

IT Based Evacuation Methodology for a Coastal Railway System Under a Tsunami Warning

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Natural disasters have been known to humans ever since the formation of early civilizations. However, as increased human interventions contribute to the destabilization of the natural balance of environmental processes, even more frequent occurrence of natural calamities are occurring today. Prediction, prevention and planning/installing, detection/warning systems are very important components before a disaster. The evacuation procedure should start only once the tsunami arrival information is confirmed. Since Sri Lankan coastal railway lines typically do not have branch lines running inland, trains cannot be detoured during the evacuation procedure. Thus, the in-line evacuation process should be well planned and guidelines made known to the operator and the users.

In this study, the South-West coastal railway line in Sri Lanka is analysed to identify the operation & evacuation of trains under a tsunami warning. The “safe” railway stations are identified depending on the station elevation with respect to the mean sea level, the capacity to store trains, and the number of tracks. It is assumed that, at a minimum, the railway control centre can be equipped to detect, and communicate with, all the trains and stations along the coastal line at any instance. The nearest “safe” and “unsafe” railway stations for each train, and the travel time to them, are determined with respect to the location and direction of each train at the warning time.

Travel times to each station are analysed depending on the distance and possible speed of a train. If there is sufficient time, trains are directed to a safe station; otherwise, to an unsafe station. If a train is sent to an unsafe station, passengers must be evacuated immediately. Short notice of a tsunami may also require evacuation of passengers at the nearest possible safe evacuation location, due to lack of time to reach any railway station.

A methodology is proposed to identify the operational control of trains under different tsunami warning times, wave heights and locations of trains relative to stations. The confusion and concern that will prevail among passengers is considered. The poor communication and signal systems in place are considered. Planning guidelines are proposed to improve communication, select safe stations under various tsunami scenarios, as well as select evacuation stations. A procedure for assigning trains to safe or evacuation stations is also advanced.

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