



Impact of the Oases Settlements on the Outdoor Thermal Comfort in Arid Climate

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ABSTRACT

The oases settlements thermal aspect caused a major handicap for inhabitants, and the city's functions specially in summer. The aim of the study focuses on the relationships between urban form and outdoor thermal comfort in arid climate following these questions: What are the outdoor thermal comfort conditions in oases settlements during summer? How far is the oasis effect beneficial for improving thermal comfort conditions in oases settlements?

KEYWORDS

Desert city, urban morphology, palm grove, oasis effect, heat stress, PET index, RayMan.

PROBLEM

The use of urban space in the arid environments become a handicap during summer, which avoid all the human activities. Desert architecture must necessarily be adapted to the arid climate, and to the environment in order to give a formula that links urban morphology and the appropriate microclimate of urban space.

In this basis, how to improve outdoor spaces and relieve heat stress in the urban oasis of Tolga Oasis Complex, which is one of the largest oases of the Saharan Desert in North Africa?

OBJECTIVE / HYPOTHESIS

- Identification of the impact of the oases on the outdoor thermal comfort during summer.
- Quantification of the physical heat by measuring and modeling urban thermal comfort during extreme summer climatic conditions.

AUDIENCE

The study's audience is for urban planners, landscape architects, urban designers, urban climate researchers.

RESEARCH QUESTIONS

In what level is the impact of oases urban forms on the outdoor thermal comfort?

How can be an adaptative model for the oasis urban components for the improvement of the outdoor thermal comfort?

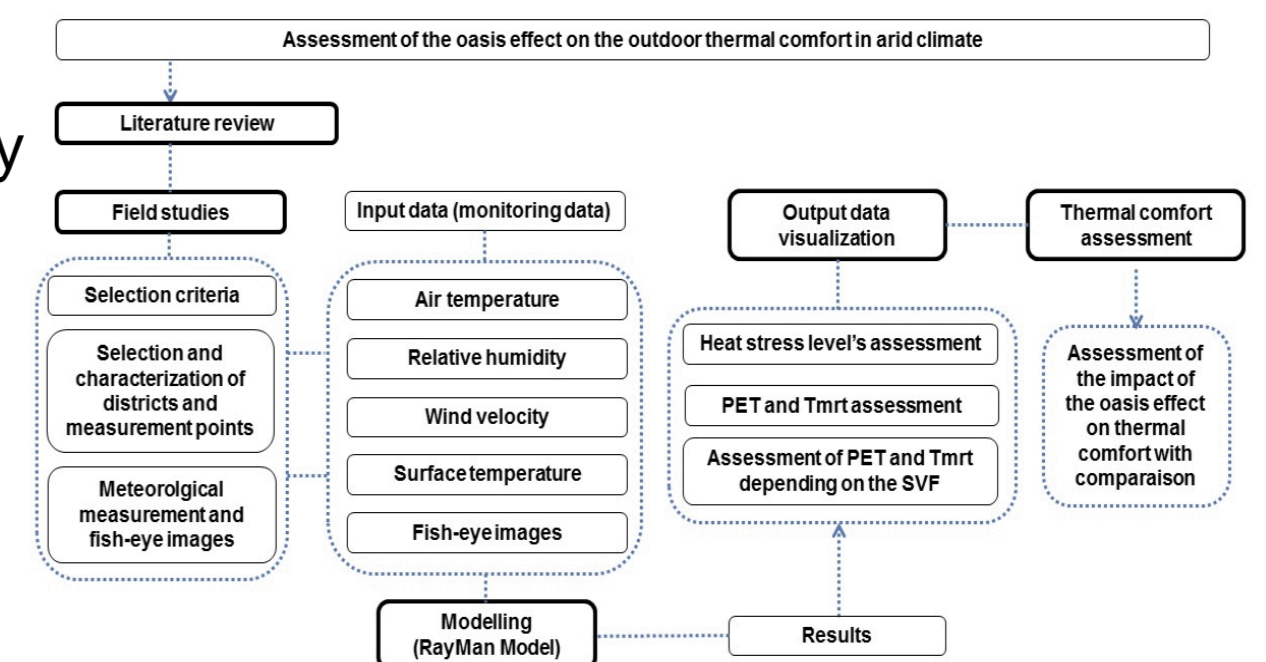
ORIGINALITY

- The originality of the study findings is mainly due to its empirical and comparative approach to assess urban thermal comfort in an Oasis Complex. None of the previously published papers compared urban comfort in a large scale Palm Grove community, in North Africa.
- This study, provides a quantification of outdoor thermal conditions inside and outside a Palm Grove during summer, in the arid climate of Algeria.

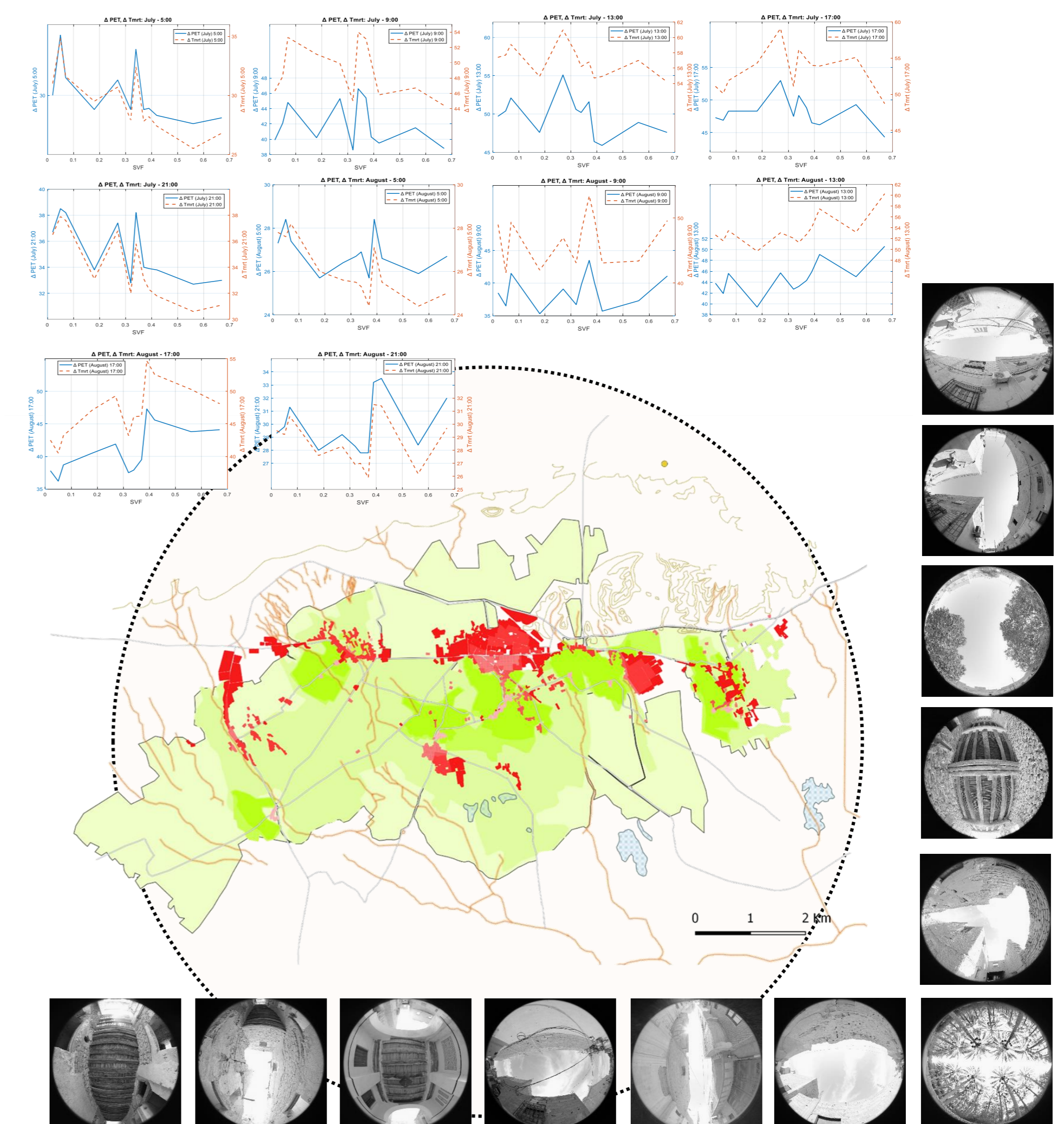
METHODOLOGY

The methodology of the study is based on three phases:

- Literature review
- Field measurement
- Modeling on RayMan Pro



RESULTS



CONCLUSION

The modeling and calculation was based on three parameters namely, SVF, Tmrt, and PET index with the help of RayMan model. The study shows a common similarity of heat stress levels (PET index), during daytime in August, between the oasis urban fabric and palm grove $\Delta \text{PET}_{\text{urban fabric.August}} = 36.3 \text{ }^\circ\text{C}$, $\Delta \text{PET}_{\text{palm grove.August}} = 36.2 \text{ }^\circ\text{C}$. The heat stress level (PET index) evaluated in July is slightly higher in the palm grove than in the urban fabric $\Delta \text{PET}_{\text{urban fabric. July}} = 40.9 \text{ }^\circ\text{C}$, $\Delta \text{PET}_{\text{palm grove.July}} = 41.7 \text{ }^\circ\text{C}$.

No significant impact of SVF on the thermal heat stress was found. Additionally, the 'oasis effect' on the outdoor thermal comfort was insignificant (during the study period).

RESOURCES

- Venhari, A.A.; Tenperik, M.; Taleghani, M. The role of sky view factor and urban street greenery in human thermal comfort and heat stress in a desert climate.
- Attia, S. The Bioclimatic Zones Concept Landscape Design Strategy for site planning in hot arid climates. In Proceedings of the 3rd CIB International Conference on Smart and Sustainable Built Environment (SABSE). TU-Delft, The Netherlands, 2009.