



Developing an integrated methodology for energy efficient retrofitting of built heritage in hot dry climates

Balance Between Thermal Comfort and Conserving the value of Khedival Cairo

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ABSTRACT

- In hot dry climates, enhancing thermal comfort and energy saving in heritage buildings, requires certain attention for conserving their cultural value.
- Khedival Cairo area, is a “buffer zone” of historic Cairo as labelled by the UNESCO, see fig 1.
- This study discusses ways to improve energy retrofitting scenarios, by covering a large segment of residential heritage buildings across Khedival Cairo area.

Fig (1). From left to right, photos show residential buildings, streets and pedestrians in Khedival Cairo area (Cairo, Egypt).



KEYWORDS

Heritage Conservation, Residential Buildings, Thermal Comfort, Energy Renovation, Khedival Cairo, Hot dry climate, North Africa

PROBLEM STATEMENT

- Khedival Cairo, has numerous heritage buildings that are in need of retrofitting in a holistic sustainable way, to keep its heritage value alive.
- The current conservation interventions do not meet the thermal comfort requirements and the sustainability goals.

GOAL/OBJECTIVES

The main goal is to develop retrofitting methods for the residential heritage buildings in hot dry climates .

- Classifying and mapping the heritage buildings of Khedival Cairo
- Defining the thermal comfort zone and users adaptive behaviour
- Proposing flexible and innovative scenarios of energy retrofitting

AUDIENCE

This research is addressed to academics, heritage conservation experts, as well as building engineers who are interested in energy renovation.

RESEARCH QUESTIONS

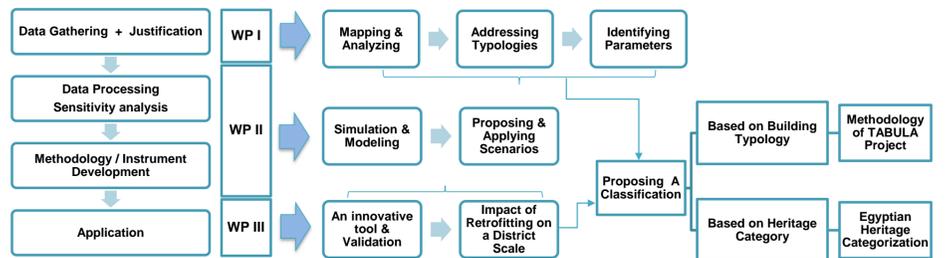
How can heritage buildings in hot dry climates be made more efficient in their thermal performance without affecting their heritage values?

- How to enhance retrofitting measures to cover a larger segment of buildings across khedival Cairo district?
- What are the factors that affect energy consumption, to achieve thermal comfort?
- What are the potential scenarios that can enhance thermal performance and energy efficiency for buildings, while keeping their heritage value?

ADDED VALUE

This topic represents a first step towards developing innovative tools that are energy-effective, which will help the stakeholders in taking the optimum decision.

METHODOLOGY



RESULTS

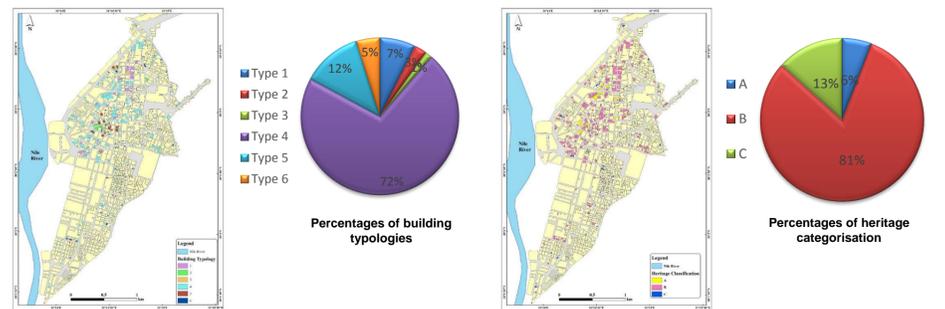


Fig (2). Building typologies

Fig (3). Heritage categorisation

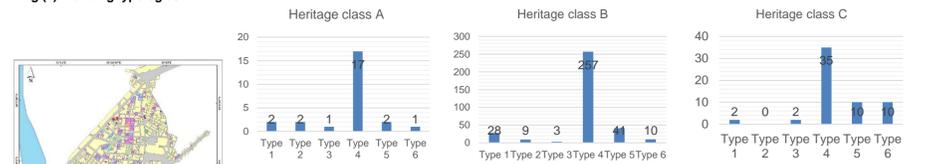


Fig (4). The proposed classification

- The preliminary results shows a new extracted classification of the residential heritage buildings in Khedival Cairo, see fig 4.
- As well as, database for each building in the study area , see fig 5, and representative case studies, see fig 5.



Fig (5) 3D Perspective shows the study area (Khedival Cairo)

Fig (6) The selected case studies for each typical class

CONCLUSION

- We have extracted a classification which is a pre-phase for energy retrofitting of Khedival Cairo buildings.
- From the proposed classification, we have defined and evaluated the weight of each heritage building category in each typology of Khedival Cairo.
- We determined the heritage category that represents the largest portion of residential building stock in this area.
- Finally, the upcoming studies will be based on proposing appropriate scenarios of energy renovation, by enhancing thermal performance while reducing energy consumption.

RESOURCES

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