Living and Sustainability: An Environmental Critique of Design and Building Practices, Locally and Globally

1. Paper / Proposal Title:

Simulation of traditional & contemporary dwellings in Ghadames, Libya

2. Format:

verbal presentation

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5. Abstract (300 words):

A rise in temperature over summer in hot countries, such as Libya, may lead to thermal discomfort and profligate use of energy sources as a result of mitigation efforts. Buildings account for almost 45% of global energy consumption, and approximately 60% of primary energy use in Libya. The use of air conditioning systems have resulted in a sharp rise in energy consumption and CO_2 emissions. Traditionally, bioclimatic design concepts have been applied and integrated into buildings in hot climates to reduce the demand

of energy consumption, but increasingly less adapted designs of housings developed elsewhere are prevalent. This results in energy being excessively used in order to achieve human thermal comfort requirements. The purpose of this work is to investigate the environmental performance of naturally ventilated (NV) and air conditioned (AC) dwellings in Ghadames and the impact of bioclimatic concepts on energy use for future housing development. A range of *EnergyPlus* simulations were carried out to predict the indoor climate conditions and energy consumption of typical NV and AC dwellings considering different scenarios including the case of electrical power cuts. Findings revealed that traditional dwellings consume 66.1% less energy than contemporary dwellings. The thermal comfort surveys of Ghadames housing indicated that comfort temperature in NV buildings ranges between 24˚ to 32˚C and 22˚C to 26˚C in AC buildings in summer. Further findings from simulation showed that building fabric and form of traditional dwellings perform far better than contemporary dwellings in terms of solar heat gains, thermal performance of materials, land use and natural ventilation. The study concluded that consolidation of certain passive design features found in traditional dwellings of Ghadames and use of appropriate architectural design and elements can help achieve zero energy housing, taking into account local community needs and future developments.

6. Author(s) Biography (200 words each): Mr. Alabid is a research student and PT lecturer at De Montfort University, Leicester School of Architecture – UK. Dr. Taki is a Reader in Energy and Indoor Climate; Subject Head - Architectural Technology; Program leader BSc Architectural Technology and MSc Architecture & Sustainability programmes, Leicester School of Architecture De Montfort University, UK. Dr. Painter is a Senior Research Fellow, Institute of Energy and Sustainable Development, De Montfort University – UK.