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Application of Thermodynamic Potential in Building Thermal Envelope Using MCA Analysis

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Editorial

The European Union Directive on Building Energy Performance paves the way for nearly zero-energy structures. There are even stricter energy saving labels – Passive house (energy demand for heating or cooling 15 kWh/m2a), Net Zero energy building, Active house, Plus energy building (connected to the grid buildings, producing more renewable energy than it consumes) – to gain greater energy source independence. All of the aforementioned options try to reduce energy demand first, and then produce the rest of the energy demand on-site or locally using renewable energy sources. Even if it is not the most cost-effective, there are high-efficiency products on the market, such as insulation materials, windows, and high-efficiency heat recovery ventilation systems to achieve the same energy efficiency criteria in northern climes as in mild regions there is an immediate demand for conceptually novel building thermal envelope ideas. Climate adaptive building shells (CABS) are a potential path in which traditional building materials with static qualities are replaced with dynamic, and thus reversible, properties in the building thermal envelope [1,2].

Climate adaptive building shells (CABS) are a potential path in which traditional building materials with static qualities are replaced with dynamic, and thus reversible, properties in the building thermal envelope. The added value of adaptive rather than static system designs. The capacity to act in reaction to variations in solar radiation to ensure outside vistas while reducing glare discomfort and preserving energy efficient building operation. Nature is praised as one of the most prominent sources of inspiration for CABS. Bio mimicry is a useful method for generating ideas for integrating adaptable shells into buildings. Bio mimicry (also known as copying nature's examples to address human issues has aided in the development of new technologies [3,4].

Innovative technical solutions for hydrodynamics (propellers), building components (shades, self-cleaning paint, etc.), and thermodynamics, however, only describing the concepts, nature properties, and applications used without providing a procedure for ranking between multiple potential strategies. For the evaluation of adopting bio mimicry concepts in a sustainable building industry, presented a quantitative technique combining primary data (questionnaire/survey) and secondary data (literature study). To determine the major building skin design criteria vs. nature inspired examples created a screening matrix (a set of qualitative descriptors without quantitative data). As a result, it's possible to conclude that there aren't enough methodological ways for emulating natural strategies to technology processes based on required building performance quantitative indicators, such as energy efficiency, such as material thermal conductivity, building energy output, and so on [5-7].

The goal of this study is to create a new hybrid MCA technique that combines AHP and TOPSIS to evaluate nature-inspired strategies against a set of quantitative energy indicators that describe building energy efficiency in order to discover the optimal option for use in the building thermal envelope. This will help to expand the application of biomimetic ideas in zero-energy building design and construction.

The research's goal, as indicated above, is to develop a system for selecting a suitable nature strategy for technological applications in buildings.

A multi-criteria analysis (MCA) technique is used to develop the proposed methodology. The following are the advantages of employing MCA:Multiple actors' interests are taken into account using quantitative and qualitative data; input data is complex, but output information is simple; the generic MCA approach has a wide range of applications [8].

The defined benefits are in line with the research's requirements. To begin with, both natural and built-environment processes are complicated, involving several internal sub processes and factors. Second, the proposed technique must offer findings to many building actors (architects, builders, engineers, building managers, and users) in a timely manner a clear grasp of the results, and the technical data used in the calculations is complete [9].

Human shelter has evolved to the point that it functions as a second skin, acting as a barrier between internal conditions (interior temperature, moisture, air exchange) and the external environment (outside temperature, moisture, wind, and precipitation). The similarities with endothermic homoeothermic animals (mammals and birds with a constant and high body temperature) are obvious: they are warmed by heat generated by their metabolism to maintain an almost constant body temperature when exposed to large environmental temperature fluctuations; they have a surface that participates in heat exchange processes and internal systems to maintain a constant temperature [10]. These solutions can be used as a model for solving human concerns related to keeping a consistent indoor temperature.

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Conflicts of Interest

The author has no known conflicts of interested associated with this paper.

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