



Climate Change, Vulnerability and Adaptation in Selected Urban Areas

Overview for the 2nd Stakeholder Workshop

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Overview

1. Climate change in Greater Cairo

2. Vulnerability to climate change in selected areas

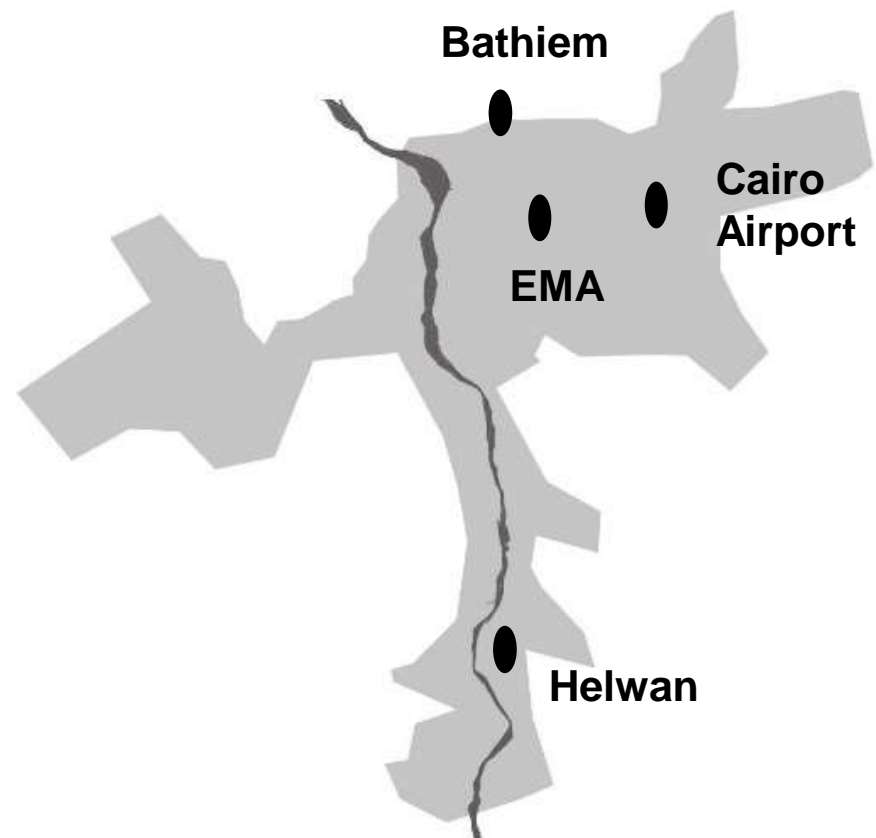
3. Option for adaptation to climate change



Analysis of climate observation data

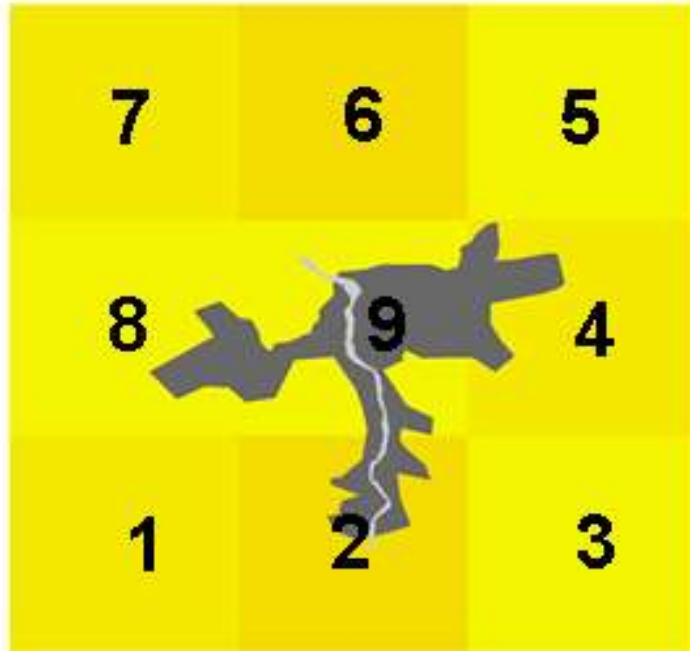
Space Science Centre,
Cairo University 2014

based on weather station
data of the Egyptian
Meteorological Agency

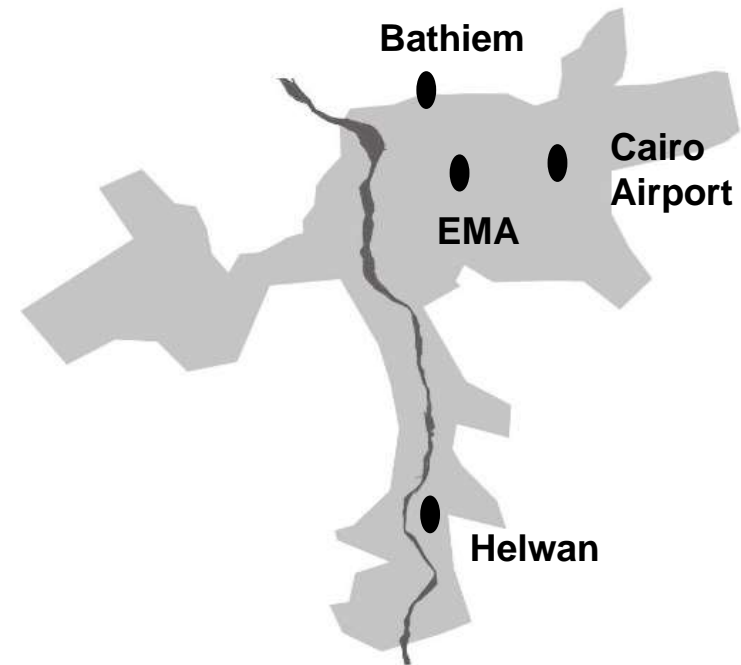




Analysis of climate indicator projections



Reg4CM data
(ca. 50 km grid size)

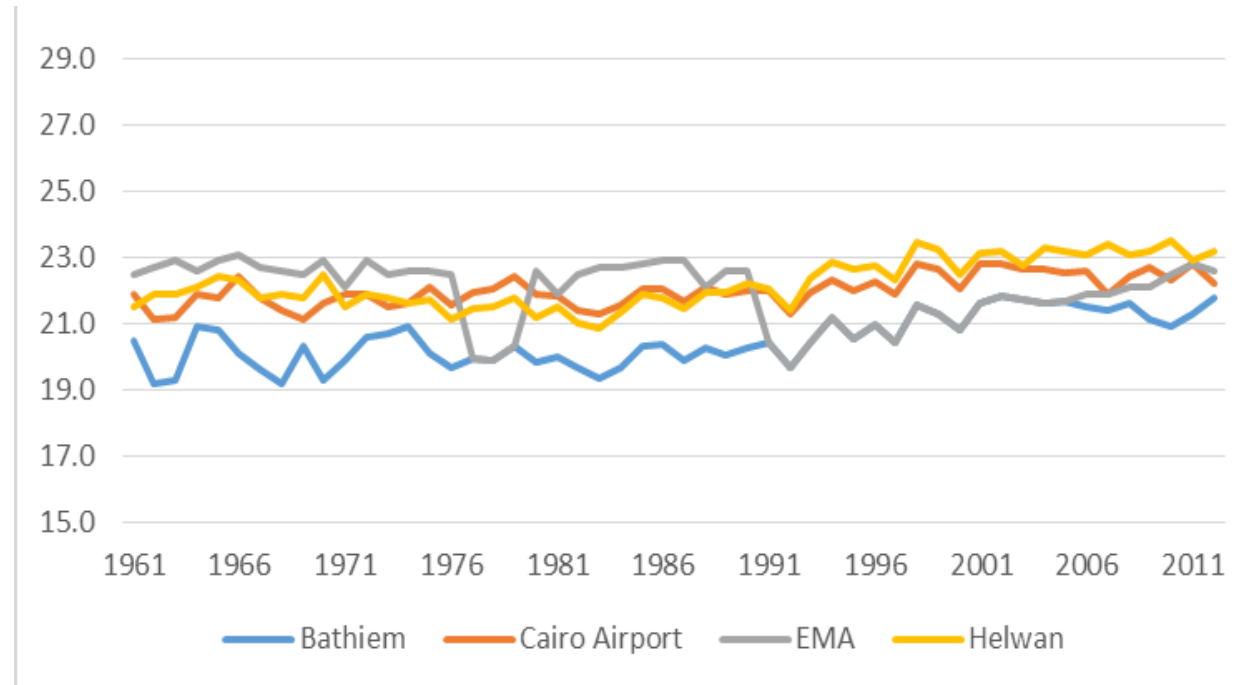


Downscaled Reg4CM data
(ca. 15 km grid size)
for 4 locations



Annual mean temperature

**Slight warming up
in the past
(1961 – 2011)**



**It is getting much
warmer
in the future:**

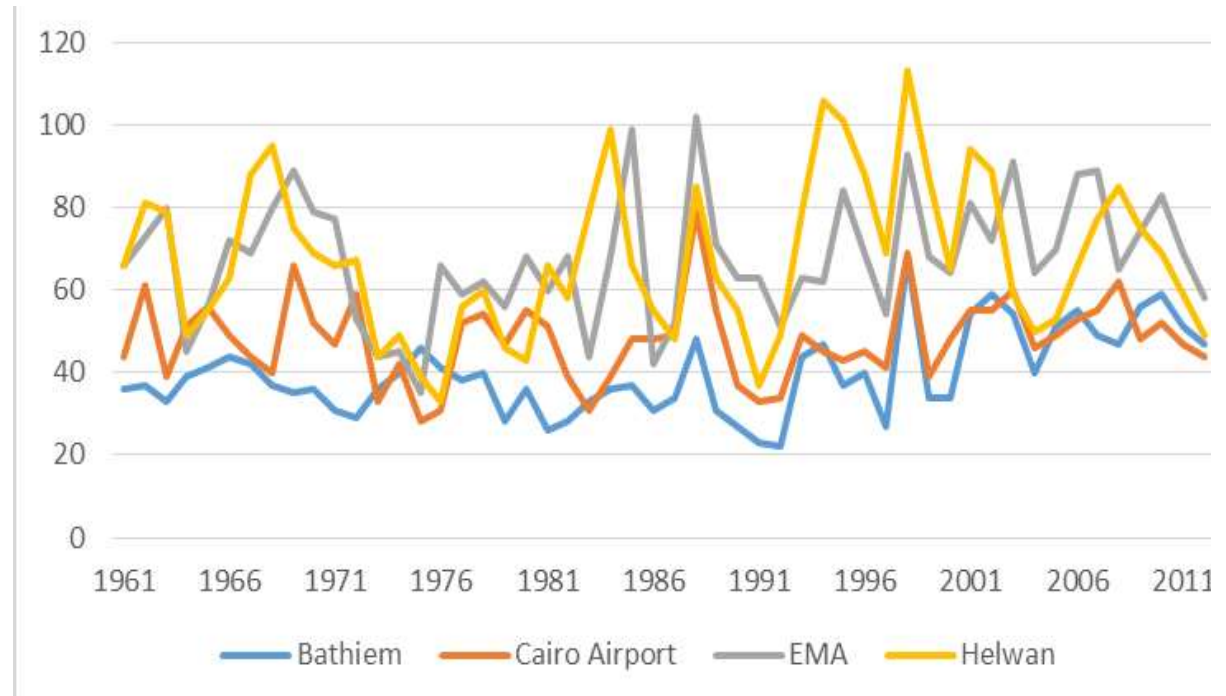
1961-1990 -> 2021-2050: + 1.1 °C

1961-1990 -> 2071-2100: + 3.5 °C



Hot days (over 35°C)

**Increase of hot days
in the past
especially
in peripheral areas**



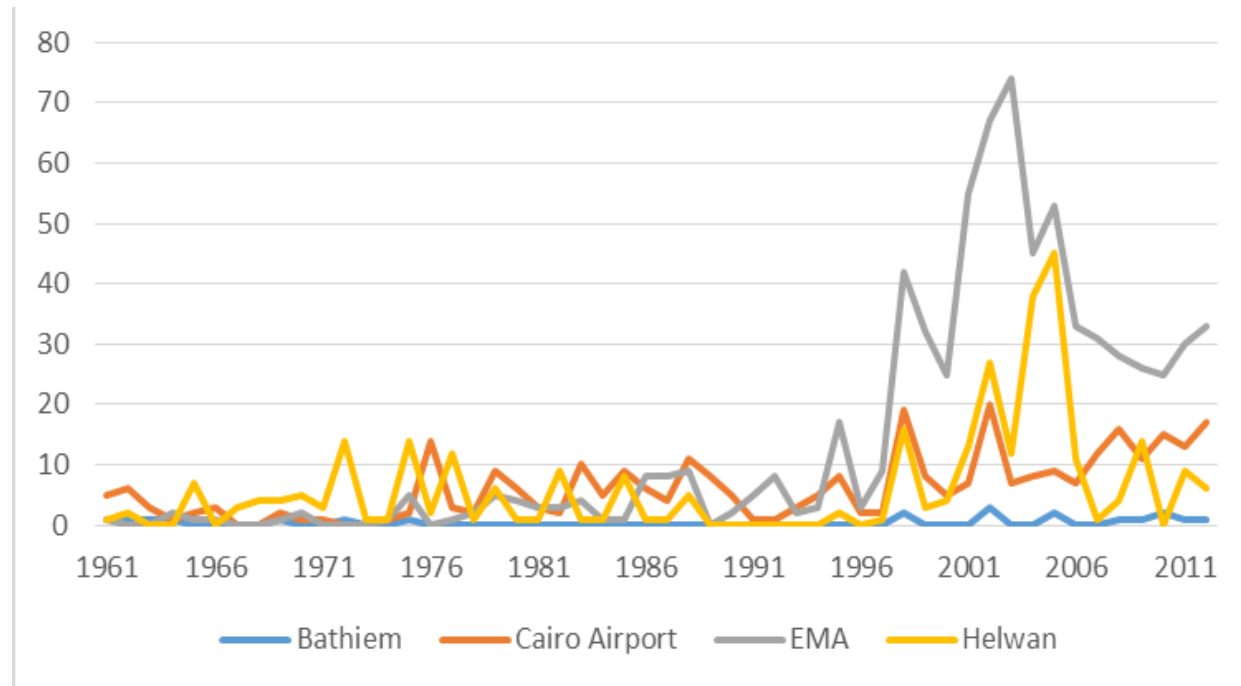
**High increase of hot days
in the future:**

1961-1990 -> 2021-2050: + 62 %
1961-1990 -> 2071-2100: + 162 %



Hot nights (over 25°C)

High increase
of hot nights
in the past



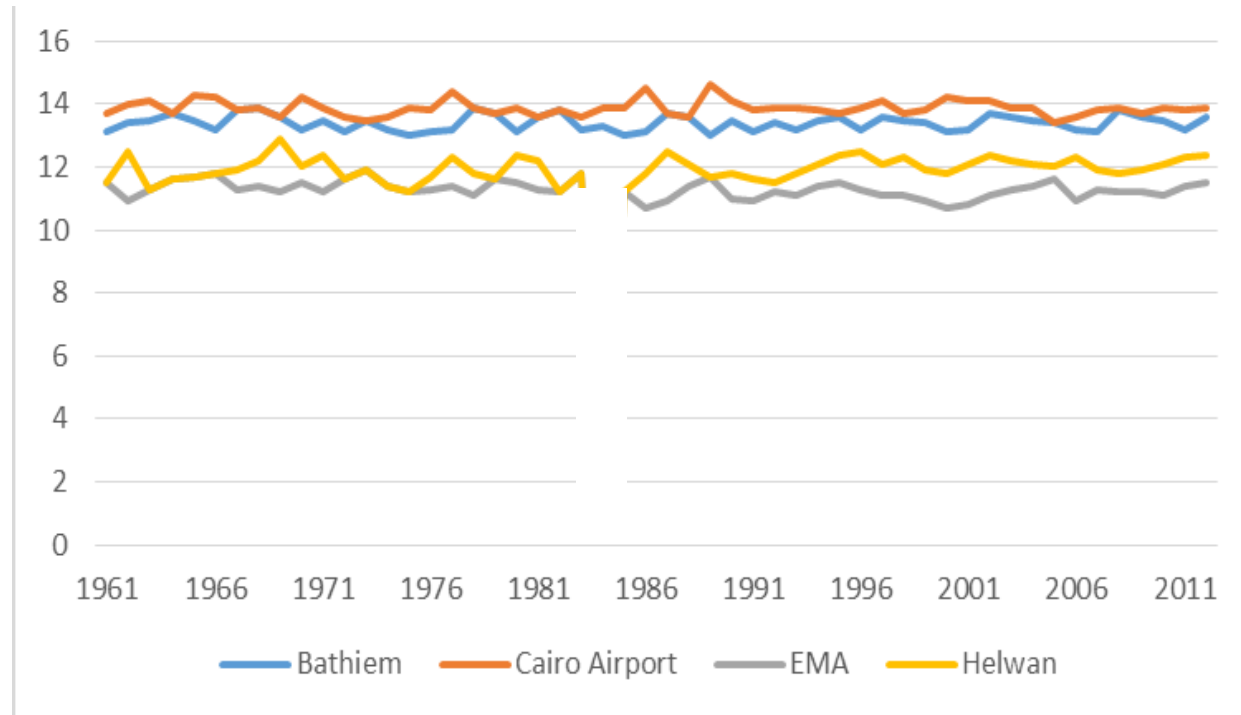
Tenfold increase of hot nights in the future:

1961-1990 -> 2021-2050:	+ 925 %
1961-1990 -> 2071-2100:	+ 1025 %



Temperature inversion days

**Very slight increase
in the past**



**But significant increase
in the future:**

1961-1990 -> 2021-2050:	+	30 %
1961-1990 -> 2071-2100:	+	35 %



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- 3. Options for adaptation to climate change**



Physical vulnerability to climate change

analysed and compared:

Ezbet El-Nasr,
Masaken Geziret El-Dahab,
Ain Shams and
Markaz El-Abhath

using

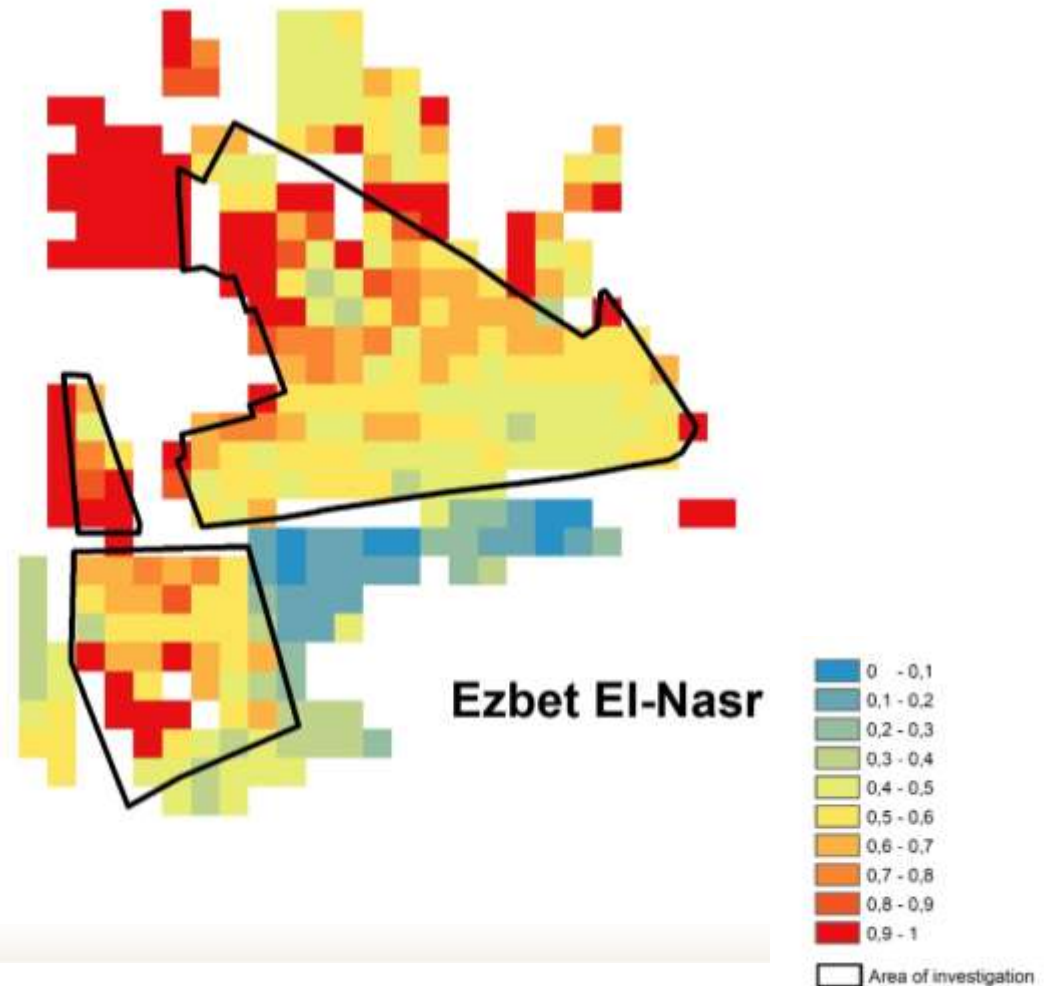
- 3D model of urban environment,
- solar radiation model,
- wind data





Heating up of buildings due to sun radiation (example of Ezbet El-Nasr)

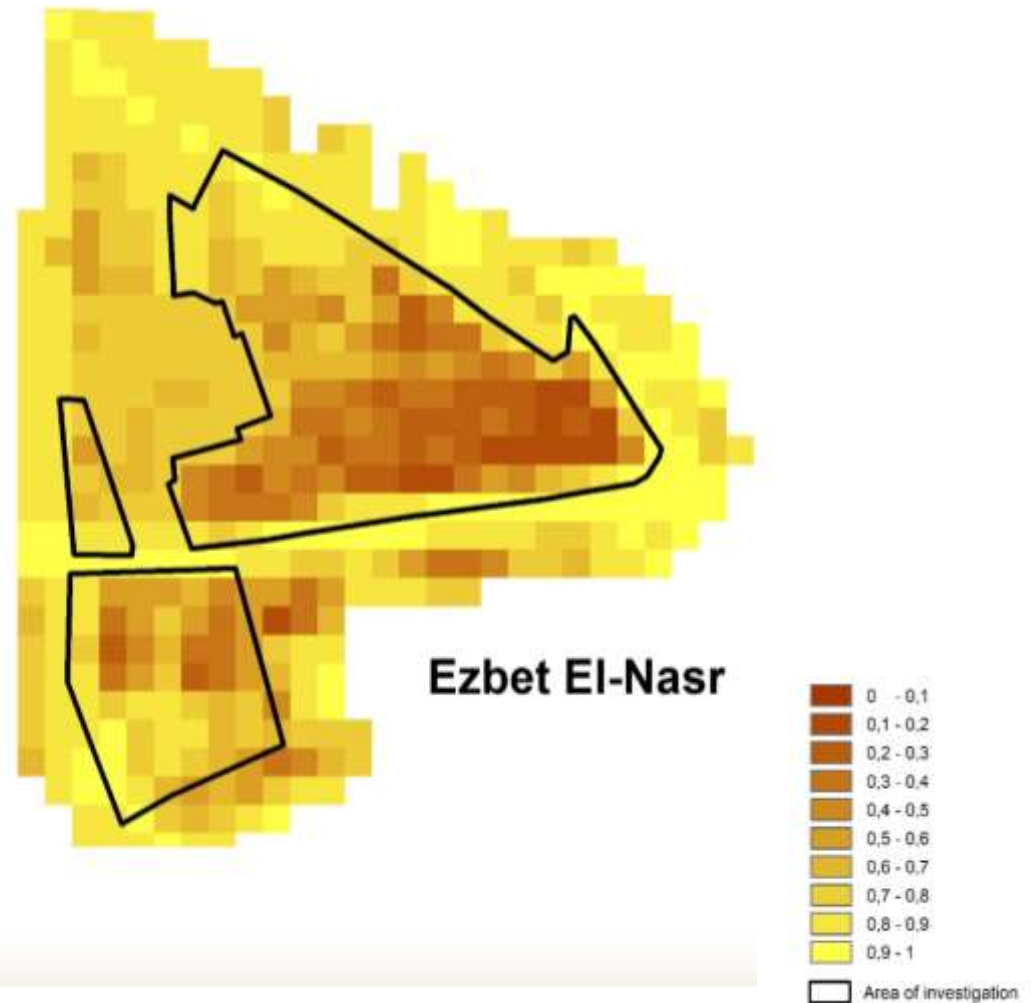
Hottest buildings are
low and free
standing.





Heating up of streets and open spaces by the sun

**Cooler streets
where settlement is
dense**

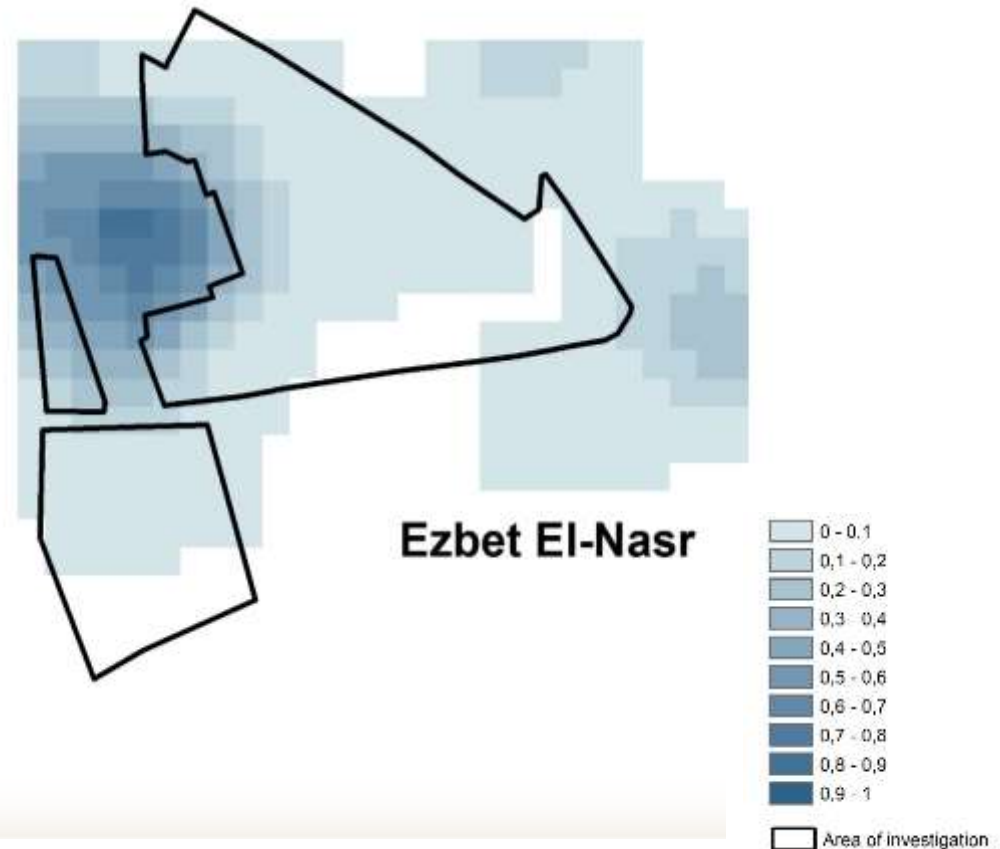




Cooling effects of green areas

**Green areas cool
down at night**

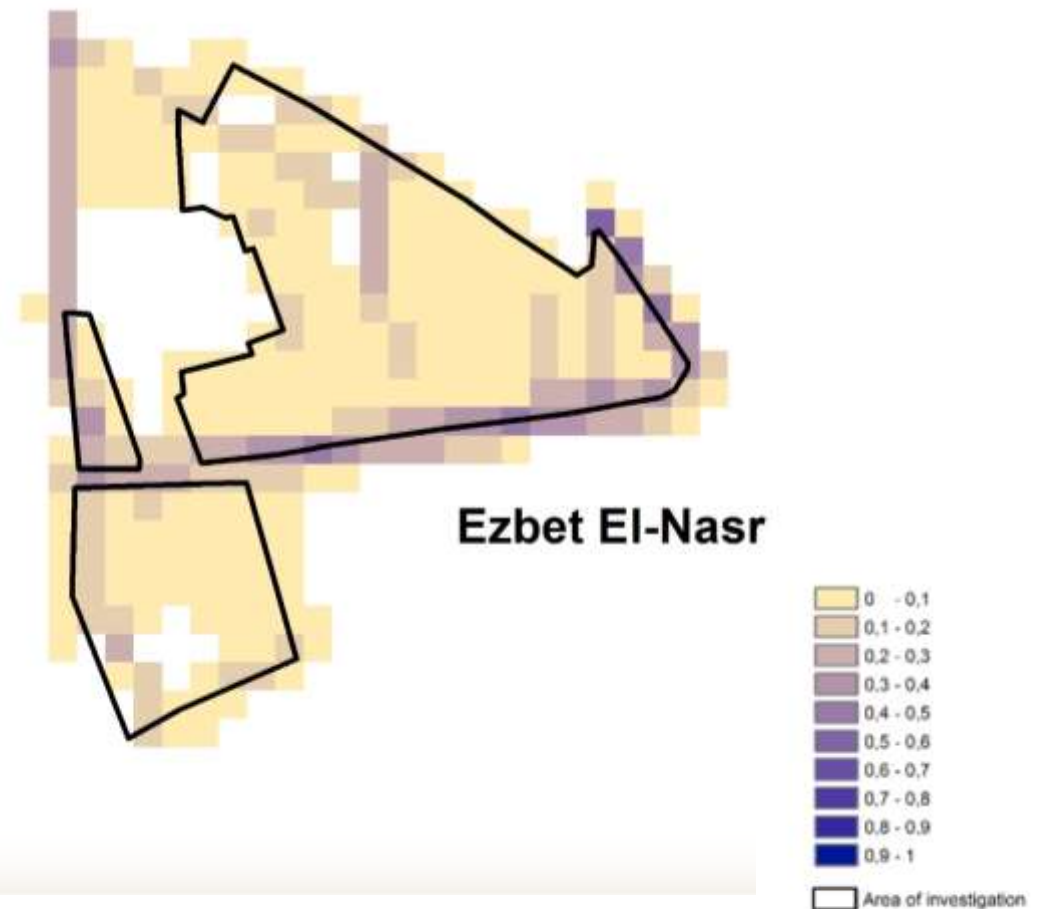
**cooler air spreads to
neighboring areas.**





Cooling effects of wind ventilation

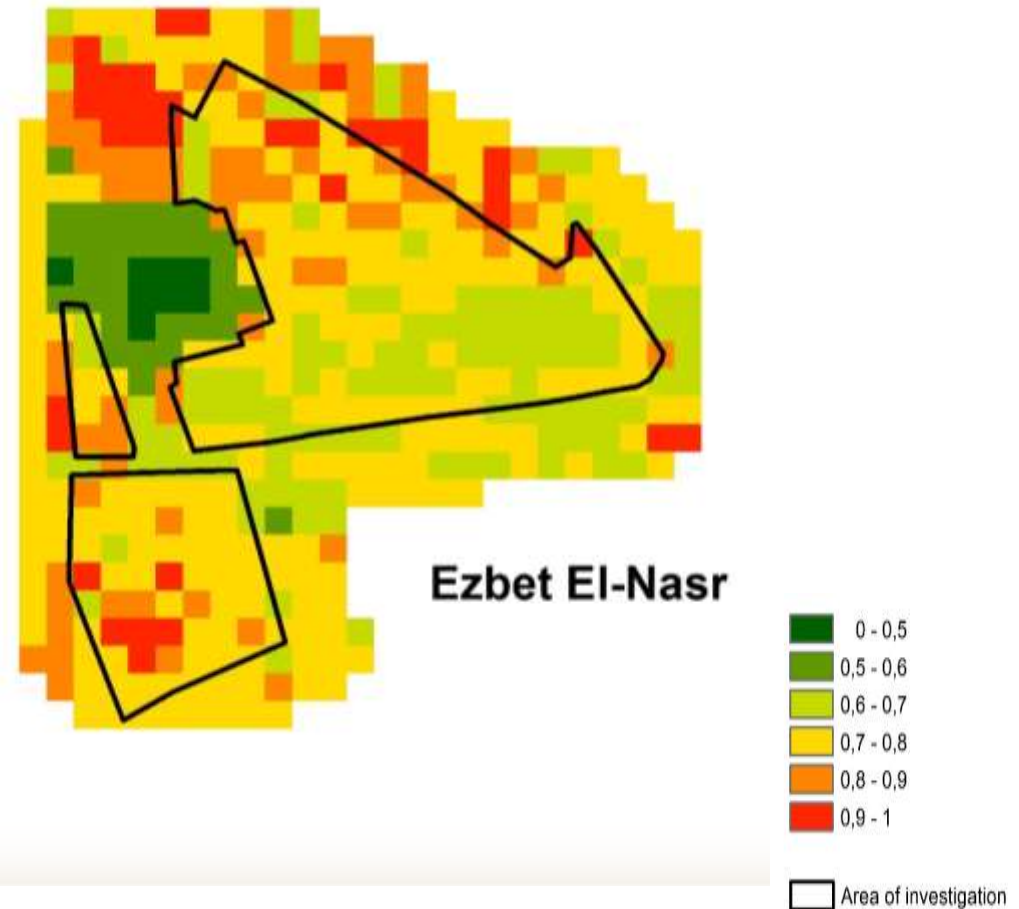
**Cooler streets are
either very wide or
run north to south.**





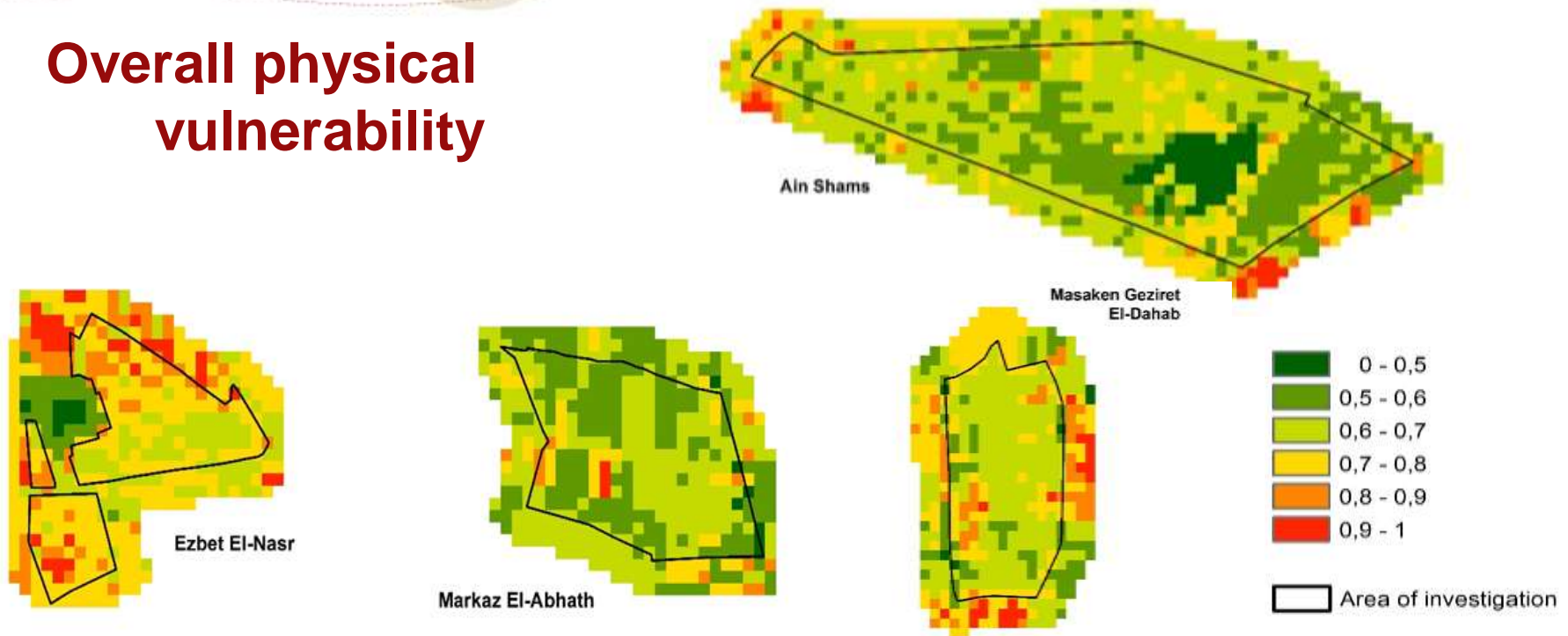
Combined results (hot spots)

**Built-up, dense parts
not as affected as
edges and newly
developing areas.**





Overall physical vulnerability



	Ain Shams	Ezbet El-Nasr	Masaken Geziret El-Dahab	Markaz El-Abhath
Total physical vulnerability	0.83	1.0	0.9	0.83



Social vulnerability to climate change

Especially vulnerable groups:

Babies	Cannot control body temperature well
Sick persons	Especially with cardio-vascular, skin and respiratory diseases
Old persons	Weak cardio-vascular system
Poor people	Cannot afford costs for adaptation e.g. air conditioning



Social vulnerability (summary of Baseline Survey results)

	Ain Shams	Ezbet El-Nasr	Masaken Geziret El-Dahab	Markaz El-Abhath
Health-related	0.69	1.0	0.94	0.9
Age-related	0.92	1.0	0.94	0.73
Living conditions related	0.41	1.0	0.5	0.62
Employment-related	0.44	1.0	0.38	0.3
Total social vulnerability	0.62	1.00	0.69	0.64



Key impacts of climate change for informal settlements

Health impacts

on persons vulnerable due to age and existing illnesses, on well-being and agility of all residents

Economic impacts

increasing prices and fluctuations of energy, water, food; impacts on household and businesses



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Different levels and types of adaptation

Behavioural adaptation

Physical adaptation

Institutional adaptation

Adaptation to extreme events

Adaptation to gradual changes

Settlement level

City level

National level

International level



PDP pilot adaptation measures at settlement level

Public space related

Street cover (green/textile)
Community garden
Sidewalk garden

Building related

Rooftop garden/farming
Rooftop cover (green/textile)
Green walls
Façade painting/plaster



Shading Street Cover





Sidewalk Garden





Greening of walls





Rooftop Farming





Shading Rooftop Cover





Façade Painting





Façade Plastering

