Country Report – Sri Lanka

Training Courses/Workshop on Synergized Standard Operating Procedures for Coastal Multi-Hazards Early Warning System, Phase II
ESCAP/WMO Typhoon Committee WMO/ESCAP Panel on Tropical Cyclones

1. Topography and Climate of Sri Lanka

Sri Lanka is a South Asian island in the Indian Ocean south east of the Indian Subcontinent which lies within the tropics between 5° 55' to 9° 51' North latitude and between 79° 42' to 81° 53' East longitude. Therefore, the climate of the island could be mainly characterized as 'tropical'. It has a total area of 65,610 km², with 64,740 km² of land and 870 km² of water. Its coastline is 1,680 km long. The central part of the southern half of the island is mountainous with heights more than 2.5 Km. The core regions of the central highlands contain many complex topographical features such as ridges, peaks, plateaus, basins, valleys and escarpments. The remainder of the island is practically flat except for several small hills that rise abruptly in the lowlands. These topographical features strongly affect the spatial patterns of winds, seasonal rainfall, temperature, relative humidity and other climatic elements, particularly during the monsoon season.

Figure 1: Map of Sri Lanka

Rainfall in Sri Lanka has multiple origins. Monsoonal, Convectional and depressional rain accounts for a major share of the annual rainfall. The mean annual rainfall varies from under 900mm in the driest parts (southeastern and northwestern) to over 5000mm in the wettest parts (western slopes of the central highlands). (Fig. 2).

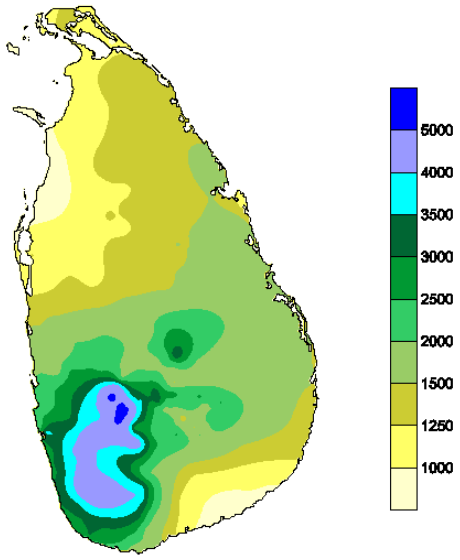


Figure 2: Annual rainfall of Sri Lanka
Source: Department of Meteorology - Sri Lanka

Regional differences observed in air temperature over Sri Lanka are mainly due to altitude, rather than to latitude. The mean monthly temperatures slightly modified influence caused by rain and seasons. The mean annual temperature in Sri Lanka manifests largely homogeneous temperatures in the low lands and rapidly decreasing temperatures in the highlands. In the lowlands, up to and altitude of 100 m to 150 m, the mean annual temperature various between 26.5 °C to 28.5 °C, with an annual average temperature of 27.5 °C (Fig. 3). In the highlands, the temperature falls quickly as the altitude increases. The mean annual temperature of Nuwara-Eliya, at 1800 m sea level, is 15.9 °C. The coldest month with respect to mean monthly temperature is generally January, and the warmest months are April and August.

The mean annual temperature varies from 27°C in the coastal lowlands to 16°C at Nuwara-Eliya, in the central highlands (1900m above mean sea level). This relatively unique feature manifesting as sunny beaches to rain forests inland is a tourist attraction.

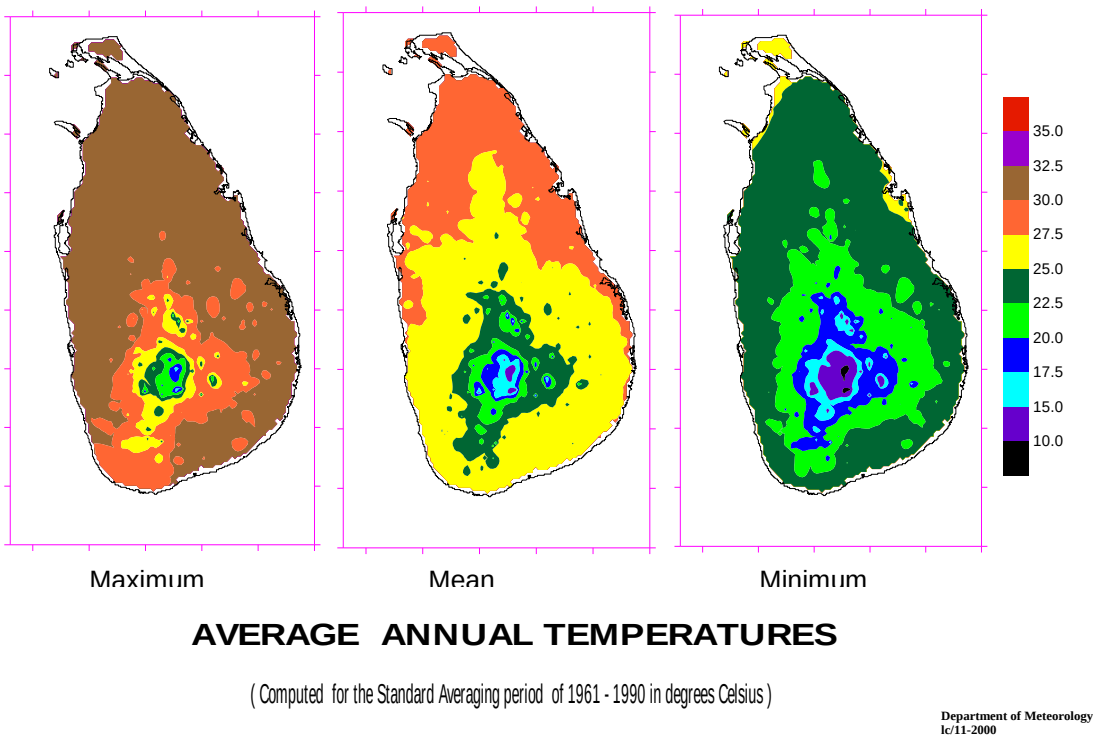
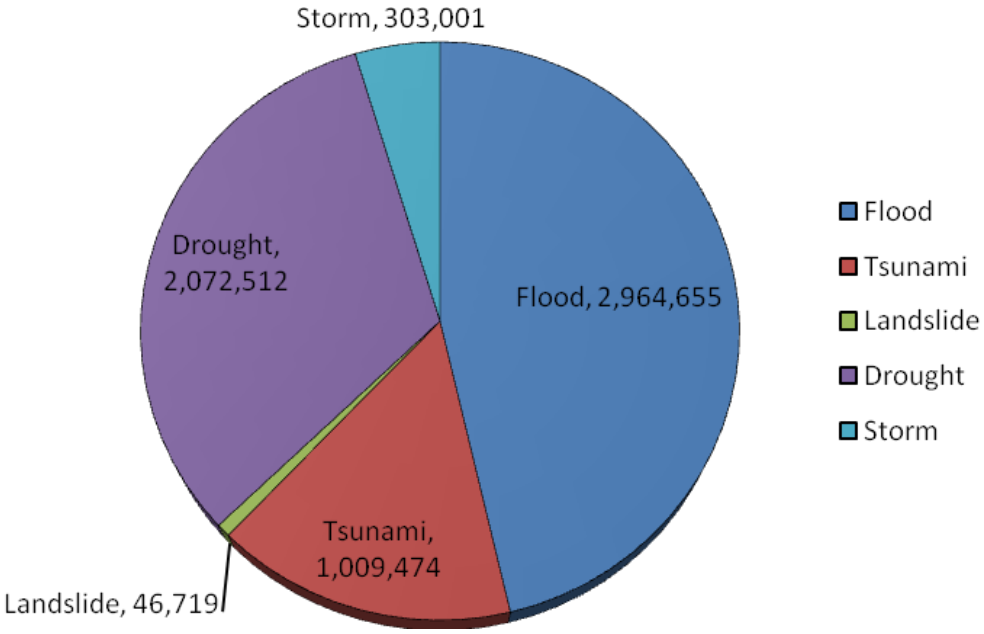


Figure 3: Average annual temperature

2. Hazard Profile of Sri Lanka

Sri Lanka being in the path of two monsoons is mostly affected by weather related hazards. Floods mostly due to monsoonal rain or effects of low pressure systems and droughts due to failure of monsoonal rain are the most common hazards experienced in Sri Lanka. Sri Lanka is also prone to hazards such as landslides, lightning strikes, coastal erosion, epidemics and effects of environmental pollution.

In 2004, almost two-thirds of the Sri Lankan coast was affected by the Indian Ocean tsunami highlighting the country's vulnerability to low-frequency but high impact events.



People affected by different disasters in Sri Lanka (1974-2004)

Source: Disaster Management Center - Sri Lanka

3. Coastal Hazards of Sri Lanka

The coastal region of Sri Lanka is important as a separate economic region. This region has one-third of the country's population, 24 percent of the country's land area, the country's principal city of Colombo, more than 80 percent of the country's fish production and rich mineral resources such as ilmenite and monazite bearing beach sands, silica sands, Miocene limestone, kaolin, china clays, copper magnetite and peat. All major roads and railways are ruining along the coastal areas.

A coastal belt surrounds the island, consisting of scenic sandy beaches and lagoons. Best beaches line along the southern coast, southwestern coast and eastern coast. Therefore economic importance of the coastal region has been enhanced by the potential for development of tourism. Industrial development has also been concentrated in the coastal region--particularly the area along the west coast. Over 80 percent of the industrial units are

located in and around Colombo, while several industries are located in other sites close to the coast (Fig. 1).

Considering coastal hazards, due to its location as an island surrounded by the Indian Ocean, Sri Lanka is mainly vulnerable to the following:

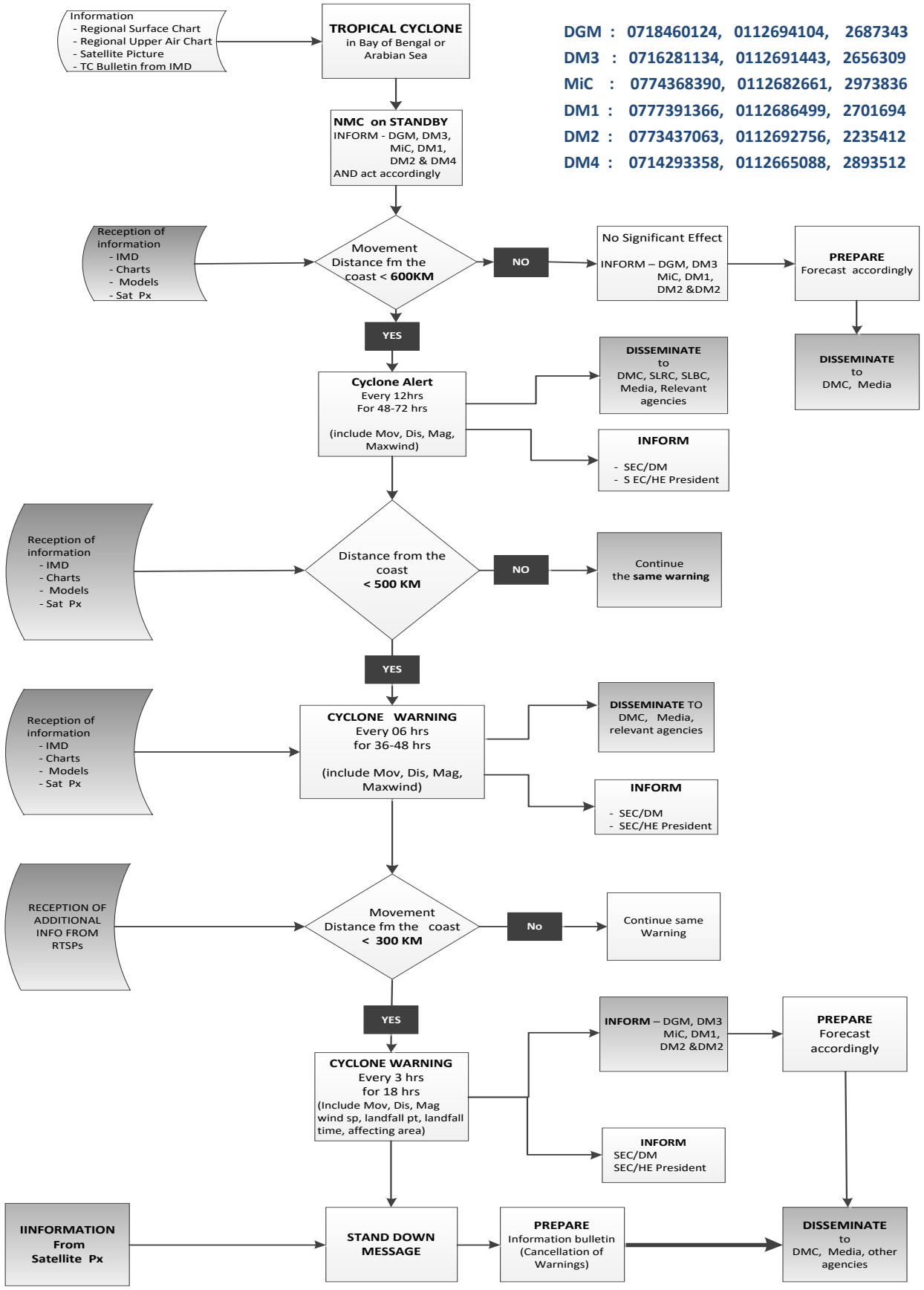
1. Hazards associated with tropical cyclones/depressions or low pressure systems which develop in the Bay of Bengal and Arabian Sea.
2. Hazards associated with Tsunamis originating from the Makran and Sumatra-Andaman subduction zones.
3. Hazards associated with heavy rain (monsoonal or thunderstorms).
4. Hazards associated with strong winds.

The Department of Meteorology in Sri Lanka is the mandated organization for issue of early warning/advisories for weather related coastal hazards and Tsunamis in Sri Lanka. The Department of Meteorology (DoM), Sri Lanka has developed Standard Operating Procedures (SOP) for most of the hazards mentioned above. The SOPs devised for tropical cyclones, tsunamis and heavy rains are frequently used by the Meteorologists on duty at the National Early Warning & Meteorological Centre in Colombo.

The following are the SOP's that are being used currently at the DoM.

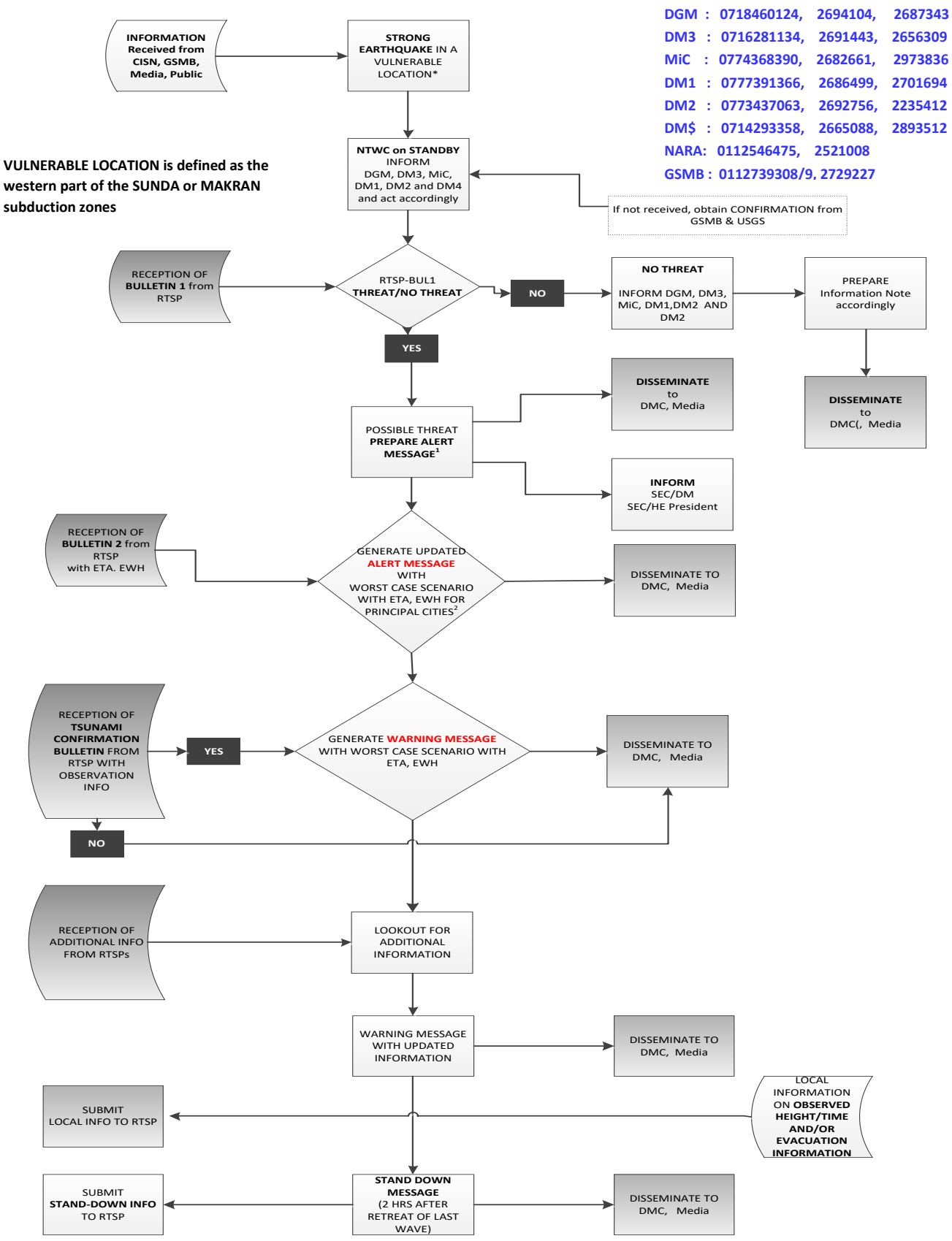
Standard Operating Procedure - for Tropical Cyclone

National Early Warning Centre, Department of Meteorology - Sri Lanka



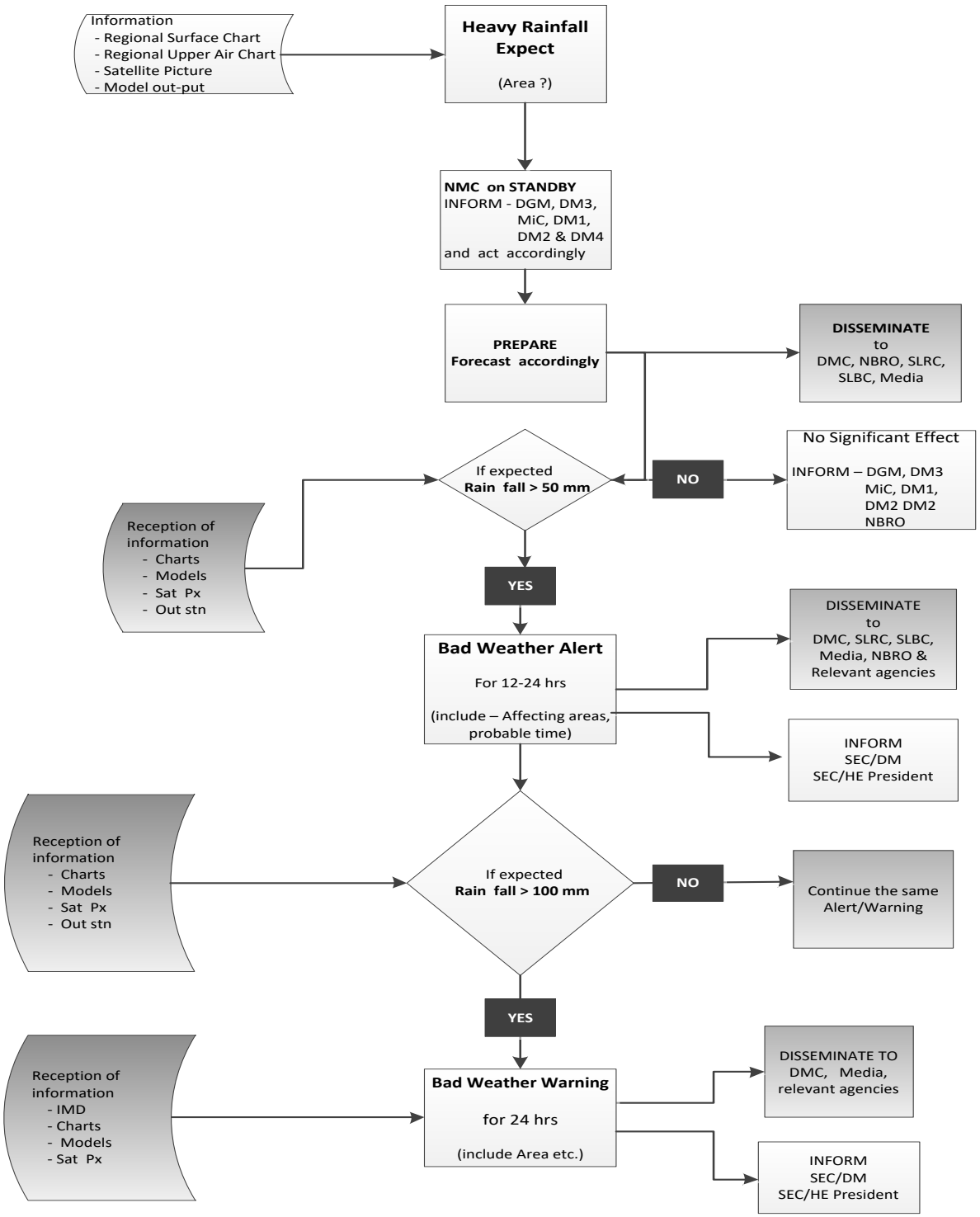
Standard Operating Procedure for Tsunami - for Duty Meteorologist

National Tsunami Warning Centre, Department of Meteorology - Sri Lanka



Standard Operating Procedure - for Heavy Rainfall

National Early Warning Centre, Department of Meteorology - Sri Lanka



DGM : Director General of Meteorology
DM3 : Director (Forecasting & Decision Support)
MiC : Meteorologist in Charge (Forecasting Div.)
DM1 : Director (Research & Development)
DM2 : Director (Observation Network & Instrument)
DM$: Director (Data Processing & Archiving)
SEC /DM : Secretary, Ministry of Disaster Management
SEC/HE President: Secretary to the President
DMC : Disaster Management Centre

DGM : 0718460124, 0112694104, 0112687343
DM3 : 0716281134, 0112691443, 0112656309
MiC : 0774368390, 0112682661, 0112973836
DM1 : 0777391366, 0112686499, 0112701694
DM2 : 0773437063, 0112692756, 0112235412
DM$: 0714293358, 0112665088, 0112893512

4. Challenges and Benefits used of SOPs

In using these SOPs, the following has been identified as **the challenges in developing and improving SOPs**. The identified difficulties were found in both initial formation of SOPs and the subsequent practical use of them.

1. In the planning stages of SOPs, the designated users resisted the change of the methods. This was mostly due to the lack of awareness on the benefits of having a SOP. In the planning stage the users had to be convinced by focusing on the positive impacts of using a SOP.
2. Determining the responsible stakeholders and identifying and dividing the responsibilities among them were tough.
3. Determining the threshold values or criteria that will trigger certain actions in the process was difficult. Complexity and the unpredictable nature of the weather and related hazards and the inability to find a universally accepted threshold value due to differences in geographic location, weather, climate etc has created confusion.
4. The initial preparation of communication and dissemination channels was tough, especially when the SOP included linking with stakeholders outside of the DoM.
5. In the practical use, it was identified that lack of knowledge on SOP and lack of training in application of the SOP has affected the effective use of it. High amount of time was consumed in training the users to acclimatize to the SOPs.
6. Lack of understanding of the overall SOP by different parties involved. All the stakeholders who are responsible for a certain partial function should have an understanding on the whole process or at least the immediately preceding and following process carried out. If not it creates panic and confusion in critical situations.
7. A proper mechanism should be established to receive a feedback from the linking agencies about the decisions that were made and report them back.
8. When different service providers have provided conflicting warnings (In the case of Tsunamis), the protocol that needs to be followed is confusing.

Below are **the benefits that the DoM believes that could be achieved by utilizing the manual on SSOP**.

1. Reduce the length and the complexity of the current SOP and improve the efficiency.
2. Proper share/ division of responsibilities among the parties involved.
3. Improve the SOP to a level where the most critical places or people's needs are addressed primarily.
4. Currently, the DoM uses different SOPs for different situations. Developing a SOP that can be used in different hazards with little or no changes would be ideal.