Disaster Management and Emergency Communication in Sri Lanka
Use of Telecommunication and ICT

by
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Director General
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Presentation Outline

- Institutional Arrangements.
- Early Warning and Dissemination
- Use of ICT in Disaster Management – Sri Lanka
Institutional Arrangements
Sri Lanka Disaster Management Act; No.13 of 2005

✓ Provides for a Framework for Disaster Risk Management (DRM) in Sri Lanka

✓ Addresses Disaster Management (DM) holistically, leading to a policy shift from response based mechanisms to a proactive approach

✓ Measures have been taken to amend the act to address the DRM concerns after 05 years of implementation
National Council For Disaster Management

Ministers in charge of:
- Social Services
- Rehabilitation & Reconstruction
- Home Affairs
- Health
- Science & Technology
- Housing
- Coast Conservation
- Irrigation
- Power
- Defence

Minister of Disaster Management

Chair Person: H.E. President
Vice Chairman: Hon. Prime Minister
Leader of Opposition
Nine Provincial Chief Ministers
Five MPs from Opposition

DMC

Ministers in charge of:
- Police
- Finance
- Land
- Fisheries & Aquatic Resources
- Foreign Affairs
- Water Supply
- Highways
- Urban Development
- Education
- Environment
Disaster Management Coordination Framework

- National Disaster Management Coordinating Committee
- District Disaster Management Committees
- Divisional Disaster Management Committees
- GN level Community Disaster Management Committees
- Sub Committees at GN Level
SUB COMMITTEES AT GN LEVEL

- Early Warning,
- Medical / Health
- Search & Rescue
- Camp Management
- Village Security
Early Warning and Dissemination
Multi Hazard Early Warning System

Warning Given by Technical Agencies

DMC & Other Relevant Agencies

Vulnerable Communities
24 x 7 National Emergency Operations Centre
Tsunami Warning System
Indian Ocean Tsunami of 26-12-2004

Time of arrival of first wave and estimated max. wave height

- 08:30 (7-12 m)
- 08:40 (6-10 m)
- 08:50 (5-8 m)
- 09:00 (3-5 m)

Note:
Earthquake occurred at 06:58 am

Numbers dead - 30,959
Numbers missing - 5,644
Numbers displaced - 500,669
Tsunami Warning System

- Meteorology Department is connected to the following:
  - Pacific Tsunami Warning Centre, Hawaii
  - Japanese Meteorological Agency
  - Other service providers

- Bulletins from PTWC & JMA are given by GTS, FAX and E-MAIL
Colombo Station measures sea level every 01 minute and transfers data every 15 minutes via Japanese Meteorological Satellite (JMA) and MeteoSat. The Colombo station consists of 2 pressure sensors, 1 radar sensor and 2 floating gauges. Trincomalee and Kirinda Stations measures sea levels every 01 minute and transfers data every 15 minutes via MeteoSat. Both stations are equipped with pressure and radar sensors. Real time data are also in GTS. Instruments donated by BSH, Germany.
Receiving Technical Information from Various Countries

- PTWC
- USGS
- GDACS
- INCOIS
- INDONESIAN MET
- RIMES
- AUS-MET
- JMA

Local Agencies

- DOM
- GSMB
- NARA

DISASTER MANAGEMENT CENTER EOC
PTWS Message


www.gdasc.org-JRC Message

Green Earth quick alert (6.1 m, depth 19.4 Km) in Vannatu 31/7 14.34 UTC POP 100 Km 0 www.gdasc.org-TRC
Multi-Hazard Early Warning Dissemination System

Receiving Early Warnings

PTWC | USGS | GDACS | INCOIS | INDONESIAN MET | AUS-MET | RIMES

Government Agencies, Critical Agencies & Stakeholders
Police
Media & General Public
Military
Regional & International Organizations
UN System, INGOs, NGOs

Dissemination of Warning

24 Emergency Operation Center

Multi-Hazards Early Warning Dissemination Unit of the DMC

District Disaster Management Committees
Divisional Disaster Management Committees
Village level DM Committees

Out Puts

Radio Comm
SLT/Dialog, SMS
Fax
Internet
Satellite com
Cell Broad.
Police Com
Military Com
Warning Towers
DEWN
Media

Speaker Sys.
Bells / Sirens
Messengers
Riders / Cyclers

Provincial Councils
District Secretariats
Divisional Secretariats
Local Authorities
Police Stations
Hospitals
Government Dpt.
NGOs, CBOs

GSMB
NARA
DOM
Methods of Dissemination

- **National Level**
  - TV Stations
  - Radio Station
  - Early Warning Towers
  - Police & Military Communication
  - Cell Broadcast/ SMS
  - Technical Devices
  - Satellite & Radio Communication (HF & VHF)
  - Telephones / CDMA/ GSM

- **Provincial / District Level**
  - Radio Communication
  - Telephones / CDMA/ GSM
  - Police & Military Communication
  - Emergency Operations Centre
  - Disaster management Coordinators

- **AGA Division / Village Level**
  - Telephones / CDMA/ GSM
  - Police Vehicles – Announcements
  - PA Systems
  - Sirens
  - Temple and church bells
  - Riders/ Push Bicycle & Motor Cycles/Messengers
  - Early Warning Sub Committees/Teams
  - NGOs and CBOs
Breaking News through Media

- Media plays a prominent role in Sri Lanka covering the entire island through Television and FM Radio more than 50 channels.
Early warning through Media.

**TV CHANNELS**
- ITN
- RUPAVAHINI
- SIRASA TV
- DERANA TV
- SHAKTHI TV
- SWARNAVAHINI
- SIYATHA TV

**RADIO CHANNELS**
- SLBC
- LAKHADA FM
- SIRASA FM
- DERANA FM
- SRI FM
- SIYATHA FM
- KIRULA FM
- LAK FM
- RANGIRI DAMBULU FM

**NEWS WEB SITES**
- SATTELITE TV

**NEWS ALERTS**
- JNW NEWS ALERTS
- DERANA ALERTS
- LIVE @ 8 ALERTS

**PEO TV NEWS BAR**
Telephone (fixed and mobile):

- Telephones play an important role in warning communities about the impending danger of a disaster.
- There were many examples of how simple phone warnings saved many lives in South Asian countries during the 2004 tsunami.
- However, there is a limitation on the use of fixed and mobile communication due to congestion of the network system.
Customized Mobile Service Network

National Emergency Operation Center
Telephones- IP Phones/CDMA/Conference SYSTEMS
Early Warning Towers

74 Early Warning towers

Repeater Stations

EW Towers
Early Warning Towers
HF / VHF Equipments
HF/VHF covering All 25 Districts in Sri Lanka

Colombo  Anuradhapura
Kalutara  Polonnaruwa
Galle    Matale
Matara   Kurunegala
Hambantota  Kandy
Ampara   Kegalle
Batticaloa  Nuwara Eliya
Trincomalee  Badulla
Mulathive  Monaragala
Jaffna   Rathnapura
Kilinochchi
Mannar
Puttlam
Gampaha
Vavuniya
Disaster Management Center provided VHF hand held's to 10 Media Agencies to communicate with DMC
Satellite communication covering 25 Districts

Thuraya Satellite phones

Hand Held

Desk Top
Short Message Service (SMS)

• Operators could communicate with each other via SMS more easily.
• SMS also has another advantage over voice calls in that one message can be sent to a group simultaneously.

Cell Broadcasting:

• cell broadcasting facility is available in all cellular phones.
• A public warning message in text can be sent to the screens of mobiles devices.
Disaster Early Warning Network (DEWN)

DEWN SYSTEM

SMS (5000 SELECTED KEY CONTACTS)

DEWN SERVER

CB

CELL BROADCAST (9,000,000 PEOPLE)

SMS

34
Deliver Messages through Internet, Email System to various Stakeholders

- Internet and email is used to disseminate information and early warning messages public.
e-mail
Mega Phone & Public Addressing Systems
Electric and Manual Sirens

Traditional Methods
Community level Last-mile dissemination

Electronic media

DEWN

Telephones Mobile/SMS

Messengers/Runners

Motor cyclists/Cyclists /Three Wheelers

Sirens/Bells

Speaker systems in villages

Telephone/Mobiles

Police vehicles with speakers

Hand held VHF set

RADIO

E-Communication

Warning Towers
"Last Mile" Dissemination

In cooperation with CBDM

DMC
District Division
Police
Military
Media

Government

Communication Tools

DEWN
Multi hazard EW tower
Temple Bell

Loudspeaker car
SMS
Handy speaker

TV & Radio

Tsunami Warning
Flood Warning
Evacuation Instruction

In cooperation with CBDM
Use of Defense Services and Police during the Early Warning Dissemination
Early warning
Dissemination

- JOH
  - ARMY HQ
  - NAVY HQ
  - AIR FORCE HQ
    - SFHQs
      - All Commands
      - All Air Bases
    - Divisions
      - Naval Bases
    - Brigades
    - Units
    - Companies
      - Platoons
Early Warning & Evacuation System

DMC

JOH

ARMY  NAVY  AIR FORCE

Vulnerable Community

Dissemination Mechanism of Military

Warning given to the vulnerable community through coastal Military locations
## Search and Rescue Teams from Defense Services

<table>
<thead>
<tr>
<th>Army Search &amp; Rescue Teams</th>
<th>Naval 4 RS Teams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colombo</td>
<td>Western Command</td>
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<tr>
<td>Kalutara</td>
<td>Sothern Command</td>
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<tr>
<td>Galle</td>
<td>Eastern Command</td>
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<tr>
<td>Matara</td>
<td>Northern Command</td>
</tr>
<tr>
<td>Hambantota</td>
<td>North Central Command</td>
</tr>
<tr>
<td>Ampara</td>
<td>North Western Command</td>
</tr>
<tr>
<td>Batticaloa</td>
<td>15 x Teams</td>
</tr>
<tr>
<td>Trincomalee</td>
<td>15 x Teams</td>
</tr>
<tr>
<td>Mulathive</td>
<td>20 x Teams</td>
</tr>
<tr>
<td>Jaffna</td>
<td>10 x Teams</td>
</tr>
<tr>
<td>Kilinochchi</td>
<td>20 x teams</td>
</tr>
<tr>
<td>Mannar</td>
<td>08 x Teams</td>
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<tr>
<td>Puttlam</td>
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<td>Gampaha</td>
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<td>Vavuniya</td>
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<td>Anuradhapura</td>
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<td>Polonnaruwa</td>
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<td>Matale</td>
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<td>Kurunegala</td>
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<tr>
<td>Kandy</td>
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<td>Kegalle</td>
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<tr>
<td>Nuwara Eliya</td>
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<tr>
<td>Badulla</td>
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<tr>
<td>Monaragala</td>
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<tr>
<td>Rathnapura</td>
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</tbody>
</table>

All Search and Rescue Teams are equipped with HF / VHF and Mobile Phones
EOC-DMC

119 Mirihana

All Coastal Police Stations

Use of Police in Tsunami Warning and Evacuation
Communication Interoperability During Disaster Response

- Urban Search and Rescue Teams
- International Assistant
- Foreign Medical Teams
- Neighboring Countries
Landslide and Flood Warning System Diagram

DoM

Automatic Rainfall Measurement System

NBRO

Dynamic Model

Elapatha

Kahawatte

Kalawana

Nivithigala

Pelmadulla

DMC

EARLY WARNING
EW and Evacuation of Communities

Public Announcements through Radio, TV (Cyclones, Floods, Landslides)

Traditional communication systems in villages

Public Evacuation
Automatic Weather Station
End-to-End EW System in Pilot Project

Satellite

Telephone Line

AWS DOM

DOI

DMC

District DM Coordinator

Rainfall Gauge

Waterlevel Gauge

Telephone Line

Last Mile
Use of ICT in Disaster Management – Sri Lanka
Information and Communications Technology (ICT) can be used to minimize the impact of disasters in many ways.

ICT is used in almost all phases of the disaster management process. In the disaster mitigation and preparedness process, ICT is widely used to create early warning systems.

ICT, like any other tool, can deliver its best when the other necessary ingredients are in place.
Where ICT fits in Disaster Management

- **Mitigation** - includes any activities reduce the impact of a disasters.
  - Risk Assessments

- **Preparedness** - includes plans or preparations made to save lives / property, and to help the response and rescue operations.
  - Evacuation planning, mapping, EW systems

- **Response** - includes actions taken to save lives and prevent property damage, and to preserve the environment during emergencies or disasters.
  - Use of near-real time satellite data for emergency responses.

- **Recovery** - includes actions that assist a community to return back to normalcy after a disaster. ICT is also useful in, Reconstruction (site suitability analysis) and build back better.
  - Damage Assessment
Images from earth observing satellites help assess the damage caused by disasters and assess vulnerability to hazards.

Satellite Meteorology help obtain precise weather forecast, thus provides early warning on floods, cyclones etc.

Satellite communications help warn people who are at risk, especially in remote areas. They help connect a disaster zone to the response agencies.

Global navigation satellite systems enable us to obtain positional information in guiding response teams, identifying hazard areas and tracking of vehicle by GPS / GSM enabled systems etc.
1 January 2004, Normal ocean condition
Digital Globe Image- Quickbird
26 December 2004, Few Minutes before Tsunami
Kalutara
Digital Globe Image- Quickbird
Use of Hazard Maps in National Planning & Development

- Objective is to determine the probability of hazard events occurring across different regions of the Sri Lanka based on geological evidence, historical data, and projections derived from theoretical analysis for major hazards,

1. Coastal Hazards
2. Landslides
3. Drought
4. Cyclones
5. Floods
Landslides hazard map

Storm Surge Map
Tsunami hazard map

Tsunami inundation map of Jaffna area
Develop Integrated Strategic Environmental Assessments (ISEA) as a Development Planning tool to Mainstream DRR

Objectives are to
- Integrate CCA & DRR into regional development plans and programmes
- Allow for systemic data gathering by technical agencies in the field and promote data sharing
- For land use planning, investments,
- local and regional level decision making on development etc

Outputs
Output is available as digital databases and maps in one web portals.
www.isea.lk
ISEA of Northern Province, Sri Lanka
Identification of Down Stream of Dam Vulnerable areas which assist to Mainstream DRR & CCA into Regional Planning
Disaster Inventory

Inventory of disaster occurrences recorded for last 30 years as a web portal for planning and decision making at all the levels

www.desinventar.lk
Use of Satellite Imageries in Emergency Responses

Connected with International Partners

• UNSPIDER
• Sentinel Asia / JAXA
• UNOSAT
Flood Inundation Mapping, East and North Central Provinces-2011

Floods shown in red color

Near Real Time Satellite Images from JAXA, Analyzed by DMC

<table>
<thead>
<tr>
<th>District</th>
<th>Inundation Area (Km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anuradhapura</td>
<td>112.28</td>
</tr>
<tr>
<td>Ampara</td>
<td>111.04</td>
</tr>
<tr>
<td>Baticalao</td>
<td>283.18</td>
</tr>
<tr>
<td>Mannar</td>
<td>105.82</td>
</tr>
<tr>
<td>Mulativu</td>
<td>70.14</td>
</tr>
<tr>
<td>Polonnaruwa</td>
<td>164.85</td>
</tr>
<tr>
<td>Trincomalee</td>
<td>268.33</td>
</tr>
<tr>
<td>Vavuniya</td>
<td>19.04</td>
</tr>
</tbody>
</table>
Batticaloa District

Livestock Damages:
- Neat Cattles: 30,191
- Buffaloes: 7,132
- Goats: 16,146
- Poultries: 105,778
- Alternative Poultries: 403

Agricultural Crops Damages
- Paddy: 115,002 Acres

(Damage status as at 31st January 2011, source: district secretariat, Batticaloa)

Tanks damaged:
- 11 (Major) 102 (Minor)

Damages to Irrigation Schemes:
- 08 Schemes, Cost of Damage: Mn 300

Roads damaged (length): 255 km

Satellite image shows flood inundation in red color.
Trincomalee District

Livestock Damages:
- Cattle: 4727
- Buffaloes: 4416
- Goats: 4901
- Poultries: 17085

Agricultural Crops Damages:
- Paddy: 32614 ha
- Vegetables: 130
- Fruits: 241
- Other Field Crops: 1,575

Damaged Irrigation Schemes:
- 09 Schemes
- Cost of Damage: Mn 250
Application of LiDAR Survey for Disaster Management
HyperDEM”
Funded by the Italian Government

Airborne acquisition (Stage 1)

Airborne acquisition (Stage 2)

Satellite acquisitions (Stage 2)

Lidar Surveys for the Coastal Zone

Puttalam
Colombo
Kalutara
Galle
Hambantota
Batticaloa
Pottuvil
Full 3-D reconstruction of the urban area of Galle. In foreview, the Dutch Fort
Project “HyperDEM”

3-D PERSPECTIVE VIEW OF THE DUTCH FORT IN GALLE

DIGITAL SURFACE MODEL

DIGITAL TERRAIN MODEL
Galle – Surge Simulation (II)

+ 1 metre

Sea level
Galle – Surge Simulation (III)

+ 2 metres

Sea level
Galle – Surge Simulation (IV)

+ 3 metres

Sea level
Galle – Surge Simulation (V)

+ 4 metres

Sea level
Initiatives in the Pipeline

• Sri Lanka Telecom automated rings to Coastal Populations for Tsunami Warning
• To provide VHF communication to Divisional and most vulnerable towns and villages.
• Establish Dynamic Web portal to disseminate all the hazards, vulnerability and risk maps (GeoNode with WB)
Thank You