



DEMOCRATIC SOCIALIST REPUBLIC OF
SRI LANKA



Country Presentation – Sri Lanka

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Geographical and Historical Background of Sri Lanka

Government of Sri Lanka

Climate conditions

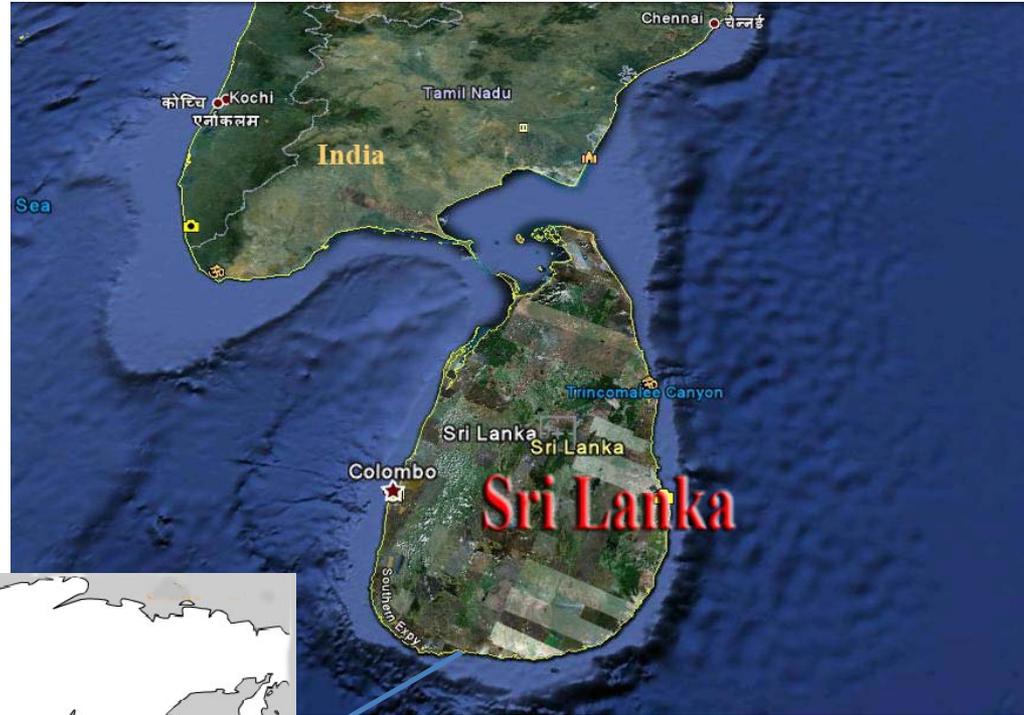
Natural Disasters and Mitigation of Landslide hazard

Disaster Management in Sri Lanka

My Institute –National Building Research Organisation

Disaster Risk Reduction (DRR) activities

The Democratic Socialist Republic of Sri Lanka (Formerly known as Ceylon)



World Map

Geographical situation

Geographical Coordinate

Longitude $79^{\circ} 42.$ to $81^{\circ} 52$ east

Latitude $5^{\circ} 55.$ to $9^{\circ} 50.$ north,

The maximum north- south length of
(formerly known the island is 435 km and its greatest width is 225 km

The Island (including adjacent small islands) covers a land area of 65,610 sq. km.

The Bay of Bengal lies to its north and east and the Arabian Sea to its West.

Sri Lanka is separated from India by the gulf of Manna and the Palk Strait

Historical Background – Kings Rural Period

Recent excavations show that even during the Neolithic Age, there were food gatherers and rice cultivators in Sri Lanka

documented history began with the arrival of the Aryans from North India.

Anuradhapura grew into a powerful kingdom under the rule of king Pandukabhaya. According to traditional history he is accepted as the founder of Anuradhapura.

The Aryans introduced the use of iron and an advanced form of agriculture and irrigation. They also introduced the art of government

In the mid 2nd century B.C. a large part of north Sri Lanka came under the rule of an invader from South India.

Invasion was intermittent and the capital was moved constantly until the Portuguese arrived in 1505

Dutch rule lasted from 1656 to 1796,

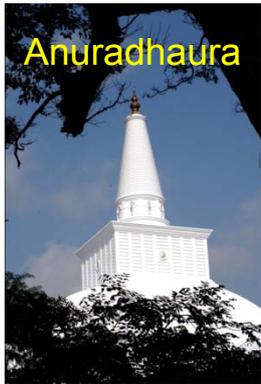
In 1815 the kingdom of Kandy was ceded to the British and thus they established their rule over the whole island.

By a process of peaceful, constitutional evolution, Sri Lanka won back her independence in 1948 and is now a sovereign republic,

Heritage of Sri Lanka

During the reign of King Devanampiya Tissa, a descendent of Pandukabhaya, Buddhism was introduced in 247 B.C. by Arahat Mahinda, the son of Emperor Asoka of India.

As declared by UNESCO, presently there are seven **World Heritage Sites in Sri Lanka**. These range from ancient cities like Anuradhapura to Sinharaja rainforests



Anuradhapura



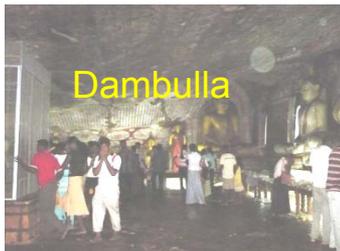
Polonnaruwa



Sigiriya



Kandy Dalada maligawa



Dambulla



Sinharaja Forest



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இலங்கை

Sri Lanka

Sri Lanka is headed by
the Executive President



President

His.Excellency Mahinda Rajapaksa

Prime Minister

Hon. D.M. Jayarathna

Minister of Disaster Management

Hon. M. Fowzie

Secretary of the Ministry of Disaster
Manahgement

Madam S.M Mohamed

Director General of the Disaster Management
Center (DMC)

Major Genaral Gamini Hettiarachchi

Director General of the National Building
Research Organisation (NBRO)

Mr. W.B.J. Fernando

Independence:

4 February 1948

Coastline:

1,340km

Terrain:

Mostly low, flat to rolling plain; mountains in south-central interior

Highest mountain

Pidurutalagala, 2,524m

Highest waterfall

Bambarakanda, 263m

National Flower



The Blue Water Lily (*Nymphaea stellata*).

Literacy rate

Female 87.9 Male 92.5

[Ethnic groups](#) - 73.8% Sinhalese/ 13.9% Tamil/ 7.2% Moors 4.6% /Indian Tamil,/.
[5% Others.](#)

Languages	Sinhala (official and national language) 74% Tamil (national language) 18% other 8% English (a link language commonly) is used in government and spoken competently by about 10% of the population
Religion	Buddhist 69.1%, Muslim 7.6% Hindu 7.1% Christian 6.2% unspecified 10% (2001 census)
Time zone	Sri Lanka Standard Time is five and a half hours ahead of GMT. (5.30 hour)
International dialing:	+94
Electricity	230 . 240 volts, 50 cycles AC

**Life
Expectancy at
Birth**

74 female,
64 male

Density

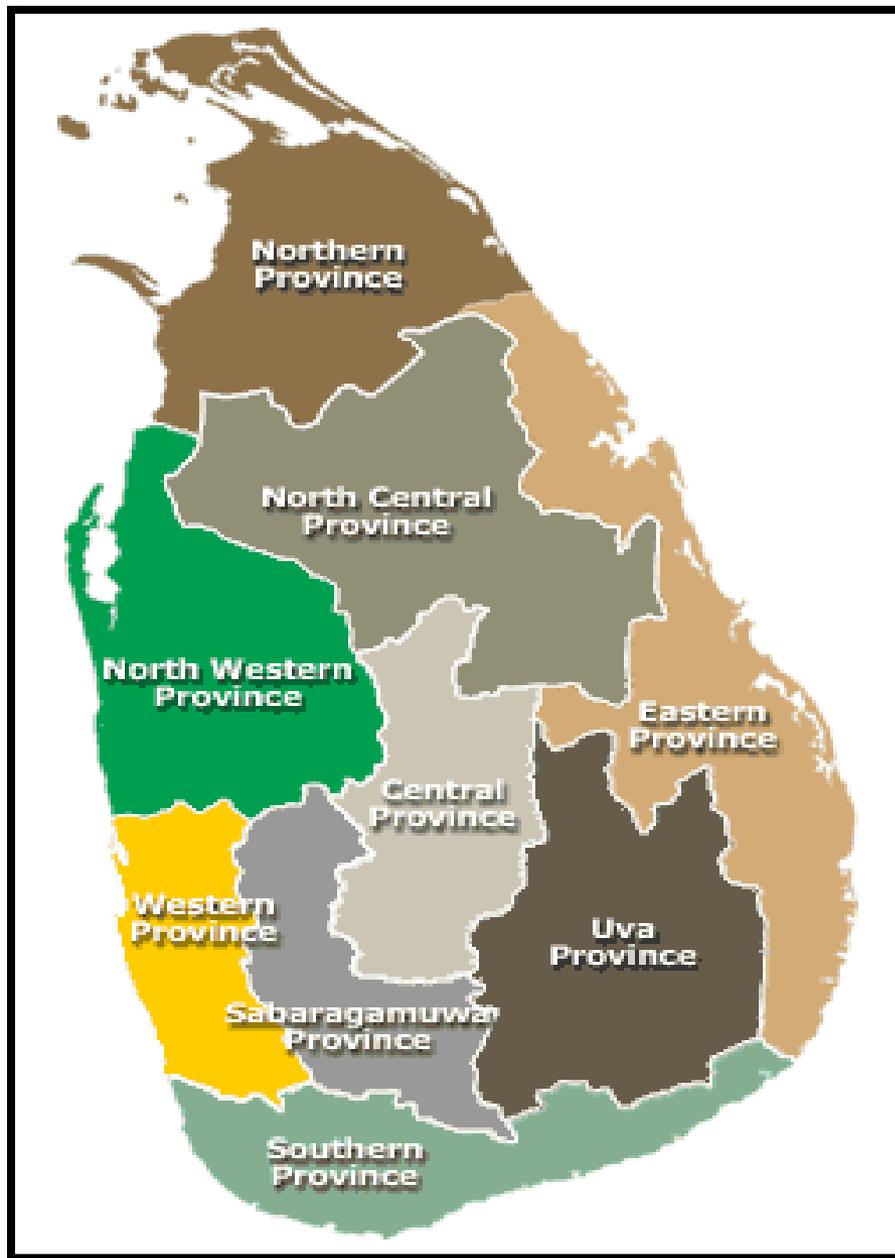
798.9 people/sq mi
309 people per sq km

Population growth

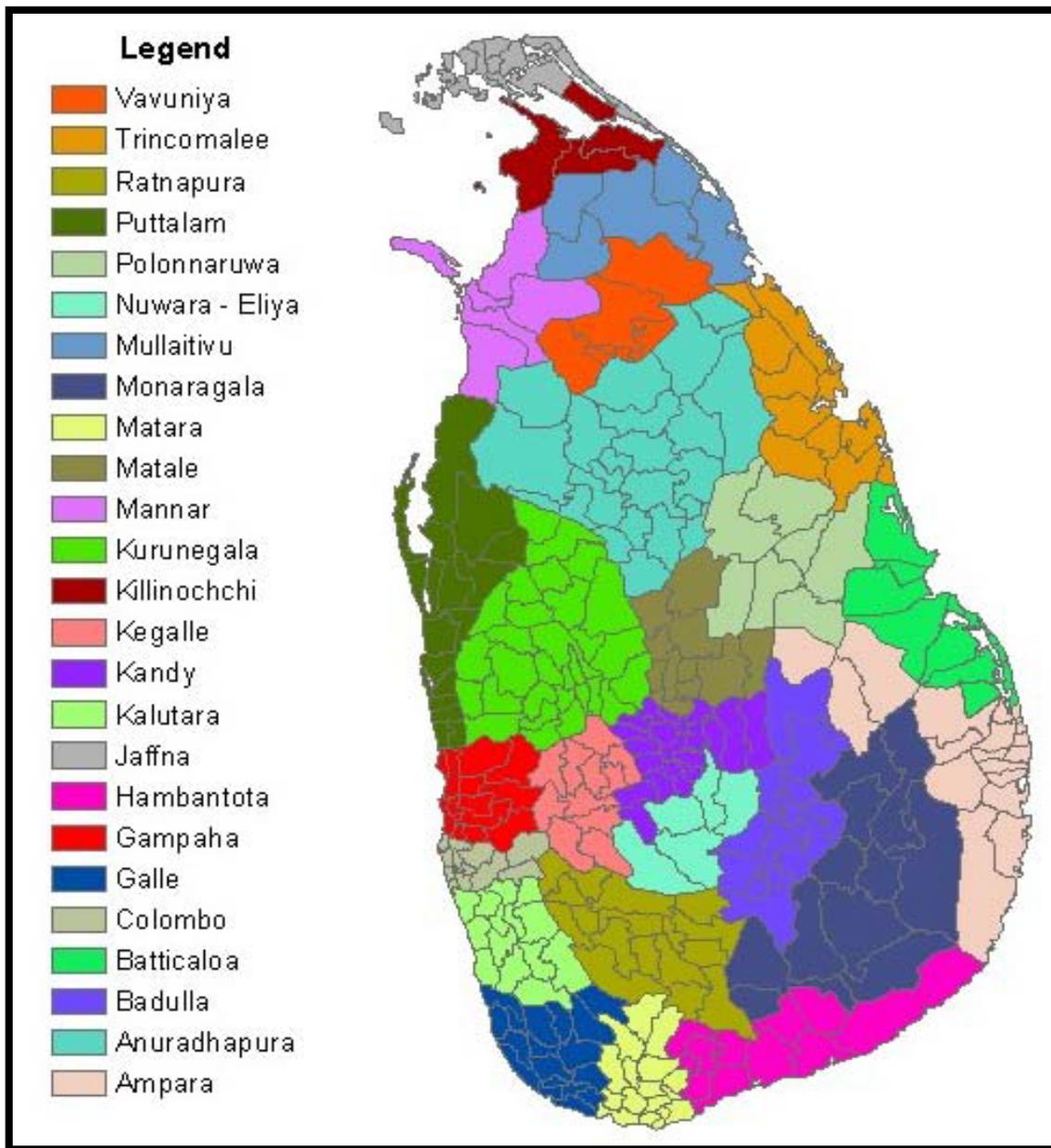
1.3%



Sri Lanka's population of around 2009 estimate 20 million has an urban rural mix of approximately 30% to 70 %



Administratively country is sub divided into nine Provincial councils



25 districts and 327 Divisions.

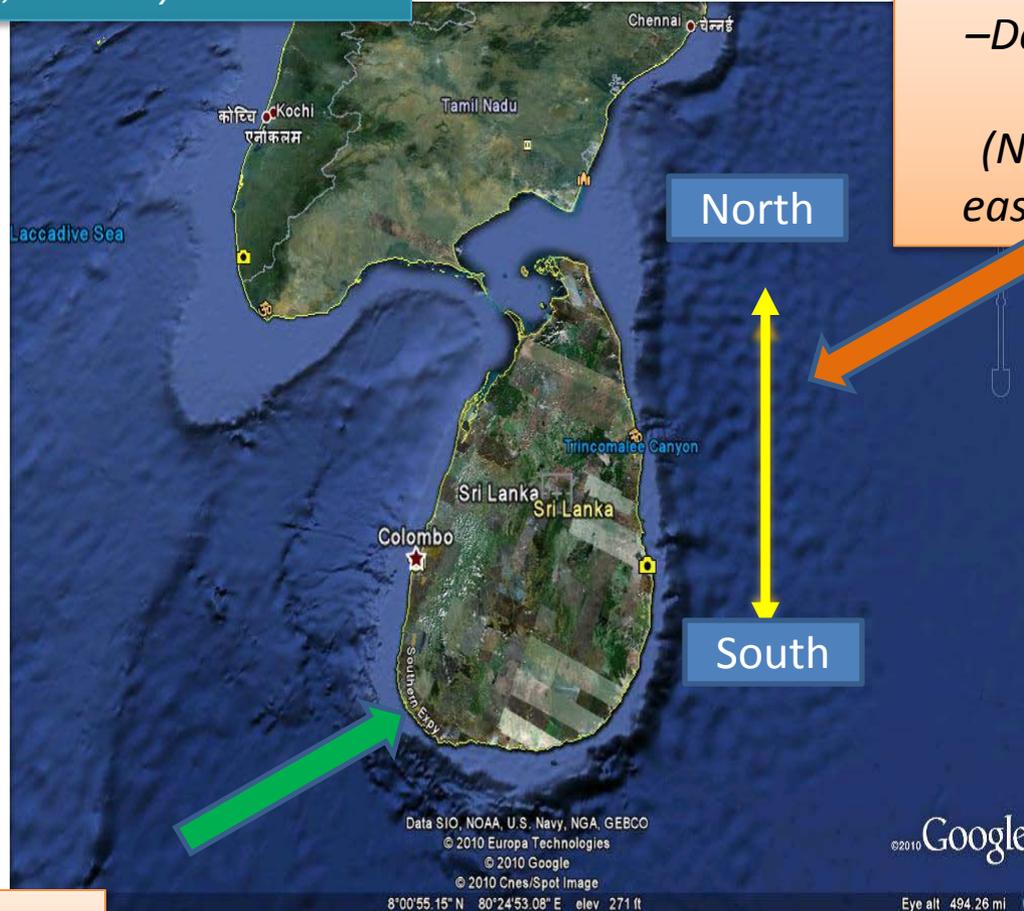
The climate of Sri Lanka is typically tropical with an average temperature of 27° C.

In the higher elevations it can be quite cool with temperatures going down to 8-16° C at an altitude of nearly 2,000 meters.

Normally-Bright, sunny, warm days.

WEATHER AND CLIMATE IN SRI LANKA

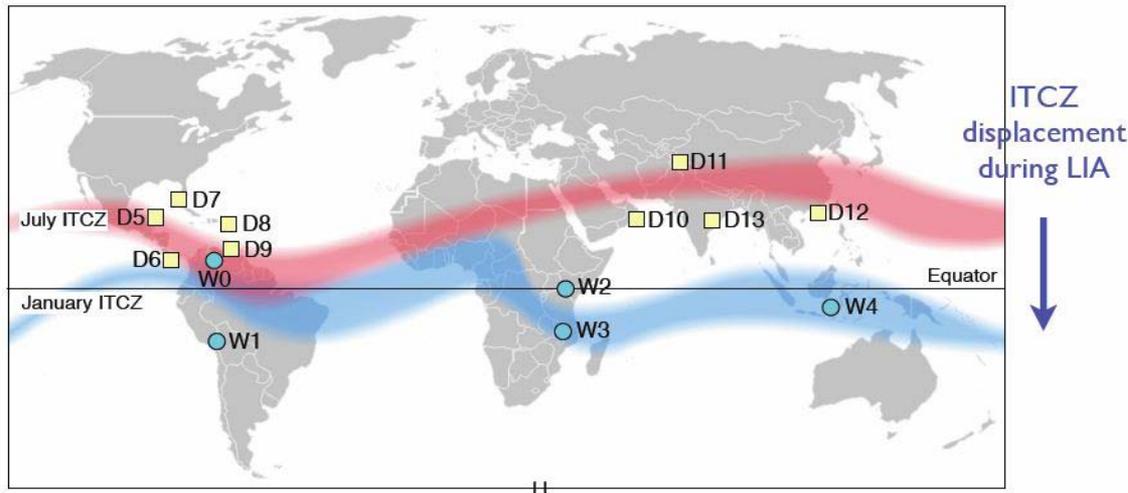
North-east monsoon
–December and
January
(Northern and
eastern regions)



The south west monsoon -May
to July western
(southern and central regions)

WEATHER AND CLIMATE IN SRI LANKA

Sri Lanka lie on Inter Tropical Convergent Zone (ITCZ) - Map



The climate of the island is mostly governed by the metrological conditions in the Bay of Bengal.

The climate of Sri Lanka can be classified as a tropical monsoonal climate marked by model seasonal rhythm rainfall of two distinguished monsoons

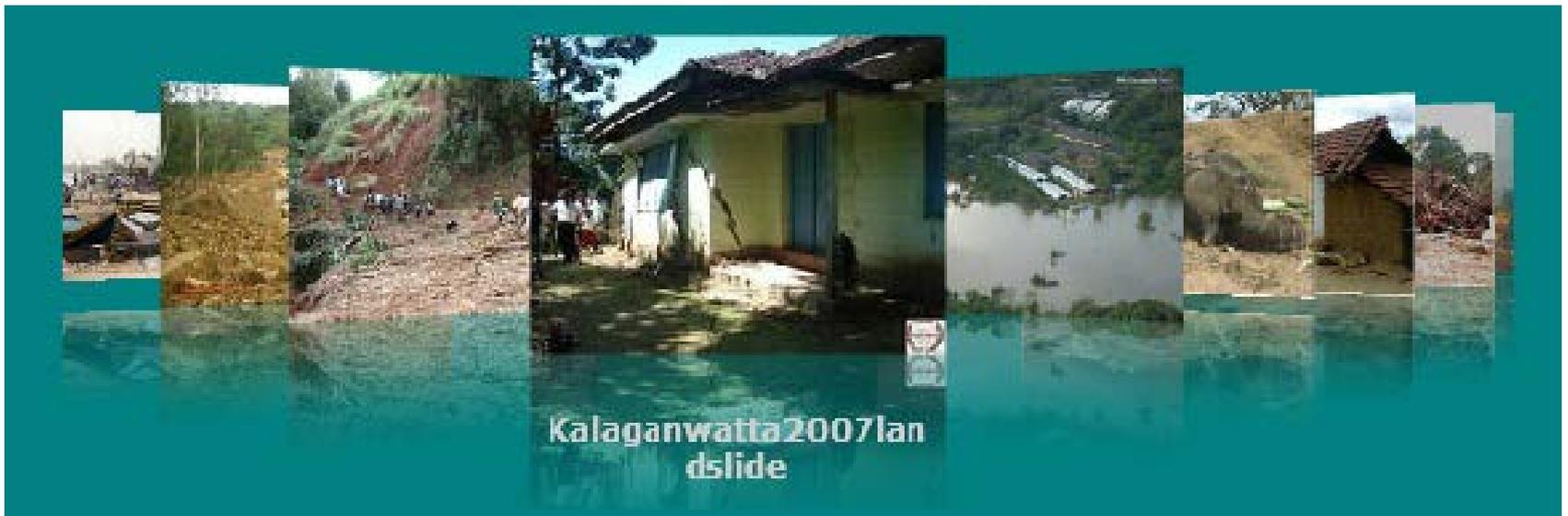
The annual rainfall in Sri Lanka varies from 900 mm to 6,000 mm and the average annual rainfall is 1836 mm. Wet, intermediate and dry zones are classified as below.

- | | |
|--------------------|--|
| Wet Zone | - Annual rainfall above 2,200 mm |
| Intermediate zone. | - Annual rain fall between 2,000 mm and 2,200 mm |
| Dry zone | - annual rainfall bellow 2,000 mm |

Natural Hazards in Sri Lanka

Natural Disasters in Sri Lanka are mainly hydro-meteorological and geological phenomenal events such as floods, landslides, cyclones, tidal waves droughts and Tsunamis

15 12:56



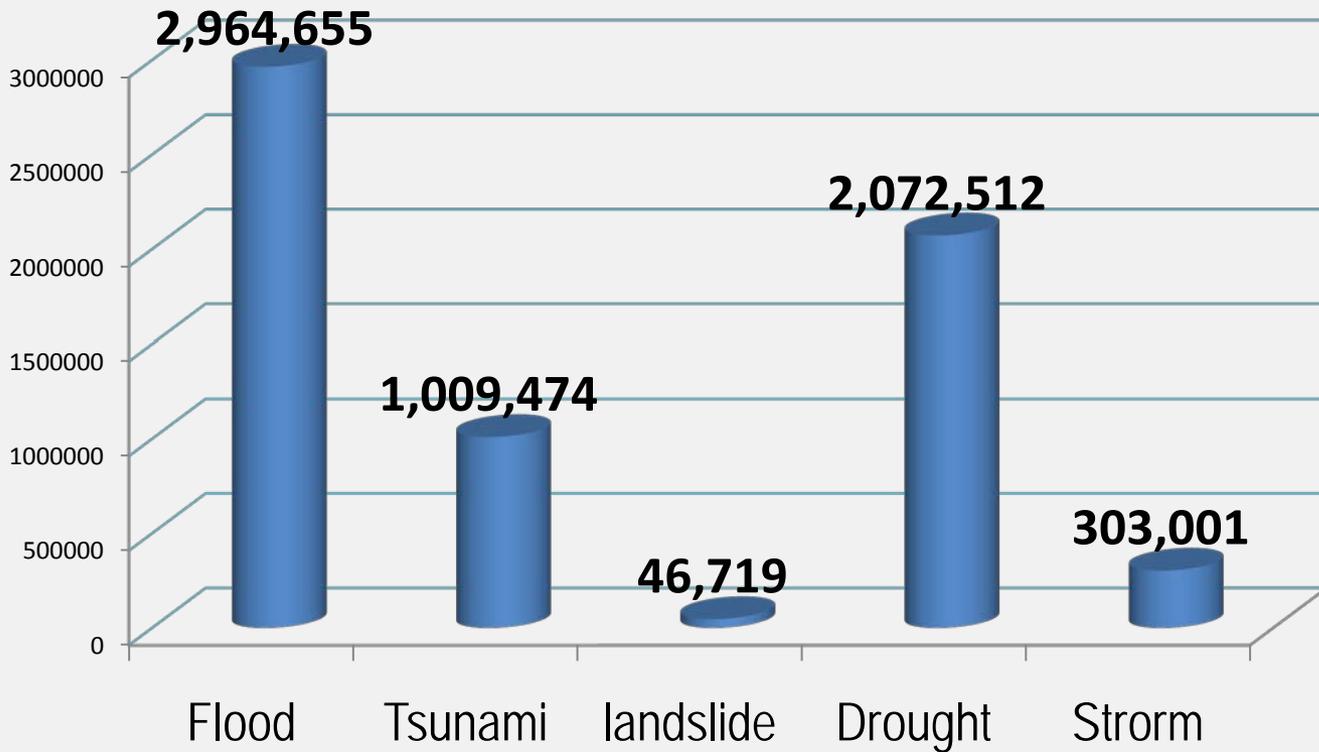
Major Natural Disasters in Sri Lanka

- ❖ Floods
- ❖ Cyclones
- ❖ Landslides
- ❖ Droughts
- ❖ Tornados
- ❖ High Winds
- ❖ Lightning
- ❖ Sea Erosion
- ❖ Sea Surge
- ❖ Tsunami
- ❖ Epidemics
- ❖ Animal Attacks

The Hazard Profile

(1974 – 2008)

Number of people affected by different disasters in Sri Lanka





Watawela -1992/1993

In Sri Lanka, most of landslides and cutting failures occur in the central highland of the country. The central region of Sri Lanka is hilly and mountainous with highly fractured and folded basement rock overlain by residual soil and colluviums.

Nuwara Eliya District – Landslide occurred 03rd June 1992

Lot of damaged made railway track and railway transport routing severely destructed

Rainfall about more than 200 mm

Mitigation of Watawala Landslide



Landslide at Wewelwatte (9th km) on Ratnapura- Wewelwatte Road



Compaction of Soil

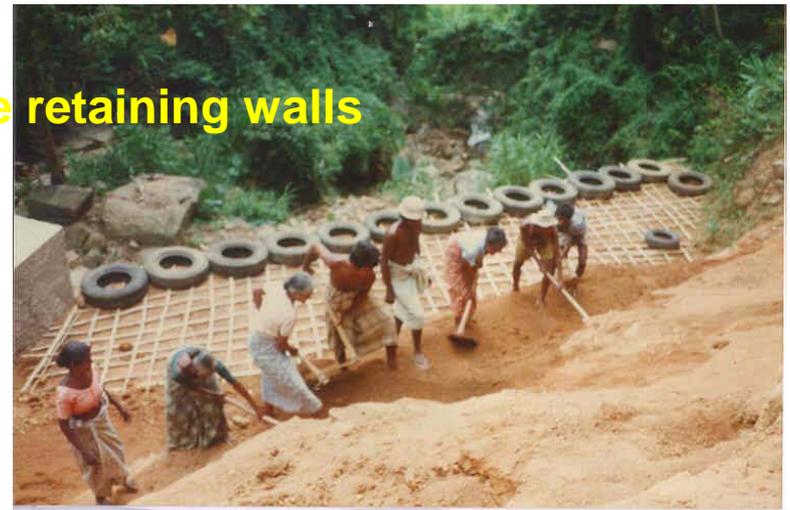
The Road had collapsed in 1980 and early 1990



Construction of a diversion drain to a length of about 500m from culverts 2/3 to 1/13 for run off and stream water coming into the landslide area.



anchored tyre retaining walls



Kandy District- Peradeniya Landslide- 2006



With the heavy rainfall from 09th -11th November 2006,
A mass of soil and rock blocks failed at the upper slope of Peradeniya town 2006 at about 21:00 hrs night.



Due to this failure one shop (Udaya Stores) was completely damaged

•Landslide occurred on 15th October 2009 at about 2.30 am with the rainfall of 80.3mm

(As at Gannoruwa Agriculture Research Center).



Land subsidence at Matale District



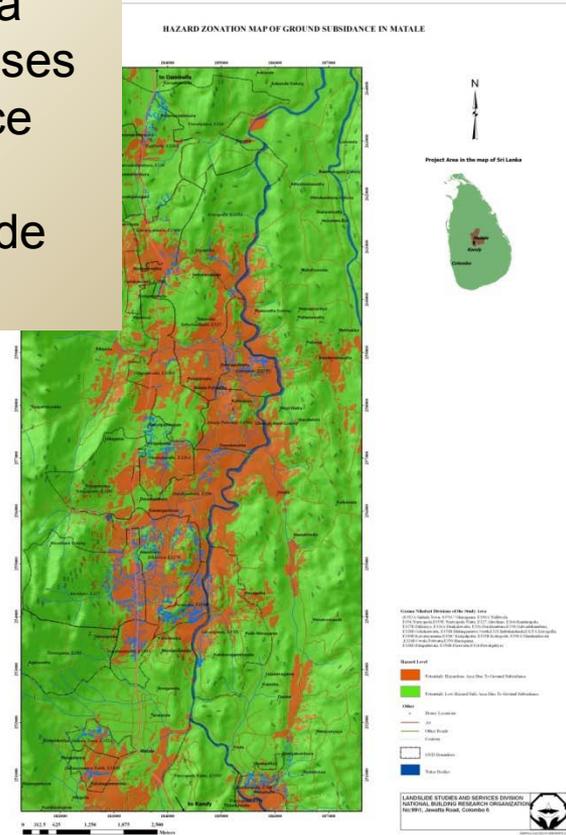
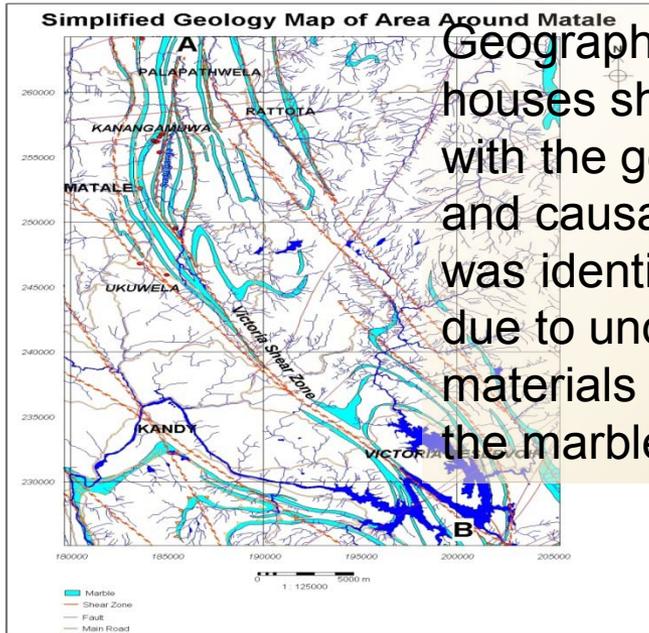
Investigation started 2006 ,
Prepared subsidence hazard
risk map

About 3000 affected houses
were identified within 24 Grama
Niladhari divisions of Matale



DRR Activities Done by NBRO and DMC

Geographical distribution of cracked houses showed an obvious relationship with the geological condition of the area and causative factor to cracking of houses was identified as the ground subsidence due to underground erosion of silty materials of the soil to the caverns inside the marble rock of the area



Drilling



Bore hole logging

Subsidence hazard map

Landslide hazard awareness programme



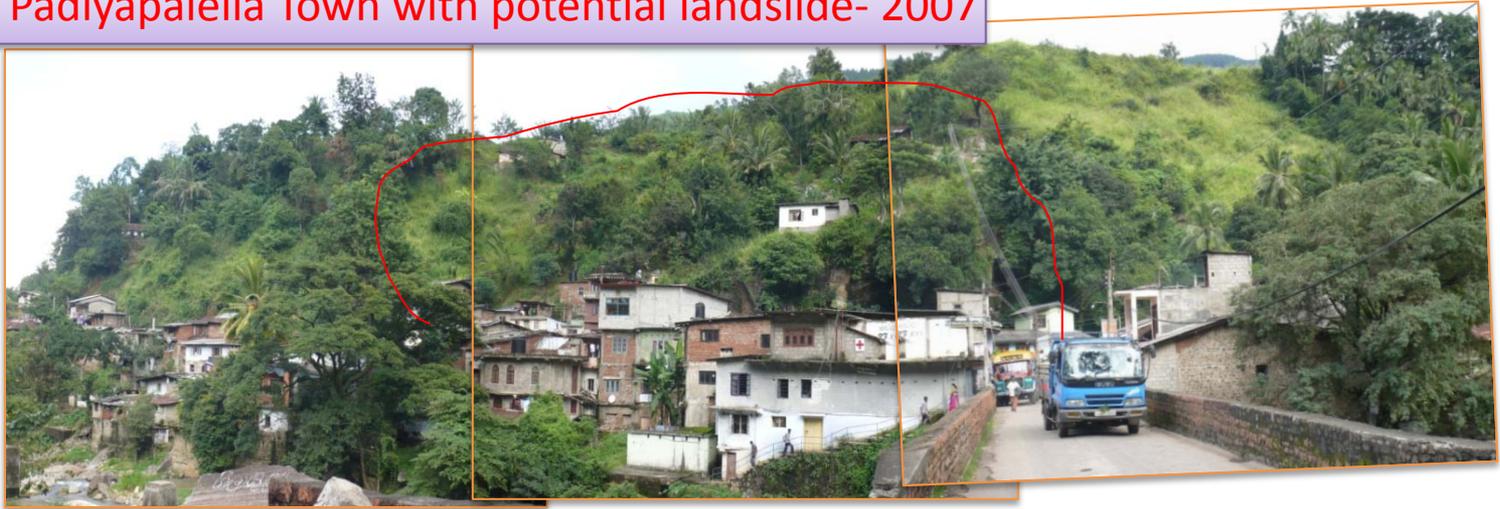
Senior professor Kapila Dahanayake
Conducted awareness for peoples living with
Subsidence hazard - Matale district



2nd awareness program
held at Padiyapelella town
on 14-03-2009



Padiyapalella Town with potential landslide- 2007



With the heavy rainfall from 11th -12th January 2007, large number of landslides occurred at the parts of Central province. Specially, both of Haguranketha and Walapane divisional secretariat areas

NBRO was started Padiyapalella landslide mitigation - 2009



Photograph showing an aerial view of Padiyapelella town with its unstable slope, after site cleaning

Resent landslide occurred Kandy District – Akurana Divisional secretariat area – (24th April 2010)



Ground instability occurred at the Dayagama Bazaar behind the Bus Stand



Resent landslide occurred Kegalle District – Galigamuwa AGA area – (28th April 2010)



Ground instability occurred Colombo District – Kolonawa AGA area –1st May 2010)





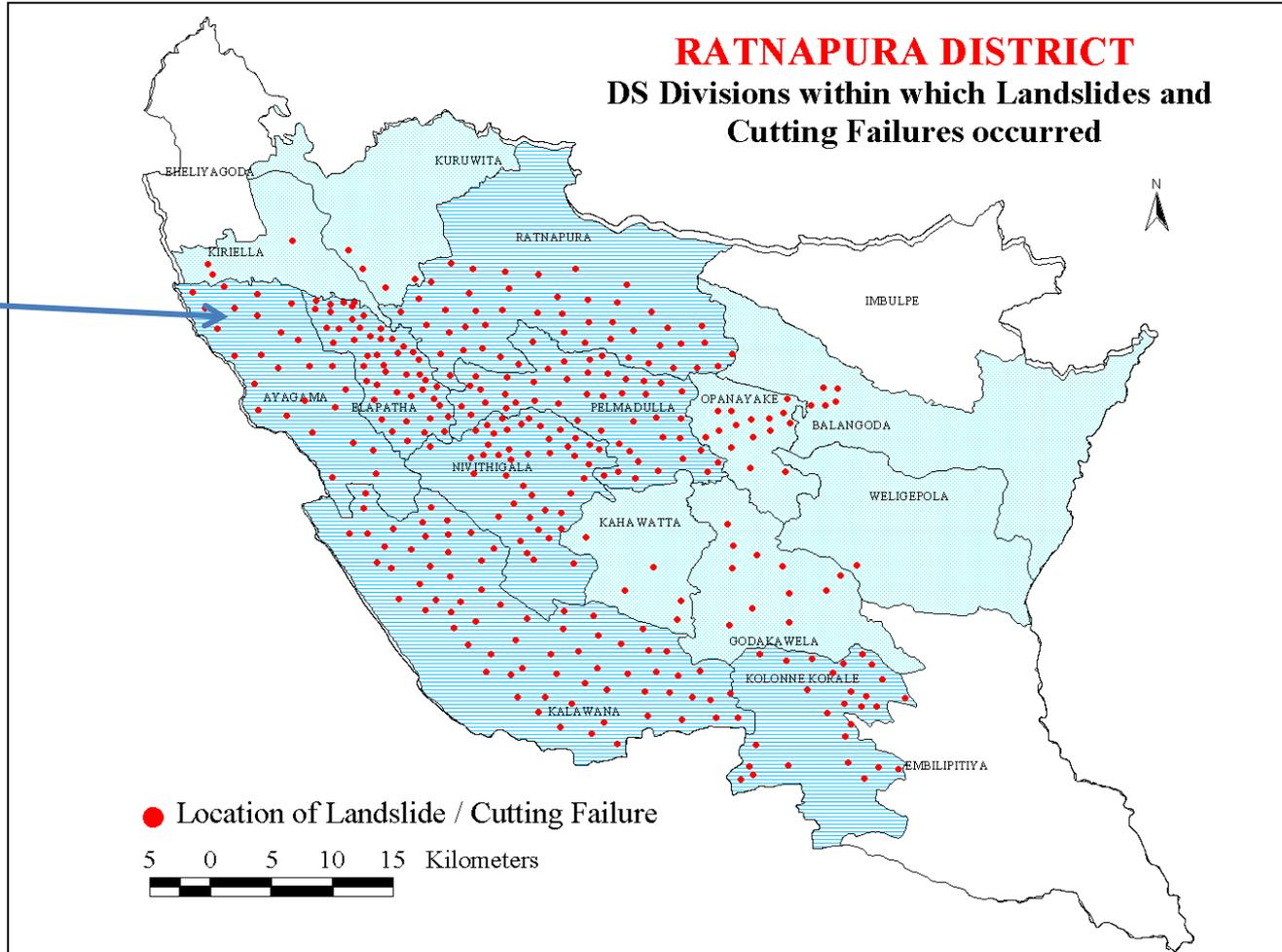
Flood in very common occurrence in Sri Lanka, during 2006 more than 400 000 people were internally displaced flood in districts Kalutara, Rathnapura, Gampha, Puttalam



Floods in Ratnapura & Matara-2006

Flood and Landslide Vulnerable District

Flood affected areas



RATNAPURA FLOODS

NORMAL FLOOD LEVEL -60 FT. MSL

MINOR FLOOD LEVEL -60 FT

MAJOR FLOOD LEVEL - 70 FT.

CRITICAL FLOOD LEVEL- 80 FT.

MAJOR FLOODS

CRITICAL	4NOS	MAJOR	12 NOS
	1913	1857	
	1940	1872	
	1941	1893	
	1989	1924	
		1947	
		1957	
		1969	
		1978	
		1982	
		1988	
		1989	
		1993	
		2003	

Summary Statistics of Damages due to Floods in May 2003 in Ratnapura District

Number of Families Affected	34,473
Number of Deaths	122
No of Refugee Camps	30
No of people in camps	1,613
No of houses fully damaged	2,544
No of houses partially damaged	8,683
No of Schools damaged	47
No of wells affected	4,452

Year	Water Level(ft) above MSL
1872	11.90
1891	9.80
1904	9.90
1906	10.80.
1913	11.00
1922	12.60
1925	11.50
1928	9.08
1930	10.91
1930	9.83
1933	9.95
1936	9.43
1937	10.33
1939	9.35
1940	11.00
1942	8.17
1943	6.58
1944	6.00
1947	12.85
1947	6.00
1952	8.25
1952	6.00
1955	8.00
1957	6.25
1963	6.42
1966	8.67
1966	9.00
1967	9.17
1971	7.33
1975	6.58
1989	9.20

The Historical Floods – Colombo District

The Highest water levels observed at the **Nagalagam Street gauge (Colombo)** during historical floods since 1837 are given below

Minor Flood Level: 5.00 ft

Major Flood Level: 7.00 ft

Dangerous flood Level: 9.00 ft

Critical Flood Level: 12.00 ft

2-2. Recent Major Disasters

year	Disaster	killed	injured	Total affected	damage (US '000s)
2004	Drought	0	0	3500000	—
2003	Flash Flood	235	0	695000	29000
2004	Flood	6	0	200000	—
2005	Flood	6	0	145000	—
2004	Tsunami	35399	23176	1019306	1316500

Are we safe from Earthquakes?

YES!!!

Why?

Located in the central part of the plate

Thick package of Precambrian metamorphic rocks

No active faults

No single earthquake occurred

Seismically stable

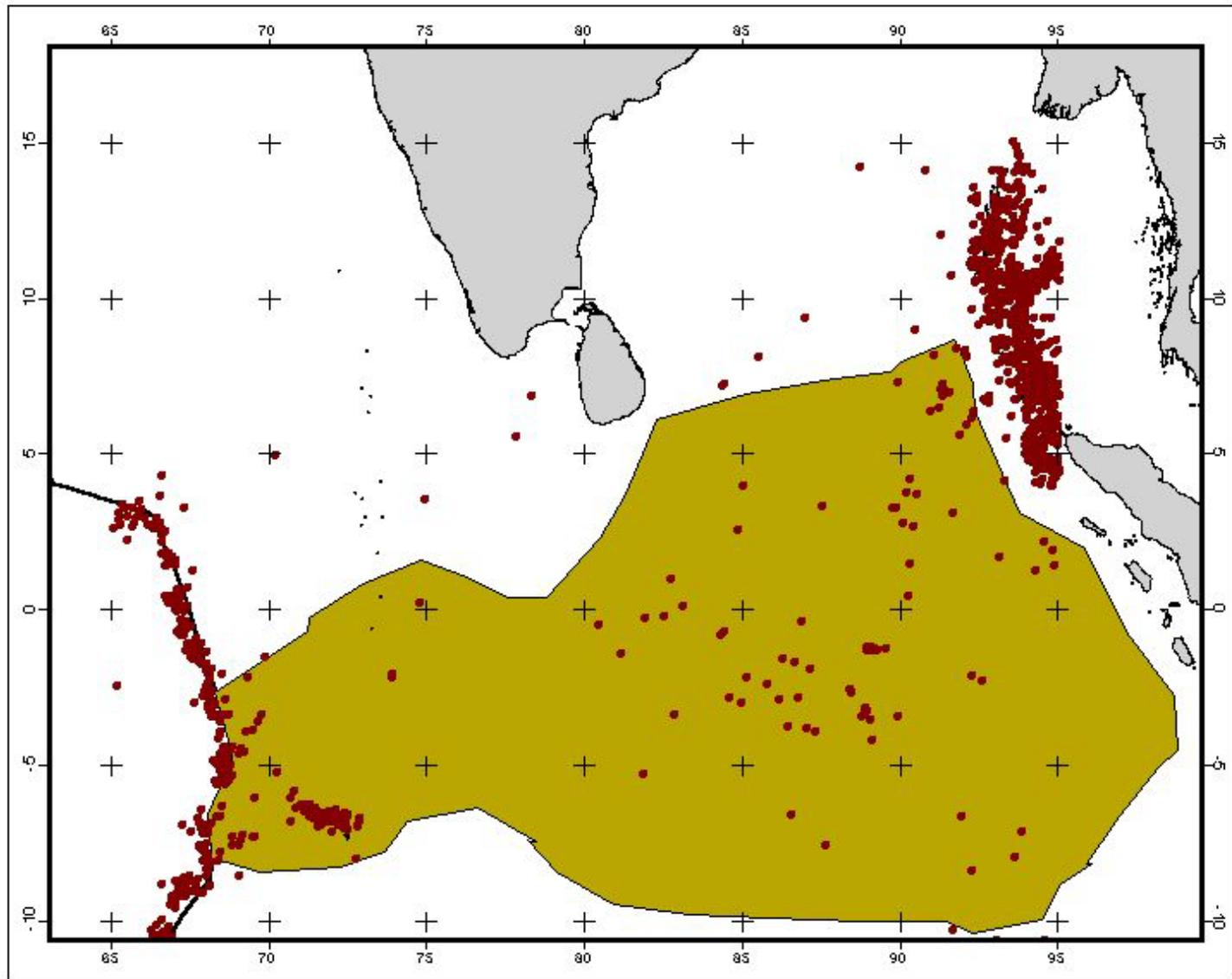
But

Feel appx. One tremor one in two years

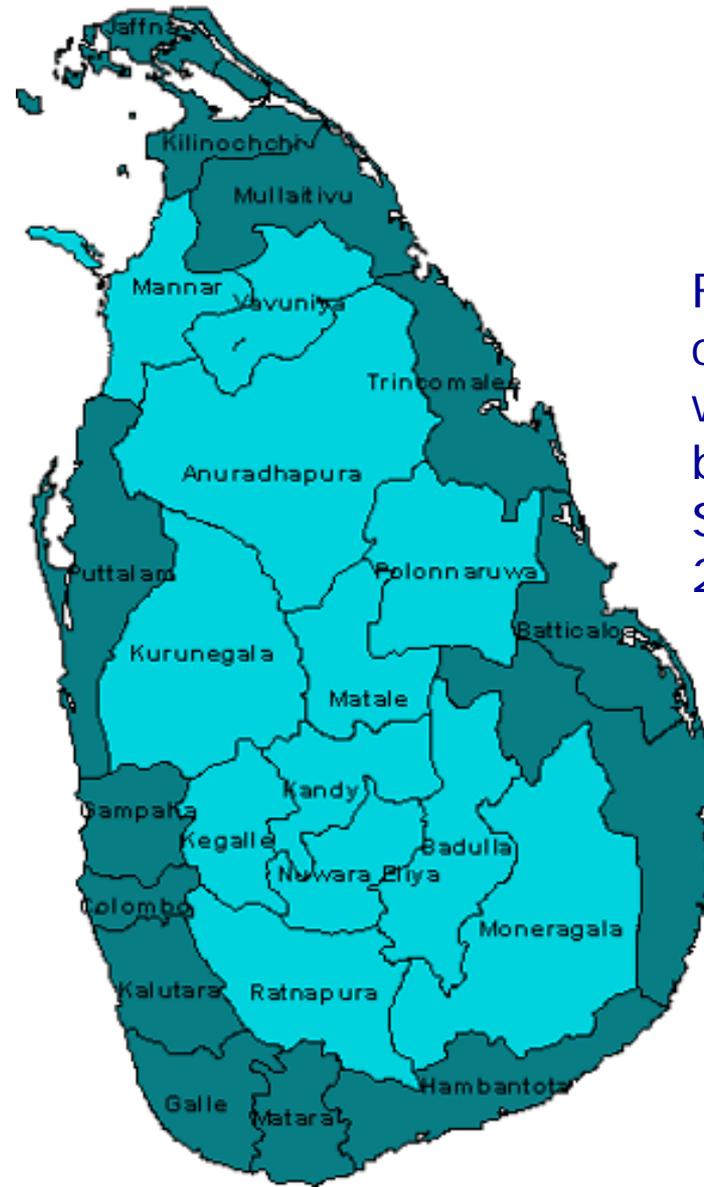
Intra-plate EQ in India

CIB mini plate activities

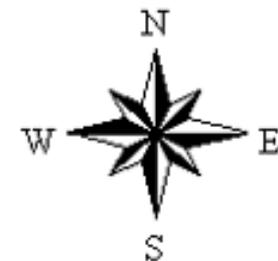
EARTHQUAKES NEAR THE ISLAND



Districts Affected



Fourteen districts in the coastal belt in Sri Lanka were severely affected by the Tsunami on Sunday December 26th, 2004



A express train from Colombo was hit by the tsunami wave at 9.35a.m. at Telwatta in Southern Sri Lanka. With 1500 people on board, only 200 survived. Villagers who were trying to escape were blocked by the train. More than 500 bodies found.



1000 children are left without parents and more than 3000 children have lost one parent

Loss of Employment : 275,000 numbers



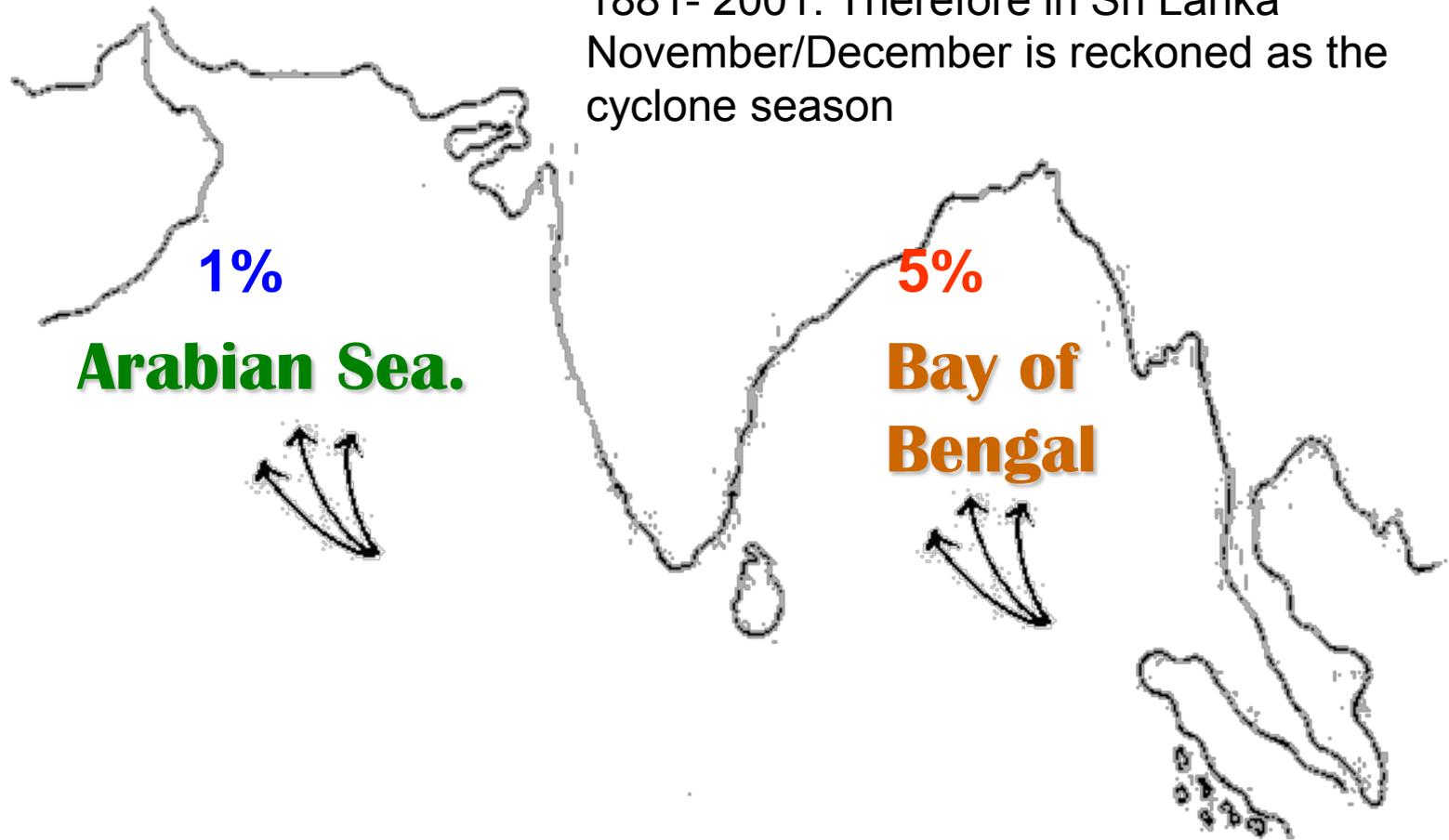
El Nino

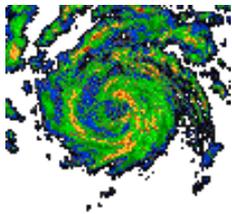
El Nino events are linked to Droughts in Sri Lanka

- El Nino is a naturally occurring phenomenon
- Extensive warming of the Equatorial surface water in the Central and Eastern Pacific Ocean Off Peru coast
- No cyclic pattern, but observed every two to seven years
- Its negative phenomenon is called La Nina

Formation Of Cyclone And Moving Direction.

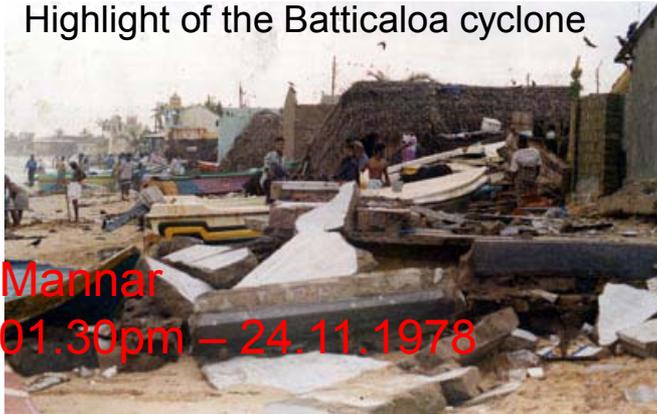
35 cyclone storms/cyclones had crossed the coast in November and December period of 1881- 2001. Therefore in Sri Lanka November/December is reckoned as the cyclone season





Cyclone Disaster

Highlight of the Batticaloa cyclone



Maximum rainfall in hours period

(23/0900am – 24/0900am) – 300mm to 400mm over Central hills

Surge - 1-2 meters in height
(maximum observed)

Batticaloa – Mannar
23.11.1978 01.30pm – 24.11.1978
07.00am

Damage

Generally over 1 million people affected

915 human lives lost

65 people permanently disabled

100,000 house suffered extreme damaged

About 50% of the roof of buildings along the path blown off

Coconut plantations and forest cover to a width of 35km of storm track wiped out



Ancient Time -Disaster Management in Sri Lanka

Sri Lanka rich in ancient culture. The hydraulic civilization found in the Dry Zone by ancient Sinhalese kings display evidence of remarkable human effort taken to mitigate the drought hazard.

The major features of this civilization were the construction of an intricate system of reservoirs for strong water for agriculture.

The number of ancient reservoirs built in varying time periods scattered over different parts of the dry zone amounts to over 10 000.

There is no doubt that the rural population in the dry zone whose survival there today as a result of the timely and proper disaster plans initiated by the ancient monarchs.

Disaster Management in Sri Lanka

Government of Sri Lanka has appointed a Cabinet Subcommittee on natural disasters in 1991. The report was submitted on February 1993 with following section,

Findings and recommendations

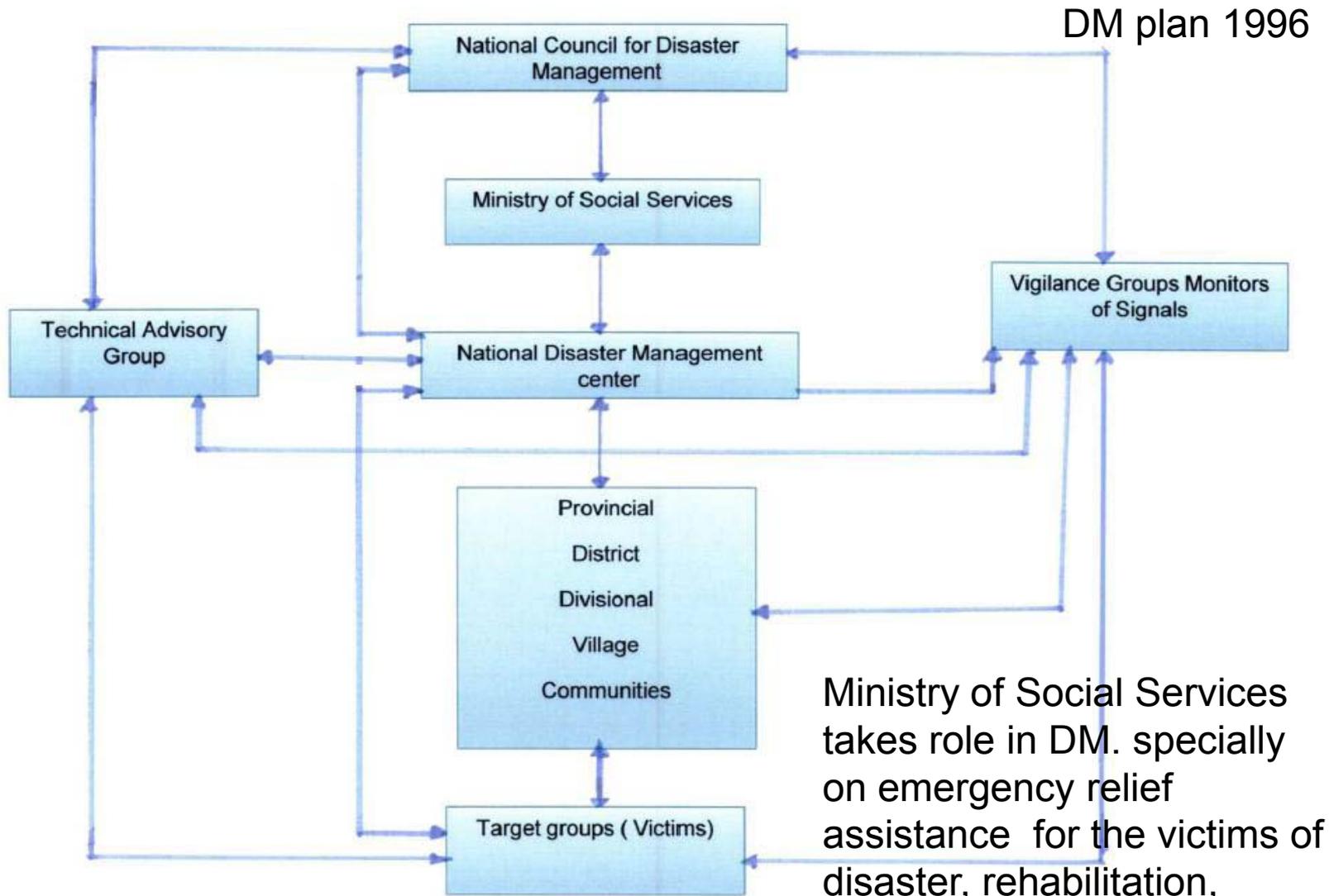
Institutional framework for national disaster management
National disaster management plan
National disaster management act

Reports of the Technical advisory group on following subjects,

Flood and cyclone
Landslide
Industrial accidents
Epidemics

National Disaster Management Center was established in July 1996, under the Ministry of Social Services, with the cabinet approval and Director was also appointed .

Proposed Institutional Framework for National Disaster Management



Ministry of Social Services takes role in DM. specially on emergency relief assistance for the victims of disaster, rehabilitation, reconstruction activities.

Current Disaster Risk Management in Sri Lanka

In 2004 Indian Ocean tsunami tragedy drove the government of Sri Lanka to take step to strength its disaster management system. On 12 December 2005, in president declared to form Disaster Management & Human Rights Ministry.



**PARLIAMENT OF THE DEMOCRATIC
SOCIALIST REPUBLIC OF
SRI LANKA**

**SRI LANKA DISASTER MANAGEMENT
ACT, No. 13 OF 2005**

[Certified on 13th May, 2005]

Current Disaster Risk Management in Sri Lanka

This act provides the provisions of establishment of

- National Council for Disaster Management (NCDM)
- the Disaster Management Centre (DMC)
- appointment of technical advisory committees (TAC)
- the preparation of Disaster Management Plan
- the Declaration of a state of disaster
- the Award of Compensation and for matters connected here with or incidental thereto

National Council For Disaster Management

Ministers in charge of

Social Services

Rehabilitation &
Reconstruction

Home Affairs

Health

Science &
Technology

Housing

Coast
Conservation

Irrigation

Power

Defence



Ministers in charge of

Police

Finance

Land

Fisheries & Aquatic
Resources

Foreign Affairs

Water Supply

Highways

Urban
Development

Education

Environment

DMC

Organizational Structure



National Level

**Disaster Management Centre
(Director General)**

**National
Consultants**

**Disaster
Management
Technology,
Mitigation
Unit**

Tech.
Com.

Tech.
Com.

**Forecasting,
Early warning
&
Dissemination
Unit**

**Finance Branch
(Deputy Director)**

**Preparedness
Planning
Unit**

Tech.
Com.

Tech.
Com.

**Personnel &
Administration
Branch
(Deputy Director)**

**Training,
Education
& Public
Awareness
Unit**

**Media Unit
(Deputy Director)**

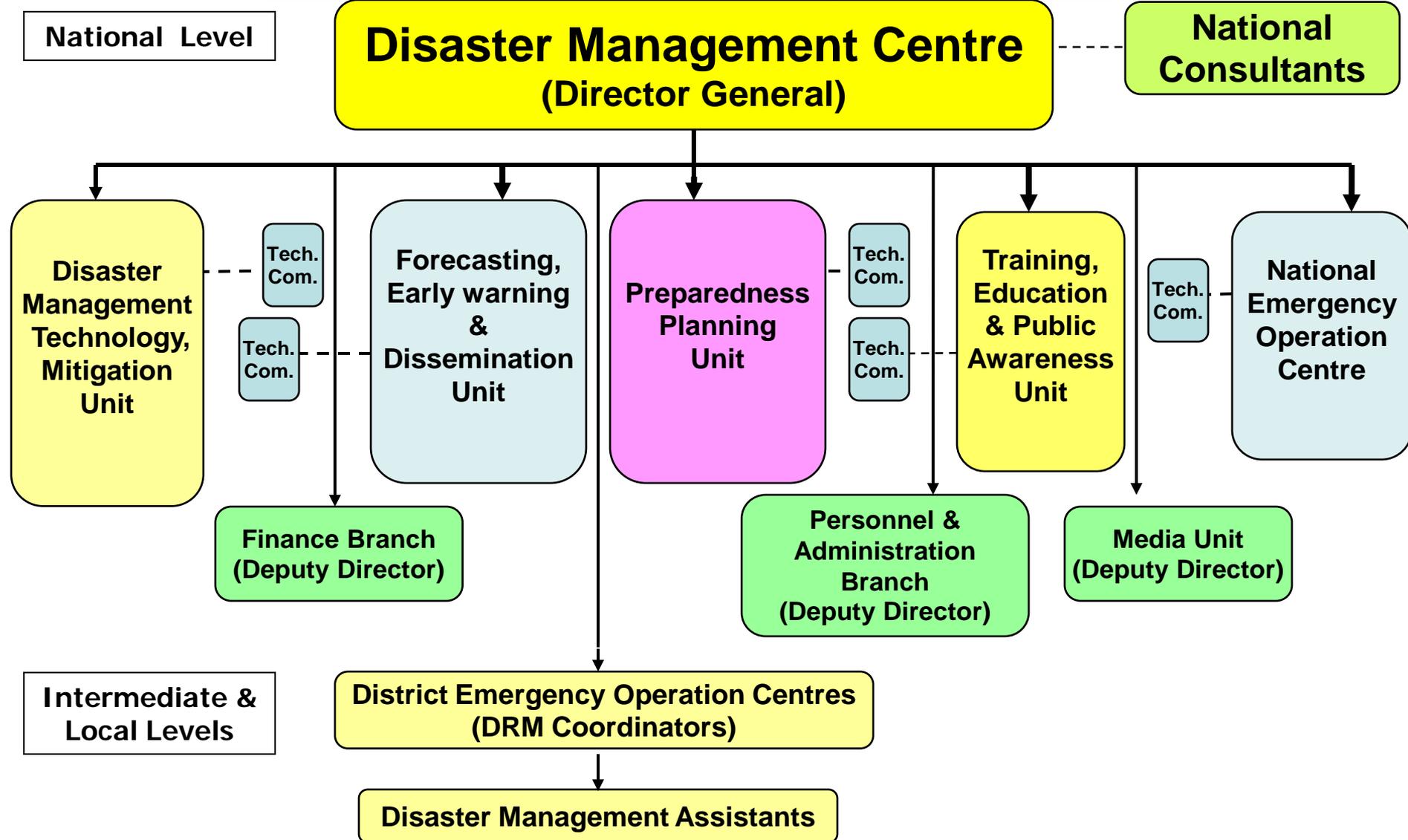
Tech.
Com.

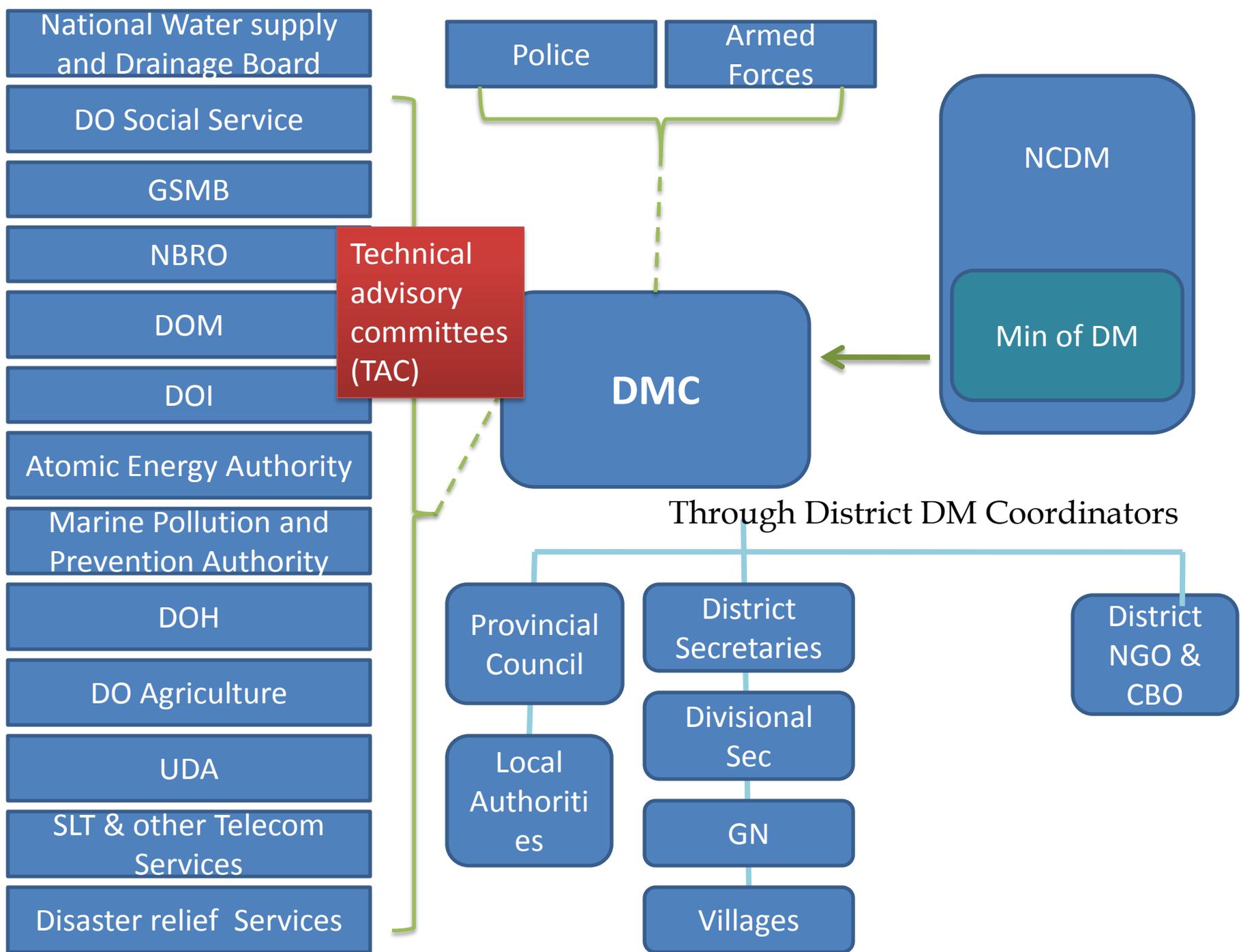
**National
Emergency
Operation
Centre**

Intermediate &
Local Levels

**District Emergency Operation Centres
(DRM Coordinators)**

Disaster Management Assistants





Cabinet changed in 2010

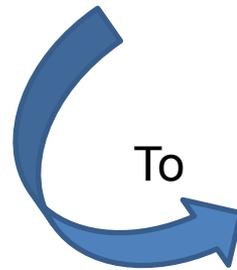
Ministry changed from

**Ministry of Disaster Management &
Human Rights**

Prime Minister

Minister

Secretary



[Hon. Ratnasiri Wickremanayake](#)

[Hon. Mahinda Samarasinghe](#)

[Prof. Rajeewa Wijesinghe](#)

Ministry of Disaster Management

Prime Minister

Minister

Secretary

Hon. D.M. Jayarathna

Hon. M. Fowzie

Madam S.M Mohamed



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Creating Disaster Free Safer Environment

NATIONAL BUILDING RESEARCH ORGANISATION



NBRO was created to serve the needs of the people in the country, and the needs differed from time to time.



National Building Research Organisation (NBRO)

Established : 1984

NBRO
(Multidisciplinary Institution)

Research

Technical Services

Development

Geotechnical
Engineering

Building
Materials

Environment
al

Project
Management

Human
Settlements
Planning

Landslide
Disaster
Mitigation

Integrated Solutions in Diverse Areas

NBRO staff

Integrated
with an in-house
Multi-disciplinary Team



Geotechnical Engineering Division was formed to cater geotechnical investigations needs in the country

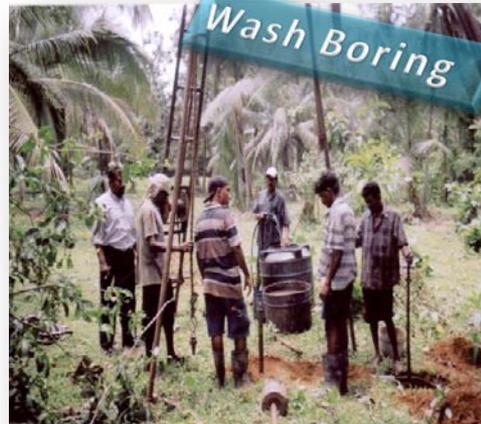
Drilling Work



Moving



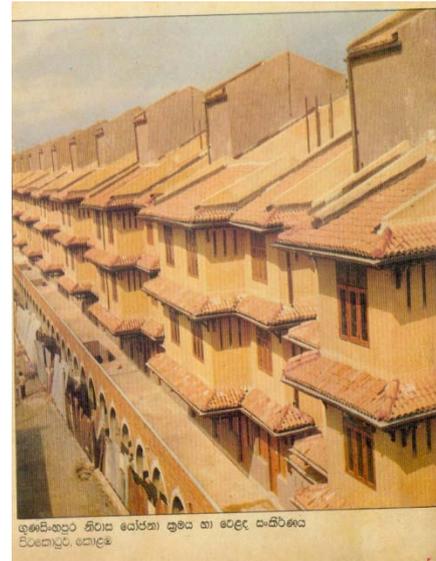
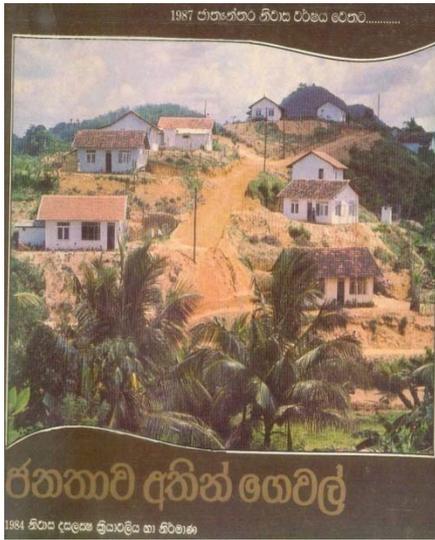
Wash Boring



Erecting



NBRO played a key role in state **Million Housing** programme

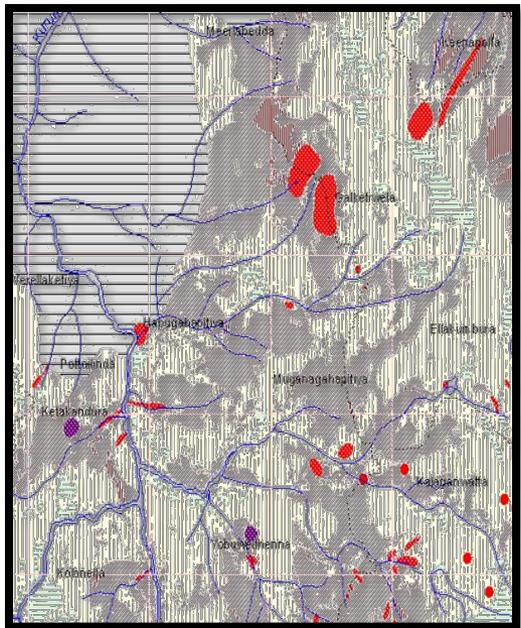
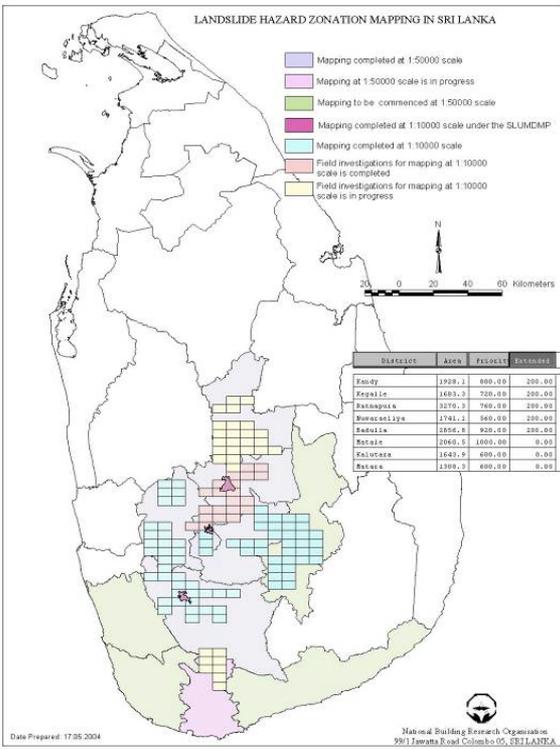


In 1988

Quality Surveillance of Pipe-Borne Water in Greater Colombo started and continued to date.

Landslide Studies and Services Division established in NBRO in 1993

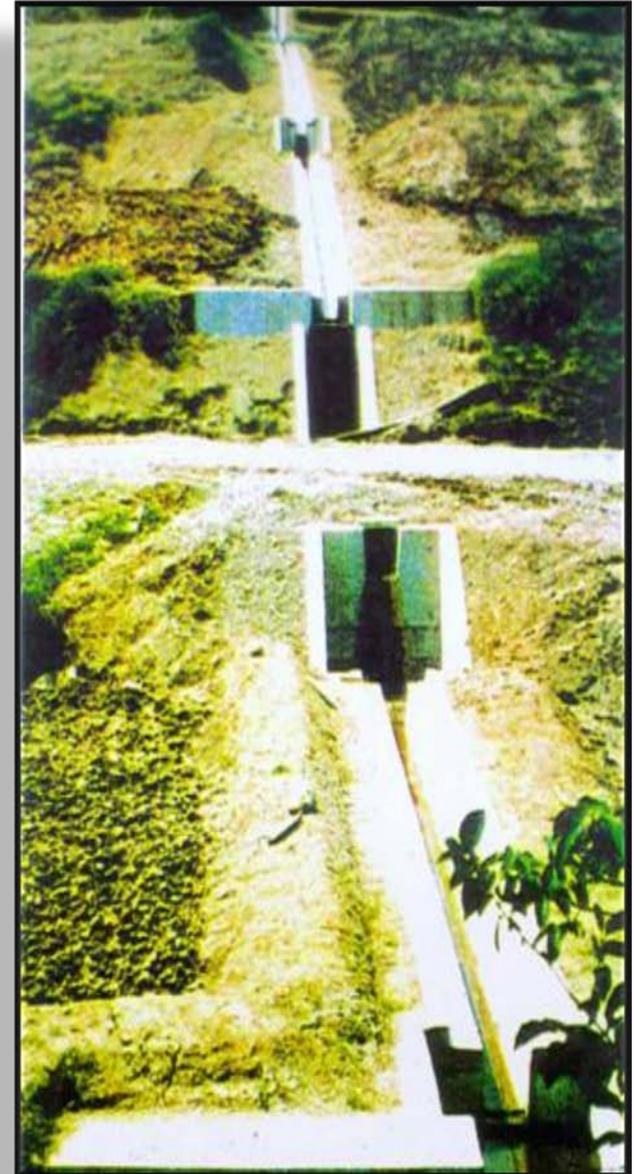
Landslides in 1986 necessitated government action to start Landslide investigations by NBRO



Landslide Hazard Zonation Mapping Project (LHMP) started in 1990 by NBRO/UNDP Chief Technical Advisor

Landslide Studies & Services Division

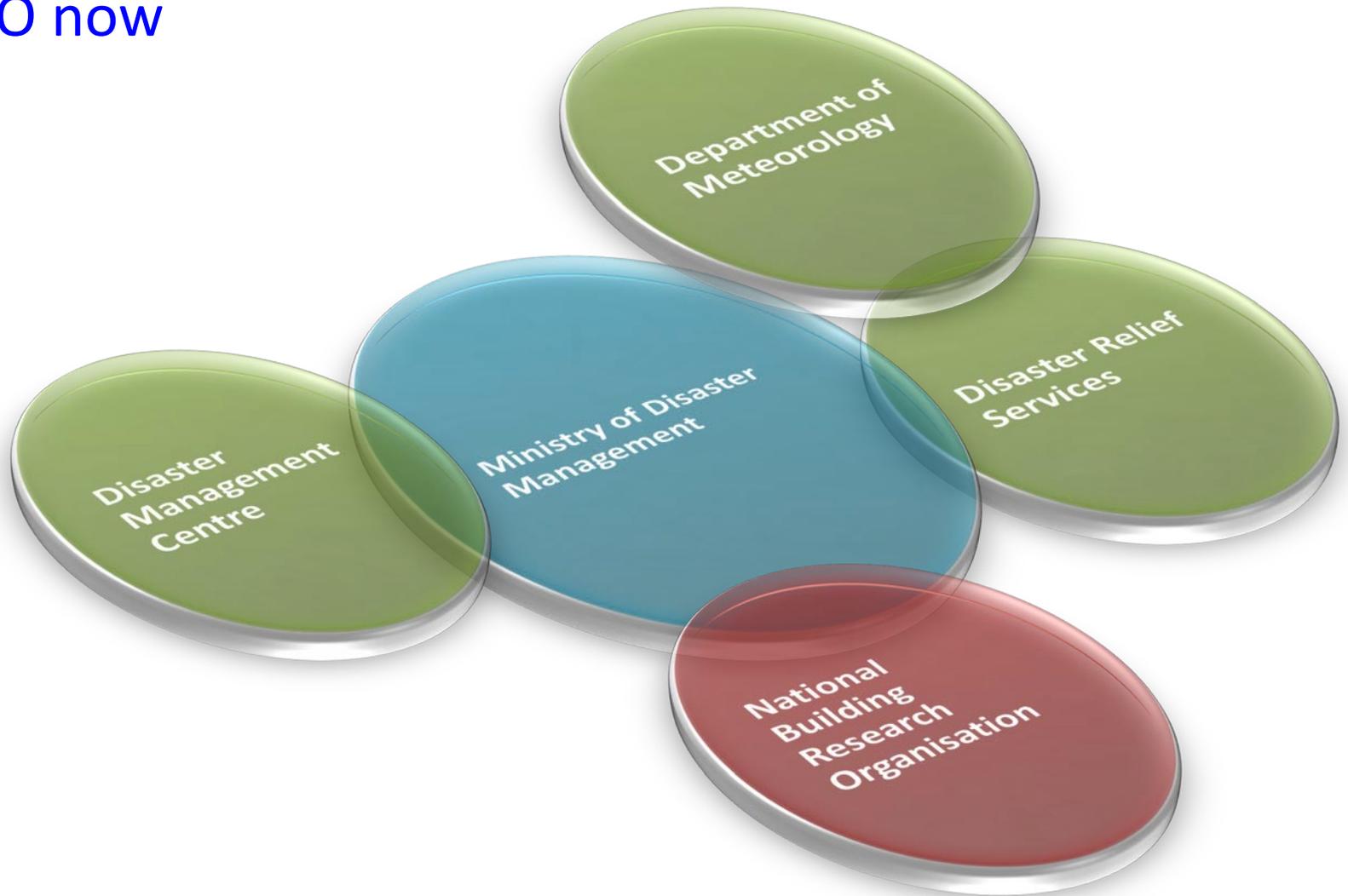
Special investigations on geo-hazards observed in landslide prone areas and proposing mitigation methods



In the past NBRO worked under many ministries

- Ministry for local government
- Ministry for policy planning and implementation
- Ministry for housing & construction
- Ministry of Disaster Management & Human Right

NBRO now



Assistance to NBRO

- **UNDP** assisted the forming of NBRO in 1984
- **UNDP** assisted to start landslide studies
- Grants from **Japan International Cooperation Agency** in 2002
- Grants from **Japan International Cooperation Agency** in 2006
- Grants from **GTZ** in 2007
- Grants from **UNDP** in 2008
- Continual assistance of **Government of Sri Lanka**

Collaboration programmes

- UNDP
 - Asian Disaster Preparedness Centre (ADPC)
 - Japan International Cooperation Agency (JICA)
 - International Institute for Geo-information Science and Earth Observation (ITC)
 - Asian Institute of Technology (AIT)
- Red Cross & Environmental Foundation Limited
- Practical Action
 - Strengthening of capacity building programme-ADRc 2010

Managed refuge camps during the period of war started for peace - 2006, Kantale, Trincomalee district



CAMP DETAILS

SCHOOL NAME : T/AR RAUFF VI, KANTALE.

GRADE	BOYS	GIRLS	TOTAL
01	12	11	23
02	08	17	25
03	09	13	22
04	03	08	11
05	04	03	07
TOTAL	36	52	88

NO OF FAMILY : 164
 MALE : 404
 FEMALE : 451

UNDER 05 YEARS OLD : 164
 UNDER 18 YEARS OLD : 188

TOTAL AMOUNT : 855

NEED OF HOUR

- Milk powder
- Clothes
- Foot wares
- medical camp
- tents

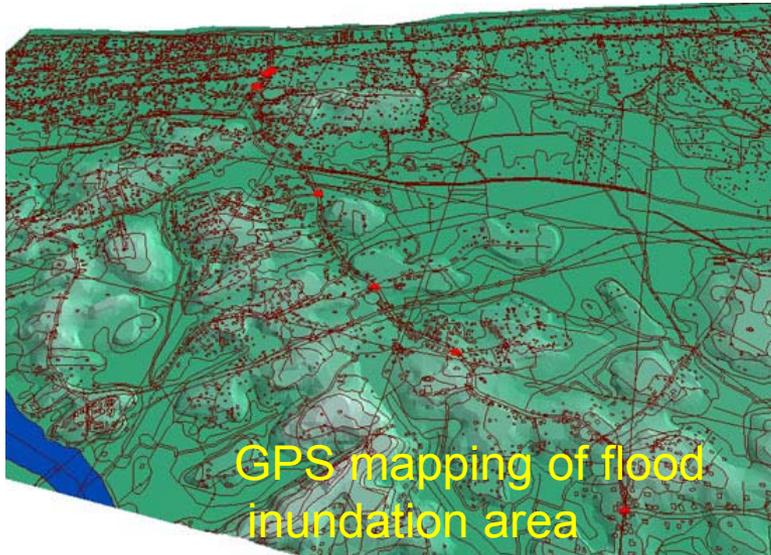
▲ Pregnancy :
 ▲ Injured :
 ▲ Dead :

SCHOOL PARTICULARS

Name: T/A-Rauff Muslim Vidyalyaya
 Address: Kantale
 Telephone: 09122
 District: Trincomalee
 U.P. Code: Kantale
 P.O. Name: Perathuveli, Post. No. 22710
 School Number: 1702020
 School Name: Perathuveli - 25222
 School Type: Type - 09
 School Map No: 03-0-196
 School Map No: 03-0-196
 School Map No: 03-0-196
 School Map No: 03-0-196



Flood inundation mapping -2006, Diyagama ds division, kalutara district

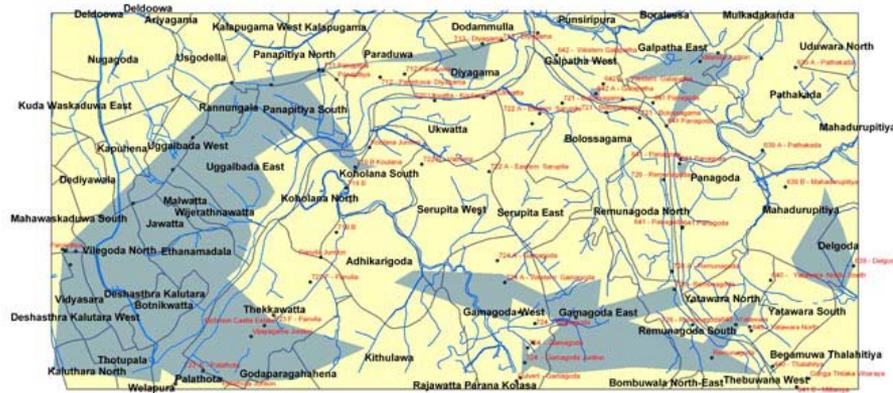


Identified risk elements in flood vulnerable areas



Capacity build up programe for Assistant Government Agents, flood vulnerable villages -2006

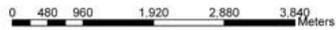
Threatening of flood inundation areas



FLOOD ELEVATIONS (Ft)



National Disaster Management Centre (NDMC)
Ministry of Disaster Relief Services



GPS Mapping and Research were carried out by Mr. Dinesh Hemachandra Geologist in NDMC.
Map Modeling based on GIS Done by Mr. D T Jayawardana Laboratory In Charge PGIS University of Peradeniya



Explained of risk element

Implemented behaviors / feelings of disasters



Risk mapping of flood hazard vulnerable areas - 2007

Biyagama ds division-Gampha district,



Recorded flood inundation levels,
duration of inundation,
Damages, list of victims....etc.

Conducted community base
awareness, introduced
embankment protection methods.

Conducted damage
assessment field
surveyed



Mahawewa , Meeriyagolla- Walapane Landslide Risk Reduction Modal Site Project Under DRM Programme



On January 11, 2007, due to heavy rain which unexpectedly fell on Walapane division, a landslide occurred in Mahawewa , Meeriyagolla Vilages.



The financial support of the UNDP and the coordination of the Disaster Management Centre

National Building Research Organisation started mitigation activities - 2008

Awareness for School children of Kerthi Bandara Maha Vidyala





Surveying of landslide



Rain gauge



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2009

දිනය

වර්ෂාපතනය-(මි.ම)

අවදානමින් සිටින්න





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Rainfall Data Record Notice Board

MAP OF MAHAWEWA LANDSLIDE (JANUARY, 2007), KUMBALGAMUWA

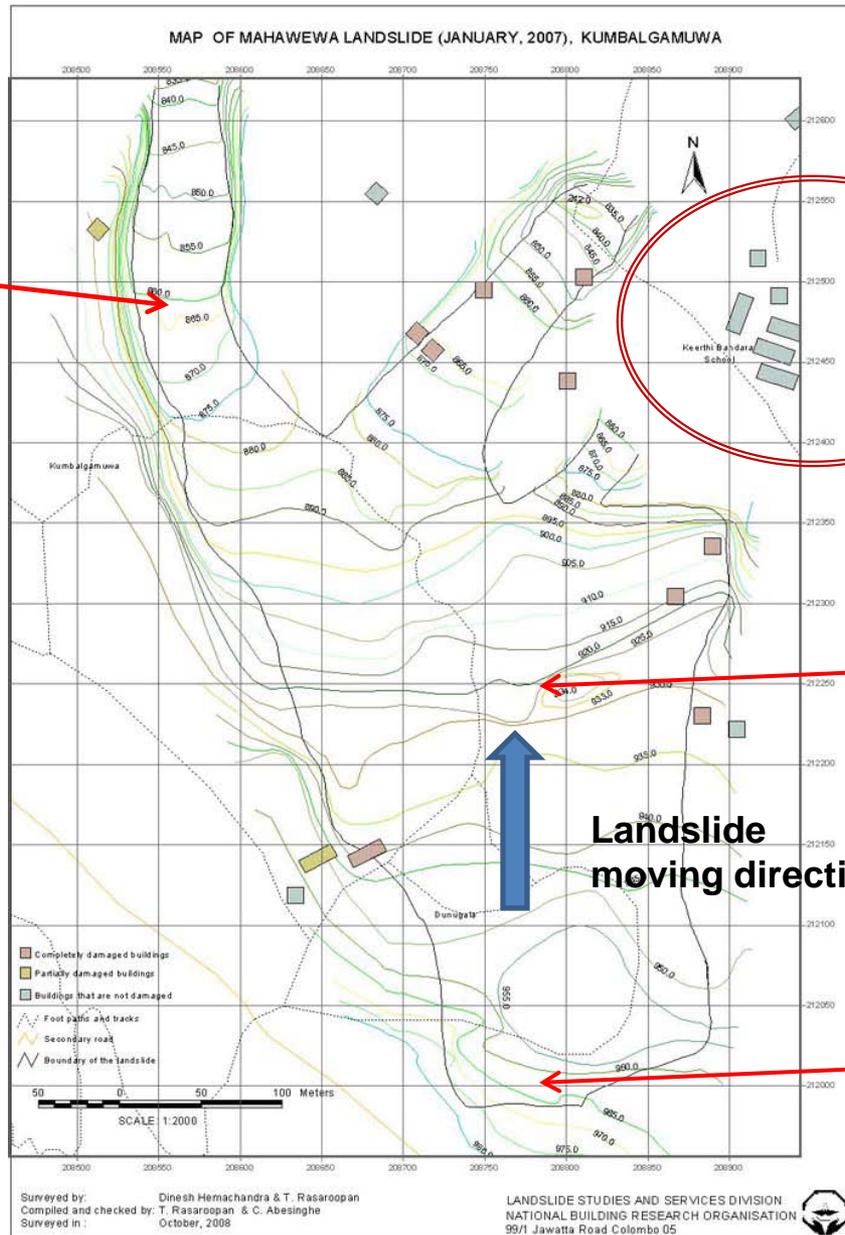
Toe area of the landslide

Keerthi Bandara School

Body of the landslide

Landslide moving direction

Head of the landslide



At present, the project area has been mapped for its topographical and geological details.

Cutting failures occurred Maharagama divisional area (17th May 2010)- Colombo district)



Technical report submitted to clients and guided how to construct gabion wall to protect future failure



Tree Plantation Programme – Rathnapura district 2009

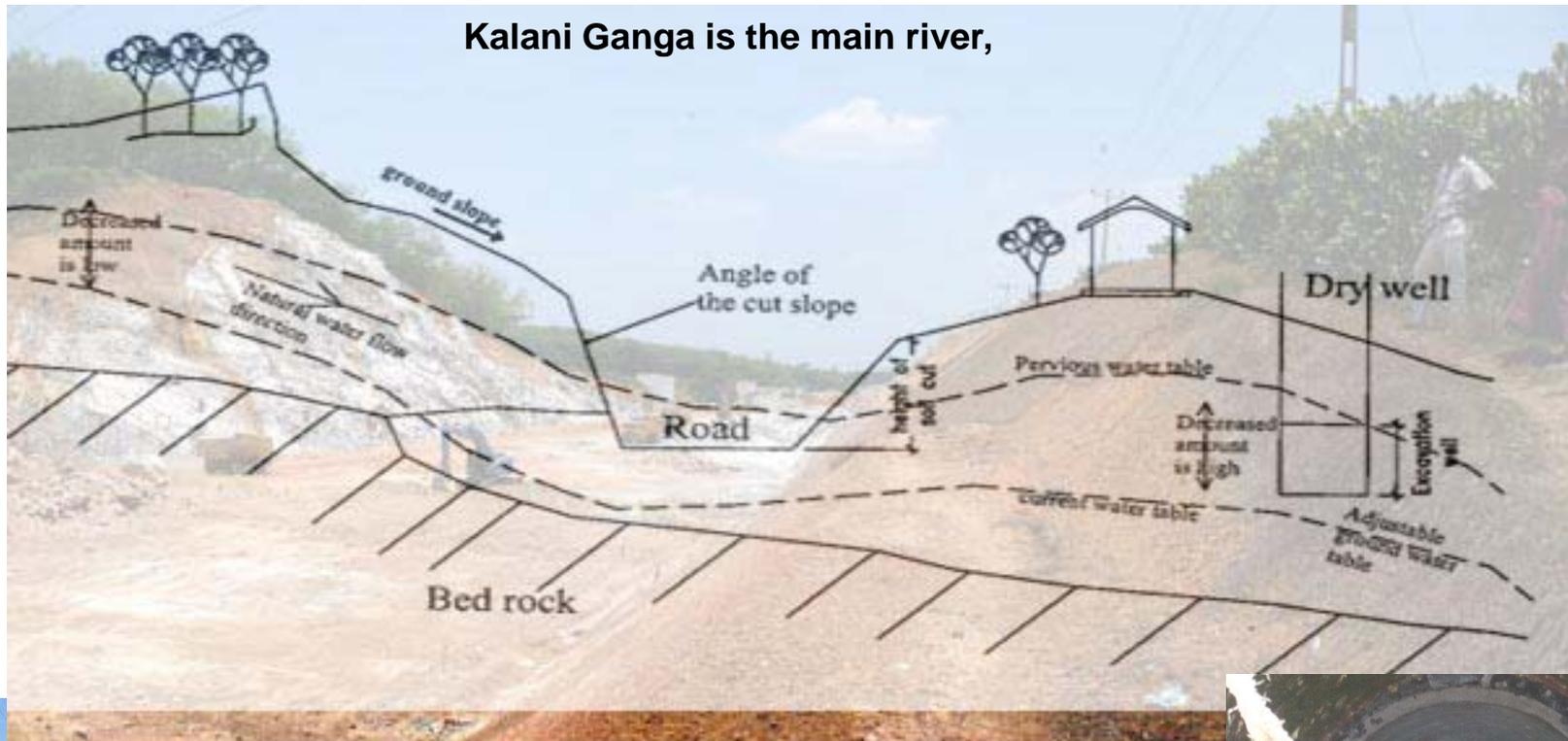


Determine the impact of rock blasting / excavation on the observed depletion of ground water table - 2010

study areas are situated in the wet zone of Sri Lanka.

Geomorphology of the study area,

Kalani Ganga is the main river,



Sociological data were also recorded during the interviews with villagers,

Reduced the water levels in their wells ,



Thank you