Landslide Risk Reduction in Sri Lanka

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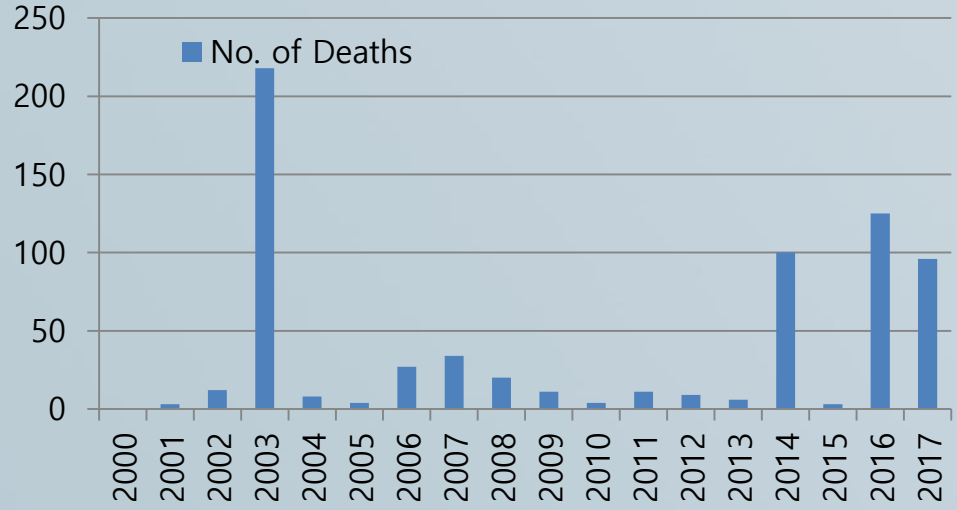
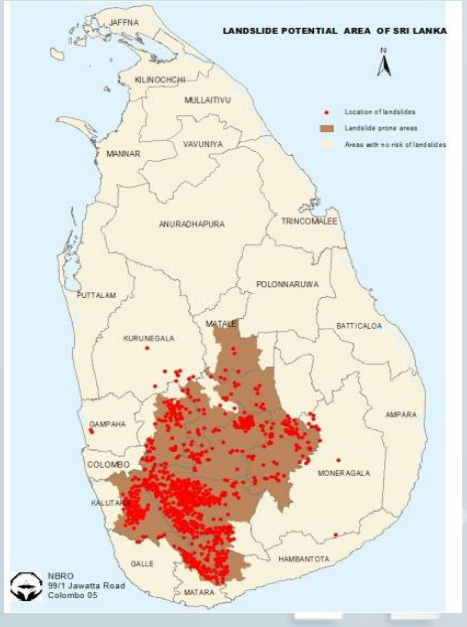
Landslides in Sri Lanka

- Landslides have become a frequent natural hazard in central highlands of Sri Lanka, which disturbs its life, causes damage to property, constructed facilities and infrastructure.
- Nearly 20% of the land area from 65,000 sq. km of total area in Sri Lanka is identified as landslide prone. Nearly 30% of total population live in these areas.



Number of lives lost due to landslides/slope failures:2000-2017



Landslide Potential Area

Landslides in Sri Lanka


Mulhalkele 1986


Watawala 1991-92

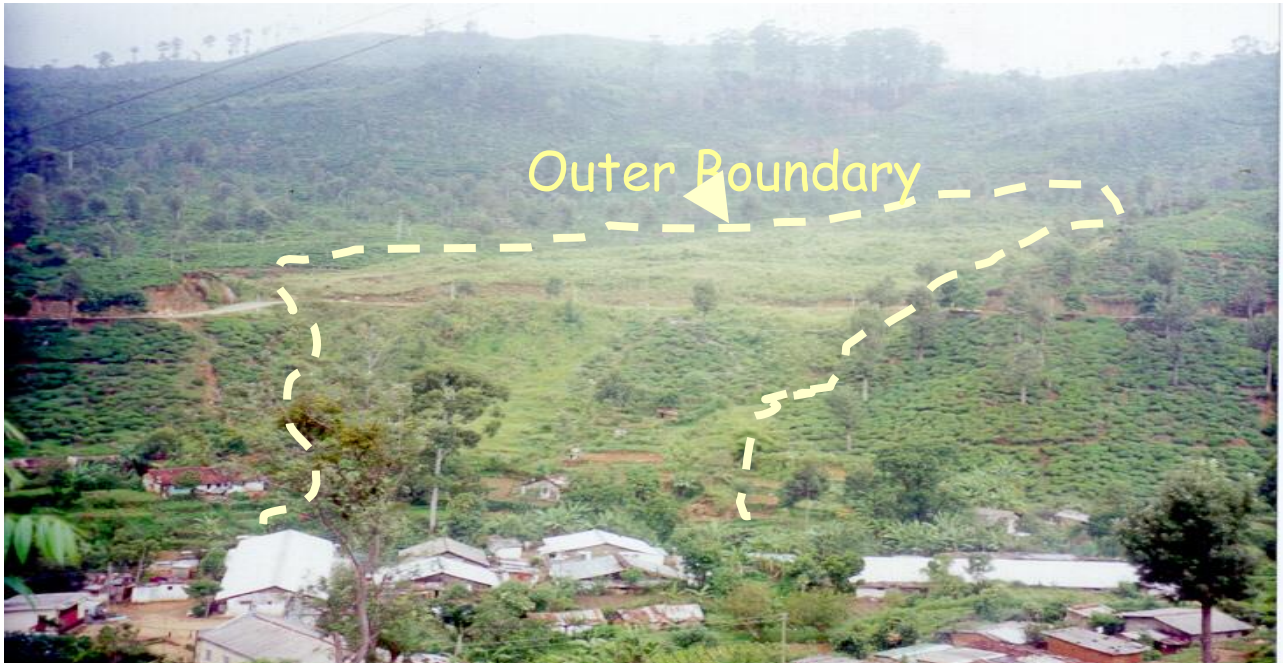

Paradeka - 2006


Ladupita,Kiriwanella- Nuwara Eliya District 2007

Landslides in Sri Lanka

Landslide along major roads

Kahagolla Landslide



Damages due to Unplanned Construction

Pilimathalawa 2007

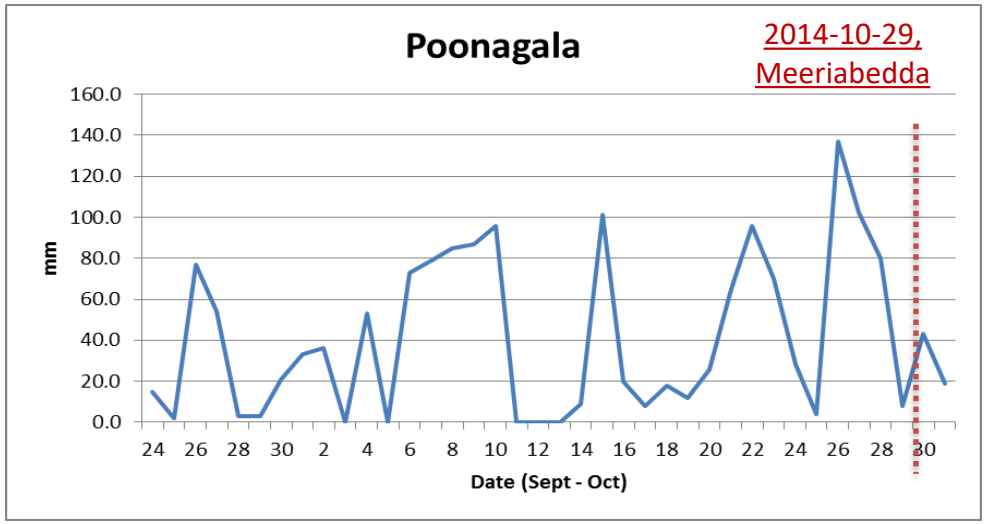
Nildandahinna - 2007

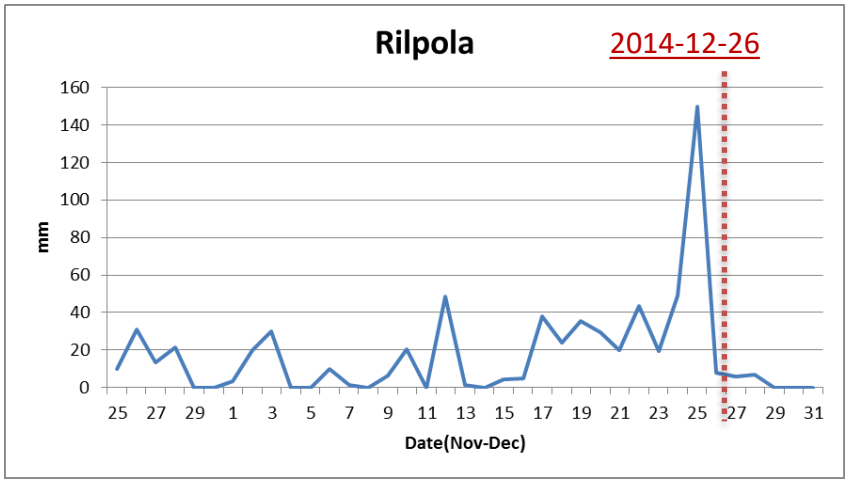
Non Engineered Construction Leading to Cutting Failures Along Main Roads

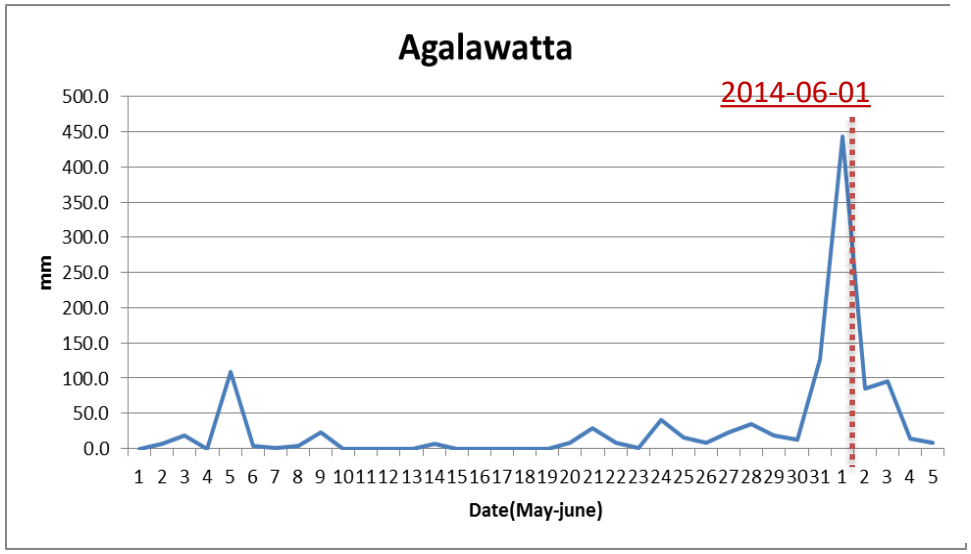
Recent Cutting Failures

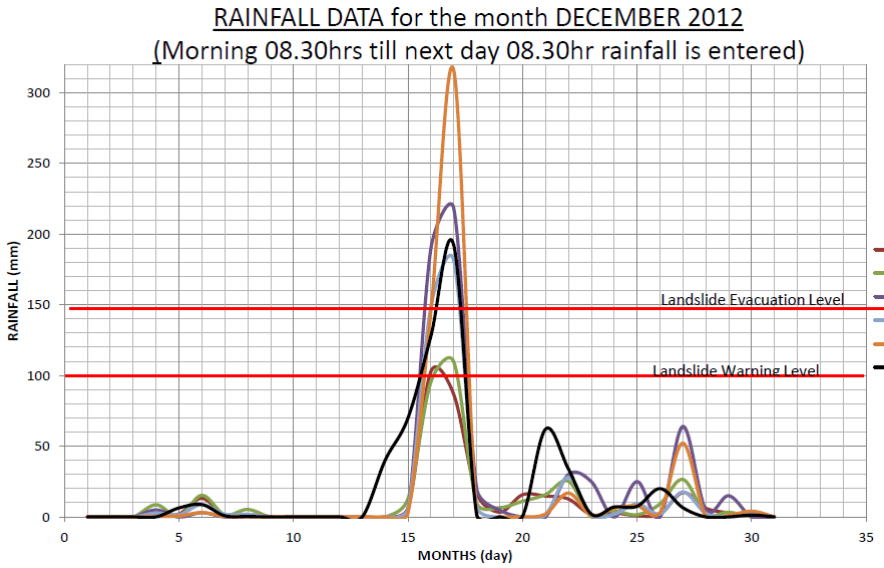
Landslides in Sri Lanka

Main triggering factor- Rainfall









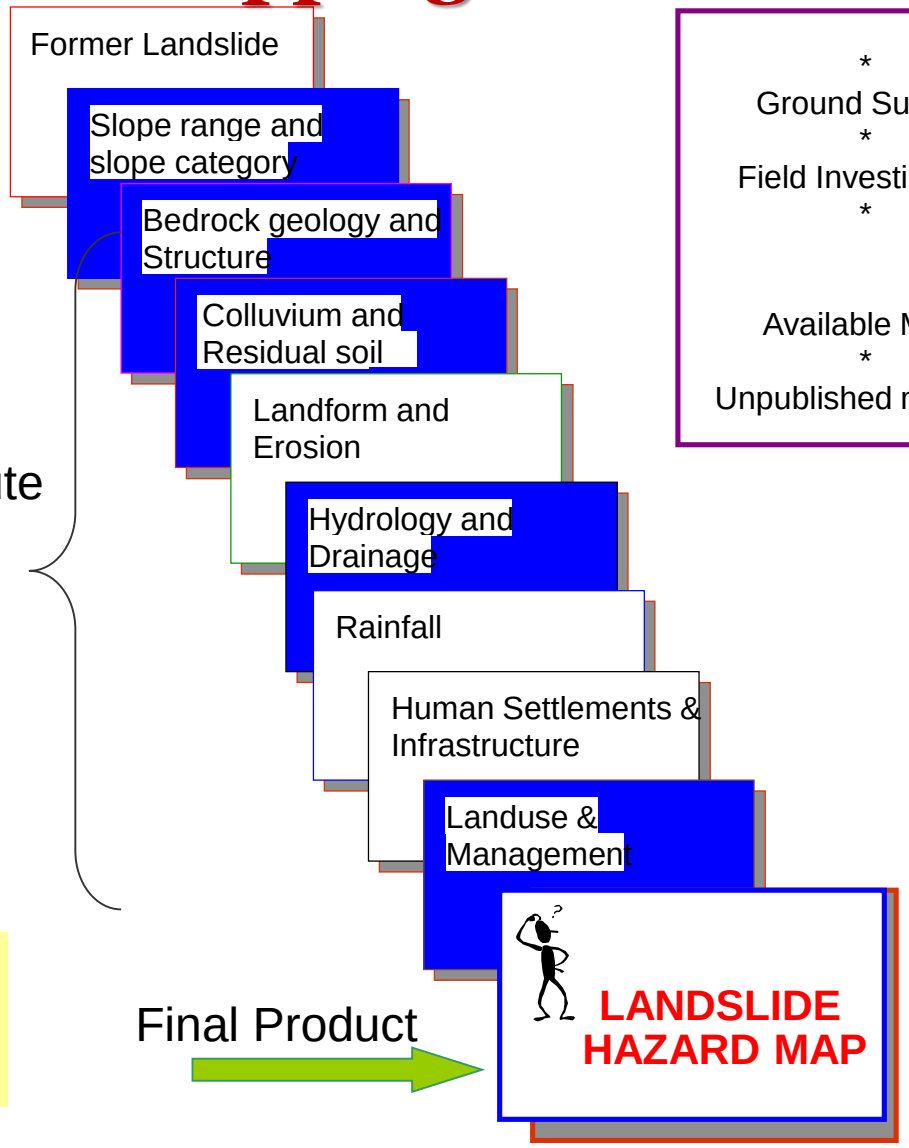
Our Strategies In Landslide Risk Management

- Landslide identification and hazard zonation mapping
- Integrate from Hazard to Risk management
- Landslide monitoring and early warning and awareness
- Landslide risk assessment for development and construction projects
- Landslide Special Investigations
- Structural mitigation works
- Related policy development and planning

Landslide Identification & Hazard Zonation Mapping

Mapping Process

Key Map



Attribute Maps

Terrain factors & Weightings

- BEDROCK GEOLOGY - 20
- SOIL COVER - 10
- SLOPE RANGE & CATEGORY - 25
- HYDROLOGY & DRAINAGE - 20
- LAND USE & MANAGEMENT - 15
- LAND FORM - 10

Allocated weights for attributes and factor maps according to the statistical analysis and experts knowledge

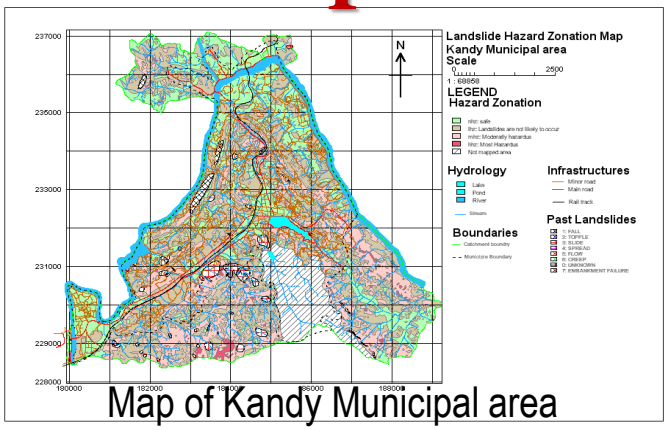
*
Ground Surveys
*
Field Investigations
*

Available Maps
*
Unpublished materials

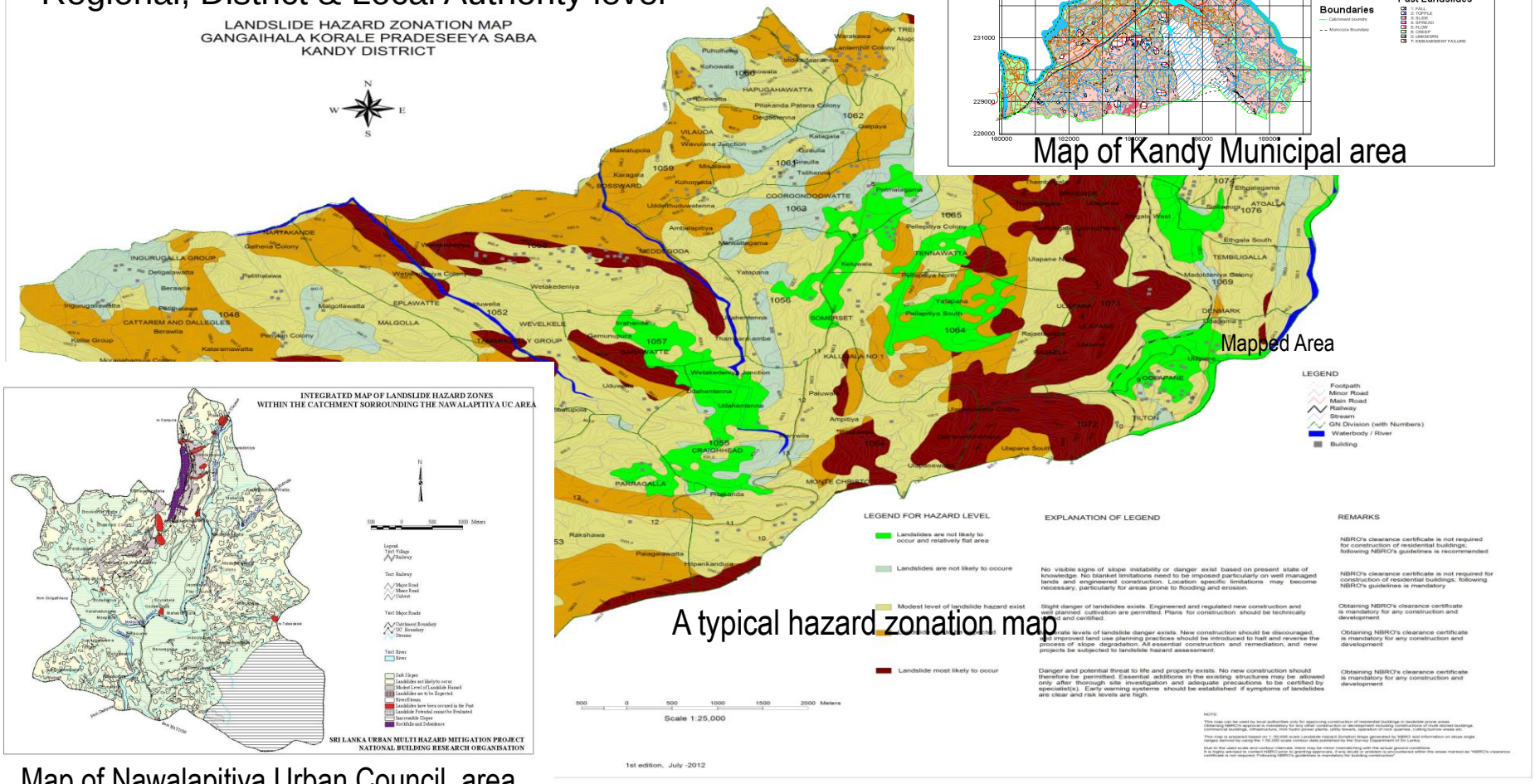
Final Product

Landslide Hazard Zonation Maps

Landslide Hazard Zonation Maps at different levels, Regional, District & Local Authority level



Map of Kandy Municipal area



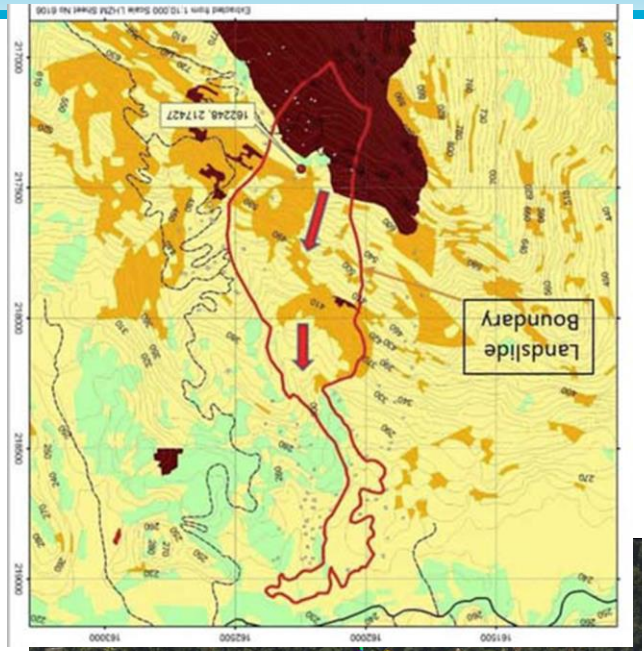
Mapped Area

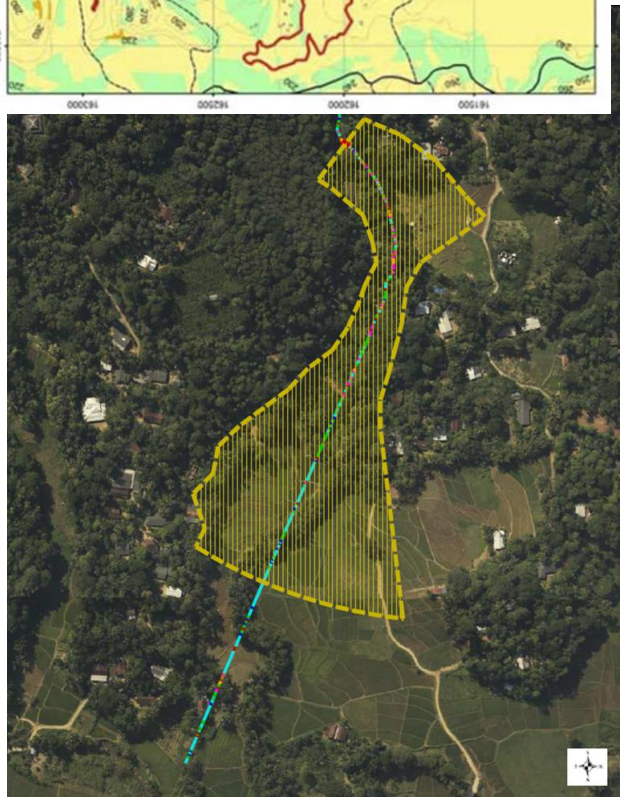
A typical hazard zonation map

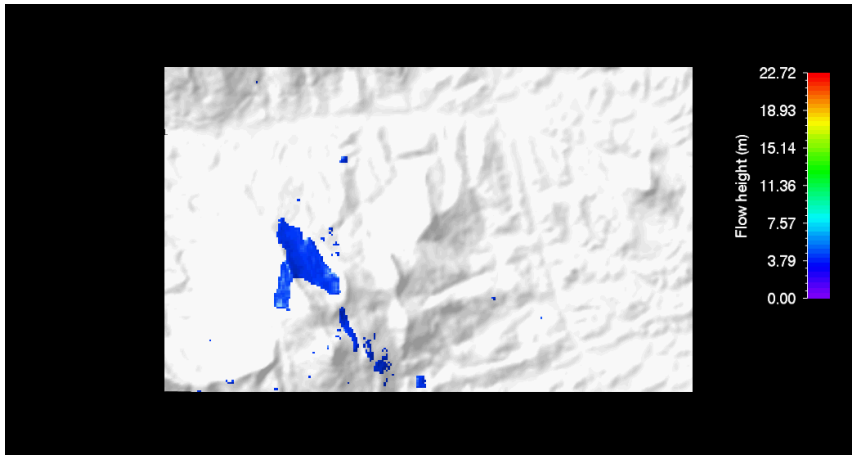
Map of Nawalapitiya Urban Council area

Development of Flow paths

Day 2016.5.17__17:00
2016.5.18__ 0:00
Damage 28dead,99missing





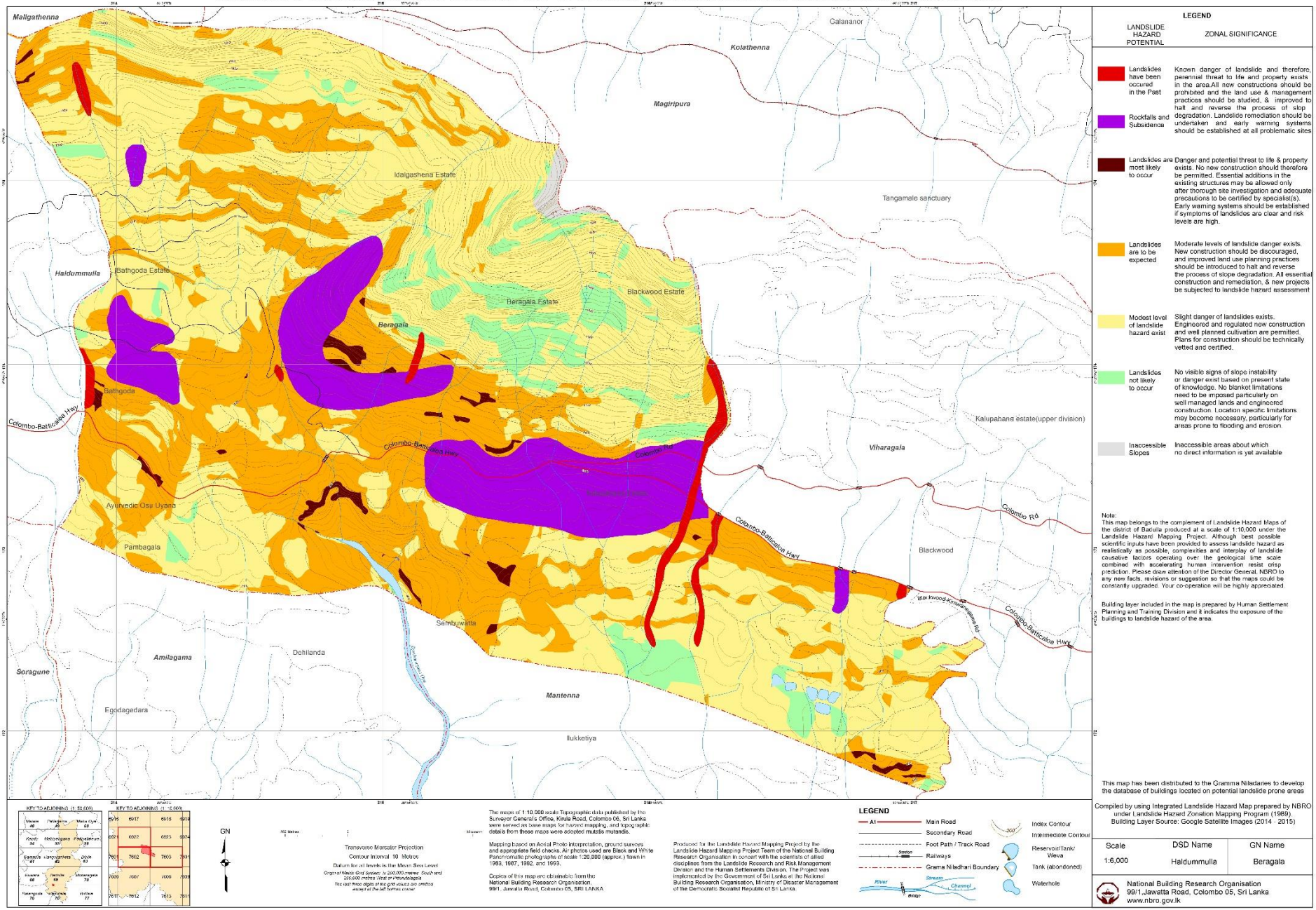


DEVELOPMENT INTEGRATED LANDSLIDE HARZED MAPS

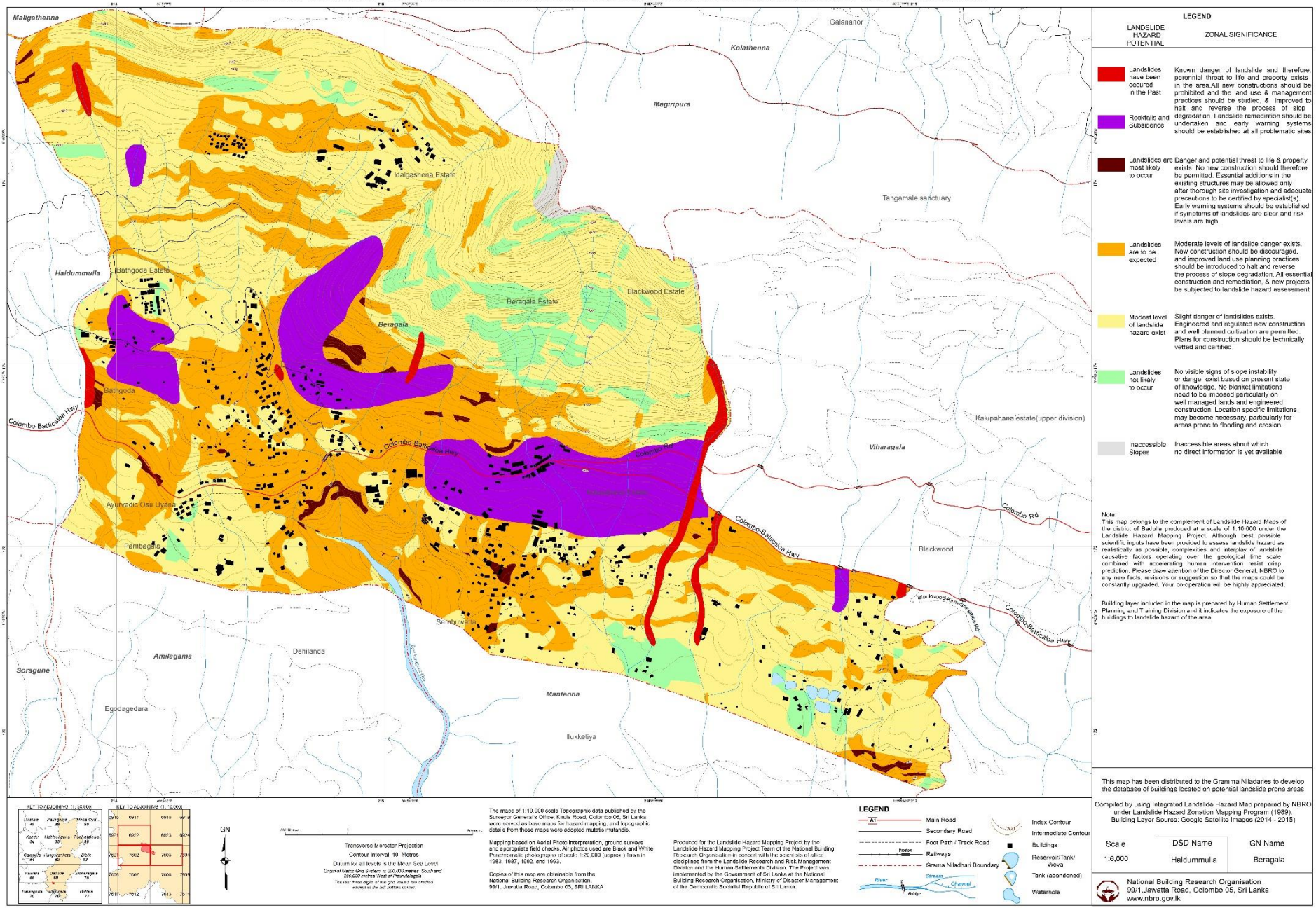
BUILDING FOOTPRINTS

INTEGRATED LANDSLIDE HAZARD ZONATION MAP

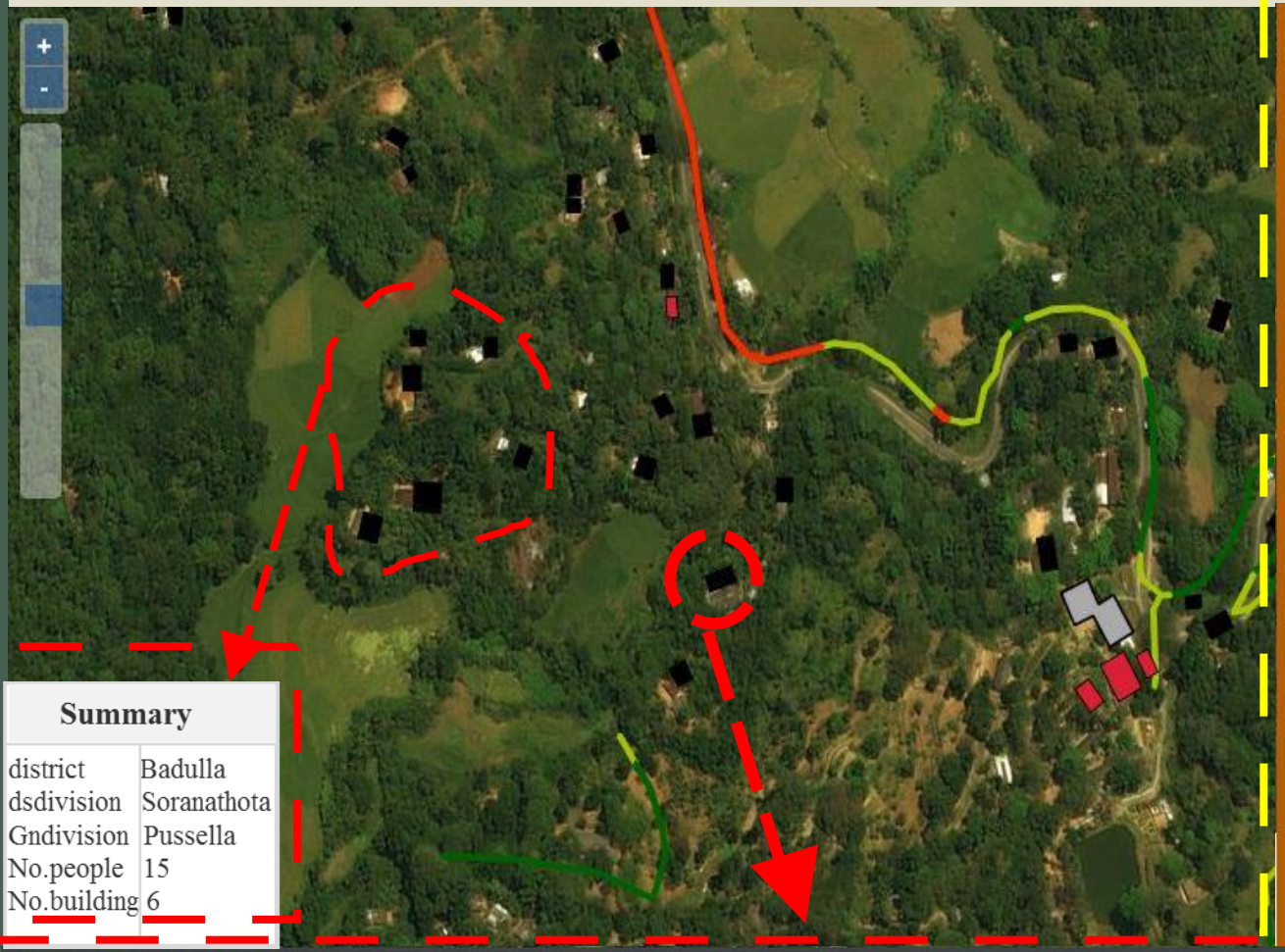
INTEGRATED LANDSLIDE HAZARD ZONATION MAP OF BERAGALA GRAMA NILADHARI DIVISION IN BADULLA DISTRICT



BUILDINGS EXPOSURE TO LANDSLIDE HAZARD



DATABASE ON ELEMENTS AT RISK – Data Base



Summary

district	Badulla
dsdivision	Soranathota
Gndivision	Pussella
No.people	15
No.building	6

Landslide Hazard Information System

Landslide Prone Areas

Measure Distance/Area

Select

Search option in different levels

Feature Filter

Select a layer

Clear filters

Layers

- SPATIAL BOUNDARIES
- TYPES OF BUILDINGS
- SPATIAL LAYERS
- BASE LAYERS

The attributes of the selected feature.

Please select a layer in the "Popup Layer" dropdown menu. Click on a feature of the selected layer to display the data.

Popup Layer

household Info

household

fid	sub_number	district	dsdivision	gndivision	sub_numb_1	head_house	home_addre	contact__n	contact_no	c
household.198	42	Badulla	Soranathota	Pussella	42	R.V Edawad Perera	8th Mile post,Thaldena,Badulla	555331846	No_Info	N

Retrieve data from selected area or building

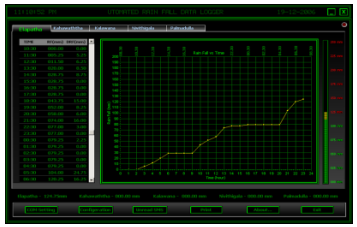
Details of the Risk Levels of the landslide prone locations at all districts

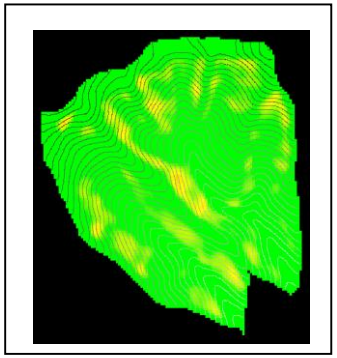
#	Province	District	Number of Houses in High Risk
1	Uva	Badulla	6,418
		Kandy	1,292
2	Central	Nuwara Eliya	3,496
		Matale	210
3	Sabaragamuwa	Rathnapura	757
		Kegalle	824
4	Southern	Matara	591
		Hambantota	343
5	Western	Kalutara	929

Investigation and Identification of Vulnerable Communities and High Risk Settlements

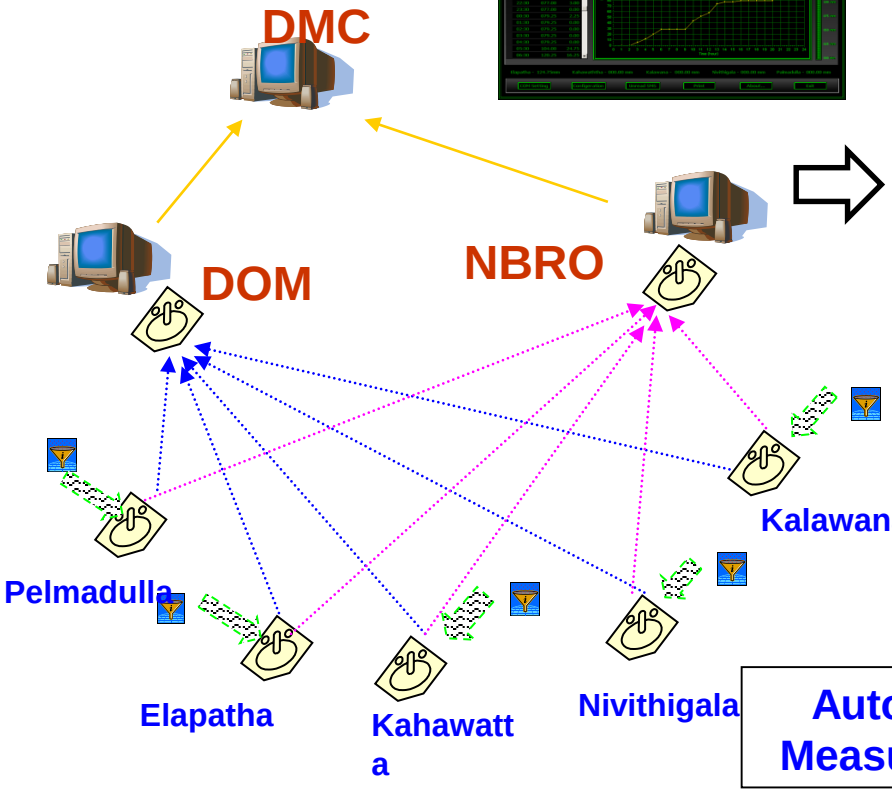
Real Time Landslide Monitoring & Early Warning

- 100 automated rain gauge stations in pre-selected catchments in landslide prone districts





Warning and Evacuation



Automatic Rainfall Measurement System

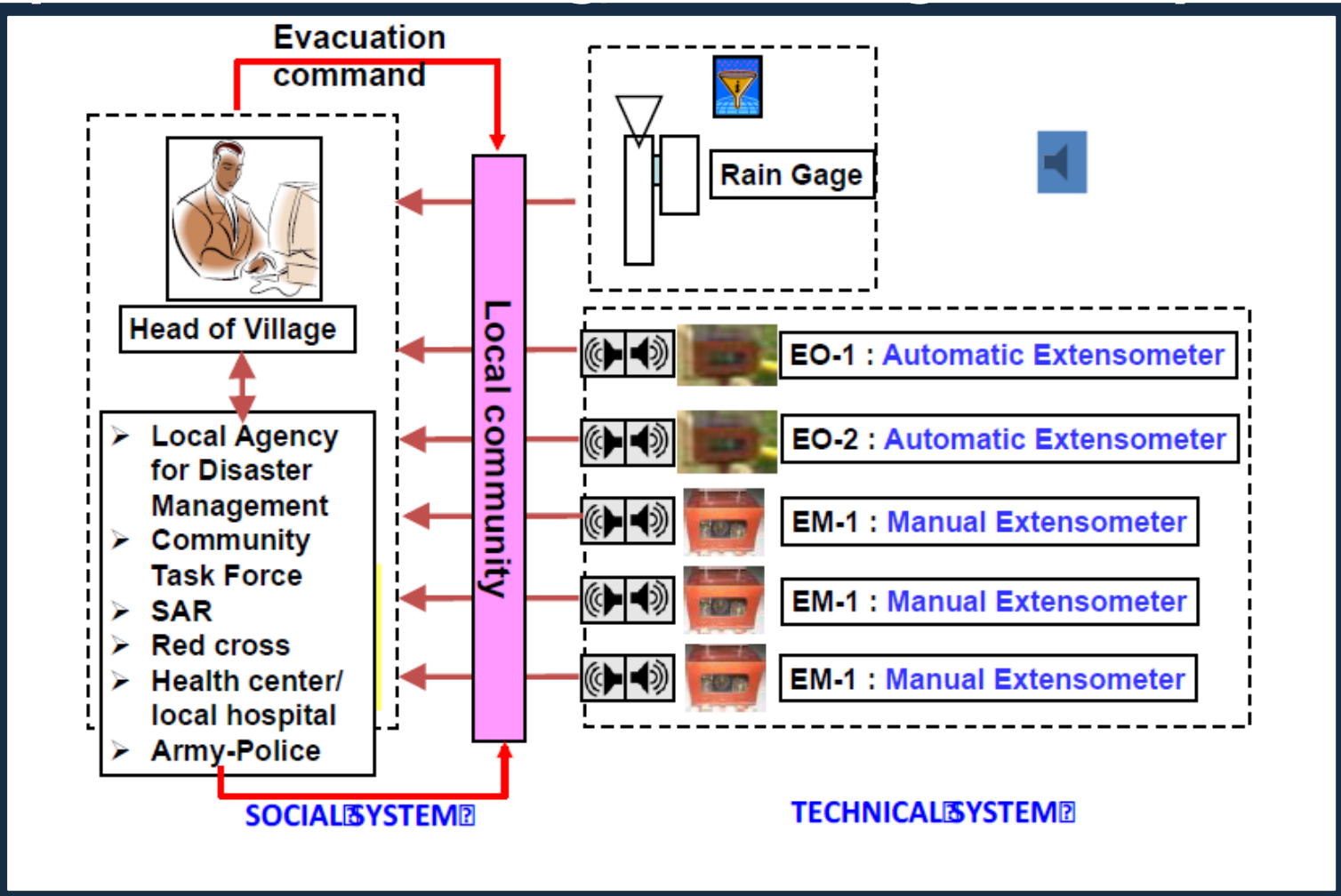
Early Warning

Standard threshold limits of the Rainfall for landslides

Alert	75 mm/day
Warning	100mm/day
Evacuation, Off limit	75 mm/hour or 150mm/day

Rainfall data is used in computer simulation and early warning is issued depending on threshold limits

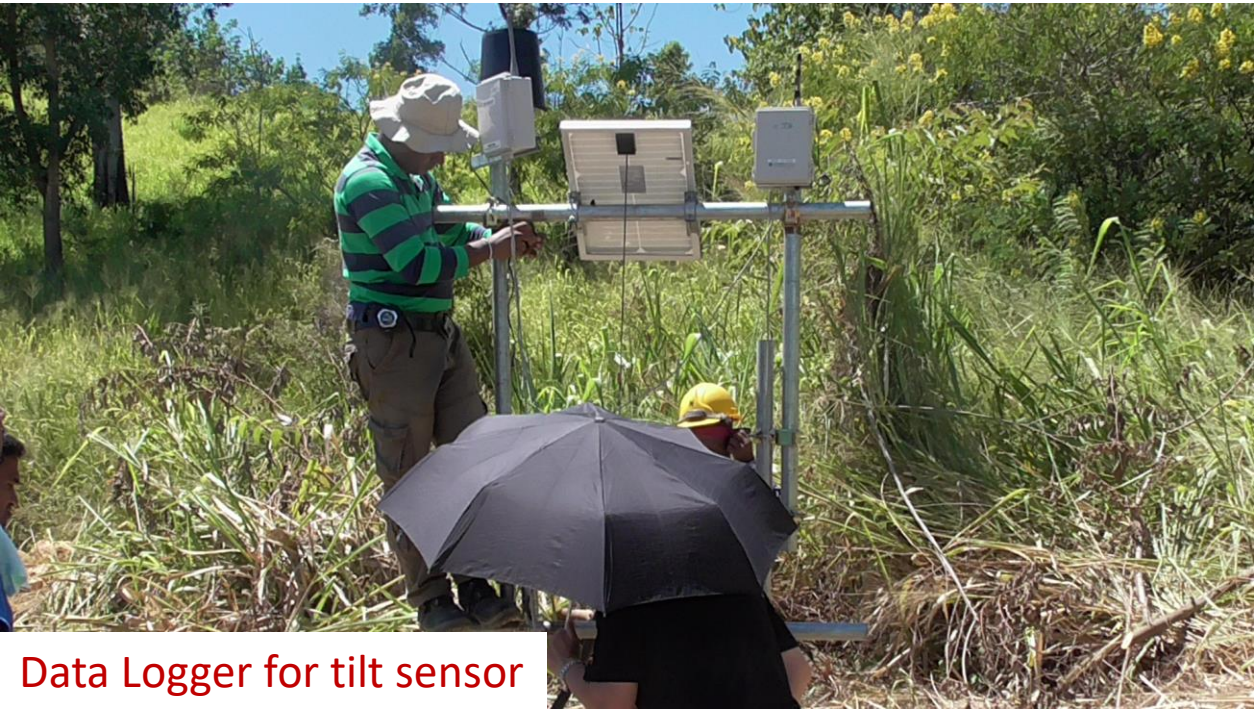
Site specific/CB Monitoring, Forecasting and Early Warning



Schematic diagram of the socio-technical management system on landslide early warning

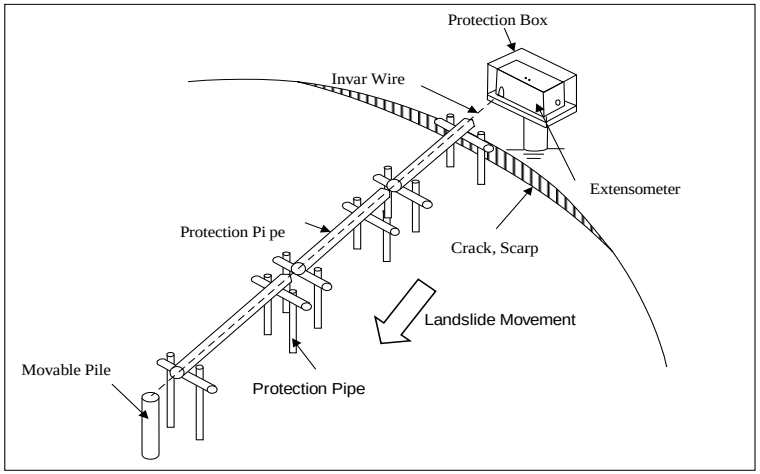
Extensometer

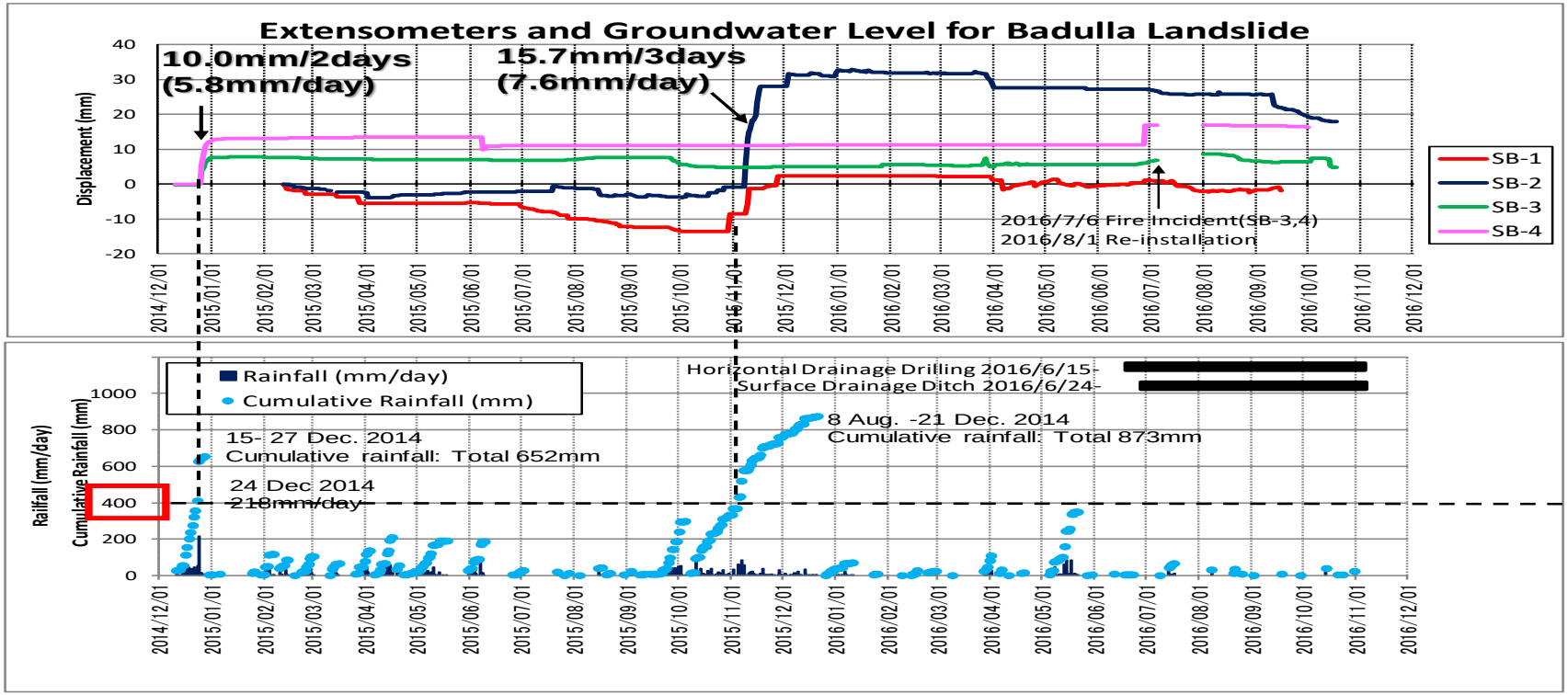
Tilt Sensor



Data Logger for tilt sensor

Instrumentation and Monitoring





Thank you