

GIS BASED TSUNAMI RISK ASSESMENT OF GALLE AREA

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Tsunami triggered by a 9.1 magnitude earthquake off the coast of Sumatra on December 26, 2004 was one of the worst natural disasters ever recorded in Sri Lankan history and also for the many South and South East Asian countries, killing tens of thousands. A long stretch of Sri Lankan coast was devastated by these killer waves, leaving more than 40,000 deaths toll and 2.5 million displaced people. Tsunami waves as high as six meters had crashed into coastal villages, sweeping away people, animals, houses, vehicles and even a train with 1700 passengers. Adequate preparedness for this type of infrequent but powerful events is utmost important for reduce loss of lives and property damages. Tsunami vulnerability maps and risk map are possible to predict the future damages by modeling the past massive events using Numerical Simulation Method.

Galle the capital of southern Sri Lanka was selected for this study because this area was severely devastated by 2004 tsunami .The main objective of this study is to prepare tsunami inundation map, vulnerability maps and risk map for the Galle area by integrating Bathymetry, Topography ,outputs of Community Model Interface (ComMIT) with Esri ArcGIS tools. Accurate Near shore bathymetry from field survey, Coast line and nearshore topography (Lidar (Light Detection and Ranging) data) were used to build coastal DEM and GEBCO (General Bathymetric Chart of the Oceans) one minute data used to model offshore DEM. These DEMs and the 2004 tsunami information uploaded to the ComMIT model. Maximum wave height, maximum wave speed as a function of location, maximum inundation line, time series of wave height at different locations indicating wave arrival time are the outputs of the ComMIT model.

ComMIT model outputs integrated with GIS analysis tools and created Tsunami Inundation Map, Hazard map and vulnerability maps for population, land use and buildings in study area. Risk map was produced using weighted overlay method of GIS. According to the map analysis, a total of 18.5 sq.km of low lying land was inundated, and the water depth reached a maximum of 6.9 m with the wave speed of 12.3 m/s. The maximum wave was taken nearly two hours and forty five minutes to reach the coast. 90.8% of inundated area is in high and moderate risk level while 9.2% are in low risk level, and seven thousand and twenty four buildings (7024) were flooded. There are sixteen schools (16), two hospitals (02), thirty eight (38) religious places and thirteen (13) major local government buildings and transport sector structures in highly vulnerable zone. Also One hundred one thousand five hundred and fifty three (101,553) persons are vulnerable to a tsunami water.

It can be concluded that GIS act as a powerful tool in risk assessment process and results of the analysis will be worthwhile for disaster mitigation program.