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The efficacy of built morphology to create comfortable microclimates in a hot arid region

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Sustainable city energy modelling for extreme climate areas such as hot arid climate zones require the knowledge of and the interaction with the territory in order to create a sustainable living for all inhabitants. To achieve this goal in an arid, dry area, we propose to modify buildings and microenvironment to affect, for example, temperatures and air humidity. To reduce energy costs and hence pollution, we need to find solutions that are more natural and capable of reducing energy costs and CO2 emissions, such as 1) the choice of an improved orientation of buildings and of the new urban area in order to reduce solar irradiation and facilitate cooling of buildings through convective air flows, 2) the implementation of green space in order to reduce CO2 emission, regulate air humidity and temperature, and to create a pleasant place to live.

The method used is the study of alternative scenarios for settlement principles and built morphology as well as the assessment of energy costs and emissions.

The first point that we must take in account for increasing the energy savings is the built morphology: examples are buildings shaped as inverted pyramids with few floors and therefore reducing energy costs and cost of vertical mobility. The shape acts like an umbrella to produce a shadow and allows the creation of green spaces and a pleasant movement through pedestrian focused facilities. The roof can host green spaces for the thermal insulation of the building and solar panels for environmentally friendly production of energy and reflection of solar rays.

Floor orientation: the rotation of the various layers/floors allows to distribute the solar irradiation and facilitate the cooling (air-conditioning) of the buildings. Services and facilities for entertainment and recreation are integrated in the buildings. Interstices and green terraces in the building will help the natural air ventilation and create a perfect machine for living.

The aggregation of inverted pyramid building types create a more interesting and enjoyable pedestrian and peaceful pathway in the building shadow to reach all available services and facilities housed in the various buildings and in the open space.

Finally, the green space on the ground and roof will be useful to reduce the CO2 pollution through photosynthesis providing inhabitants with a high quality of life in a green microclimate. In addition to settlement principles, the built morphology creates comfortable microclimates for the human life.

The objective of this research project is to identify a built typology able to define an urban model capable of improving the life of people living under extreme environmental conditions.

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