Identifying Hazards related to Earthquake in Downtown San Diego, California.

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GIS Suitability Modeling Map

ABSTRACT

San Diego houses three active faults; the Rose canyon fault, the Elsinore fault and the San Andreas fault. The Rose canyon which runs through the city, puts 75 percent of the population residing within 15kms radius from itself, under high threat from earthquakes [1]. Although many studies have attempted to study the effect of each of the earthquakes in the past, comprehensive risk assessment and mitigation strategies still have scope for improvement in the San Diego County [2, 3]. Earthquake prediction [4], Hazard Risk Management [5] and Damage control [6] are topics where most of the work has been done so far, with little efforts towards area-wise risk assessment, which is not common knowledge among general public. The current study is an attempt to assess the risk to infrastructure in the downtown of the San Diego city, and to allow residents to be better prepared and resilient in the unfortunate event of an earthquake. Two- and three-dimensional photos of infrastructure in high-risk zones have been identified and analyzed through ArcGIS for this poster.

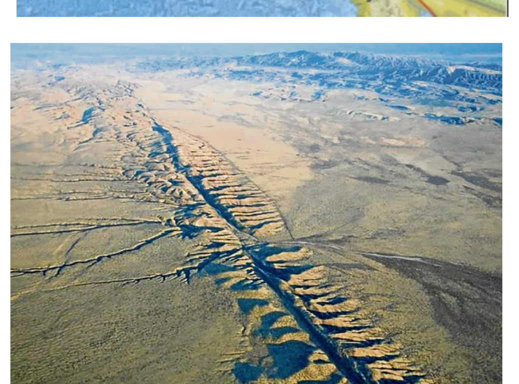
INTRODUCTION

Like all of California, San Diego County is known to have a high risk of earthquakes. There are hundreds of faults dispersed throughout the region and most of San Diego's population live less than 15 miles radius from the 3 major faults:

- Rose Canyon which crosses along the coast and beneath downtown San Diego
- Elsinore and San Jacinto which cuts through east of the county.

However, San Diego doesn't have a history of earthquakes compared to the rest of Southern California. The Rose Canyon is a major active fault in the city of San Diego that has not induce an earthquake since 1862. Consequently, a false narrative has been created over the years by the San Diego population that within their area, they are immune from earthquake hazards. Due to the proximity of the fault to the city and the main economic hub, it is imperative to assess and identify the risk and vulnerability of the San Diego population if an earthquake were to happen and to bring awareness through preparedness and mitigation plans.

Fig.1 Earthquake in San Diego, Ca, Fig.2 San Andres Fault MAP
Fig.3 Earthquake in San Francisco, Fig.4 San Andres Fault Aerial



GIS MAPPING MATERIALS

Fig.5 (2D) ArGIS MAP, Downtown San Diego, CA. & Legend

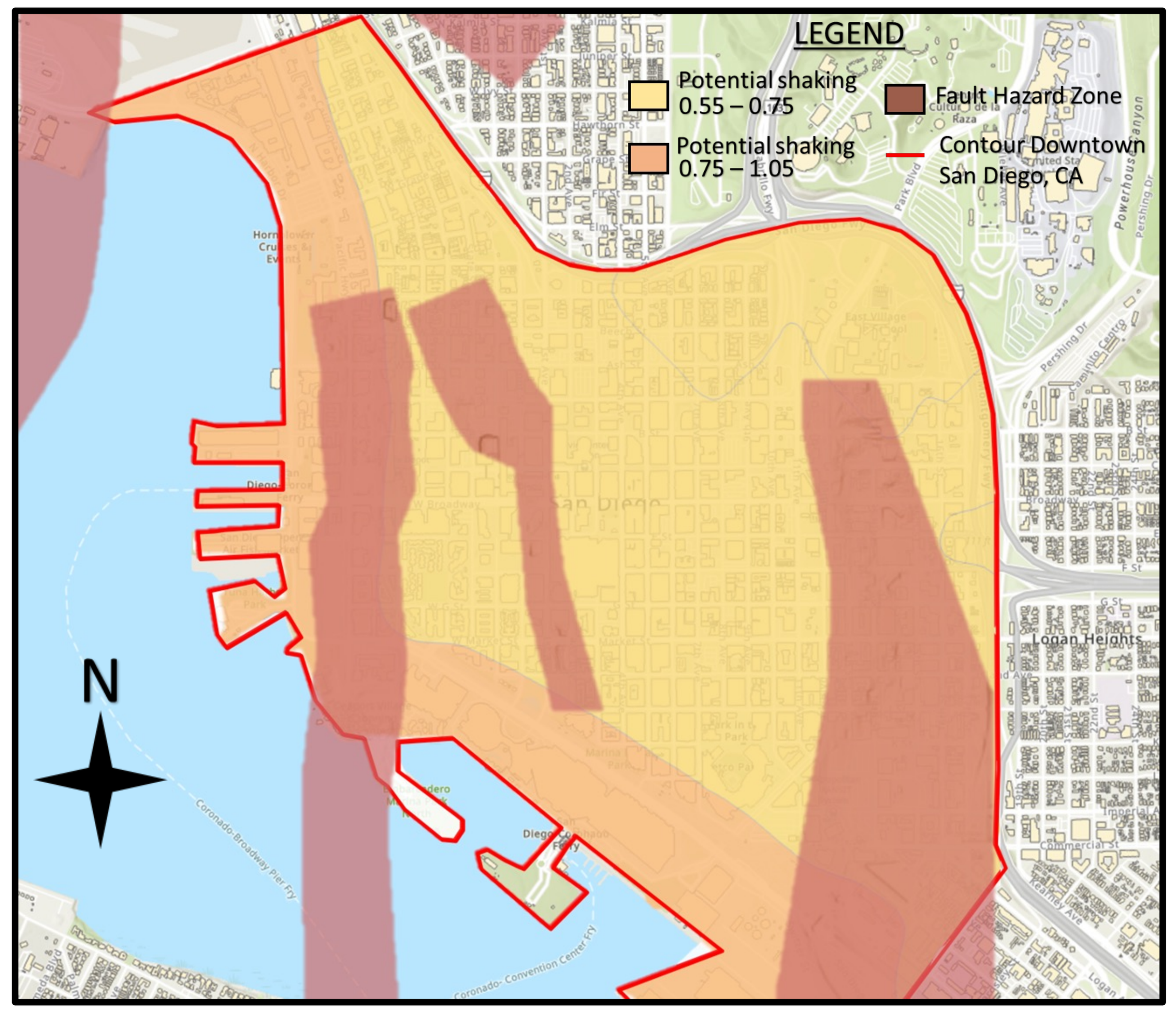


Fig.6 (3D) ArGIS MAP, Downtown San Diego, CA. & Building at risk

Fig.7 Three-Dim. (3D), **Buildings in BLUE** Medium Risk, Zone 1

Fig.8 Three-Dimensional (3D) **Buildings in RED**, High Risk, Zone 2

Note, In the north, Medium risk buildings are illustrated in Zone 1. which is bounded by (W Laurel Street & California Street), and in the south, bounded by (Kettner BLVD. & Harbor Drive)

High risk buildings are illustrated in Zone 2. which is bounded by a rectangular area between Pacific highway & Kettner Blvd with Cedar Street and the bay.

Other areas have been observed as risky, but those are not represented in terms of potential shaking (damage to property).

CONCLUSION

The risk categories developed from the suitability model was applied to the 3D shapefiles to create colorized attributes that can highlight which specific buildings and parcels within the Downtown of San Diego community are at high risk based on the risk parameters described in the methodology.

The hope in illustrating these risks as shown will help municipal agencies (such as the Historic Preservation office) as well as non-profit organizations to prioritize documentation, assessment and retrofit/repair initiatives that will better inform reconnaissance surveys.

METHODOLOGY ADOPTED

The information and maps were obtained from ArcGIS and USGS (United States Geological Survey) and FEMA. The GIS suitability modeler is used to identify the best location to site areas of interest such as determining the where to build a housing development or determine best areas for flood control.

For this study, the initial step was determining the risk criteria to be used in the modeler and transform each data set to a common suitability scale ranging from 1 to 10 where "1" is the lowest risk and "10" is the highest risk assigned. Described below are the risk criteria utilized in this study:

Building age, Average 1950

Average Household Income, 90.000 USD per year

Following the determining and transforming the values from the criteria above, an equal weight was assigned relative to each criteria to develop the suitability map included herein A tertile distribution was utilized to divide the data into three parts where each risk category (low, medium, and high) contained a third of the criteria data sets.

AIM OF GIS IN THIS STUDY

GIS is the ideal environment for earthquake loss modeling because, it can analyze spatially distributed data such as demographics, the built environment, and infrastructure with a vast number of different attributes including quake magnitude, geological conditions, and structure type. In the current study, we aim to use GIS to aid in managing the impact of earthquakes and other disasters through the following steps of disaster management

- Assessing risk and hazard locations in relation to populations, property, and natural resources
- Integrating data and enabling understanding of the scope of an emergency to manage an incident
- Recommending preventive and mitigating solutions
- Determining how and where scarce resources should be assigned
- Prioritizing search and rescue tasks
- Identifying staging area locations, operational branches and divisions, and other important incident management needs
- Assessing short- and long-term recovery operations

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