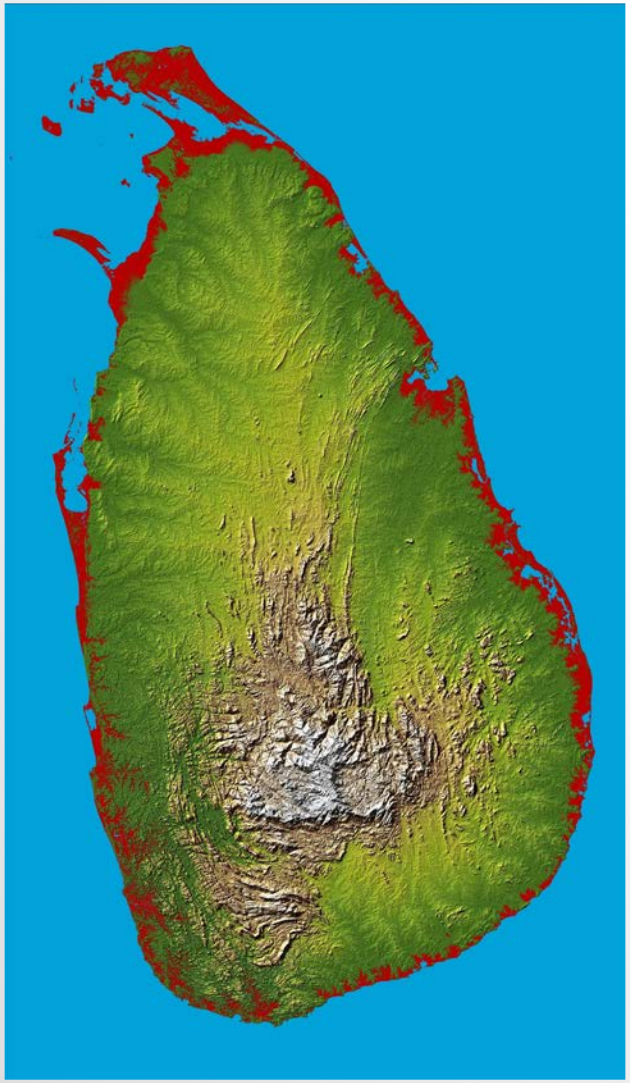
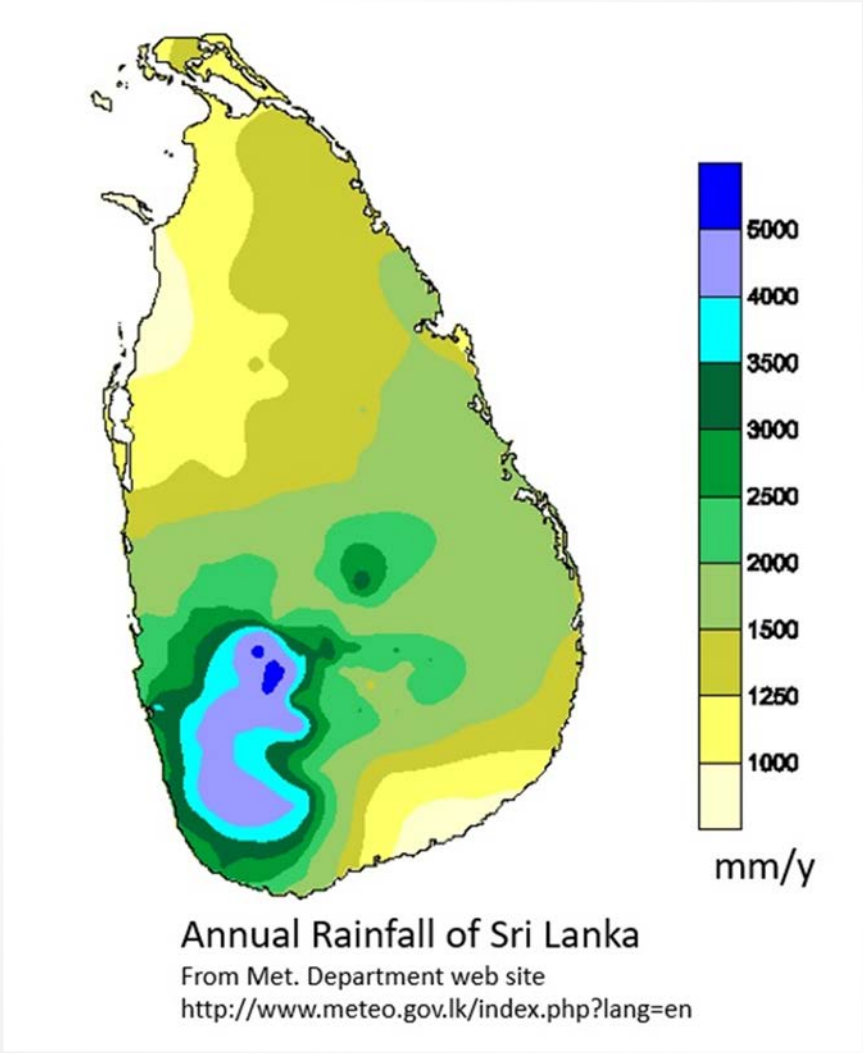
LANDSLIDE RISK REDUCTION IN SRI LANKA

Eng. (Dr.) Asiri Karunawardena
Director General
National Building Research Organisation
Sri Lanka



Topography of Sri Lanka



Annual Rainfall of Sri Lanka
From Met. Department web site
http://www.meteo.gov.lk/index.php?lang=en

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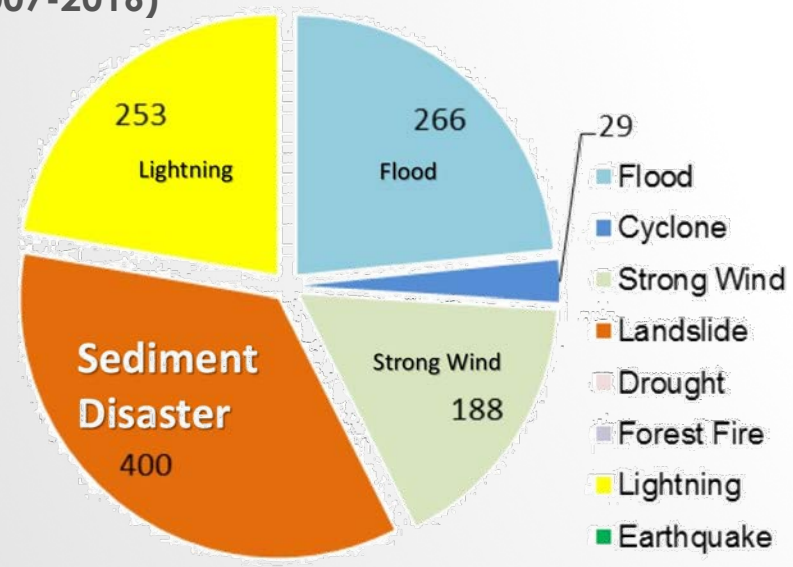
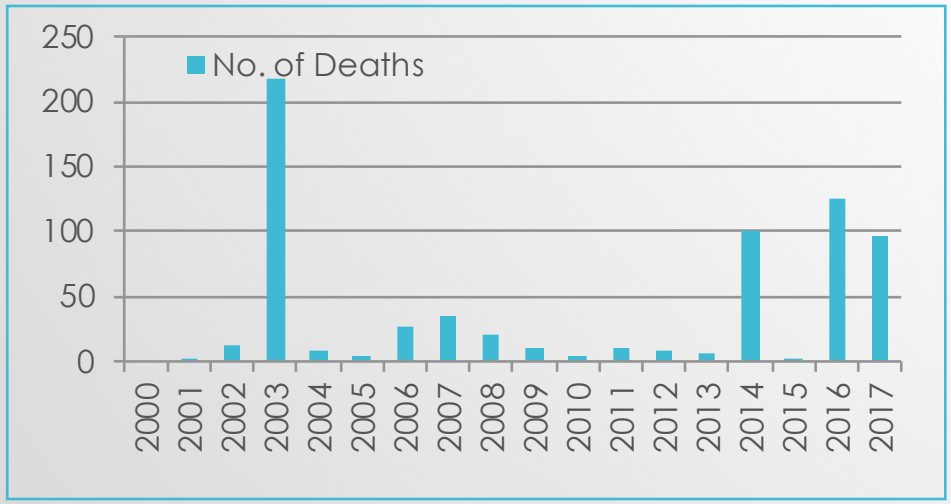
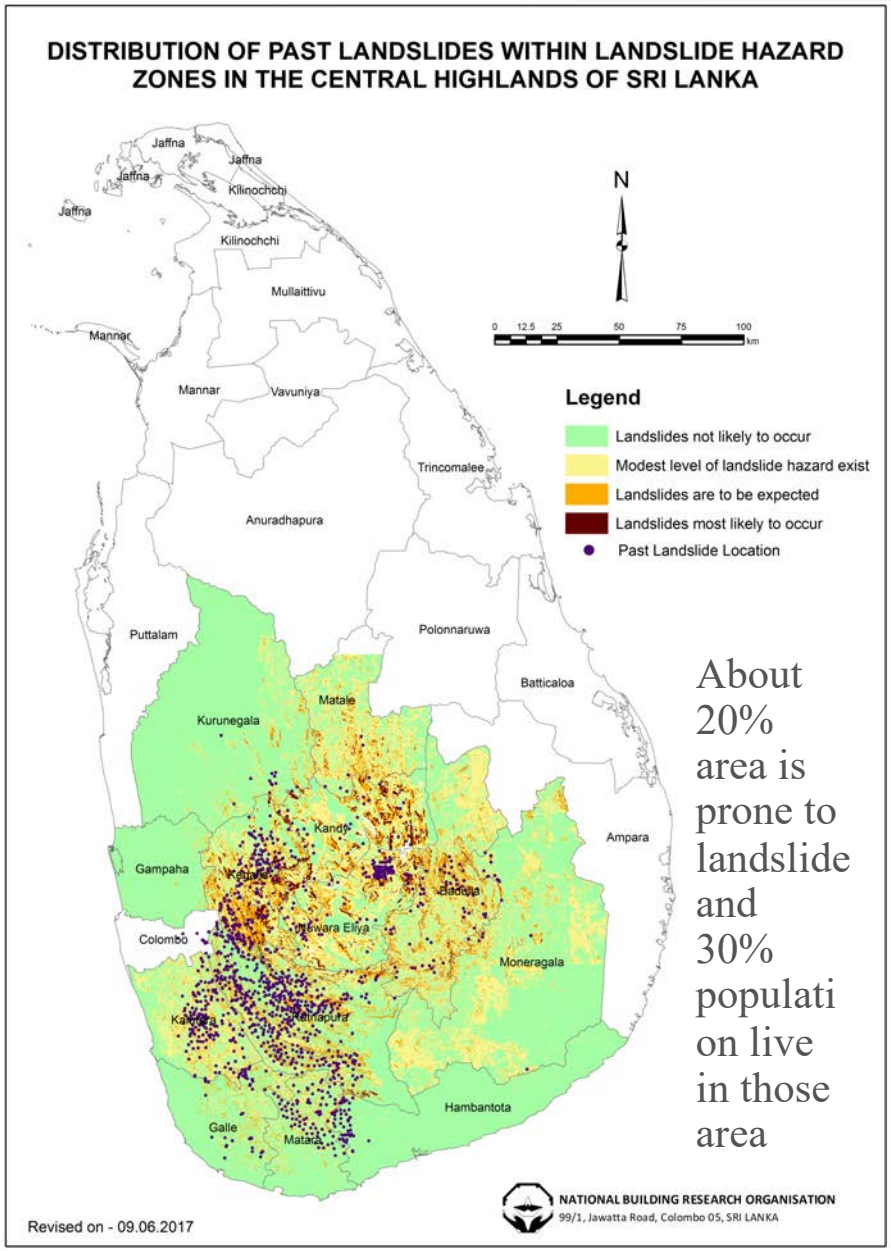
Deaths & Missing by Natural Disasters in 10 years (2007-2016)



The most victims are from Sediment Disasters



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



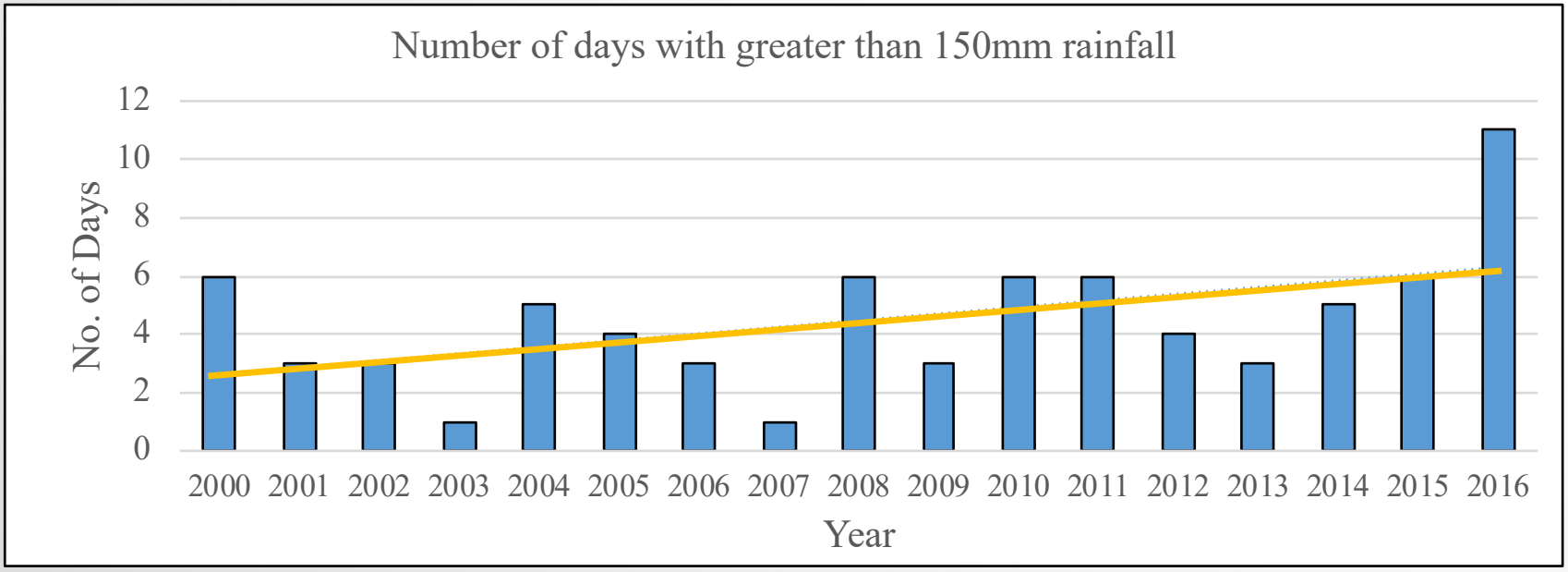
About 20% area is prone to landslide and 30% populati on live in those area

Year	Land Extent (million ha)	Population (millions)	Land-man ratio Ha/man
1871	6.55	2.4	2.7
1901		3.5	1.8
1953		8.1	0.8
1986		16.5	0.4
2000		20.0	0.3

Decreasing Trend of Land-man Ration with Population

Depicts the increasing pressure on land and reason for encroachment of slopes

Trend of total number of days with very heavy rainfall



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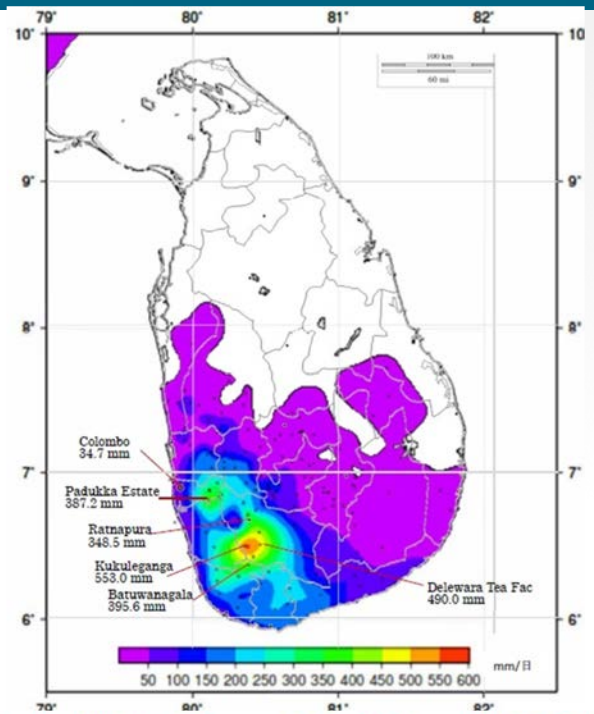
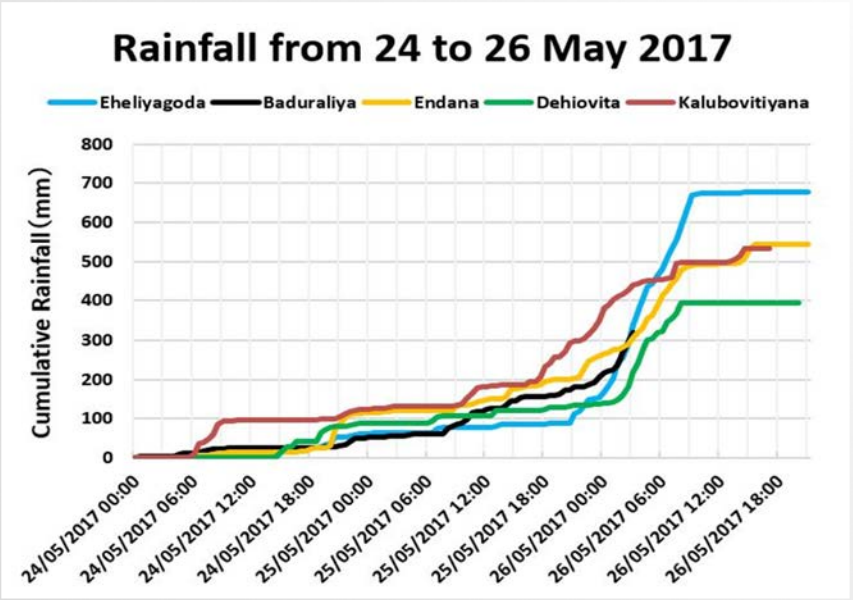
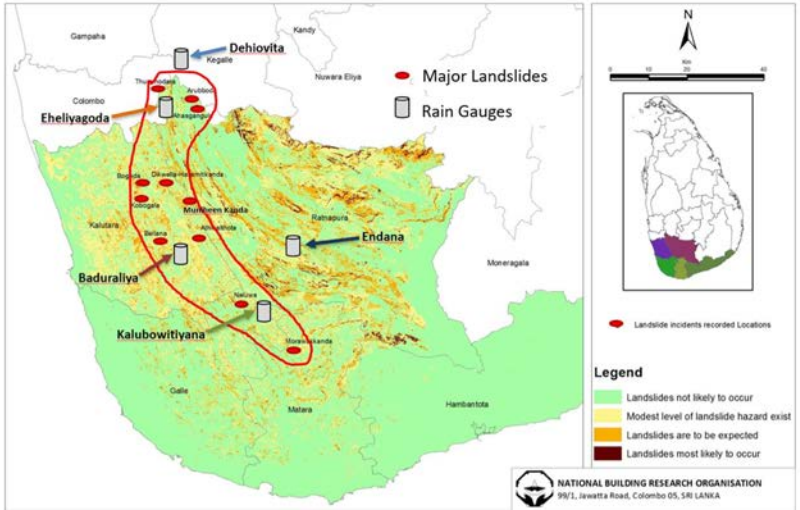


Major Landslide incidents recorded during the period of 24-27 May 2017

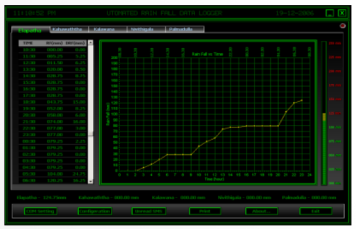


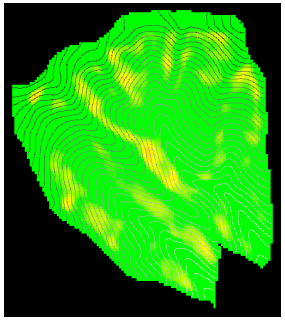


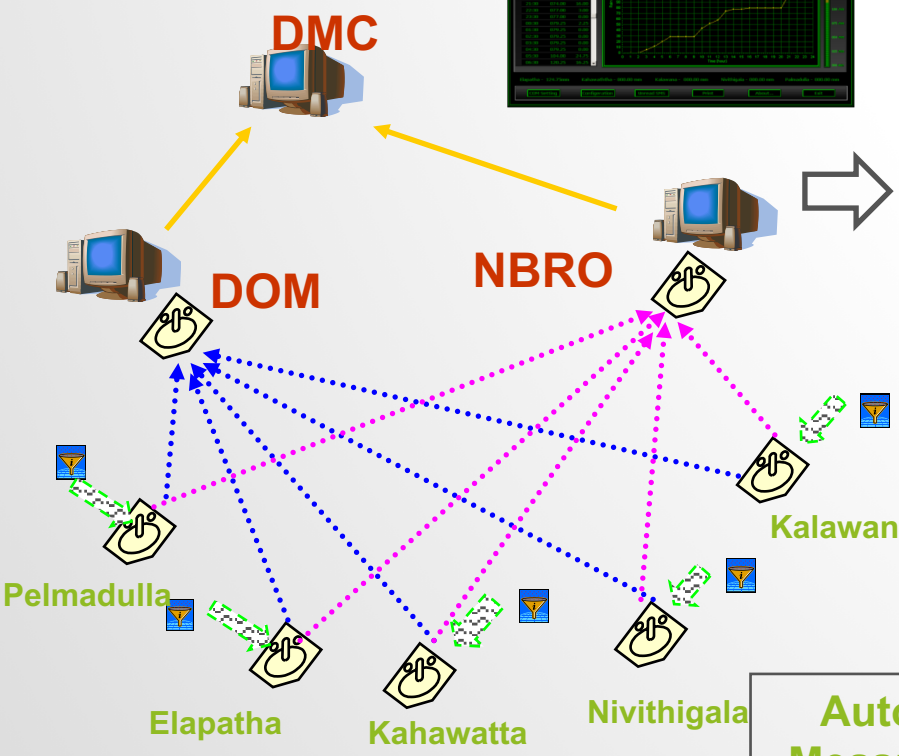
Live Landslide - Maskeliya

REAL TIME LANDSLIDE MONITORING & EARLY WARNING

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







Warning and Evacuation

Early Warning

Automatic Rainfall Measurement System

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

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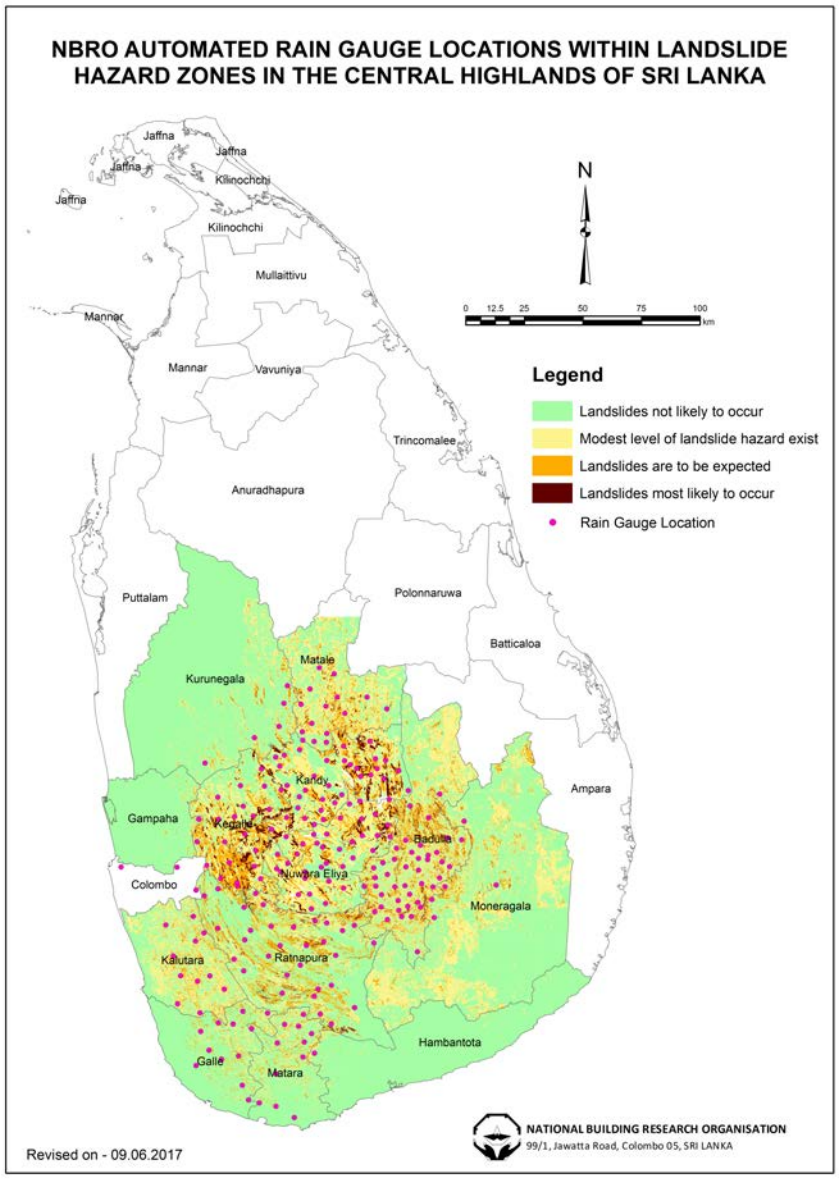

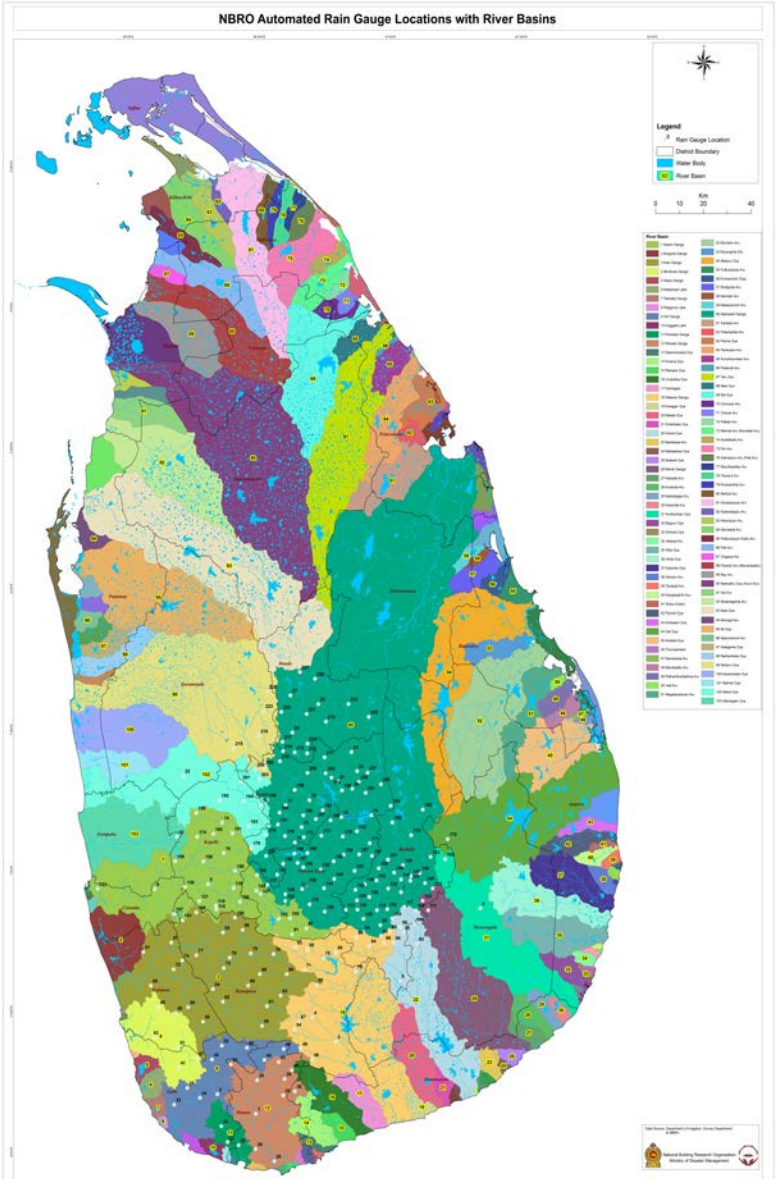

200 Automated rain gauges

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ARGS Online
- Data View
  - eMonitor 1
  - eMonitor 2
  - eMonitor 3
  - Overview
  - Last 8.30 Rainfall
  - Stations
- Graphical View
- Management
- Administration
- About
- Logout

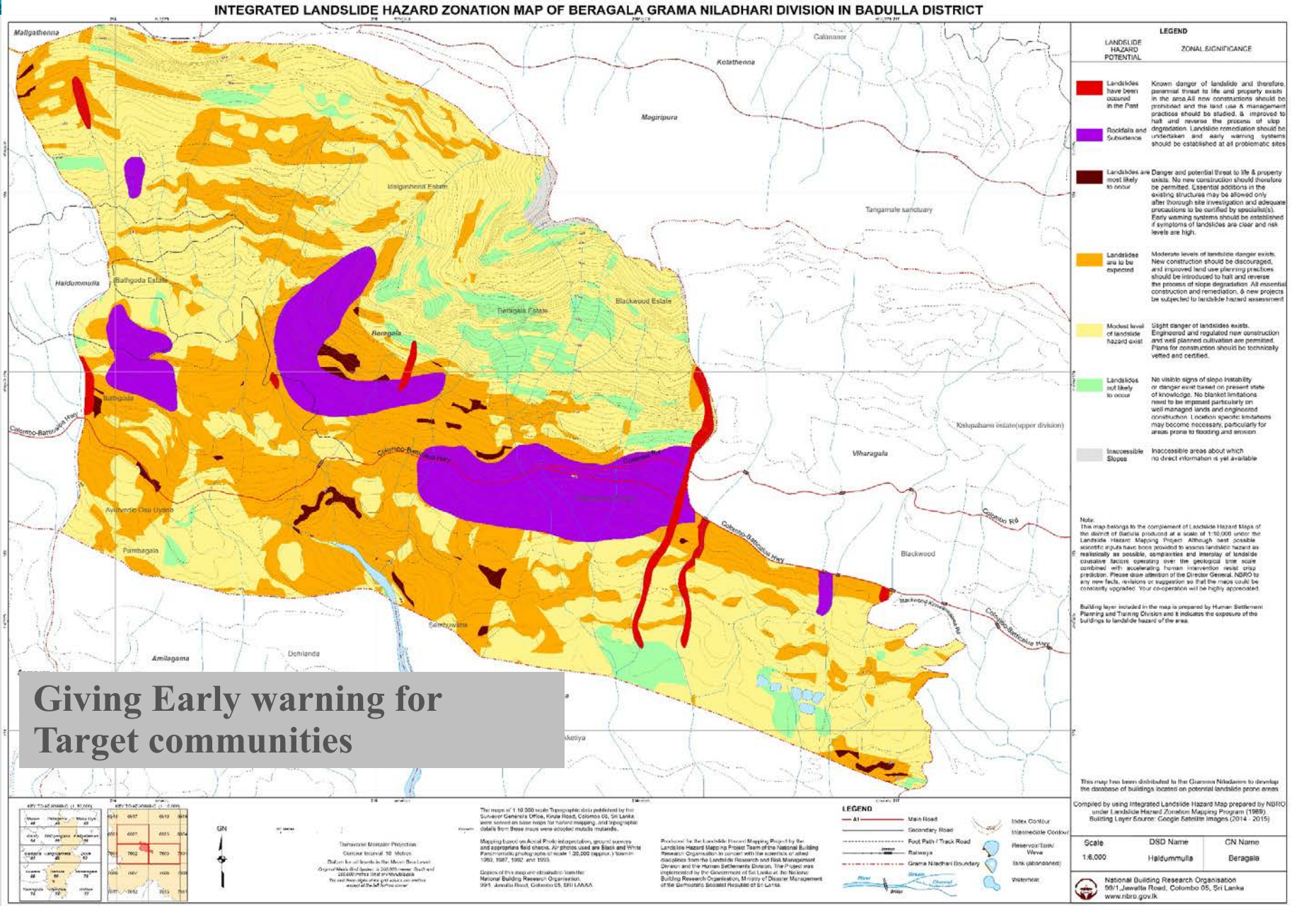
Expand all | Collapse all

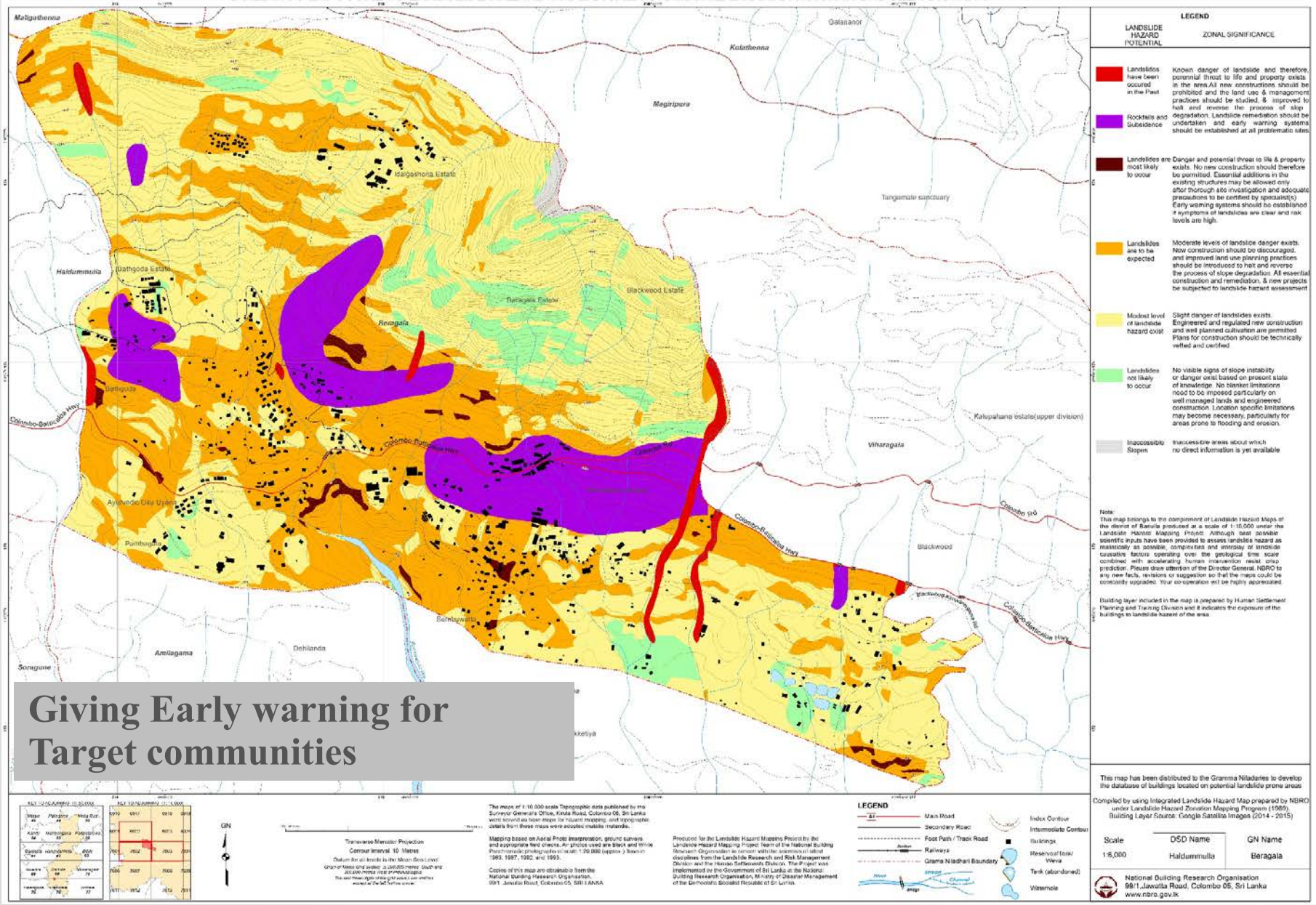
R52	Morawaka	Matara	20/05/2018 02:00:00 PM	49.50	49.50	20.50	075.00/100.00/150.00
R53	Pallegama	Matara	21/05/2018 08:30:00 AM	1.25	1.25	0.25	075.00/100.00/150.00
R54	Bengamuwa	Matara	20/05/2018 07:30:00 AM	0.00	0.00	0	075.00/100.00/150.00
R55	Urubokka	Matara	21/05/2018 08:30:00 AM	37.25	37.25	-	075.00/100.00/150.00
R56	Madakanda	Hambantota	21/05/2018 09:00:00 AM	0.00	1.50	0	075.00/100.00/150.00
R57	Walasmulla	Hambantota	21/05/2018 08:30:00 AM	94.50	94.50	0	075.00/100.00/150.00
R58	Warapitiya	Hambantota	16/12/2015 01:30:00 PM	0.00	0.00	0	075.00/100.00/150.00
R59	Dewathura Pri.	Monaragala	20/05/2018 04:00:00 PM	0.00	1.00	----	075.00/100.00/150.00
R60	Yalkumbura	Monaragala	21/05/2018 08:30:00 AM	0.00	4.25	0	075.00/100.00/150.00
R61	Wellawaya	Monaragala	13/05/2018 04:00:00 AM	0.00	0.00	-	075.00/100.00/150.00
R62	Eheliyagoda	Ratnapura	21/05/2018 09:00:00 AM	2.25	218.75	2.25	075.00/100.00/150.00
R63	Endane	Ratnapura	21/05/2018 09:00:00 AM	0.25	154.75	0.25	075.00/100.00/150.00
R64	Erathna MV	Ratnapura	21/05/2018 09:00:00 AM	0.00	0.00	0	075.00/100.00/150.00
R65	Kaltota	Ratnapura	21/05/2018 09:00:00 AM	2.25	30.25	2.25	075.00/100.00/150.00
R66	Namunuthenna	Ratnapura	14/05/2018 02:00:00 AM	0.00	0.00	0	075.00/100.00/150.00
R67	Omalpe	Ratnapura	20/05/2018 07:30:00 PM	71.50	71.50	1.00	075.00/100.00/150.00
R68	Pinnawala	Ratnapura	21/05/2018 09:00:00 AM	2.25	98.75	2.25	075.00/100.00/150.00
R69	Rambuka MV	Ratnapura	21/05/2018 02:30:00 AM	1.00	149.75	1.00	075.00/100.00/150.00
R70	Ratnapura	Ratnapura	21/05/2018 09:00:00 AM	0.00	272.75	0	075.00/100.00/150.00
R71	Suriyakanda	Ratnapura	21/05/2018 09:00:00 AM	13.00	116.25	13.00	075.00/100.00/150.00
R72	Ulinduwawa	Ratnapura	21/05/2018 09:00:00 AM	0.50	148.50	0.50	075.00/100.00/150.00
R73	Waleboda	Ratnapura	21/05/2018 08:30:00 AM	117.50	117.50	3.25	075.00/100.00/150.00
R74	Weligepola	Ratnapura	21/05/2018 09:00:00 AM	0.25	65.25	0.25	075.00/100.00/150.00
R75	Wewelwaththa	Ratnapura	21/05/2018 08:30:00 AM	145.75	145.75	3.00	075.00/100.00/150.00

Alert 75 mm/day

Warning 100mm/day

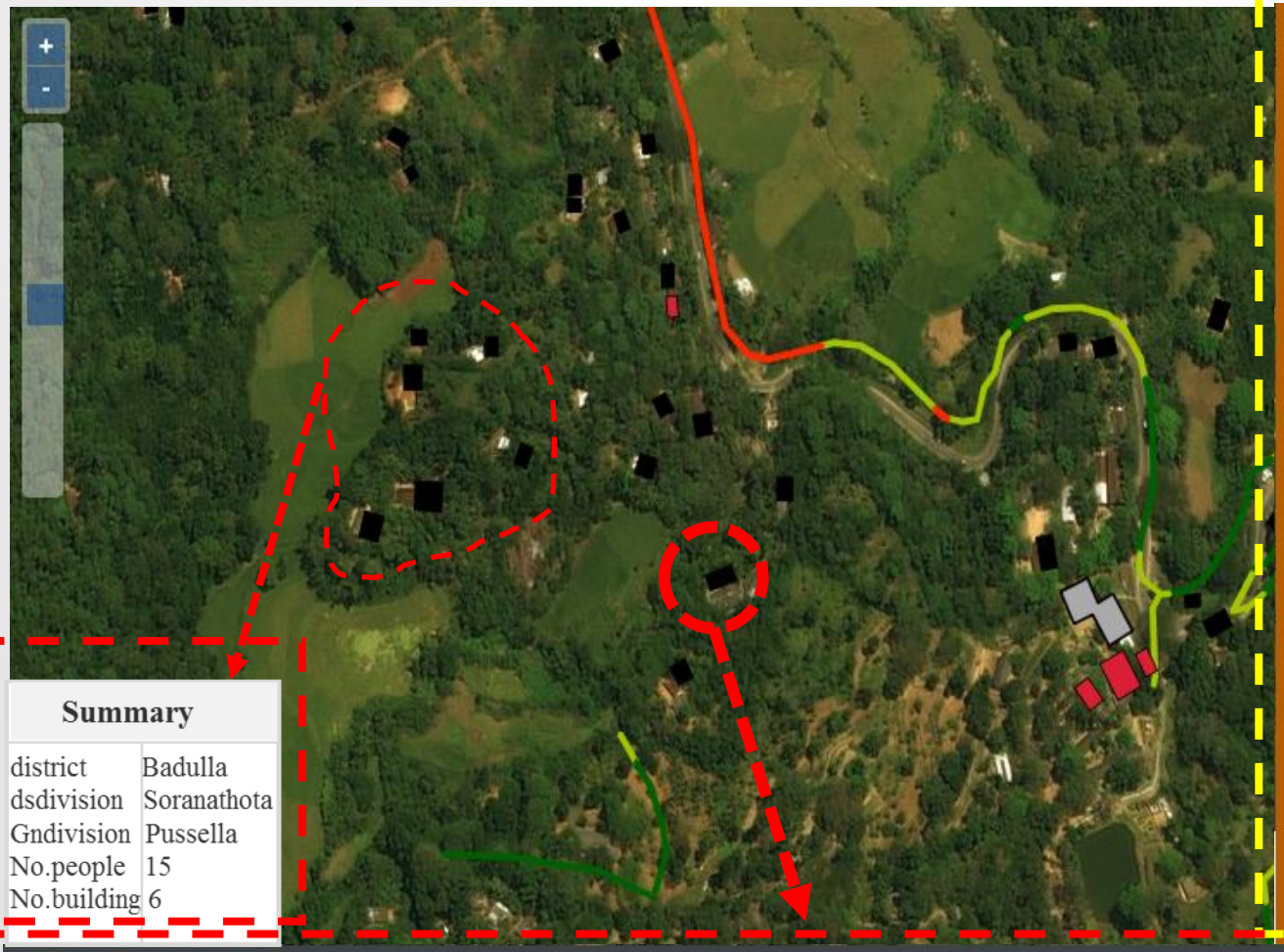
Evacuation, Off limit 75 mm/hour or 150mm/day


INTEGRATED LANDSLIDE HAZARD ZONATION MAP OF BERAGALA GRAMA NILADHARI DIVISION IN BADULLA DISTRICT
LEGEND
LANDSLIDE HAZARD POTENTIAL
ZONAL SIGNIFICANCE
Landslides have been occured in the Past
Rockfalls and Subsidence
Known danger of landslide and therefore, perennial threat to life and property exists in the area.All new constructions should be prohibited and the land use & management practices should be studied, & improved to halt and reverse the process of slop degradation. Landslide remediation should be undertaken and early warning systems should be established at all problematic sites
Landslides are most likely to occur
Danger and potential threat to life & property exists. No new construction should therefore be permitted. Essential additions in the existing structures may be allowed only after thorough site investigation and adequate precautions to be certified by specialist(s). Early warning systems should be established if symptoms of landslides are clear and risk levels are high.
Landslides are to be expected
Moderate levels of landslide danger exists. New construction should be discouraged, and improved land use planning practices should be introduced to halt and reverse the process of slope degradation. All essential construction and remediation, & new projects be subjected to landslide hazard assessment
Modest level of landslide hazard exist
Slight danger of landslides exists. Engineered and regulated new construction and well planned cultivation are permitted. Plans for construction should be technically vetted and certified.
Landslides not likely to occur
No visible signs of slope instability or danger exist based on present state of knowledge. No blanket limitations need to be imposed particularly on well managed lands and engineered construction. Location specific limitations may become necessary, particularly for areas prone to flooding and erosion.
Inaccessible Slopes
Inaccessible areas about which no direct information is yet available
Note:
This map belongs to the complement of Landslide Hazard Maps of the district of Badulla produced at a scale of 1:10,000 under the Landslide Hazard Mapping Project. Although best possible scientific inputs have been provided to assess landslide hazard as realistically as possible, complexities and interplay of landslide causative factors operating over the geological time scale combined with accelerating human intervention resist crisp prediction. Please draw attention of the Director General, NBRO to any new facts, revisions or suggestion so that the maps could be constantly upgraded. Your co-operation will be highly appreciated.
Building layer included in the map is prepared by Human Settlement Planning and Training Division and it indicates the exposure of the buildings to landslide hazard of the area.
This map has been distributed to the Grannies Niladaries to develop the database of buildings located on potential landslide prone areas
Compiled by using Integrated Landslide Hazard Map prepared by NBRO under Landslide Hazard Zonation Mapping Program (1989)
Building Layer Source: Google Satellite Images (2014 - 2015)
Scale
DSD Name
GN Name
1:6,000
Haldummulla
Beragala
National Building Research Organisation
99/1, Jawatta Road, Colombo 05, Sri Lanka
www.nbro.gov.lk
LEGEND
Main Road
Secondary Road
Foot Path / Track Road
Railways
Grama Niladhari Boundary
Index Contour
Intermediate Contour
Reservoir/Tank/ Wewa
Tank (abandoned)
Watermask
Mallgathenna
Kolathenna
Magiripura
Idangashenna Estate
Tangamale sanctuary
Haldummulla
Balligoda Estate
Beragala Estate
Blackwood Estate
Beragala
Balligoda
Colombo-Ratnapura Hwy
Kshupaharni estate(upper division)
Viharagala
Ayurvedic Osu Uyana
Pambagala
Colombo-Batticaloa Hwy
Blackwood
Sembuwana
Amilagama
Dohilanda
Giving Early warning for
Target communities



Giving Early warning for Target communities

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

Further Expected Information

- Improve the accuracy of the system
- Development of regional threshold limits
- Public awareness and preparedness to act according to the warning

Challenges and Expected support

- Warning are still not effectively communicated , and not sufficiently acted upon.
- How Early warning can be used to reduce the infrastructure damage
- Best practices should be shared and advertised among the regional stakeholders

Thank You