Ministry of higher education and scientific research
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Faculty of Science and Technology
Department of Architecture

LACOMOFA

1st AUITM

Workshop

ARCHITECTURAL AND URBAN INVESTIGATION TOOLS AND METHODS

Methodology Analyze of an Article Based on The Application of ENVI-met Simulation Tool for Assessing Outdoor Human Thermal Comfort Through Greenery.

Dyna Chourouk ZITOUNI
Department of Architecture, Biskra university.

Introduction

Outdoor thermal comfort has been one of the primary research areas in the field of urban climatology during the last few decades due to the [UHI] phenomenon. The study of urban microclimates using numerical simulation methods is gaining a lot of academic interest [1].

The ENVI-met model, developed by Michael Bruse is one of the most frequently used simulation tools. Over 3000 scientific articles and independent studies have demonstrated its potential and strategy [2] which made us want to learn more about this software and apply it to our future research to assess physical and perceptual variables and identify the factors that strongly impact them, such as outdoor greenery, in this case, to create a healthier microclimate and suitable outdoor thermal conditions.

In this poster, we attempt to analyze the methodology and tools used in the work of Zhao et al. (2018) which aims to investigate the Impact of Tree Locations and Arrangements on Outdoor Microclimates and Human Thermal Comfort in an Urban Residential Environment in Arizona, USA [3]. With the intention to find a similar line of research in the context of the city of Biskra, inspired by the methodology used by Zhao et al. (2018).

Methodology

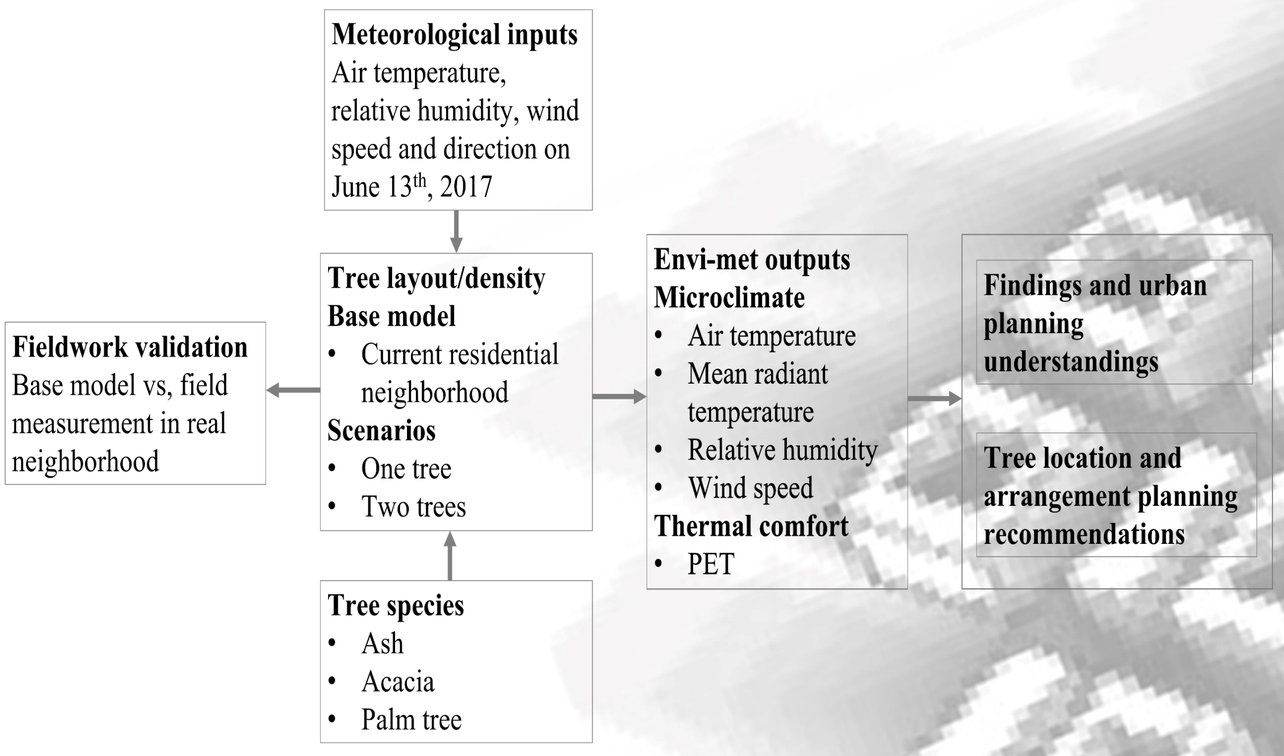

Figure 1: Methodology framework
Source: Zhao, Q., Sailor, D. J., & Wentz, E. A. (2018).

Since the focus of this research was to better understand the effects of tree positions and arrangements on outdoor human thermal comforts, the paper have examined each of these three scenarios with alternative tree locations.
For each study case, air temperature, MRT, wind speed, and relative humidity were simulated for 24 hours on 13 June 2017 and used physiological equivalent temperature (PET) as the indicator for the thermal perception (See figure 1).
Finally, we can conclude that the methodology used by Zhao et al. (2018) can be adopted to our future similar study at the same investigation scale, but in a Saharan context such as Biskra, and since all the tools are available at our laboratory LACOMOFA, where we can use the TESTO 480 tool for the fieldwork measurement and obtain an ENVI-Met software license for the numerical model simulation. Figure 2 summarizes the methods we want to use in our future study.

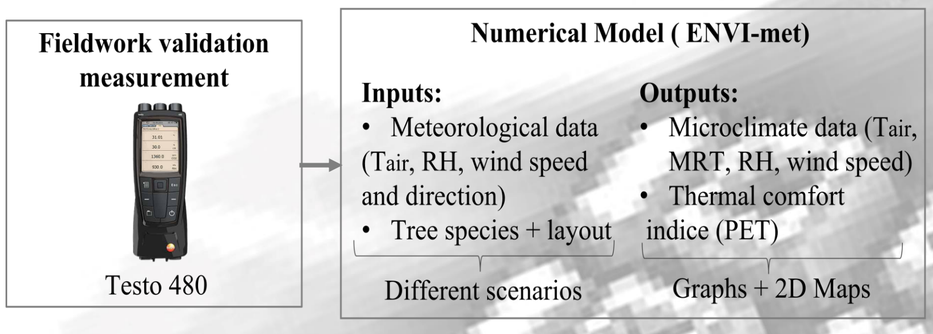

Figure 2: Methodology framework for future study
Source: Author, 2022.

Conclusion

Numerical models are flexible, they can replicate and compare outdoor microclimates and human thermal comfort under a wide range of parameters and configurations. ENVI-met is an extremely valuable tool for assessing urban climate. Using its different interactive modules, it can specify any form of surface and material for buildings, as well as greening features for facades and roofs [2].
In this poster, we attempted to present a research methodology that uses ENVI-met as the primary investigation tool and shares many similarities with our future work, such as the study goal of improving people's outdoor thermal comfort through greenery in a hot and arid climate using several tree species like palm trees in different locations in an urban residential environment. Although, in our future study we will only investigate the existing tree species since ENVI-met enable us to create our own personalized tree models.

References

[1] Tsoka, S., Tsikaloudaki, A., & Theodosiou, T. (2018). Analyzing the ENVI-met microclimate model's performance and assessing cool materials and urban vegetation applications–A review. Sustainable cities and society, 43, 55-76.

[2] Accueil. (n.d.). ENVI-Met. Retrieved May 7, 2022, from https://www.envimet.com/fr/

[3] Zhao, Q., Sailor, D. J., & Wentz, E. A. (2018). Impact of tree locations and arrangements on outdoor microclimates and human thermal comfort in an urban residential environment. Urban Forestry & Urban Greening, 32, 81-91.