Elements to develop a Tsunami-Early Warning Plan for the city of Galle in Sri Lanka.

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FOREWORD:

The December 26, 2004 tsunami caught many nations of the Indian Ocean by surprise, provoking fatalities surpassing a quarter of a million people in coastal areas and huge economic losses. To support early warning efforts in Sri Lanka, a tsunami early warning plan has been prepared for the city of Galle, located on the southwest corner of the island incorporating the four the elements proposed by PPEW-ISDR for efficient and effective early warning. The plan has been drafted according to the following criteria:

- *Identification of high risk areas.*
- *Identification of key agencies which must play an active role in the routine operation of the system within the city.*
- *Identification of measures to be included in the plan related to emission of warnings, as well as anticipated response issues.*

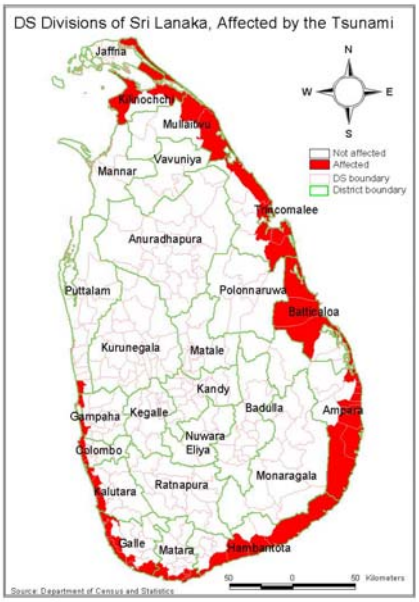

Figure 1: tsunami-affected areas in Sri Lanka.

The following sections outline the elements which have been considered to draft the warning plan.

1 - Inputs from Risk Assessment: *who to warn first!*

Considering the impacts of the tsunami, as well as the fact that early warning systems target basically people to reduce fatalities and injuries; risk assessment for tsunami-early warning has initially focused on identifying those people most vulnerable and exposed to the hazard. Five groups have been identified as highly vulnerable: *women*; *children*; *people with permanent or temporary incapacities*; *fishermen and people who work in coastal areas*; and *highly dense areas such as bus stands, markets, and train stations*. Considering these criteria, high risk areas have been identified as priority areas regarding early warning for prompt evacuation within the city of Galle. Table 1 presents a preliminary listing of such areas.

Table 1: High risk areas in Galle

Hospitals	**Schools**	**Densely populated areas**		
Mahamodera hospital	Mahamodera School of Nursing	Public Bus Stand Train station	District Secretariat Municipal Council	Fish, Fruit, vegetable markets
Central Hospital	Dadalla BTS College; C.W.W. Kannagara; Suddharma College; Vidyaloka College	Main street Sea-side street Road to Colombo Road to Matara	NAVY Port facilities Prison	Neighborhoods located by the ocean shore. 3 Fishing marinas

2 - Inputs for the Warning Service:

In relation to warnings, the Government appointed the Technical Committee for Disaster Early

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Warning -TCDEW- under the Chairmanship of the Director General of Meteorology and comprising several stakeholders to issue warnings. According to the guidelines drafted by the TCDEW, advisories and warnings will be disseminated to coastal populations via the Police network, as well as via mass media (radio and television). Advisories are issued in case of earthquakes which can have the capacity to generate a tsunami and are based on information gathered from seismograph networks spanning the Indian Ocean region. Warnings are issued once confirmation of a tsunami has been gathered through complementary information supplied by sea-level measuring devices to be located throughout the Indian Ocean as well. Figure 2 presents an overview of the tsunami-early warning structure. The warning service will include national, district, municipal, and local levels.

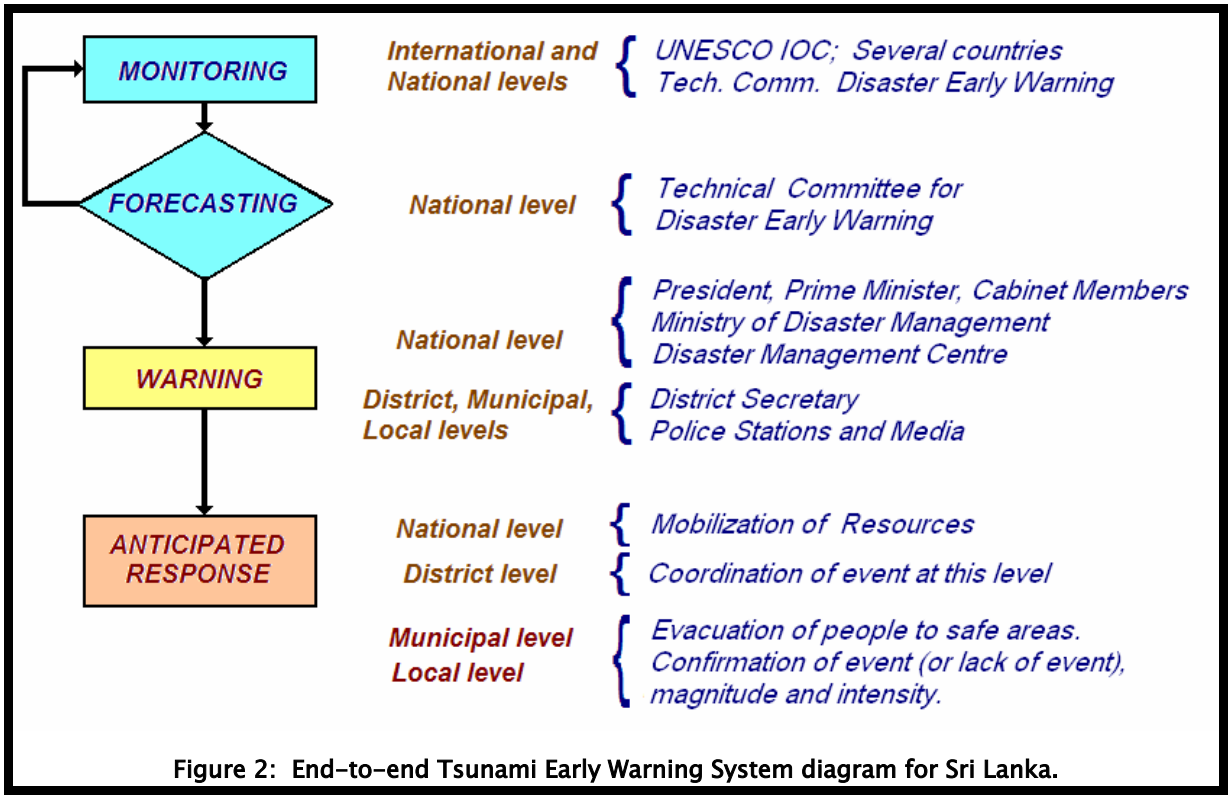

Figure 2: End-to-end Tsunami Early Warning System diagram for Sri Lanka.

3 – Dissemination of warnings: *warning routes within the city of Galle!*

The systematization of high risk areas, possible evacuation roads, safe areas, and particular rivers in the town led to the design of a strategy to warn the population at risk within the city of Galle to be carried out by the Police Department. The strategy included the prioritization of risk areas into two classes: **high** and **medium** risk. Routes were then identified to reach these areas, and the outcome has been a proposal to establish four **high-priority warning routes** and six **medium priority warning routes**. Table 3 presents these routes and main institutions to be warned, as well as additional information regarding evacuation procedures.

Figure 3 presents a map indicating roads (brown), rivers (blue), and the proposed warning schemes. High priority routes are labeled with red lines, while medium priority routes are labeled with black arrows.

To aid the Police in managing the evacuation of people and vehicles, support could be provided by the Armed Forces, either the Army or the Navy. Coordination of such emergency evacuation procedures should be coordinated by the Police and the Armed Forces.

In the case of fishing boats and vessels, it is recommended that the Navy coordinate efforts to lead such vessels to the sea in a coordinated fashion. Additional coordination in the case of larger ships must be handled by the Captain of the Port of Galle.

Table 3: Proposed warning routes

High priority routes	Medium Priority routes
1 Road to Colombo: targeting the commercial area on this road, the School of Nursing, Mahamodera hospital, C.W.W. Kannagara and Dadalla BTS colleges. Route ends in next village and Police will stop all incoming traffic into the city at this village.	**A- Humes-Richmond Road:** targeting technical colleges on this road, commercial sectors, as well as housing areas. Target is to evacuate people inland through this road.
2 Road to Matara: targeting Sea-side street, fishing marinas next to fort and NAVY; NAVY, Port of Galle, Ceylon Petroleum Company, Ceylon Electric Board, Suddharma College; commercial segment on this road, and Cement Factory. Police are to stop incoming traffic before entering city in the area of Unawatuna.	**B - Wakwella Road:** targeting the commercial area, cinema, Vidyaloka college, as well as private hospitals and clinics in this area. Target is to evacuate people inland through this road.
3 Area within Bus stand and Train station: targeting the Municipal building, the area in the Fort, and the Prision. Police are to guide evacuation of people in these populated areas into highlands inland, as well as empty buses into the Fort area.	**C - Road to Karapitya:** targeting the commercial area inland from Main street, in particular the public market.
4 Commercial area downtown: targeting the Post Office building, the commercial area in the Main street, as well as the fish and vegetable markets.	**D - Bandanarayaka Mawatha Road:** targeting neighborhoods behind the NAVY and the Port, to evacuate people inland.
	E - Area behind the Port: targeting neighborhoods behind the Port area, to evacuate people inland.
	F - Akuressa road: targeting the commercial area in this road, as well as Uswathun College and neighborhoods in this area.

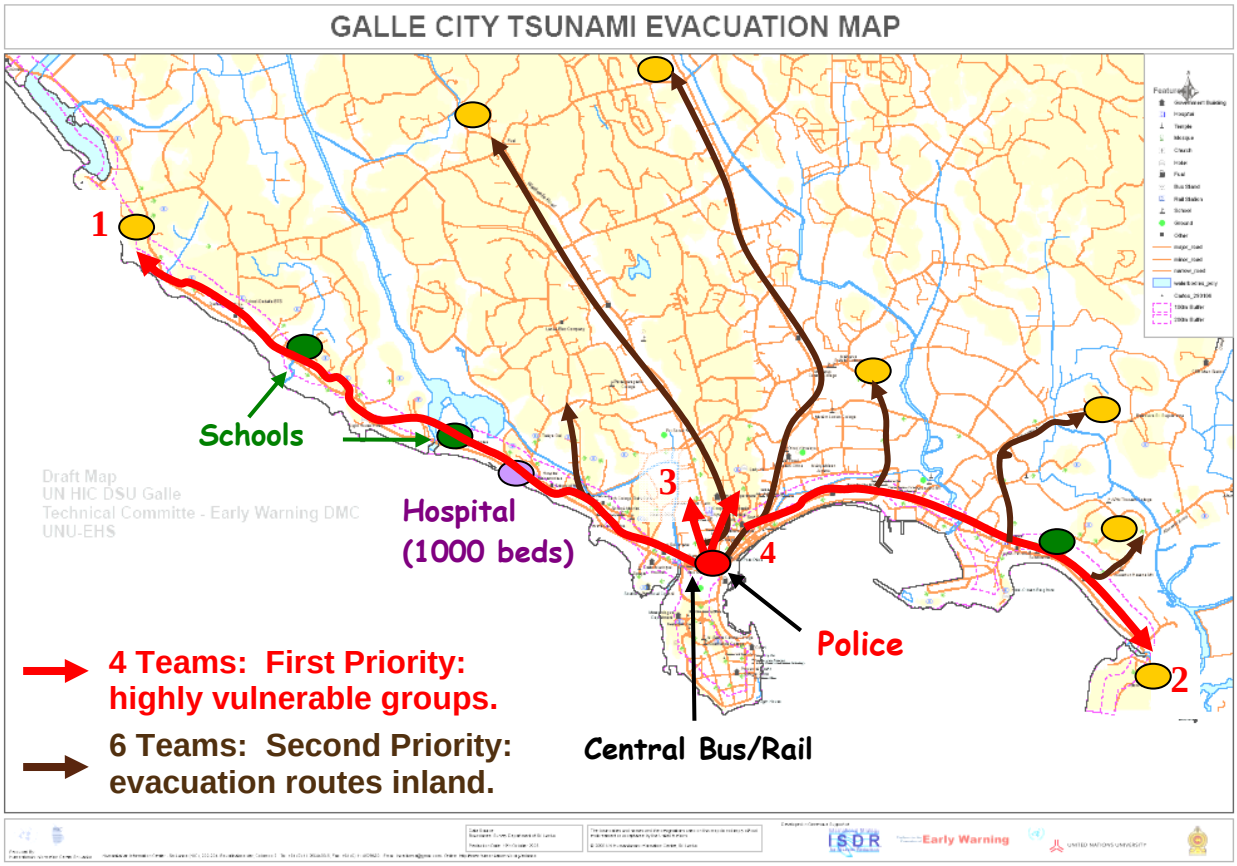

Figure 3: Suggested routes for Police to issue warnings. First priority–red lines, second priority–brown lines. The bus stand and train station are first priority areas.

4 - Inputs for the Anticipated Response:

To complement the efforts carried out at the national level by the TCDEW, efforts have also been carried out within the city of Galle spanning awareness campaigns via the posting signs on roads (evacuation maps, evacuation routes, and tsunami-safe areas), elaboration and distribution of leaflets and posters, execution of workshops, as well as through drills and special activities targeting the tourism section in a particular area of the district.

Drill in the C.W.W. Kannagara School

As part of the activities carried out to complete the **end-to-end tsunami early warning system**, a drill was carried out in October 2005 in the C.W.W. Kannangara school under the coordination of UNU-EHS and TCDEW the support of the Disaster Management Centre of Sri Lanka, UN-OCHA, as well as local authorities. The drill highlighted the establishment of a school committee composed of older students who should guide and assist younger children in evacuating to the upper parts of the building in case a warning is issued.

Posters and Leaflets:

To promote awareness regarding tsunamis in Sri Lanka and how to respond in case of a warning, posters and leaflets designed by the TCDEW have also been printed in Tamil and Singhalese language. These have been distributed and posted in such places as the bus stand, markets, and other public areas.

Focusing on the Tourism Sector: a public-private partnership.

In an effort to promote a public-private partnership, an effort has been undertaken with the tourism sector in the Unawatuna resort area. Composed of many hotels and restaurants usually attended by foreign and local tourists, this area demands measures presented in English language.

Following an initial awareness workshop with the attendance of owners and managers of these facilities, a local ad-hoc committee was set up to coordinate efforts regarding the posting of different types of signs in roads and facilities, the elaboration of emergency plans, the implementation of sirens, as well as coordination with both the TCDEW and the Disaster Management Centre which is in charge of coordinating this task.

CONCLUSIONS:

Experiences throughout the world point out to the need of end-to-end and efficient early warning systems. The project executed in the city of Galle is one example of such an end-to-end system, where efforts have targeted the linking of elements of the chain from the national level to the local level.

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