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Development of Tsunami Emergency Response System Along Coastal Area of Dwarka Gujarat, India

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Abstract:- *Tsunami is very important phenomena in the disaster management problems. The big tsunami in Indian ocean was occurred in Aceh Indonesia on December 26, 2004 was killed more than 200.000 peoples, the tsunami disaster management become very important to study.The overall goal of this study focuses on developing a tsunami risk zones & evacuation map to contribute to a tsunami early warning information system for Indian subcontinent. This presents study the hazard mapping & risk zones for Tsunami and strategy for Tsunami evacuation for dwarka (22.2300° N, 68.9700° E) at western coast of Gujarat state on Indian subcontinent. The need for the study is to aware people for the hazard of tsunami and saving maximum lives when tsunami occurs there. The past historical earthquakes of Tsunamigenic source of Makran subduction zone which was responsible for causing tsunami on western coast of Gujarat state of for Indian coasts are studied. The outcomes of this study can be utilized by public policy and decision makers in developing disaster management strategies. The purpose of a TEP(Tsunami Evacuation plan) is to save the life of those persons that might be affected by the incoming tsunami waves . We overlaid satellite image on the tsunami risk map, and identified the region to be particularly at risk in study area. We expect that the tsunami risk map presented here will supportive to tsunami emergency response system along the western coast of dwarka . Therefore, local evacuation plans and development of tsunami emergency response system arrangements are needed..*

Keywords:- Tsunami risk zone maps , Evacuation Route Map, GIS

I. INTRODUCTION

Tsunami is a Japanese word meaning harbour wave. **Tsunami** is a phenomenon of gravity waves produced in consequence of movement of the Ocean floor that as a result of earthquakes, landslides, volcanic eruptions and large meteorite impacts. . Gujarat state has the longest coastline in India about 1600 km, and has massive capital and infrastructure investments in its coastal regions. With rapid developmental activities along the coastline of Gujarat, there is a need for developing tsunami emergency response system in visualizations database using geoinformation technology.

For anyone in tsunami evacuation zones, strong ground shaking from an earthquake is the natural warning that a tsunami might be coming. People on the beach or in harbour areas should evacuate for any felt earthquake and, if strong shaking lasts for 20 seconds or more, all people within evacuation areas should move inland or to higher ground. However, strong earthquake shaking can also cause additional hazards, such as landslides or downed power lines, which can inhibit or prevent safe evacuation .

The big tsunami in the Indian Ocean on 26 December 2004, claiming more than 225,000 lives, has important the urgent need for development of tsunami emergency response systems for various vulnerable coastlines around the world, especially for those neighboring the Indian Ocean. The second deadliest tsunami prior to 2004 in South Asia occurred on 28 November 1945. It originated off the southern coast of Pakistan and was destructive in the Northern Arabian Sea and caused fatalities as far away as Mumbai. More than 4000 people were killed by both the earthquake and tsunami.

Identification of these potential hazards along evacuation routes, evacuees might be routed through areas where they could become injured while moving away from potential tsunami inundation areas. The state tsunami program provides assistance to jurisdictions that request help preparing or reviewing evacuation plans to address local-source tsunamis . However, for local jurisdictions that would like to evaluate these potential evacuation hazards using their own resources, the following step-by-step guidance is provided as, A tsunami evacuation plan (TEP) is a plan that will be invoked if a tsunami alarm has been triggered. Hence a TEP will affect a variety of preparedness measures to be activated in the case of tsunami alert.

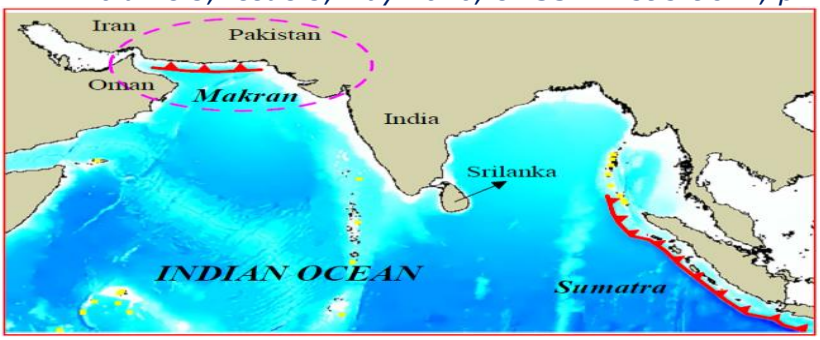

Fig 1: Great Earthquakes in MSZ.(V.M Patel et. al., 2011)

II. STUDY AREA

Dwarka is a small city and a municipality of Devbhoomi Dwarka district in the state of Gujarat in northwestern India. It is located on the western shore of the Okhamandal Peninsula on the right bank of the Gomati River. Dwaraka is situated in the extreme west of the Indian state of Gujarat in the Saurashtra peninsula on the Arabian Sea. Dwarka is an important city for Hindu Pilgrimage. The city is famous for the Dwarkadish temple or Jagat Mandir. It is located 22.2300° N, 68.9700° E on the earth. It s figure & map of city is shown below.

Fig 2 Location map of study area

III. METHODOLOGY

The Step wise procedure of tsunami risk zones maps &evacuation mapping is as following:

Step 1: The mapping is stepwise process. In mapping of tsunami The first step of raster layer operation is geo-referencing of satellite images. Satellite images collected from Google Earth ortho photos were used for geo-referencing.

Step 2: A DEM is defined as a file or a database containing points over contiguous areas. The needed field height data for DEM generation can be obtained from point, line or polygonal vector height maps or stereo satellite/vector images. The SRTM data were used to create DEM OF Dwarka.

Step 3: The contours are generated in the geo-referenced image. Than the coastal regions are shown using different colors and risk zone map is prepared by showing 1 to 6 m heights by different colors.

Step 4: The details of topography and colors indicated in risk zones map is made by Arcgis & autocad software.

Step 5: The evacuation maps are then prepared according to recommendations.

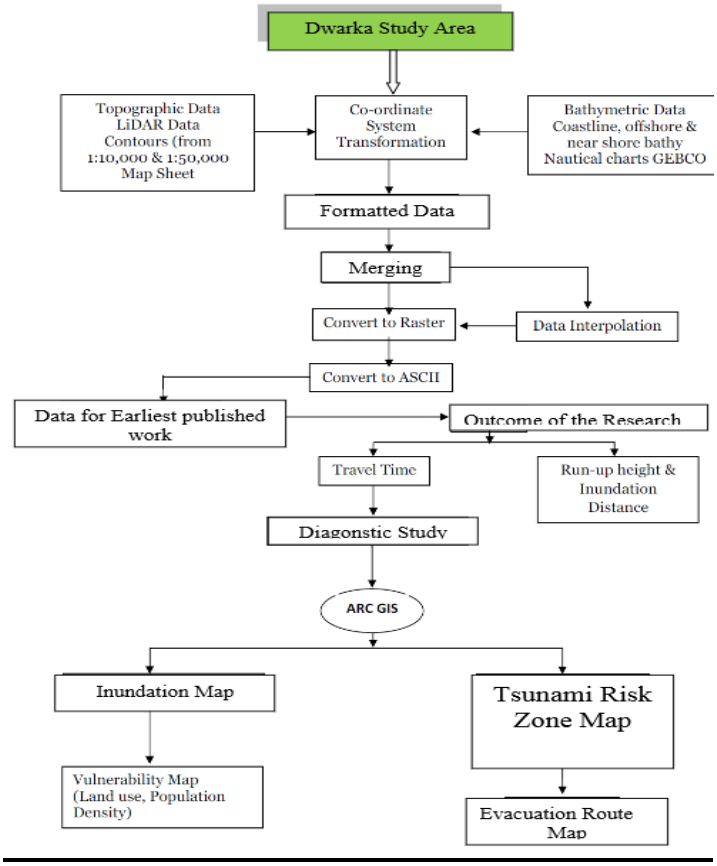

Fig 3: Flow Diagram of Methodology

IV. RESULTS AND ANALYSIS

The satellite image of dwarka city is shown in the sketch. The population density is assumed to be dense in densely populated area as shown in satellite map. Various thematic maps are generated for parameters to be analysed. Figure 3 shows DEM(Digital Elevation Model) of Dwarka city, Figure 4 shows Population map with existing routes, Figure 5 shows snap shot of Geo-reference map of dwarka city.
Figure 6 ,7 & 8 is snapshot of low , medium & high tsunami risk zones of dwarka city. Its described with the various run up height of tsunami water rise level. At last prepard the evacuation direction & route map of dwarka city .

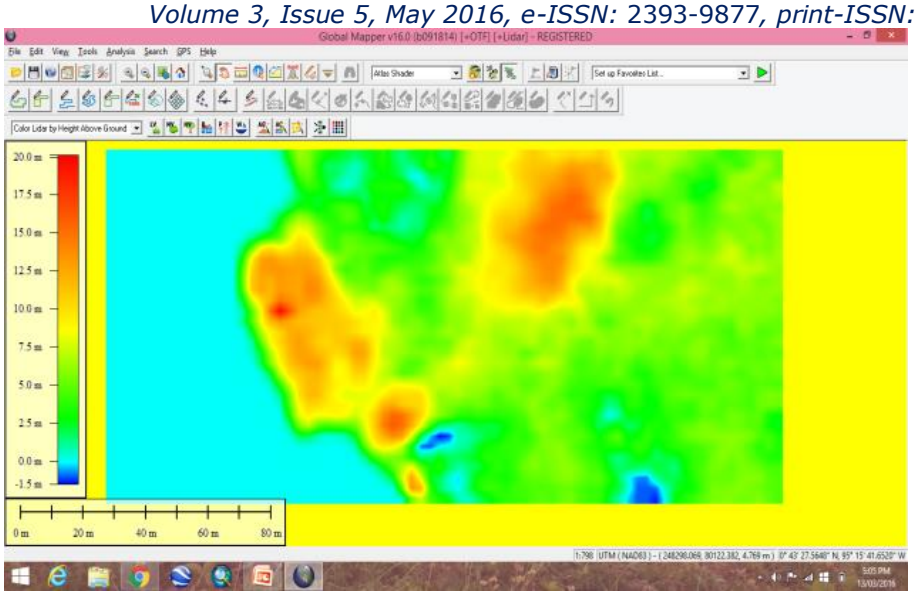

FIG 4: DEM OF DWARKA

Fig 5: Population map with existing routes (Source: Google Earth)

Fig 6: Snap shot of Geo-reference map of Dwarka city

0 to 2m run up height of tsunami

Fig 7: Snap shot of Tsunami low risk zone map of dwarka city

0 to 4m run up height of tsunami

Fig 8: Snap shot of Tsunami Medium risk zone map of dwarka city

0 to 6m run up height of tsunami

Fig 9: Snap shot of Tsunami High risk zone map of dwarka city

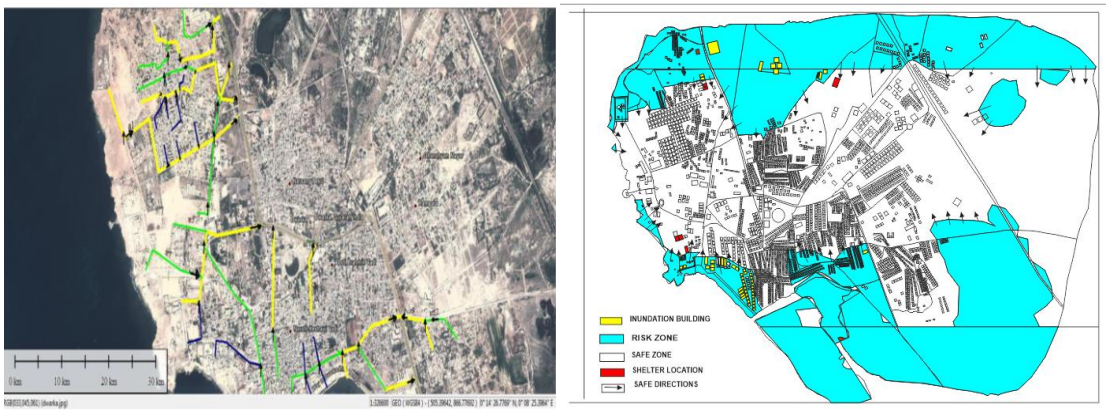

Fig 10 : Evacuation Route Map Analysis

V. CONCLUSIONS

In the future, scientists/researchers need to focus on visualization and animation of disaster risk. The study was performed to show the advantages of GIS/CAD models and satellite images in disaster risk assessment of the Dwarka coast, Gujarat. The disaster risk visualization created by geo-information technologies of Geographic Information Systems (GIS), Remote Sensing (RS) and Computer Aided Design (CAD) are powerful tools for conveying information to decision-making process in natural disaster risk assessment and management. The main aim of the study is to visualize each zones tsunami risk level which improves decision-maker's & understanding of the disaster level..Evacuation is the most important and effective method to save human lives during a tsunami. An important factor in establishing evacuation measures during a tsunami is an accurate representation of the timing of people's responses to the emergency. In this study, with the help of satellite technology tsunami evacuation map is generated for western coast of Gujarat state of for Indian subcontinent. In this study evacuation map of study area is generated in an open source map digitalization tool.

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