The effects caused by earthquakes in India in the last 50 years have acted as a wake-up call for administrators, engineers, scientists, and the general public. City planners need to consider the magnitude of disruption that an earthquake may have on their city in the event of a future earthquake to develop proper earthquake disaster mitigation plans. Generally, seismic zonation is divided into two categories, macro and micro. The macro level constitutes larger areas such as a country or continent. However, microzonation is implemented on a smaller scale by considering local geology, regional seismicity, and local site circumstances. Earthquake damage patterns depend mainly on the condition of the local site and the magnitude of the earthquake. In India, 60% of geographical areas are vulnerable to seismic disturbances of various intensities. Natural calamities such as earthquakes cannot be predicted or prevented. Buildings and infrastructure developments based on microzonation studies and constructing it according to earthquake resistant designs however will reduce the impact of an earthquake on the structure.

Seismic microzonation urban areas, which included industrial buildings and residential areas, were first attempted in 1954 in Yokohama City, Japan. Different zones, equivalent soil conditions, and seismic coefficients were taken into consideration. The subdivision of natural territory into multiple smaller seismic zones is known as seismic microzonation. It provides detailed information about earthquake hazards at a larger scale. The zoning scale depends on the accurate data on database and the reliability of the appropriate map. Micro level zonation is critical for cities and urban centers due to the increasing population. Building damages differ during an earthquake due to changes in subsoil behaviour. The site effects are mainly based on the geotechnical properties of subsoil.

Earthquake damage is primarily affected by three types of factors: the source and path of the earthquake, the local geology and geographical location, and the design and construction of the structure. Seismic hazard analysis discusses the evaluation of the first two classes of variables. Earthquake risk analysis is the starting point for earthquake

mitigation and involves a multidisciplinary approach that incorporates contributions from geology, seismology, geotechnical, and structural engineering. Information regarding the geological conditions of specific sites, ground response to earthquake movements and their effects on the safety of buildings is needed, taking the desired aspects of buildings into consideration.

Coimbatore is one of the fastest growing tier-II cities in Tamil Nadu, a state in south India. Geographically, it is located between $11^0$00'58'' and $11^0$01'61'' in North latitude and between $76^0$58'16'' and $76^0$09'71'' in East Longitude. Coimbatore is situated on the banks of the Noyyal River, surrounded by the Western Ghats, and administered by the Coimbatore Municipal Corporation. It is the second largest city in Tamil Nadu for software development. The city also adopted the Smart Cities Mission program by the Government of India. According to the 2011 census, the town has an area of 257.04 $km^2$ and a population of 16,01,438. Hence, it was considered with various aspects of microzonation map with GIS approach - local geology and geotechnical conditions, microzonation with geophysical approach and seismic hazard analysis are discussed in literature review.

A geophysical method is used for investigating the subsurface of relatively deep geologic structure. Field surveys were conducted in 40 locations in Coimbatore for this study. A grid map of Coimbatore Corporation was created at the size of 2.78km x 2.78km (7.73Sqkm). Site identification and site response modelling using shear wave velocity was done using the uniform building code-1997 as well as the international building code-2009. Considering that amplification is only confined to the soil layers in the top 30 m, soil classification was based on the average top 30 m soil shear wave velocity ($Vs^{30}$) (Gazetas, G. 2003). In the present study, an attempt was made to determine Coimbatore's subsurface profile through the use of shear wave velocity for ground response analysis and site-specific response spectra generation.

Understanding the geotechnical characteristics of near-surface materials is a fundamental component of seismic microzonation. Every soil type responds differently to ground motions, imposed according to earthquake loading, based on its physical characteristics, depth to bedrock, and natural frequency. Large amplifications of seismic signals often occur where layers with low seismic velocity overlap layers with high seismic velocity, i.e., in areas where soft sediments cover bedrock or stiffer soils. These layers of soil above the bedrock can attenuate or intensify the motion of an earthquake depending on their geotechnical characteristics, their depth and layering arrangement. Bore log data were collected at seven locations in the study area. The district of Coimbatore does not have any economically valuable mineral resources. Calcareous rock, quartz, and feldspar occur in small quantities in this area. There are also economic deposits such as gravel, rough stone, brick earth, and granite in this area. The availability of huge quantities of limestone in Madukkarai Block's Ettimadai & Walayar area has contributed to the growth of the cement industry there.

Various layers such as geology, soil, and lineament were considered for microzonation. It is necessary to weigh all factors and alternatives. Saaty proposed a multi-criteria analysis method called Analytical Hierarchical Process (AHP) for determining the influence of each of the layers. Artificial Neural Network (ANN) is a branch of computer science used in intelligent computer analysis, design, and implementation. This soft computing technique has proven extremely successful in the analysis and resolution of civil engineering issues. A neural network's efficiency and computational complexity are highly dependent on the design of the network, which is usually determined by its input, output, and hidden layers. Cost analysis is an important factor in decision making. With the help of STAAD.Pro software, a cost analysis was performed against varying zone factors (0.16 and 0.12). The quantity of steel and concrete on different zones of a same structure was compared based on the hazard map. According to this study, concrete is saving 11.32% of costs, and steel is saving 8.80%.

Therefore, seismic microzonation serves the purpose of providing structural design input by replacing national macrozonation maps. This map can be used for city planning and for selecting sites for infrastructure development. A seismic hazard analysis and microzonation map is the first steps in mitigating earthquake damages. According to the Indian national disaster management authority, microzonations are recommended for cities with a population of one million or more.