



# 6<sup>TH</sup> INTERNATIONAL CONFERENCE ON KNOWLEDGE & INNOVATION IN ENGINEERING, SCIENCE & TECHNOLOGY

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## **A Self-Cooling Wall System: Sizing Biomimicry in Green Building Design in GCC countries**

**M. Salim Ferwati<sup>1</sup>, Ali Keyvanfar<sup>2,3,4</sup>, Arezou Shafaghat<sup>5</sup>, Omar Ferwati<sup>6</sup>**

<sup>1</sup>Department of Architecture and Urban Planning, College of Engineering, Qatar University, 2713, Doha, Qatar

<sup>2</sup>College of Architecture and Construction Management, Kennesaw State University, Marietta, Georgia, 30060, USA

<sup>3</sup>Facultad de Arquitectura y Urbanismo, Universidad Tecnológica Equinoccial, Calle Rumipamba s/n y Bourgeois, Quito 170508, Ecuador

<sup>4</sup>Jacobs School of Engineering, University of California, San Diego, 9500 Gilman Dr, La Jolla, California, 92093, USA

<sup>5</sup>Institute of Research and Development, Duy Tan University, Da Nang 550000, Vietnam

<sup>6</sup>School of Architecture, Waterloo University, 7 Melville Street South  
Cambridge, Ontario Canada

### **Abstract**

This research is inspired to address the growing challenge of green building design and climate change in Qatar, and targets the QNV 2030 ambition to physical and mental healthy environment for people. For the regions where are subject to warm and hostile climate, this research has extended rethinking to nature and exploiting the biomimicry in building's indoor environment quality (IEQ), which play leading roles in building microclimate and thermal behavior, and of course, local identity. This study has developed a new cooling system called self-cooling wall system. To develop the self-cooling wall system, the research has conducted three steps; 1) critical review on aerodynamic and static behaviors of windcatchers and exterior framed walls of traditional houses utilizing mud in Gulf Cooperation Council (GCC) countries and Nigeria, 2) exploration study on biological and natural form of cactus plant, 3) experimental study on employing the procurement of cooled water in terracotta pots, and 4) design a framed-cooling wall which embodies the biological and natural characteristics of cactus and also thermomechanical characteristics of the Terracotta pots applied in building facade and windcatcher. This system is such a sustainable and eco-friendly passive cooling system grounded in traditional architectural



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design using local materials, suitable for the GCC countries and the regions with a similar climate. This system can substantially provide a thermal comfort indoor environment for users in longer hours and consistent temperature, particularly, in summer days. It is applicable to either old and new buildings seizing traditional and modern architecture.

**Keywords:** aerodynamic behavior; cactus plant; self-cooling wall; terracotta pot; windcatcher; green building design; thermal comfort.