



Development of a methodological approach to urban rehabilitation for a comfortable outdoor thermal environment

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ABSTRACT

Historic centers are presented as a field of intervention for the involvement of sustainable development in the rehabilitation strategy.

It is in this context that the main objective of this research falls. develop a methodological approach to urban rehabilitation to quantify and control urban thermal comfort at the scale of a traditional district before and after the intervention.

This approach is also able to assess the possible benefits of passive mitigation strategies.

KEYWORDS

Urban microclimate; Mediterranean climate ; Pedestrian comfort; PET; Mitigation strategy; Simulation.

PROBLEM

Transformations in the morphological parameters of historic centers cause complex interactions of physical phenomena and changes in microclimatic parameters such as "solar radiation, wind flow and operative temperature".

The challenge in our case is to ensure a viable and comfortable outdoor thermal environment through the rehabilitation process of these neighborhoods.

OBJECTIVE / HYPOTHESIS

The main goal of this research is to develop an algorithm-based methodological approach to urban rehabilitation in order to quantify and control the urban thermal environment.

- WP1: Critical review on the methodologies used for the evaluation of outdoor thermal comfort.
- WP2: Quantify the thermal comfort existing in the streets of the Casbah of Algiers.
- WP3: Evaluation of the effect of passive strategies on quantified thermal comfort.
- WP4: Creation of a methodology for the rehabilitation of the built environment and urban thermal quality control
- WP5: Study the performance of the proposed methodology on the selected case study

AUDIENCE

UNESCO, ICOMOS, OWHC, OGEBG

RESEARCH QUESTION

To what extent can the urban rehabilitation process improve the outdoor thermal comfort for users?

ORIGINALITY

The added value of this research is first of all the exploration of thermal comfort in traditional fabrics on an urban scale, then the development of a methodology based on a multicriteria algorithm adapted to the rehabilitation of historic cities for a better outdoor thermal comfort.

METHODOLOGY

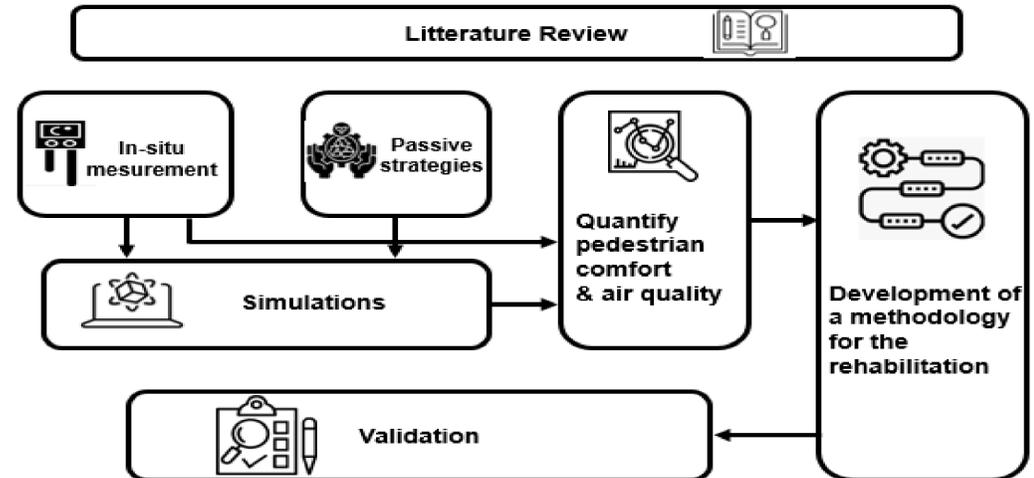


Fig 1. Heat map PET

RESULTS

Improving the microclimate and the quality of the thermal environment in outdoor spaces through the urban rehabilitation methodology by targeting precise indicators of comfort. The expected results are the objective and subjective evaluations of the microclimatic comfort, the results of solar radiation and the model of the air flow then the results of the calculation of the PET and APCI indices, as well as the effects of the morphological configuration and the passive strategies on comfort.

The figure is a heat map of the PET at the neighborhood scale and Table 1 shows the comfort ranges for the latter. These are examples of what we would expect to have as results during this study.

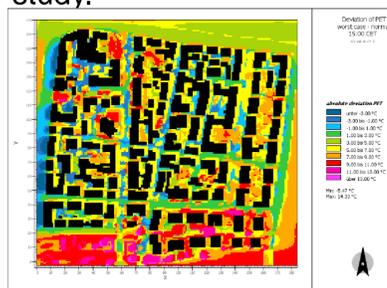


Fig. 2 Heat map PET

Tab. 1 outdoor thermal comfort level stress via PET index

Date	Time	PET, -S1			PET, -S2			PET, -S3		
		1	2	3	4	5	6	7	8	9
15.07.2016	00:00	0.32	0.18	0.56	0.39	0.42	0.67	0.87	0.78	0.64
	01:00	25.7	25.6	25.7	25.6	26	26.5	26.4	26.8	26.4
	02:00	25.7	25.1	25.6	24.8	25	25.9	25.6	26.5	25.8
	03:00	25	24.7	24.9	24.3	24.2	25.6	25.5	25.8	25.4
	04:00	24.7	24.3	24.7	24.6	24.3	25.4	25.5	25.4	25.5
	05:00	22.7	23	23.2	23.2	22.9	24.1	23.5	23.3	23.6
	06:00	25.1	25.3	25.5	25.1	24.6	26	25.9	25.4	24.7
	07:00	30.3	30.3	30.3	29	29.5	33	30.7	30.3	29.6
	08:00	34.5	34.8	34.8	33	34.5	35.8	34.4	34.4	34.4
	09:00	39.6	39.7	39.6	44.3	39.4	44.2	39.2	39.2	39.3
	10:00	43.4	43.2	43	46.3	42.6	48	46.9	42.2	42.2
	11:00	47.4	47.2	47	49.7	45.5	50.8	49.7	45.9	45.2
	12:00	52.6	52.3	52.9	51	49	53.4	51.6	51.6	51.9
	13:00	54.1	54.9	54.5	49.7	52.8	54.9	54.3	54.6	55
14:00	59.5	59.2	59.7	52	51.3	55.8	58.2	57.9	53.7	

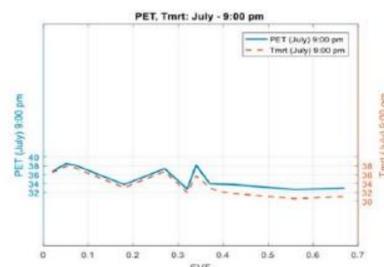


Fig. 3 Variations between PET and Tmrt



Fig. 4 Solar radiation

CONCLUSION

- Establish a clear methodological approach to rehabilitation for historic centers
- improvement of the outdoor thermal comfort during the urban rehabilitation process

Resources

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