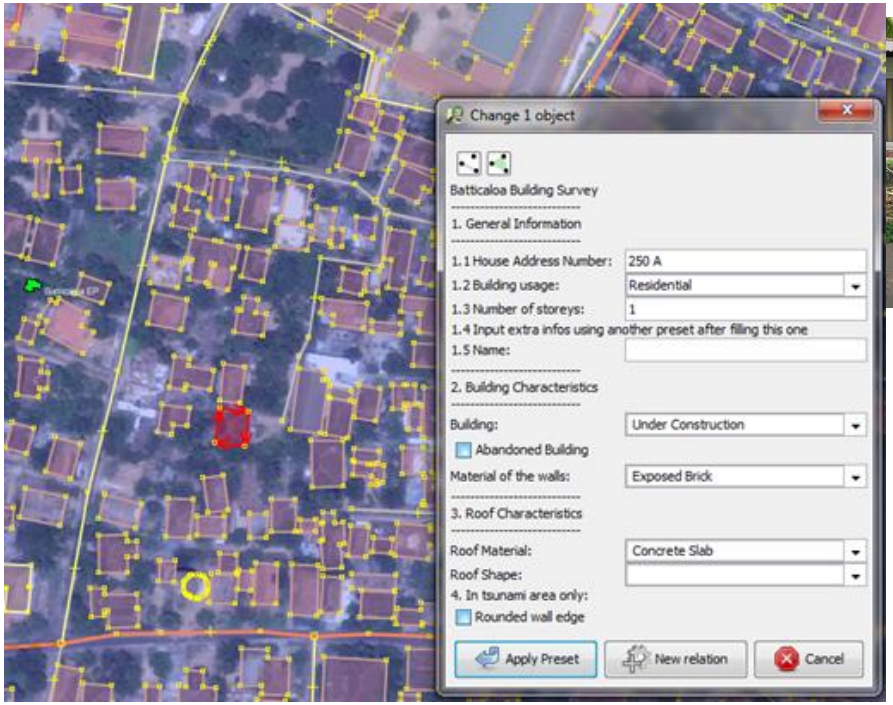
Field Data Collection

Using Tabs

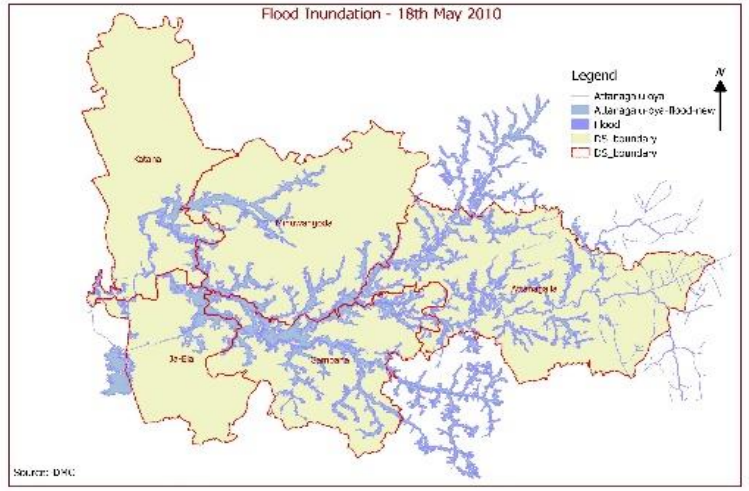
Verify and Update the Database

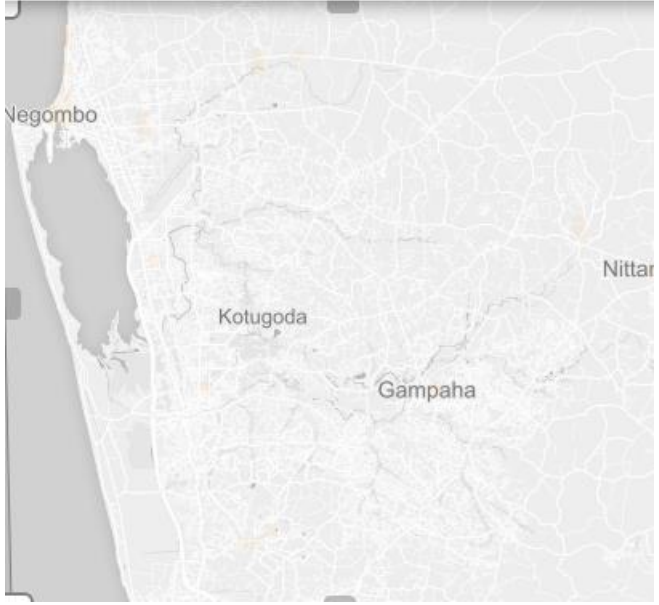




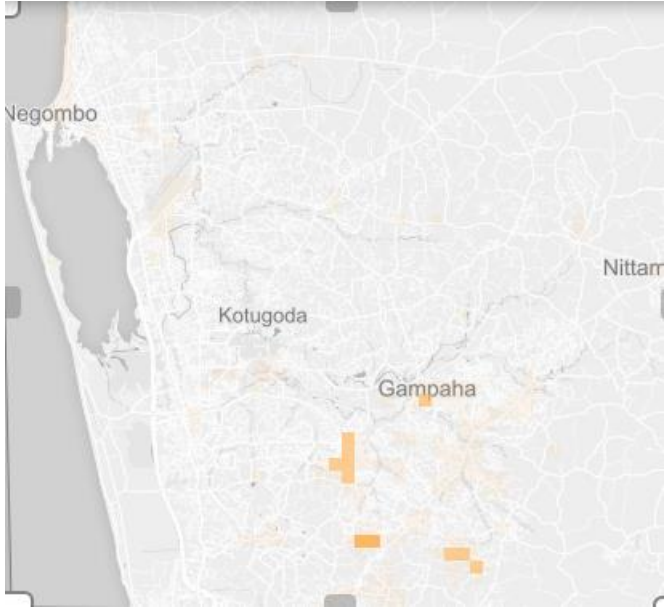


Attanagalu Oya Project Area

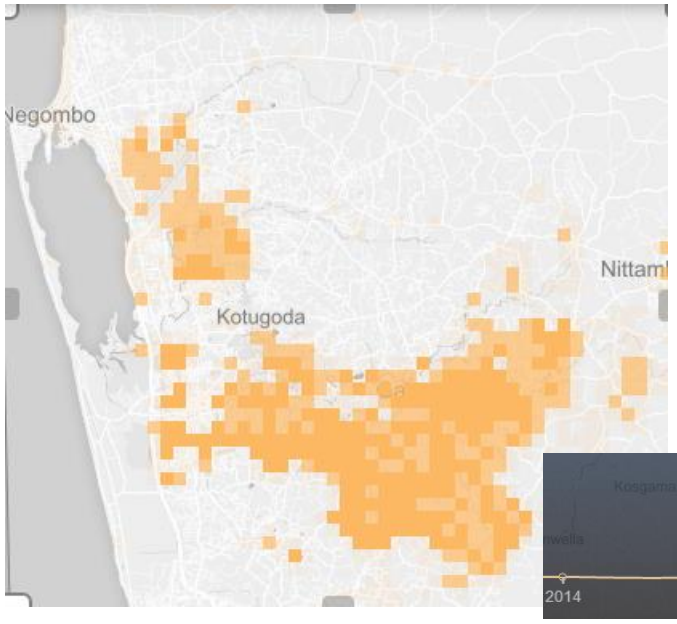




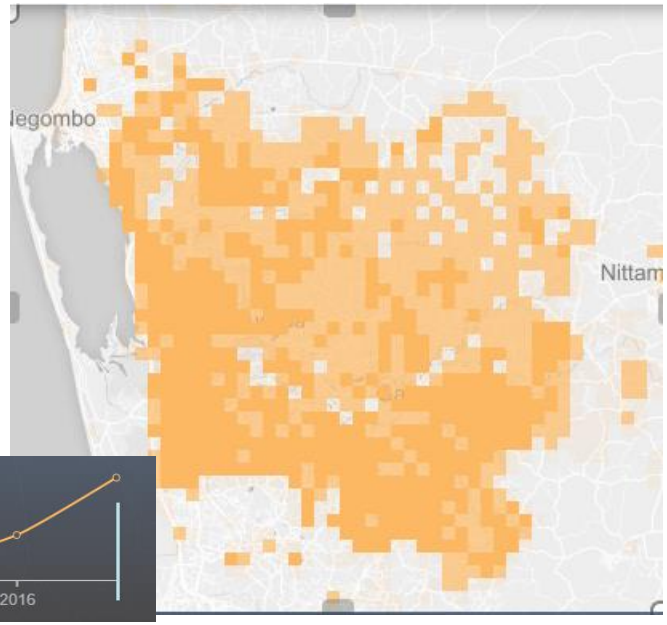
32 Buildings - January 2014



2562 Buildings - January 2014



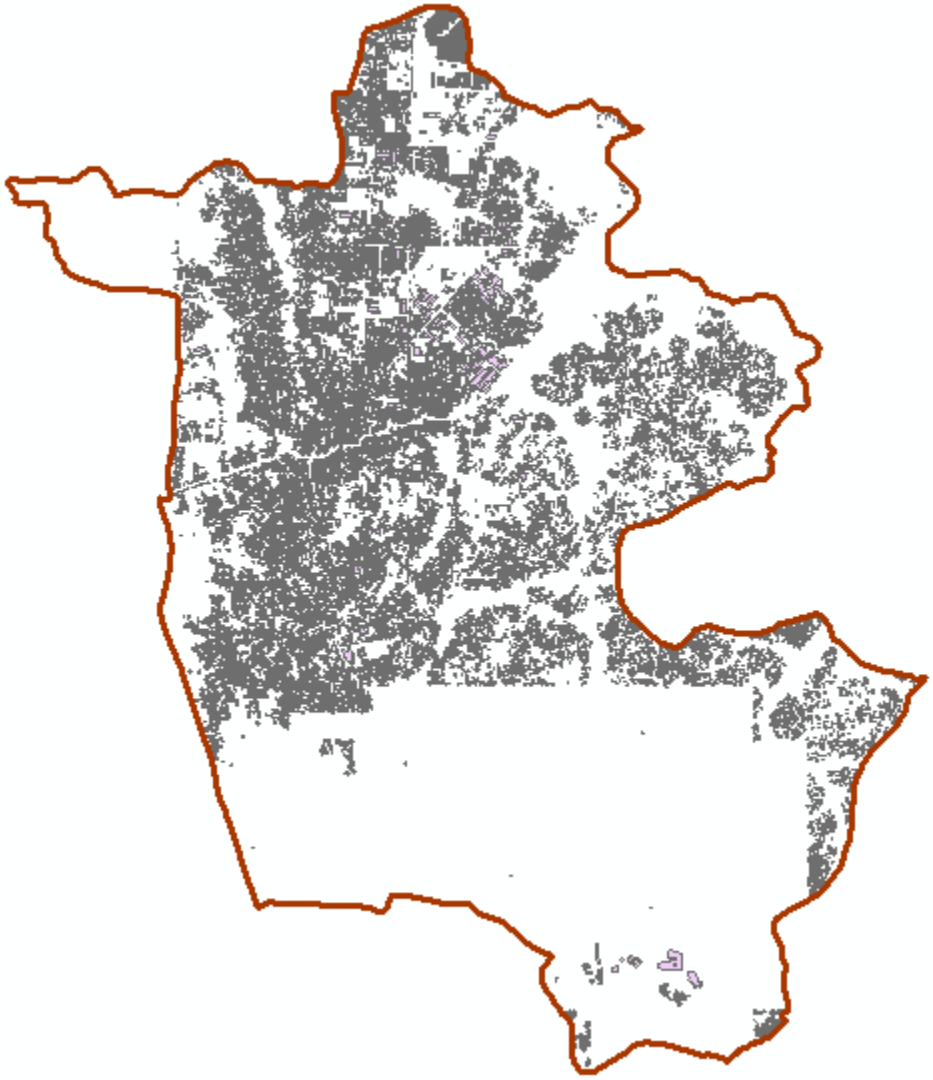
100,784 Buildings - January 2015



229,751 Buildings - Today

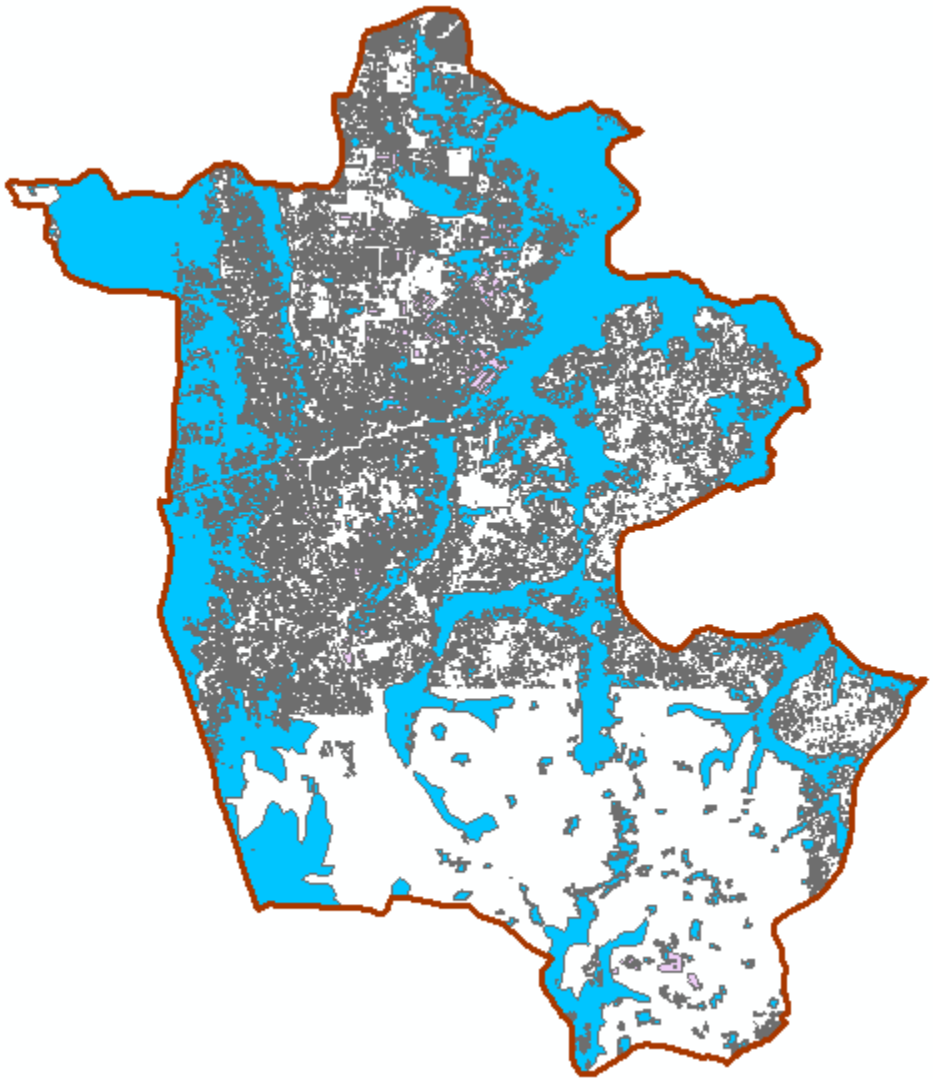
CASE STUDY

Ja – Ela Divisional Secretariat

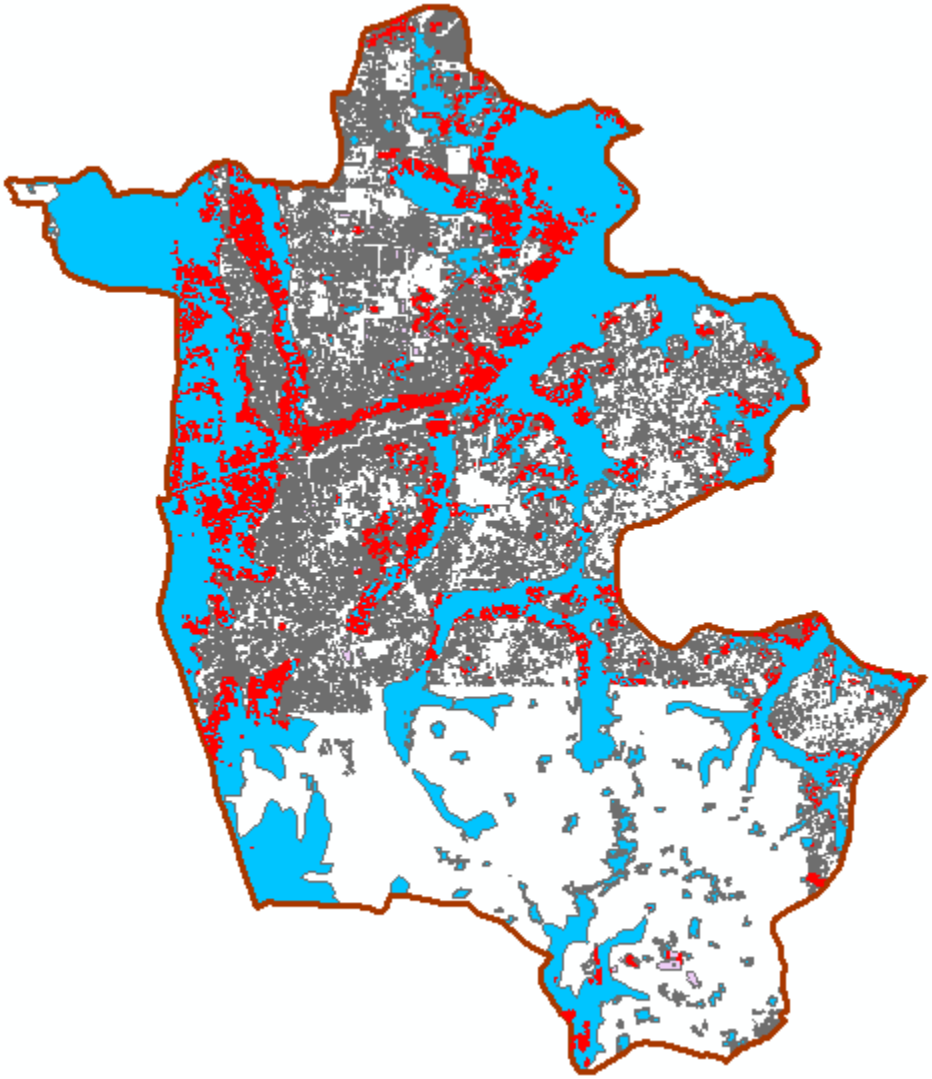


Building Exposure

39,697 Buildings



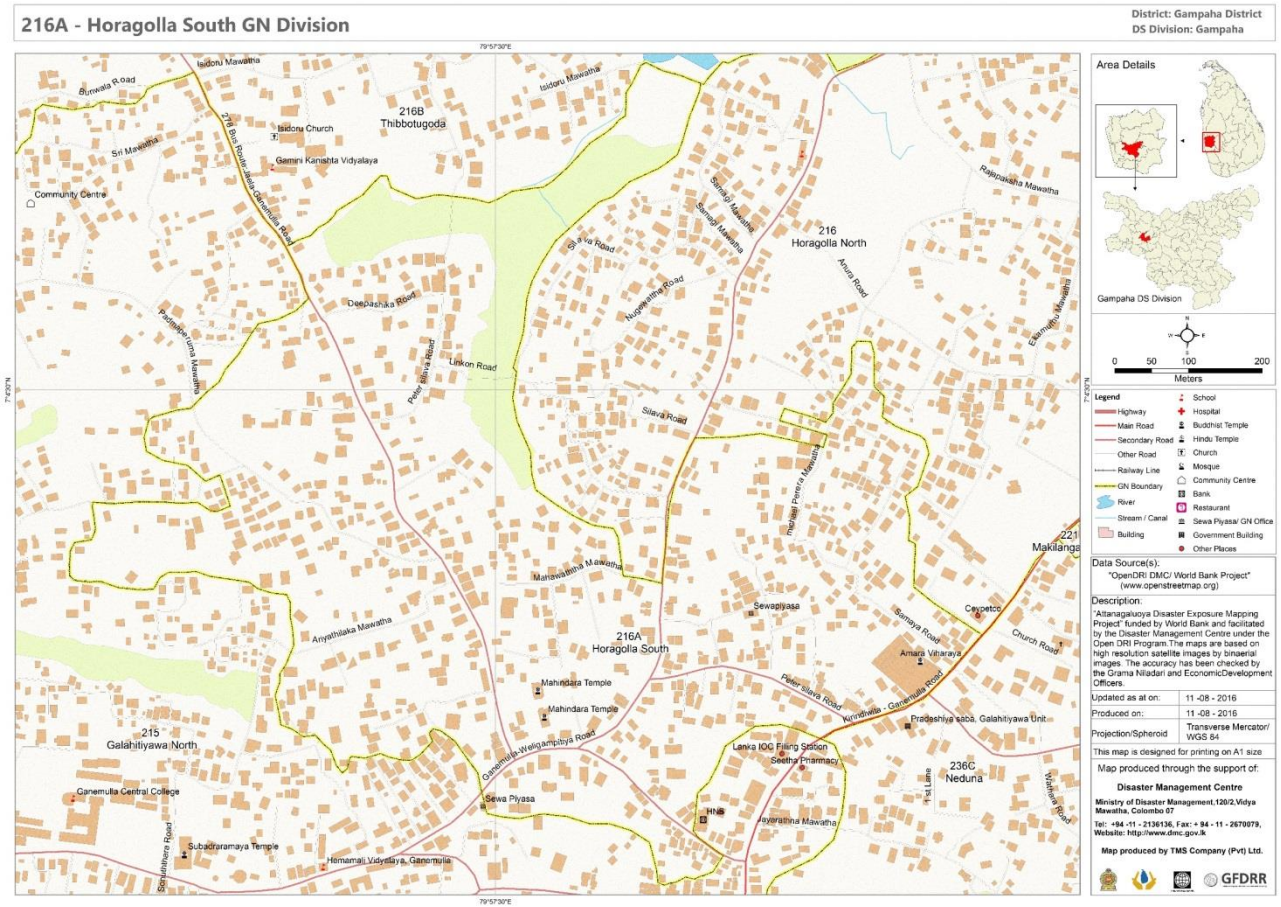
Building with Flooding



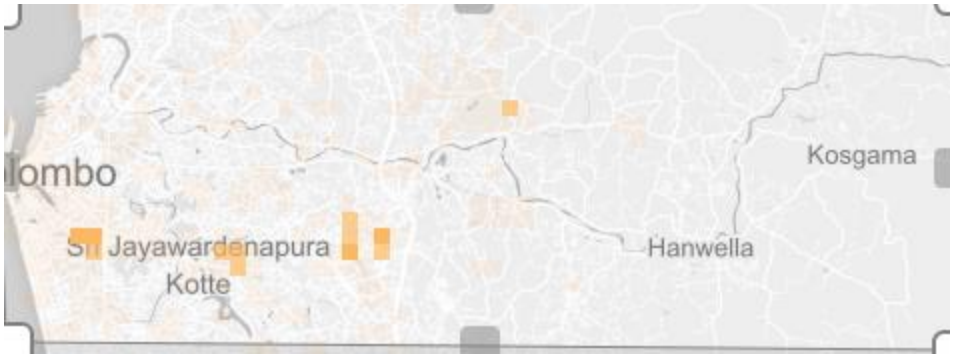
Affected Buildings by Floods
11647 Buildings

Project Outputs – Launched Today

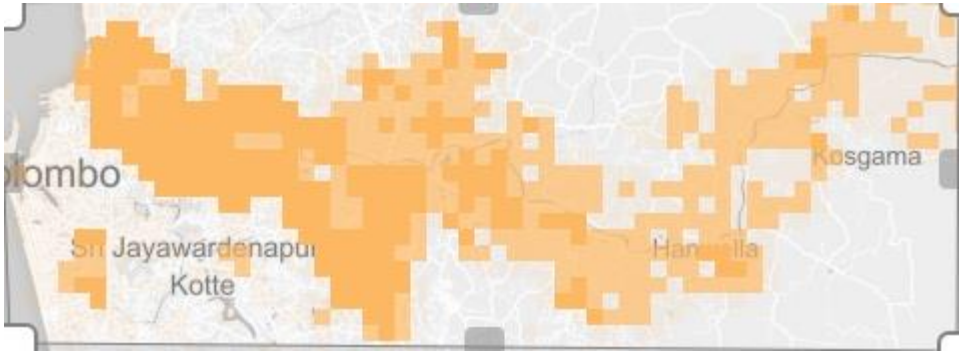
- **Printed GN Maps with boundary, buildings and land use**
- **Digital database of buildings with attributes**



Power of Volunteerism
Mapping with OSM – Flood May 2016



3429 buildings - January 2016



114,421 buildings – Today (Aug. 2016)

Humanitarian Open Street Map Team

Get Involved | Projects | News | About | Partnerships | Donate | Contact

Sri Lanka Flooding 2016

Sri Lanka has been hit in the past few days by flooding: https://www.bing.com/search?q=sri+lanka+flooding
HOT has been asked to activate and immediately start tracing buildings by the Disaster Management Center (DMC) of Sri Lanka, who work closely with World Bank GFDRR. They are in urgent need of detailed housing unit information. There are links on the HOT Tasking Manager: http://tasks.hotosm.org/
This is the earliest phase of response so we are actively working to find other actors on the ground that the HOT Community can collect and provide geo data for. This means that you should check the front page of the tasking manager often, different jobs to support different ground activities might be coming up.
HOT members Robert Banick and Mikel Maron will be leading HOT's response to this crisis. They can be contacted at:
mikel.maron at hotosm.org
rbanick at gmail.com

History of this Activation

Reactivity of the OSM Community

- 30 May - Over One Million Map Changes by just under 400 Mappers usi
- 28 May - 125,000+ Buildings have been contributed by 370 Mappers!
- 25 May - 100,000+ Buildings have been contributed by 335 Mappers!
- 23 May - 80,000+ Buildings have been contributed by 300 Mappers!
- 21 May - 50,000+ Buildings have been contributed by 245 Mappers!
- 18 May - HOT received a request to Activate…

6

SPATIAL DATA SHARING

UNSPIDER Technical Advisory Mission (TAM)

UNSPIDER TAM Recommendations

1. **Policy and Coordination**
   - ✓ DM Policy update
   - ✓ Improve inter-agency coordination
   - ✓ Sharing mechanism between data providers and users / Institute strengthen
   - ✓ **Data sharing policy / NSDI**
   - ✓ **Data policy for interoperability / common arrangement to obtain satellite data**
2. **Data and Access / Info Management**
   - ✓ Improve base line data at 1:10,000 including DEM
   - ✓ Development of Hazard & Risk Maps
   - ✓ Right to access data from different institutes
   - ✓ A dedicated unit for Information Management in DMC
   - ✓ **Implementation of NSDI**
3. **Capacity Building**
   - ✓ Building institutional and individual capacity

Cabinet Paper for NSDI

Draft-2

අමාත්‍ය මන්ඩල සංදේශය

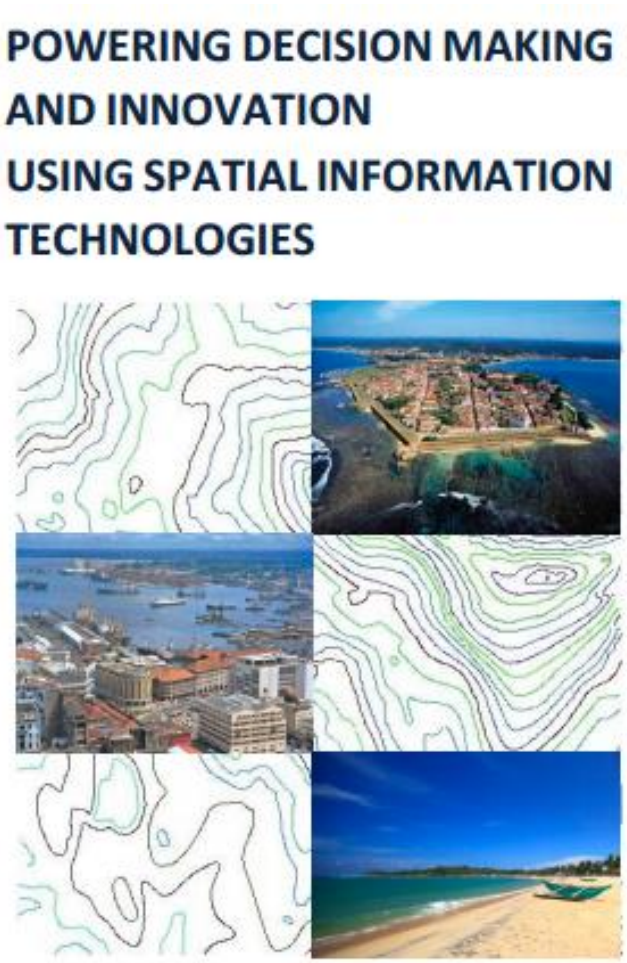
ජාතික අවකාශමය තොරතුරු පිළිබඳ යටිතල පහසුකම් පද්ධතිය ගොඩනැංවීම

භූගෝලීය නැතහොත් අවකාශමය පිහිටුම් හා බැඳුනු තොරතුරු රාජ්‍ය මෙන්ම පෞද්ගලික අංශයේද සැලසුම්කරුවන්, තීරණ ගන්නන් හා කළමනාකරුවන් විසින් තම කටයුතු සැලසුම් කර ගැනීමට හා තීරණ ගැනීම් සඳහා මෙවලමක් ලෙස යොදා ගනු ලැබේ. එබැවින් පොදුවේ ගත් කළ ජාතික සංවර්ධන ක්‍රියාවලිය වඩාත් කාර්යක්ෂම කිරීම සඳහා මෙම තොරතුරු වඩාත් සාර්ථක ලෙස බෙදා හදා ගැනීම, හුවමාරු කිරීම, ගබඩා කිරීම හා ආරක්ෂා කිරීම ඉතා වැදගත් කටයුත්තකි. එයට අමතරව මෙම තොරතුරු ආපදා කළමනාකරනය, ජලය, විදුලිය හා දුරකථන පහසුකම් වැනි සේවාවන් වඩාත් ඵලදායී ලෙස සැපයීම හා අස්වනු කළමනාකරනය වැනි විවිධ කටයුතු සඳහාද යොදා ගැනීම මගින් එම කටයුතුද වඩාත් කාර්යක්ෂමව සිදු කිරීමට අවස්ථාවක් ලබාදිය හැකිවේ.

එමෙන්ම දිනෙන් දින දියුණුවෙමින් යන තොරතුරු මත පදනම්වූ ලොවෙහි භූගෝලීය හා අවකාශයීය තොරතුරු ඉතා වැදගත් තැනක් ගනී. විශ්වාසනීයත්වය හා ඉහළ ගුණාත්මක බවින් යුතු තොරතුරු බොහෝ ක්‍රියාවලින් සඳහා

It took around 01 year to approve this paper…

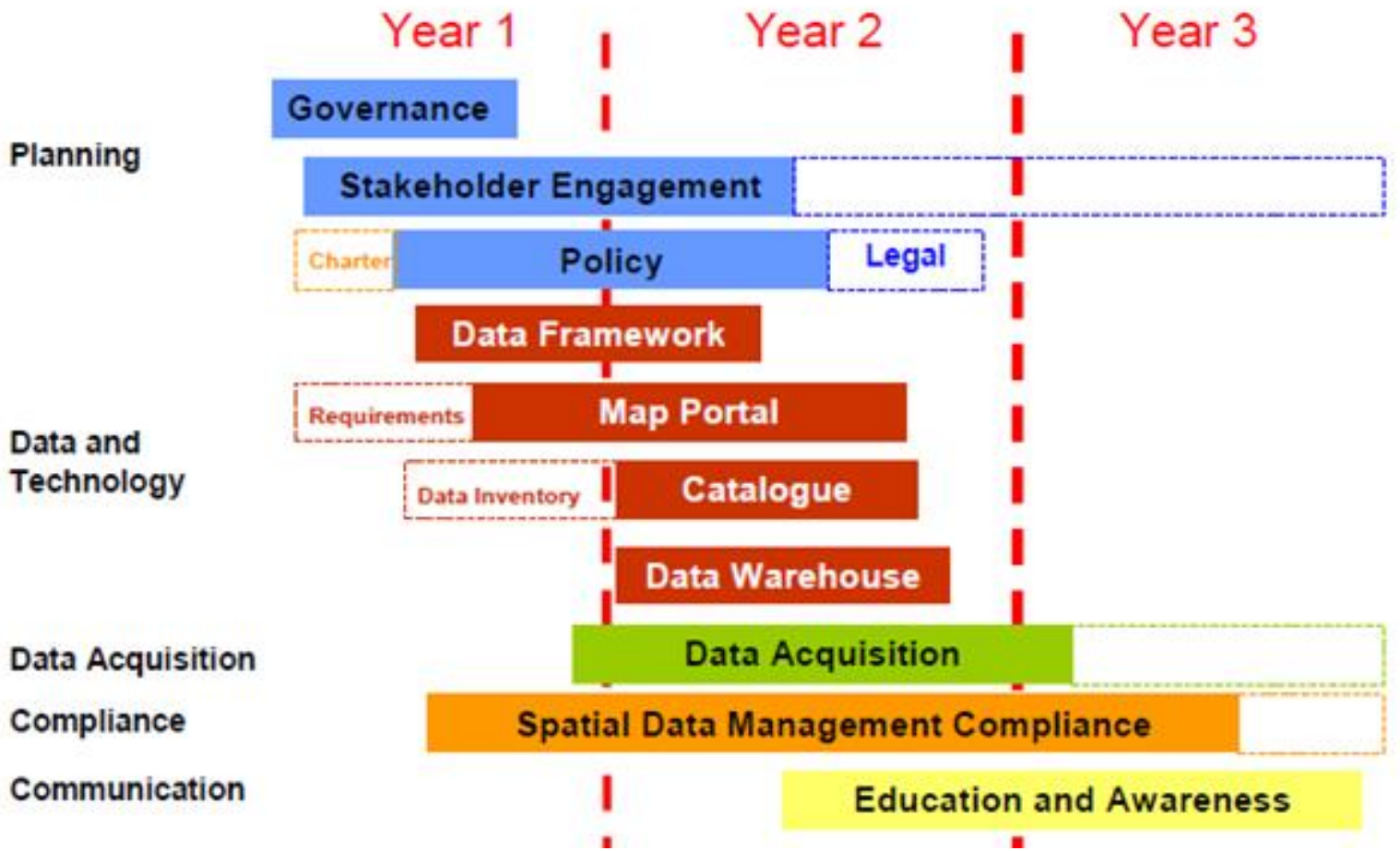
Sri Lanka Spatial Data Infrastructure



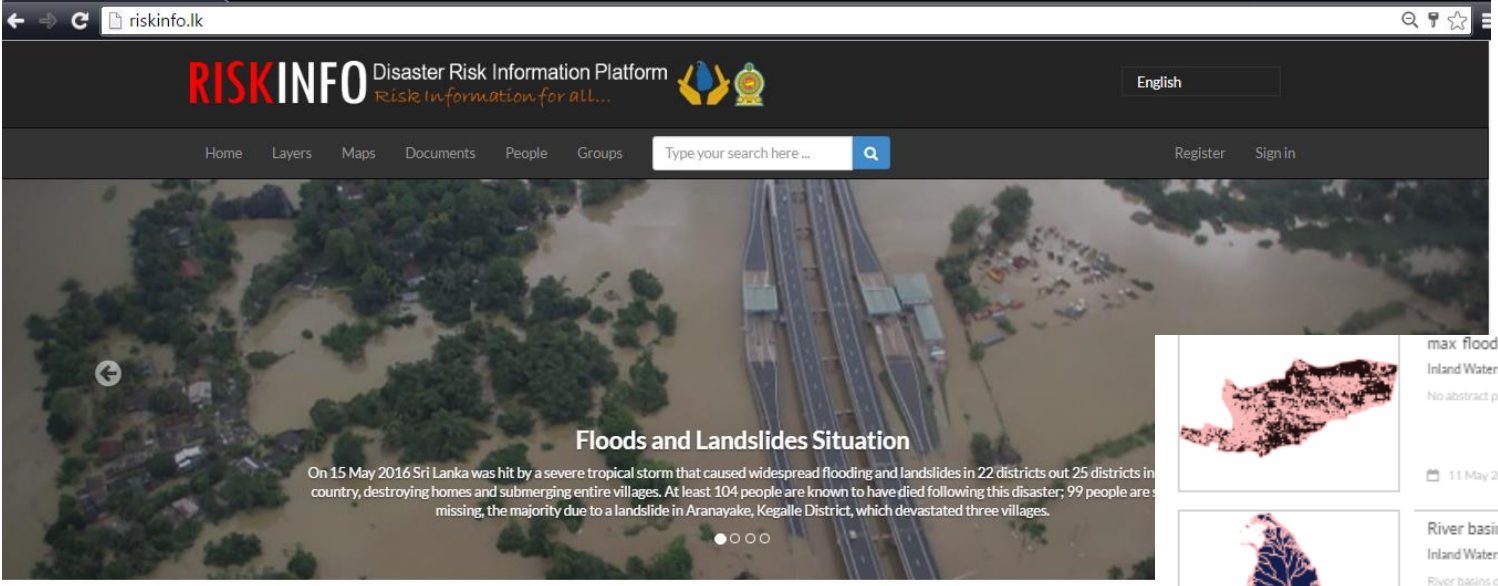
Cabinet decision:

1. To implement NSDI with overall supervision of Prof. Tissa Vitharana
2. Appointed parliamentary committee to oversee the process
3. Implement Pilot project by Sec MDM

NSDI Implementation 2016-19



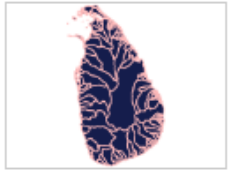
Government has allocated 3.5 US $ Millions for this work



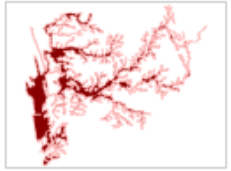
DATA LAYERS

RiskInfo lets you upload, manage, and browse data. Search for data that is valuable to you, or upload your own

max flood eventmay2003 sld99
Inland Waters by admin
No abstract provided
11 May 2016 | 11 | 0 | 0 Create a Map



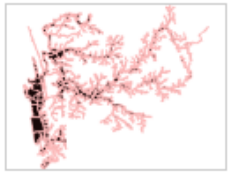
River basins of Sri Lanka
Inland Waters by admin
River basins of Sri Lanka. Projected in WGS84.
3 May 2016 | 15 | 0 | 0 Create a Map



attanagalu wgs84
Inland Waters by srimal
The footprint of the Attanagalu river
5 Mar 2016 | 51 | 0 | 0 Create a Map

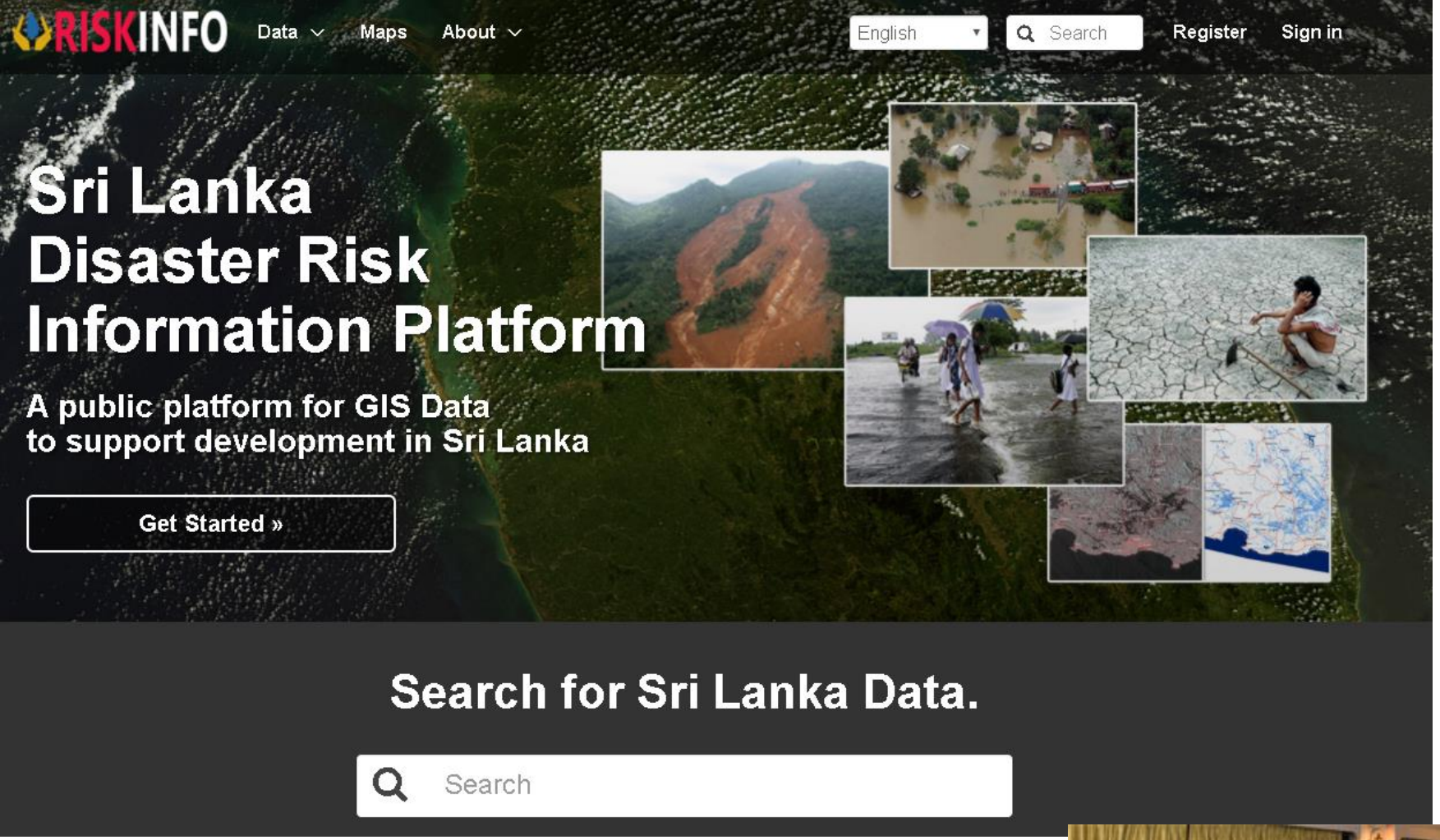
district combined sri lanka 1
Society by admin
No abstract provided
1 Mar 2016 | 31 | 0 | 0 Create a Map

Population within 500m of a tsunami inundation zone
Environment by admin
The total number of persons affected by a potential tsunami going 500m inland. Built off an intersect of a tsunami hazard model and 2012 census data.
3 Jul 2014 | 73 | 0 | 0 Create a Map



Census areas intersecting projected Attanagalu Oya flooding (no b...
Society by admin
2012 census areas falling within a projected flood of the Attanagalu Oya river basin
26 Jun 2014 | 67 | 0 | 0 Create a Map

RISKINFO is the strategy to share all the Risk related data



www.riskinfo.lk

Launched on 21 Dec 2017

towards a
safer

Sri Lanka

Thank You