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The Assessment of Outdoor Thermal Comfort inside Oasis Settlements in North Africa - Algeria

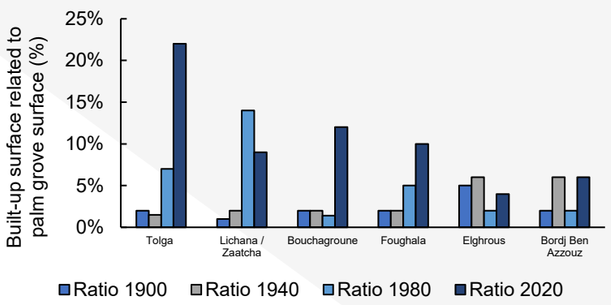
METHODOLOGY

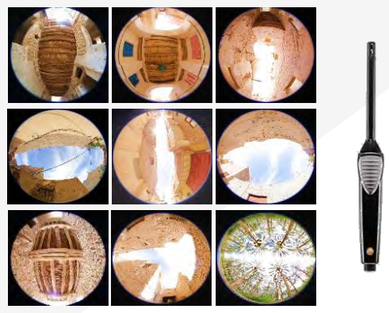
1. Identifying the surface's correlation between the cultivated area (palm grove) and built-up area by analysing the surfaces sprawl of the studied context

2. Microclimatic measurements for the outdoor thermal comfort assessment: air temperature (Ta), relative humidity (RH), air velocity (Va), and surface temperature (Ts) in four stations

QGIS

RayMan





RESULTS

Site	Measurement Point	PET 5:00 a.m.		PET 9:00 a.m.		PET 1:00 p.m.		PET 5:00 p.m.		PET 9:00 p.m.	
		July	August	July	August	July	August	July	August	July	August
Old Lichana	1	30	27.3	39.9	38.5	49.7	43.8	47.3	37.8	36.7	29.3
	2	31.5	27.4	44.8	41.5	52.1	45.6	48.3	38.7	38.2	31.3
	3	31.3	26.4	45.3	39.1	55.1	45.7	53	41.9	37.4	29.2
Old Tolga	4	28.8	26.7	38.6	36.7	50.6	42.7	47.5	37.5	32.8	28.3
	5	28.8	26.1	40.2	35.3	47.6	39.4	48.3	40.5	33.8	28
	6	27.6	26.2	41.5	37.3	48.9	45	49.3	43.8	32.7	28.4
Farfar	7	35.1	28.4	42.1	36.5	50.4	42	46.9	36.2	38.5	29.8
	8	33.9	26.9	46.6	39.8	50.2	43.2	50.7	37.9	38.2	28
Palm grove	9	28.8	25.7	45.4	43.5	51.6	44.3	48.8	39.5	34	27.8
Thermal comfort stress level		17–26		26–28		28–37		37–42		>42	
		Neutral No thermal stress		Slightly warm Slight heat stress		Warm Moderate heat stress		Hot Strong heat stress		Very hot Extreme heat stress	

The influence of the oasis settlements on the PET index was insignificant. Despite the large difference between the oasis settlements and the palm grove surfaces, the measurements and calculation did not identify any noticeable variation throughout the built environment thermal comfort. We processed the housing materials such as albedo in all the study period additionally to the SVF

LACOMOFA

SBD LAB Sustainable Building Design Lab

Urban Climate Modelling

8 September 2021

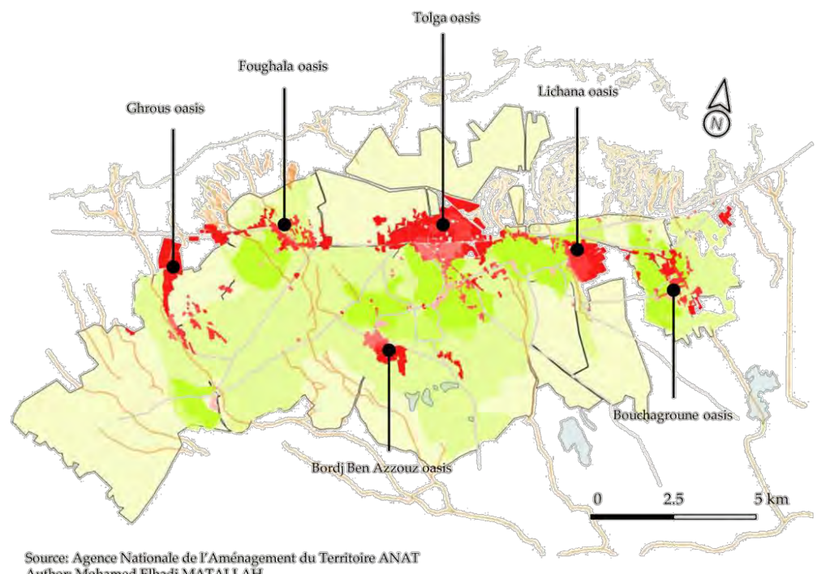
PROBLEM

The use of outdoor spaces through the arid environments become very difficult during summer, which disturbs all the human activities.

Desert settlements must necessarily be adapted to arid climate, and to the environment in order to give a formula that links between urban morphology and the extreme climate conditions. Accordingly, the outdoor spaces' geometry influence the thermal heat stress throughout the Tolga Oasis Complex, which is considered as one of the largest oases territories in North Africa.

RESEARCH QUESTIONS

- What is the impact of an oasis settlements on the outdoor thermal comfort during the hot period?
- What is the impact of the cultivated area on the outdoor thermal comfort?



Source: Agence Nationale de l'Aménagement du Territoire ANAT
Author: Mohamed Elhadi MATALLAH
Date: 31/7/2020

AUDIENCE

Architects

Urban Planners

Climate Research

CONCLUSION

This study identified the relationship between the built-up area and the cultivated area (palm grove) inside an oasis network, as well as the impact of palm tree groves on the outdoor thermal comfort during summer in the Tolga Oasis Complex in Algeria. Despite the large scale of cultivated and irrigated area (palm grove) surrounding the built environment, which presents a small surface compared to palm groves, the so-called oasis effect was not significant during the extremely hot days. Also, the outdoor thermal comfort was affected strongly by extreme weather conditions and created an extreme heat stress notably inside the palm grove generating a warming effect over daytime hours.

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