

Application of Renewable Energies in Buildings with Complex Topologies

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INTRODUCTION & AIM

The application of renewable energy in buildings, particularly solar radiation, supports more energy-sustainable city development by enabling buildings with lower energy consumption. This work will analyze the influence of external environmental variables, such as air temperature, air relative humidity, air velocity, carbon dioxide concentration, solar radiation, and other factors, on the assessment of comfort levels, namely the thermal comfort and indoor air quality that the occupants are subjected to in city buildings, using renewable energies.

CONCLUSION

The results indicate that the south-facing spaces, equipped with internal greenhouses, are thermally comfortable, and the airflow rate transported to the north-facing spaces, used as cold spaces, also ensures thermal comfort.

The proposed solution ensures an airflow rate that guarantees good indoor air quality conditions in all spaces.

METHOD

The work will be developed numerically, using numerical software that simulates the thermal response of buildings. The building, equipped with internal greenhouses, will be analyzed. The study examines the evolution of air temperature, building surface temperatures, air relative humidity, air velocity, carbon dioxide concentration, and direct and diffuse solar radiation in outdoor and indoor environments throughout the day. The level of thermal comfort will be assessed using the PMV index. Indoor air quality will be evaluated based on the carbon dioxide concentration to which

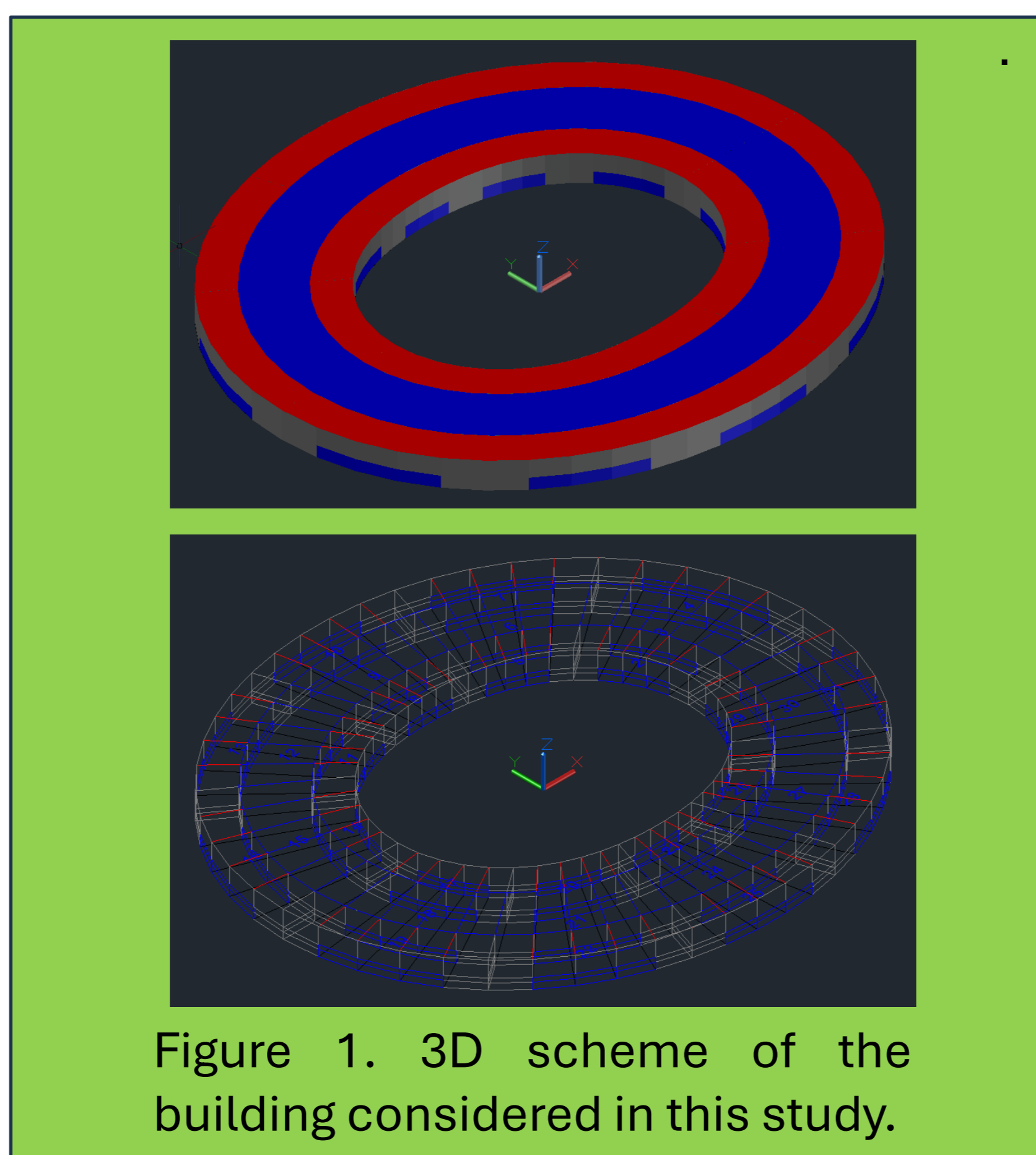


Figure 1. 3D scheme of the building considered in this study.

occupants are subjected. The study was conducted in winter conditions and in a Mediterranean environment.

The internal greenhouse, for example, with its hall entrance or covered walkways, is protected by glass facing east, west, and mainly south. The greenhouse stores energy inside the buildings. This energy is transported to cold spaces, such as interior spaces or those facing north, to improve thermal comfort. The renewable airflow rate during transport from the greenhouse to the cold spaces ensures acceptable indoor air quality in both spaces.

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