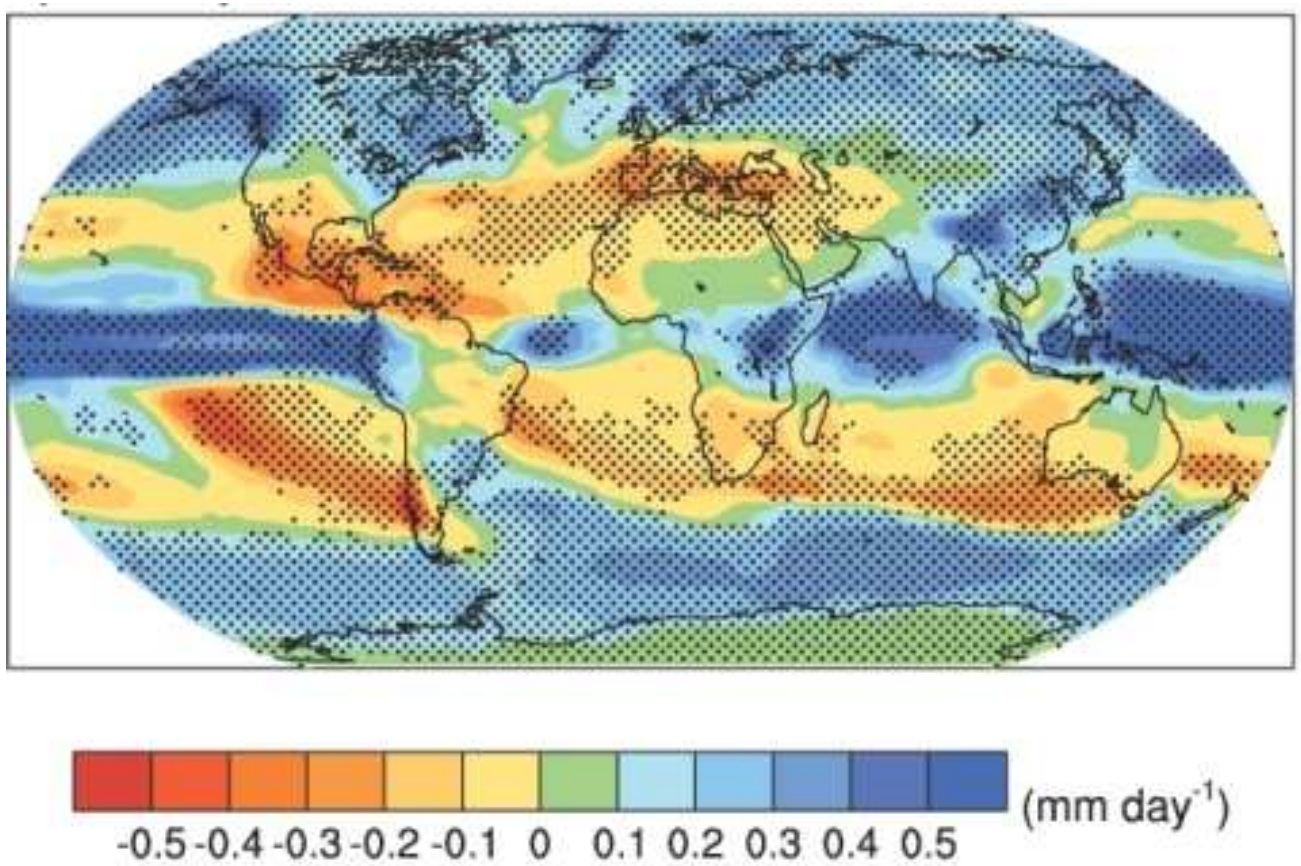
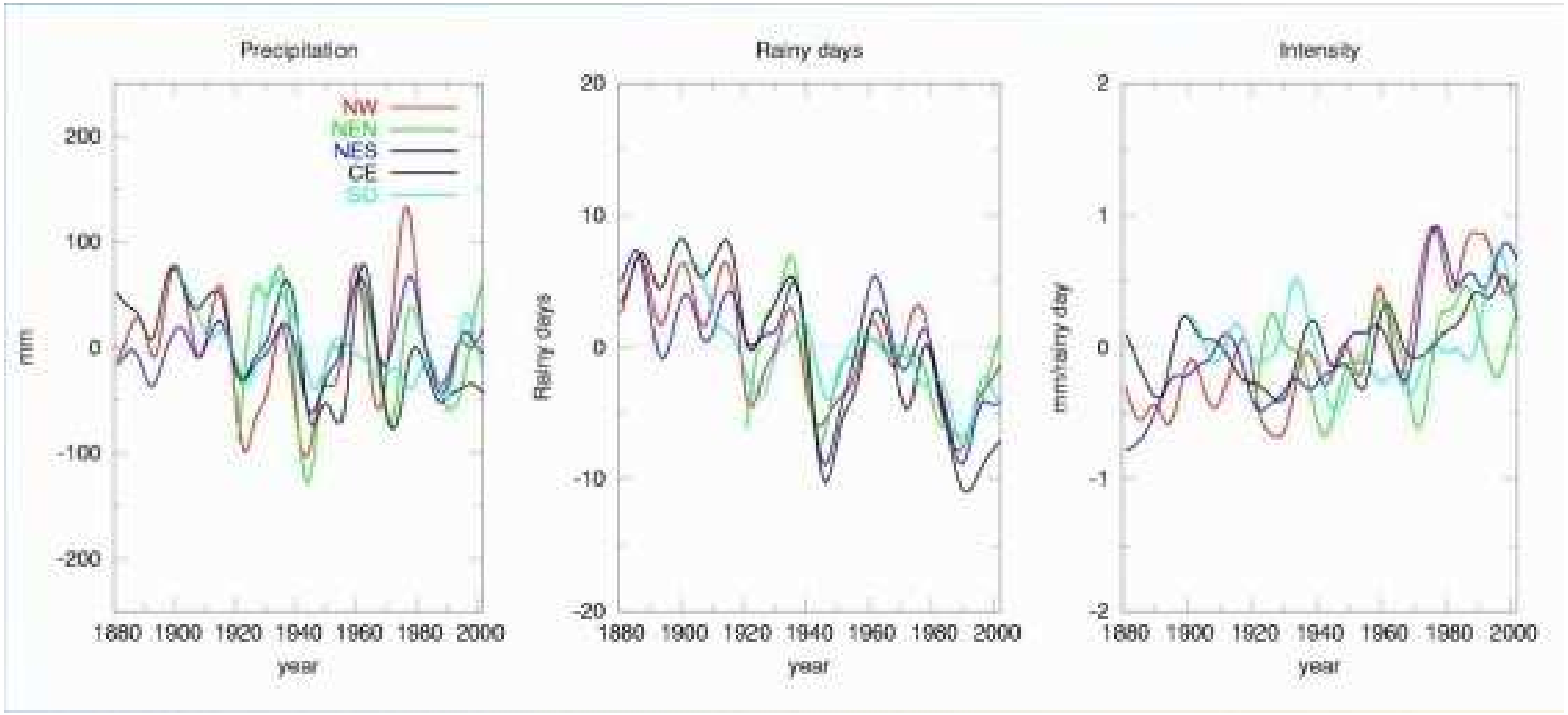
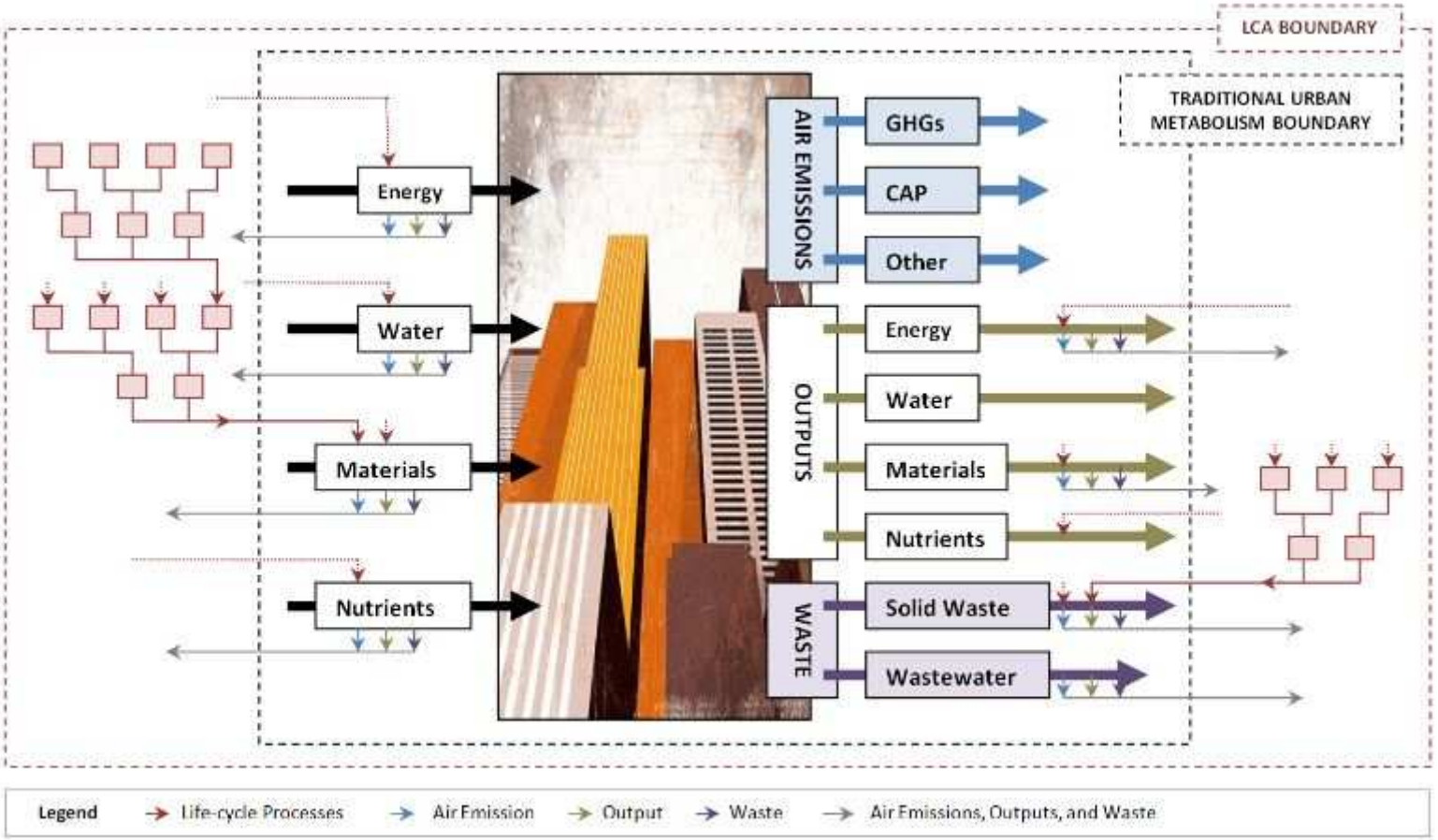
Cambiamenti climatici ed effetti sulle città

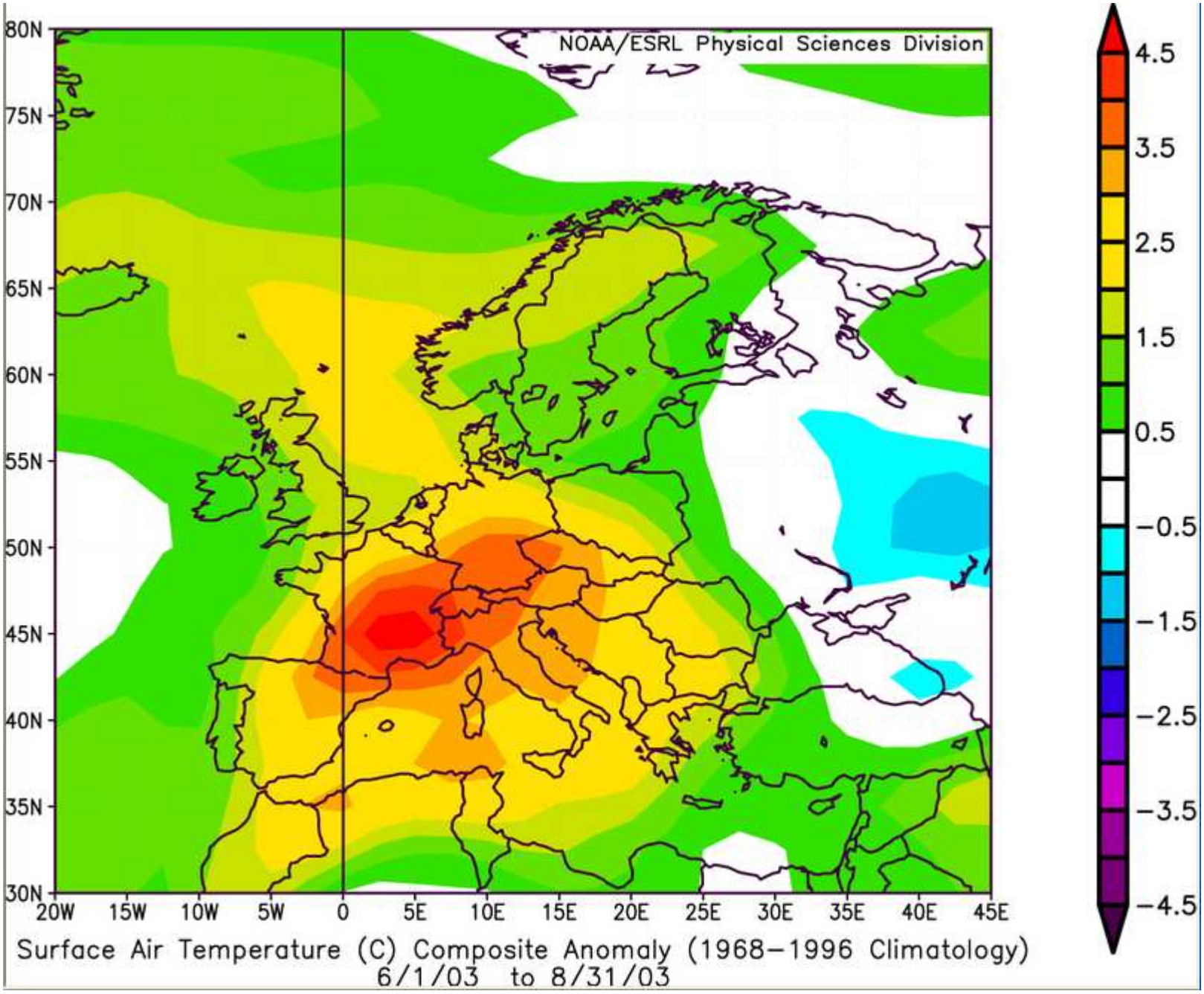
T.Georgiadis

IBIMET-CNR

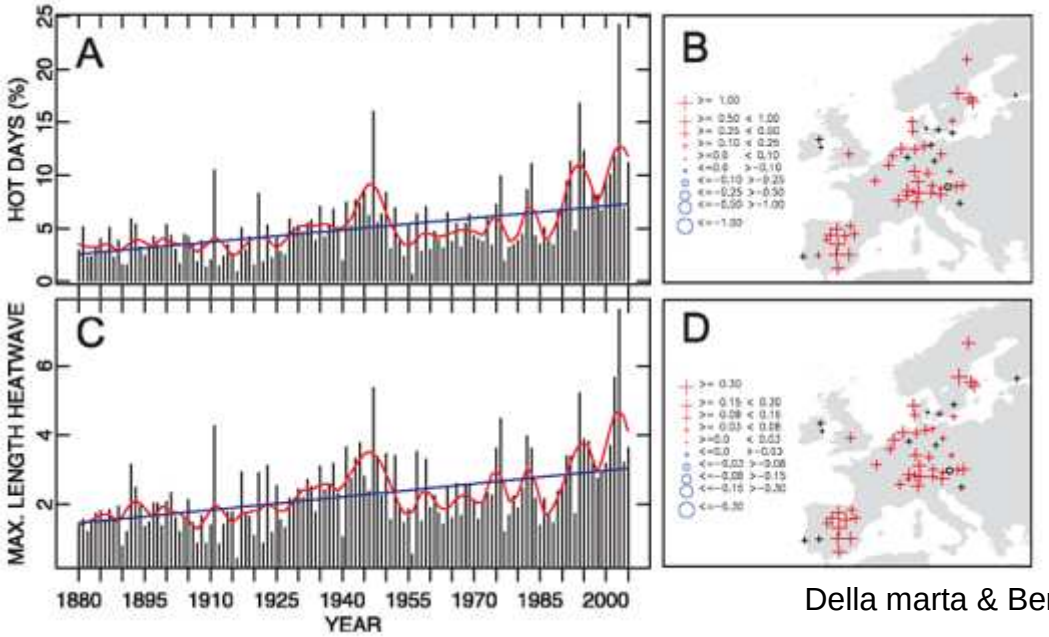

-0.5 -0.4 -0.3 -0.2 -0.1 0 0.1 0.2 0.3 0.4 0.5
(mm day-1)


Precipitation
NW
NEN
NES
CE
SO
mm
200
100
0
-100
-200
1880 1900 1920 1940 1960 1980 2000
year
Rainy days
Rainy days
20
10
0
-10
-20
1880 1900 1920 1940 1960 1980 2000
year
Intensity
mm/rainy day
2
1
0
-1
-2
1880 1900 1920 1940 1960 1980 2000
year

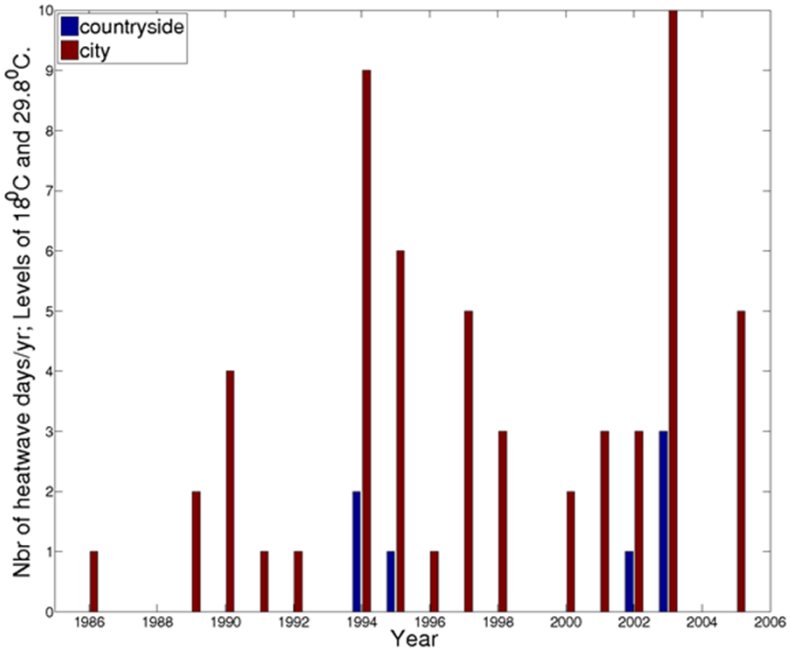

LCA BOUNDARY
TRADITIONAL URBAN METABOLISM BOUNDARY
Energy
Water
Materials
Nutrients
AIR EMISSIONS
GHGs
CAP
Other
OUTPUTS
Energy
Water
Materials
Nutrients
WASTE
Solid Waste
Wastewater
Legend
Life-cycle Processes
Air Emission
Output
Waste
Air Emissions, Outputs, and Waste


NOAA/ESRL Physical Sciences Division
80N
75N
70N
65N
60N
55N
50N
45N
40N
35N
30N
20W
15W
10W
5W
0
5E
10E
15E
20E
25E
30E
35E
40E
45E
4.5
3.5
2.5
1.5
0.5
−0.5
−1.5
−2.5
−3.5
−4.5
Surface Air Temperature (C) Composite Anomaly (1968−1996 Climatology)
6/1/03 to 8/31/03

u1

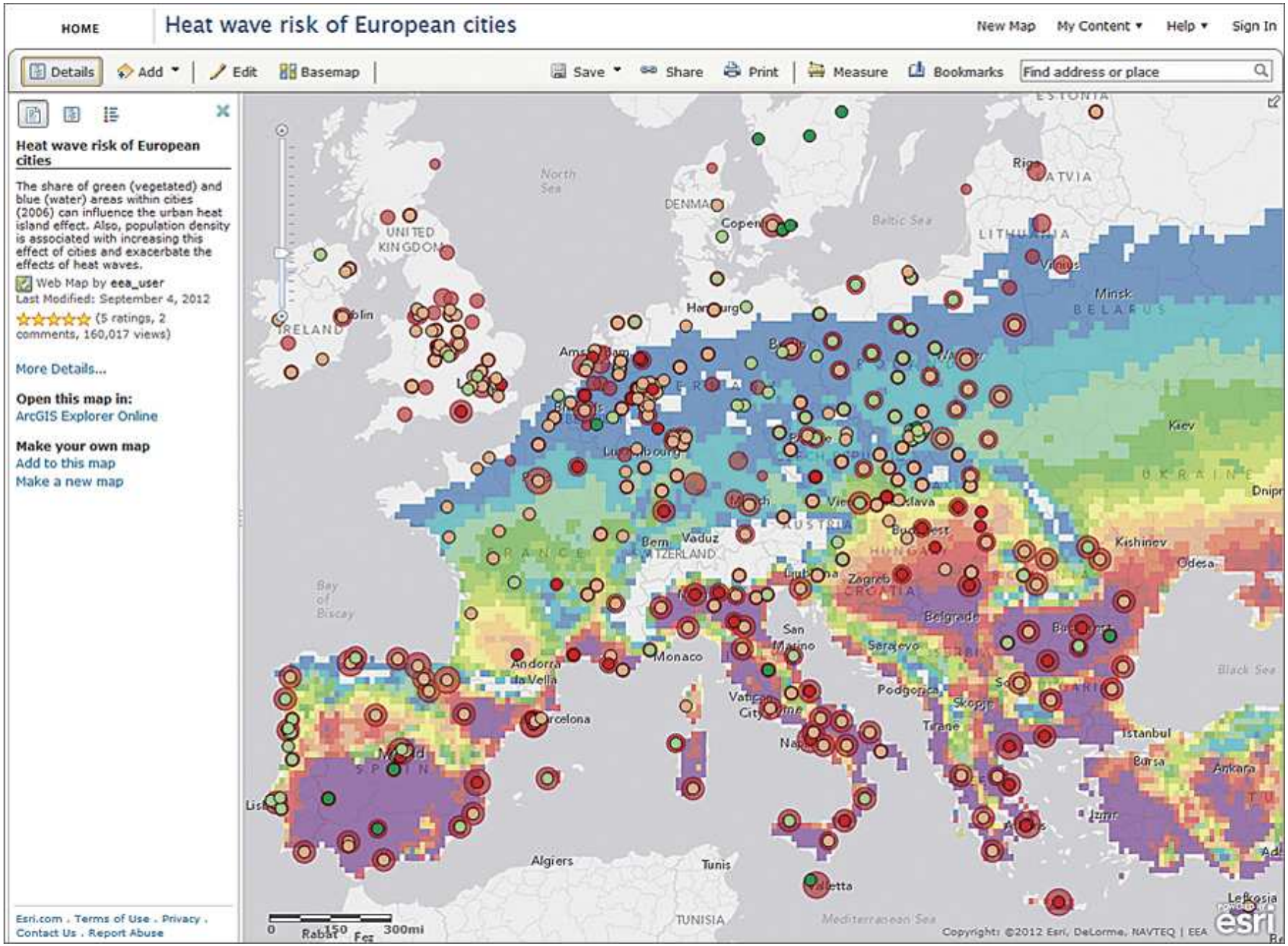


Della marta & Beniston 2007



Diapositiva 6

u1 utente; 07/09/2015


HOME
Heat wave risk of European cities
New Map
My Content
Help
Sign In
Details
Add
Edit
Basemap
Save
Share
Print
Measure
Bookmarks
Find address or place
Heat wave risk of European cities
The share of green (vegetated) and blue (water) areas within cities (2006) can influence the urban heat island effect. Also, population density is associated with increasing this effect of cities and exacerbate the effects of heat waves.
Web Map by eea_user
Last Modified: September 4, 2012
(5 ratings, 2 comments, 160,017 views)
More Details...
Open this map in:
ArcGIS Explorer Online
Make your own map
Add to this map
Make a new map
Esri.com . Terms of Use . Privacy .
Contact Us . Report Abuse
North Sea
Baltic Sea
Bay of Biscay
Black Sea
Mediterranean Sea
UNITED KINGDOM
IRELAND
DENMARK
LATVIA
LITHUANIA
BELARUS
Minsk
Kiev
UKRAINE
Kishinev
Odesa
Istanbul
Bursa
Ankara
Izmir
Lefkosia
Algiers
Tunis
TUNISIA
Rabat
Fez
0
150
300mi
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esri

The main causes of illness and death during a heatwave are **respiratory and cardiovascular diseases**. Additionally, there are specific heat-related illnesses including:

- **heat cramps** – caused by dehydration and loss of electrolytes, often following exercise
- **heat rash** – small, red, itchy papules
- **heat oedema** – mainly in the ankles, due to vasodilation and retention of fluid
- **heat syncope** – dizziness and fainting, due to dehydration, vasodilation, cardiovascular disease and certain medications
- **heat exhaustion** – is more common. It occurs as a result of water or sodium depletion, with non-specific features of malaise, vomiting and circulatory collapse, and is present when the core temperature is between 37°C and 40°C – left untreated, heat exhaustion may evolve into heatstroke
- **heatstroke** – can become a point of no return whereby the body's thermoregulation mechanism fails. This leads to a medical emergency, with symptoms of confusion; disorientation; convulsions; unconsciousness; hot dry skin; and core body temperature exceeding 40°C for between 45 minutes and eight hours. It can result in cell death, organ failure, brain damage or death. Heatstroke can be either classical or exertional (eg in athletes)

Long-term or severe illness

People with long-term or severe illness are likely to be at particular risk, including the following conditions:

- respiratory disease
- cardiovascular and cerebrovascular conditions
- diabetes and obesity
- severe mental illness
- Parkinson's disease and difficulties with mobility
- renal insufficiency
- peripheral vascular conditions
- Alzheimer's or related diseases

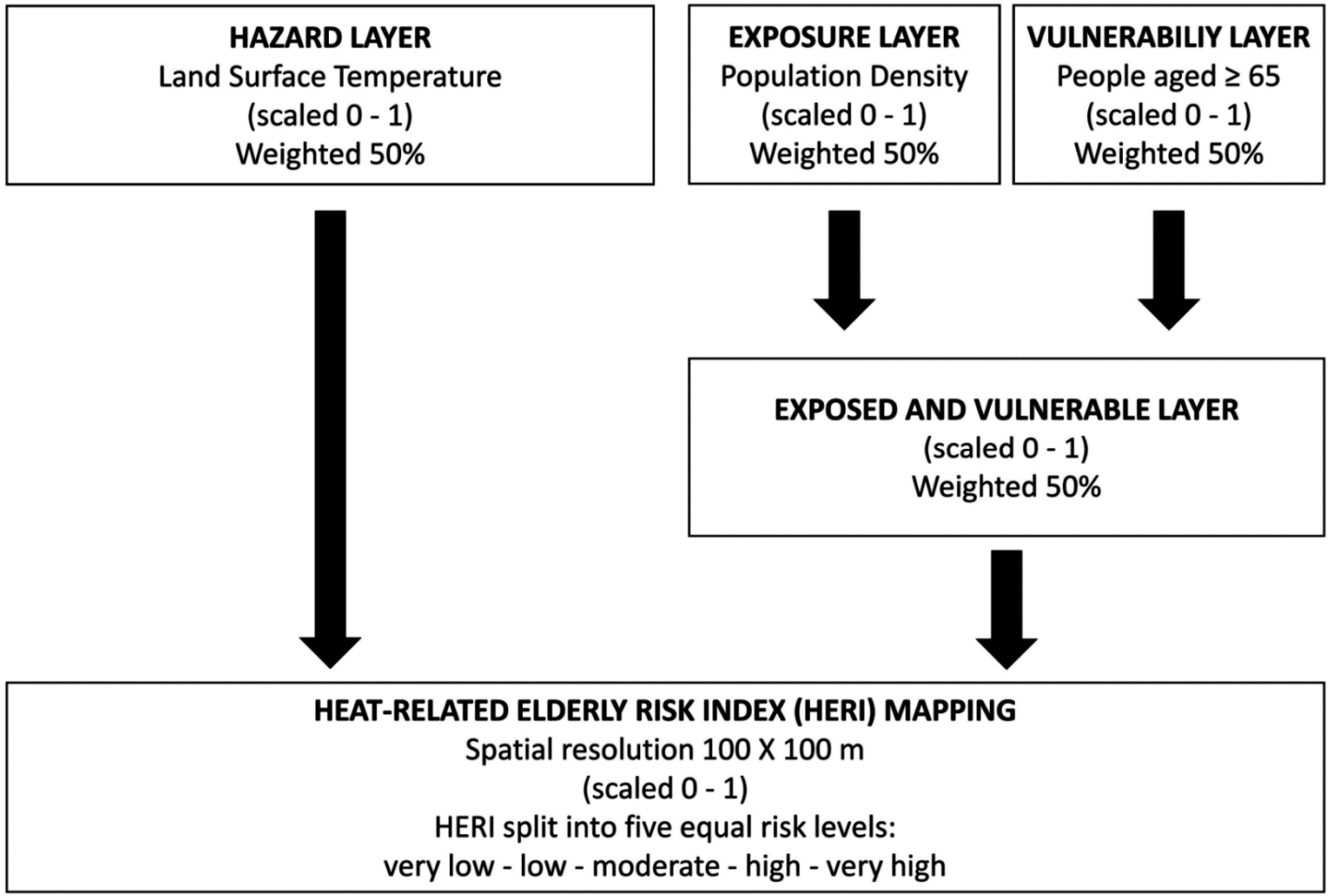
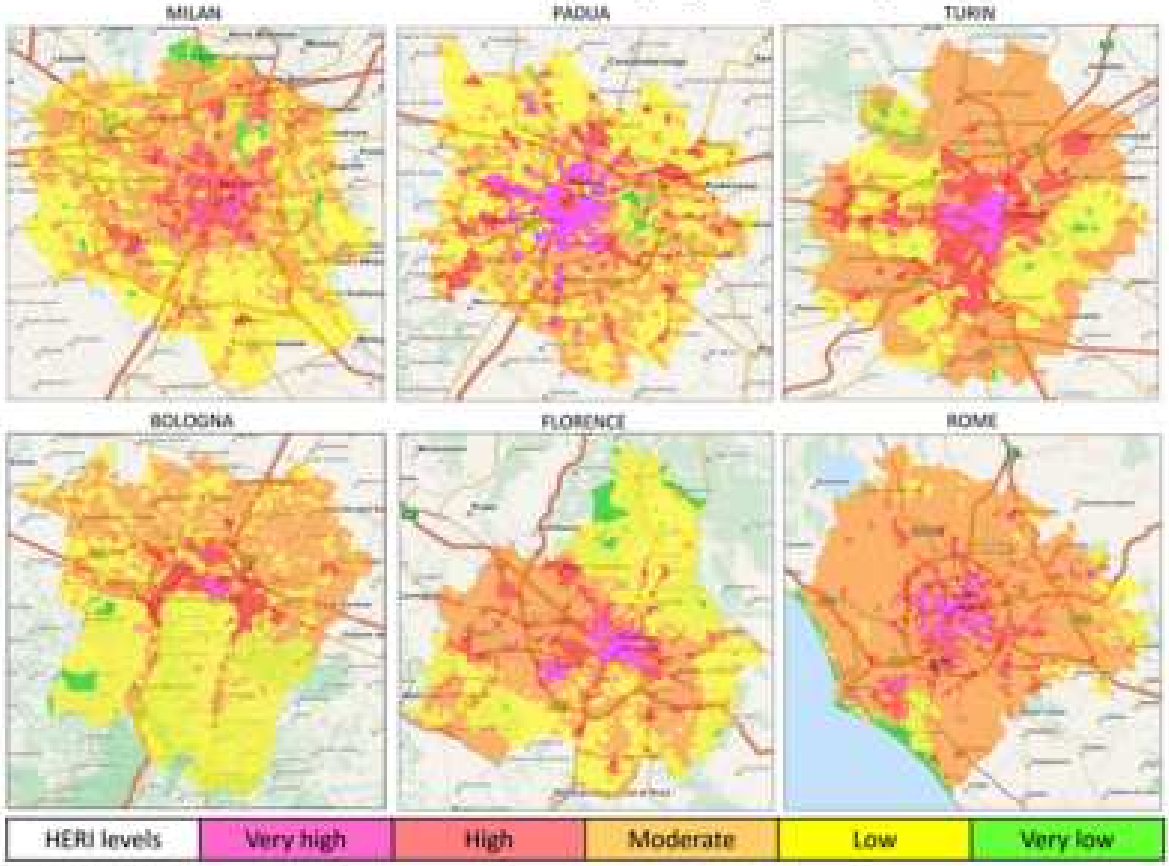

HAZARD LAYER
Land Surface Temperature
(scaled 0 - 1)
Weighted 50%
EXPOSURE LAYER
Population Density
(scaled 0 - 1)
Weighted 50%
VULNERABILIY LAYER
People aged ≥ 65
(scaled 0 - 1)
Weighted 50%
EXPOSED AND VULNERABLE LAYER
(scaled 0 - 1)
Weighted 50%
HEAT-RELATED ELDERLY RISK INDEX (HERI) MAPPING
Spatial resolution 100 X 100 m
(scaled 0 - 1)
HERI split into five equal risk levels:
very low - low - moderate - high - very high

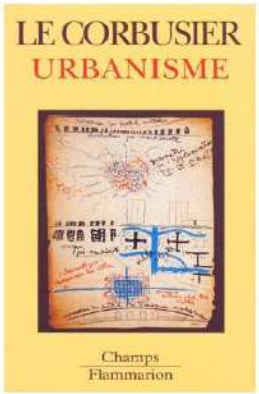
Fig 2. Maps of daytime heat-related elderly risk levels in the main inland Italian cities during the 2001–2013 summers (May-September).



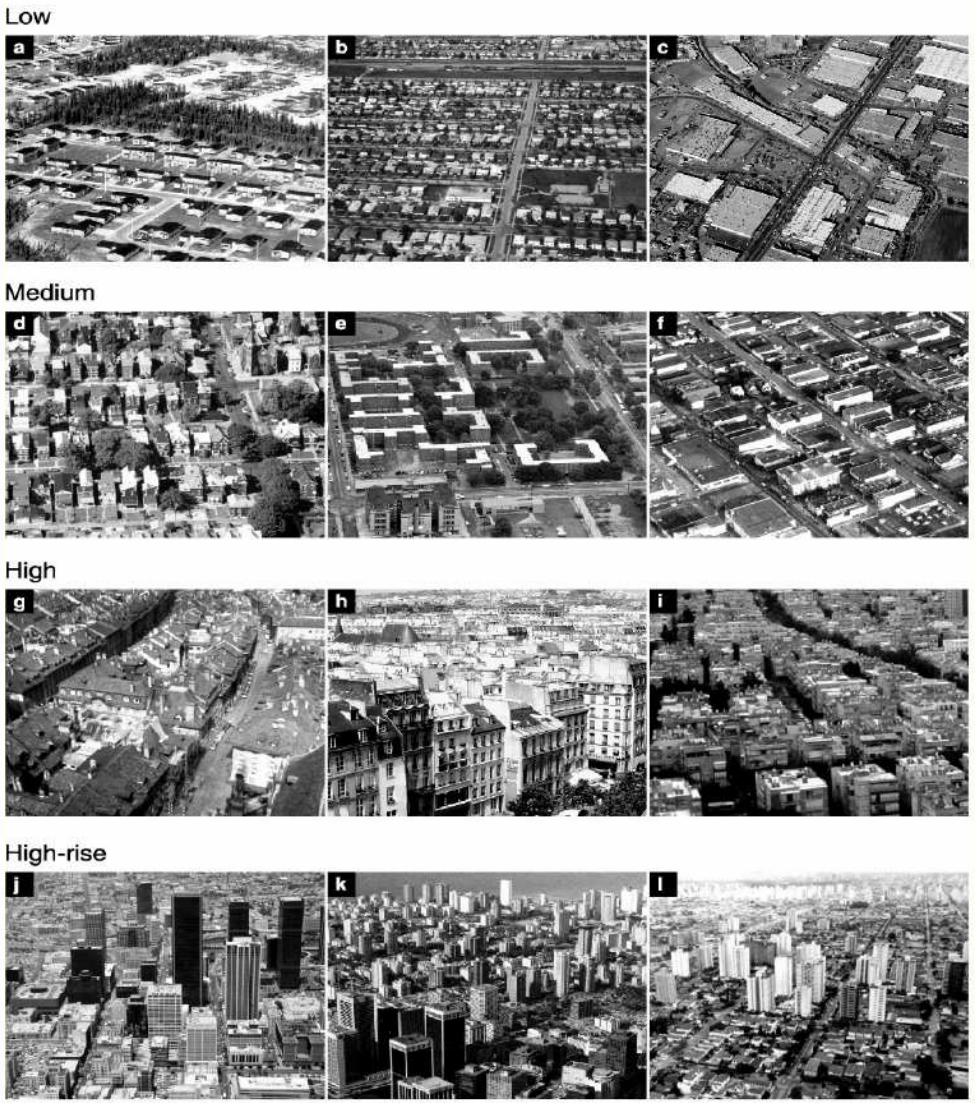
Morabito M, Crisci A, Gioli B, Gualtieri G, Toscano P, et al. (2015) Urban-Hazard Risk Analysis: Mapping of Heat-Related Risks in the Elderly in Major Italian Cities. PLoS ONE 10(5): e0127277. doi:10.1371/journal.pone.0127277
http://127.0.0.1:8081/plosone/article?id=info:doi/10.1371/journal.pone.0127277

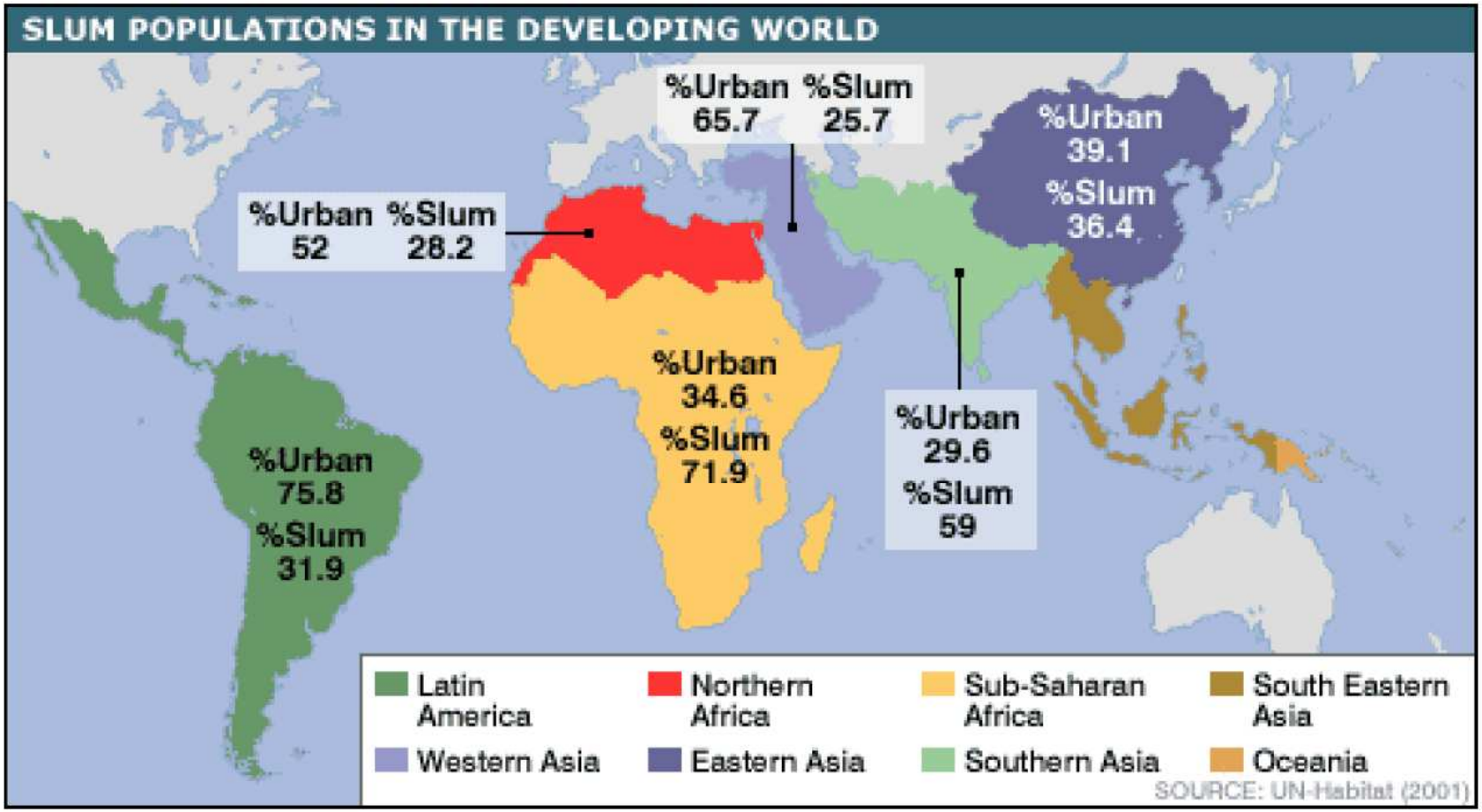
Le Corbusier 1924

"La ville est un outil de travail. Les villes ne remplissent plus normalement cette fonction. Elles sont inefficaces : elles usent le corps, elles contrecarrent l'esprit. Le désordre qui s'y multiplie est offensant.



leur déchéance blesse notre amour-propre et froisse notre dignité. Elles ne sont pas dignes de l'époque: *elles ne sont plus dignes de nous*."





Per la maggior parte della popolazione umana il futuro e' rappresentabile attraverso l'orizzonte degradato dell'accampamento urbano (urban sprawl)

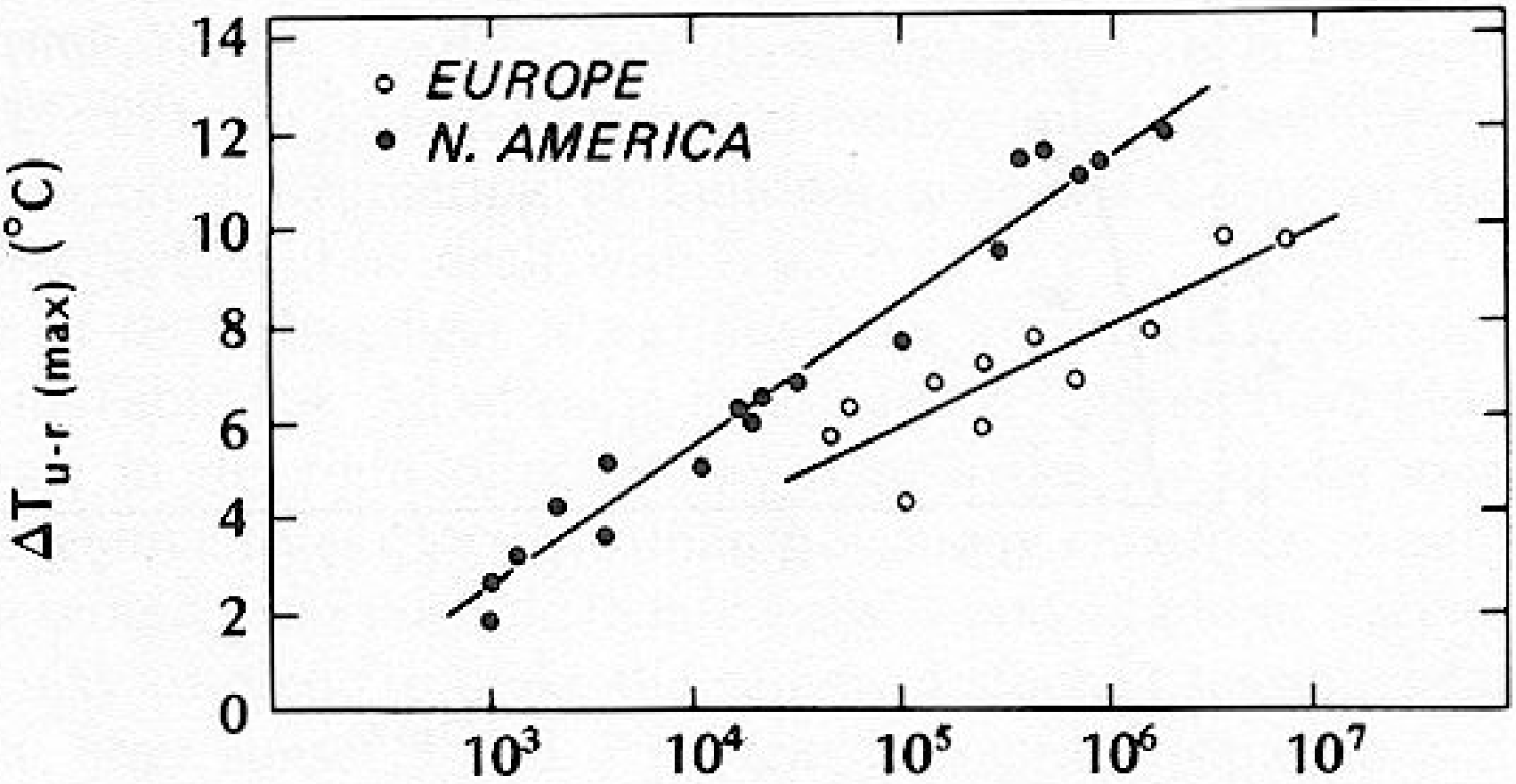
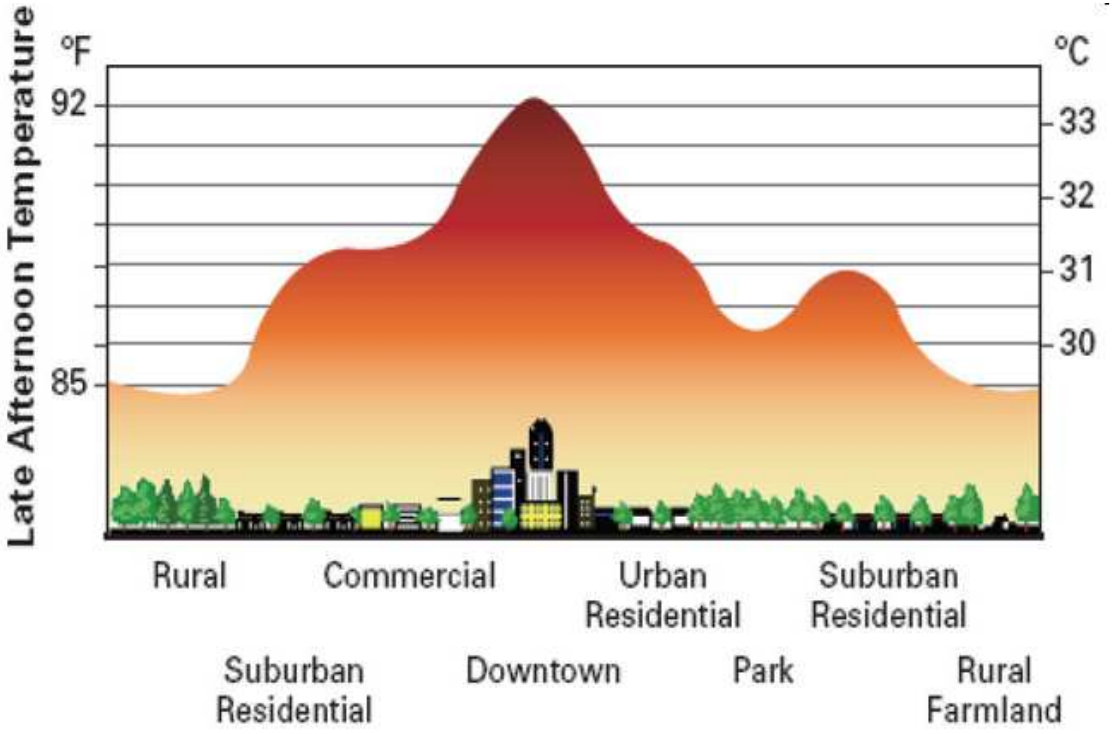


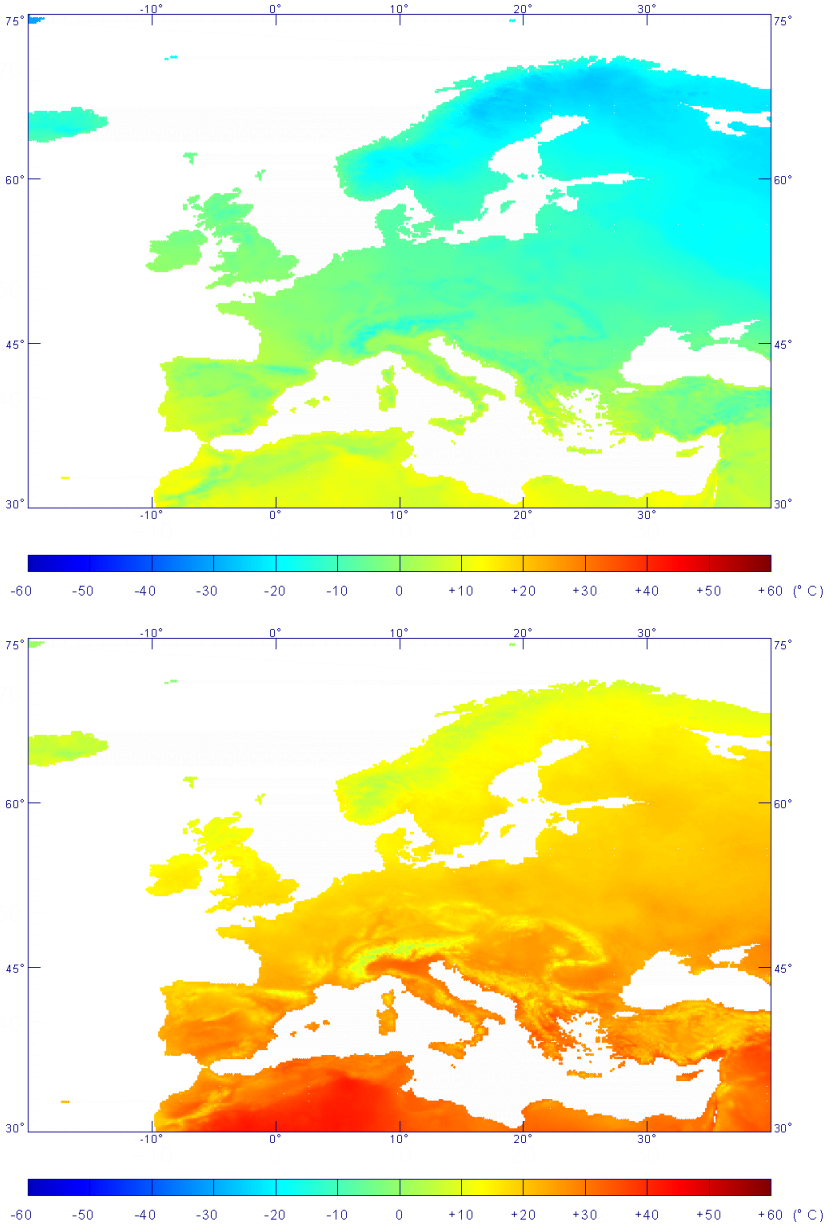
Figure 8.15 Relation between maximum observed heat island intensity ($\Delta T_{u-r(max)}$) and population (P) for North American and European settlements (modified after Oke, 1973).

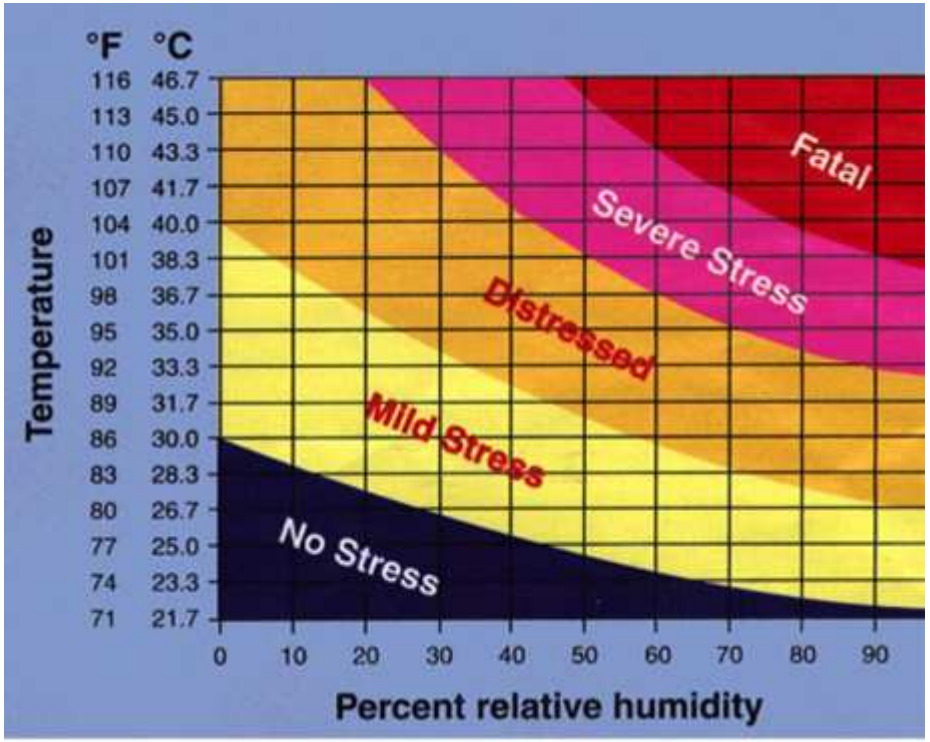

Temperature (˚C)
0
50


Late Afternoon Temperature
°F
°C
92
85
33
32
31
30
Rural
Commercial
Urban Residential
Suburban Residential
Suburban Residential
Downtown
Park
Rural Farmland

Seasonal values of PET for different IPCC-Scenarios for 1960-1990 and 2070-2100 for Europe

		Winter	Spring	Summer	Autumn
Base	**Max**	**16.0**	**27.2**	**43.1**	**29.8**
	Min	**-27.6**	**-15.0**	**1.2**	**-13.9**
A1F	**Max**	**21.2**	**34.7**	**51.6**	**37.9**
	Min	**-17.9**	**-6.9**	**5.7**	**-7.0**
A2A	**Max**	**20.3**	**33.4**	**51.5**	**36.4**
	Min	**-19.4**	**-8.6**	**5.4**	**-8.1**
B1A	**Max**	**18.4**	**30.7**	**48.3**	**33.8**
	Min	**-20.8**	**-10.4**	**3.8**	**-10.5**
B2A	**Max**	**19.2**	**31.6**	**49.5**	**34.7**
	Min	**-22.1**	**-10.7**	**4.2**	**-9.2**





PET (°C)	Thermal sensation	Physiological stress level
	very cold	extreme cold stress
4	……	……
	cold	strong cold stress
8	……	……
	cool	moderate cold stress
13	……	…….
	slightly cool	slight cold stress
18	…….	…….
	comfortable	no thermal stress
23	…….	……..
	slightly warm	slight heat stress
29	…….	……..
	warm	moderate heat stress
35	…….	……..
	hot	strong heat stress
41	…….	……..
	very hot	extreme heat stress

Thermal Comfort

Six factors that affect thermal comfort

- Temperature
- Wind Velocity
- Mean Radiant Temperature
- Humidity
- Clothing Insulation Factor
- Metabolic Heat Rate

Figure 3a: Typical Daily Summer Rural Energy Balance

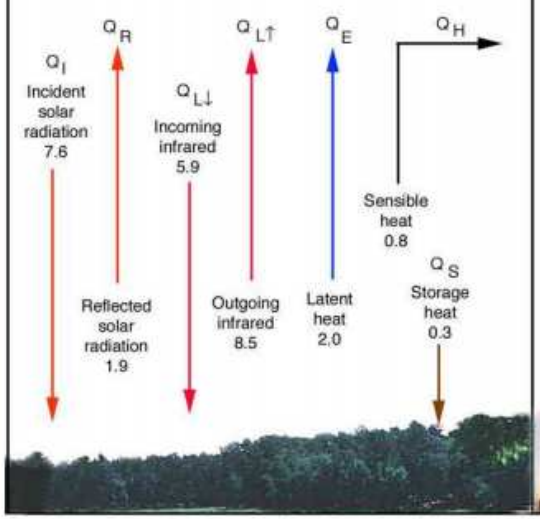
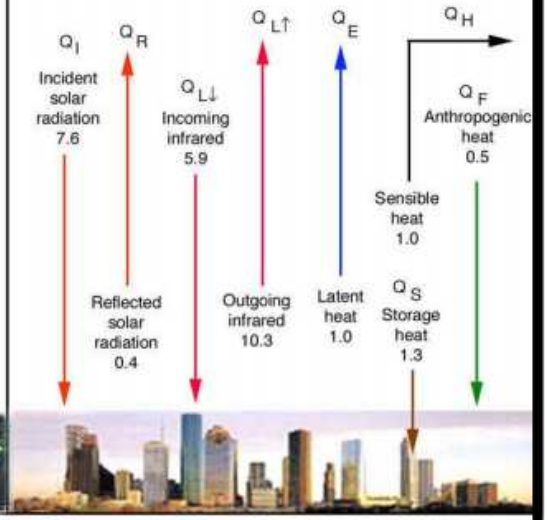
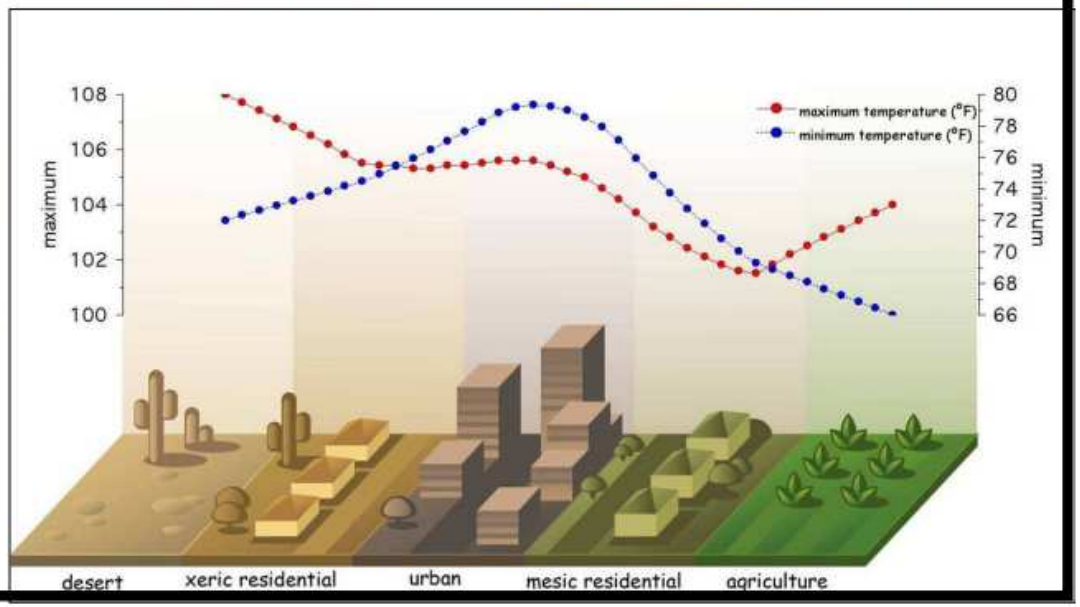
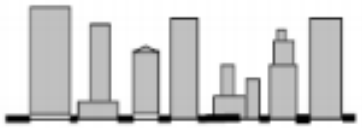


Figure 3b: Typical Daily Summer Urban Energy Balance

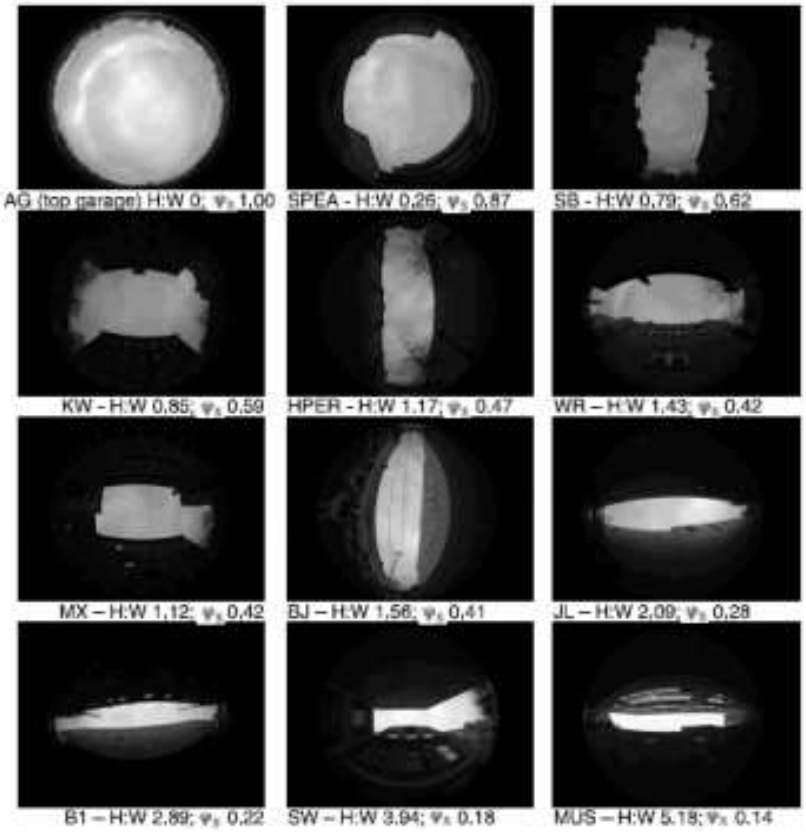




Urban Climate Zone, UCZ[1]	Image	Roughness class[2]	Aspect ratio[3]	% Built (impermeable)[4]
1. Intensely developed urban with detached close-set high-rise buildings with cladding, e.g. downtown towers		8	> 2	> 90
2. Intensely developed high density urban with 2 – 5 storey, attached or very close-set buildings often of brick or stone, e.g. old city core		7	1.0 – 2.5	> 85
3. Highly developed, medium density urban with row or detached but close-set houses, stores & apartments e.g. urban housing		7	0.5 – 1.5	70 - 85
4. Highly developed, low or medium density urban with large low buildings & paved parking, e.g. shopping mall, warehouses		5	0.05 – 0.2	70 - 95
5. Medium development, low density suburban with 1 or 2 storey houses, e.g. suburban housing		6	0.2 – 0.6, up to >1 with trees	35 - 65
6. Mixed use with large buildings in open landscape, e.g. institutions such as hospital, university, airport		5	0.1 – 0.5, depends on trees	< 40
7. Semi-rural development, scattered houses in natural or agricultural area, e.g. farms, estates		4	> 0.05, depends on trees	< 10

Key to image symbols: buildings; vegetation; impervious ground; pervious ground

SKY-VIEW FACTORS ESTIMATION

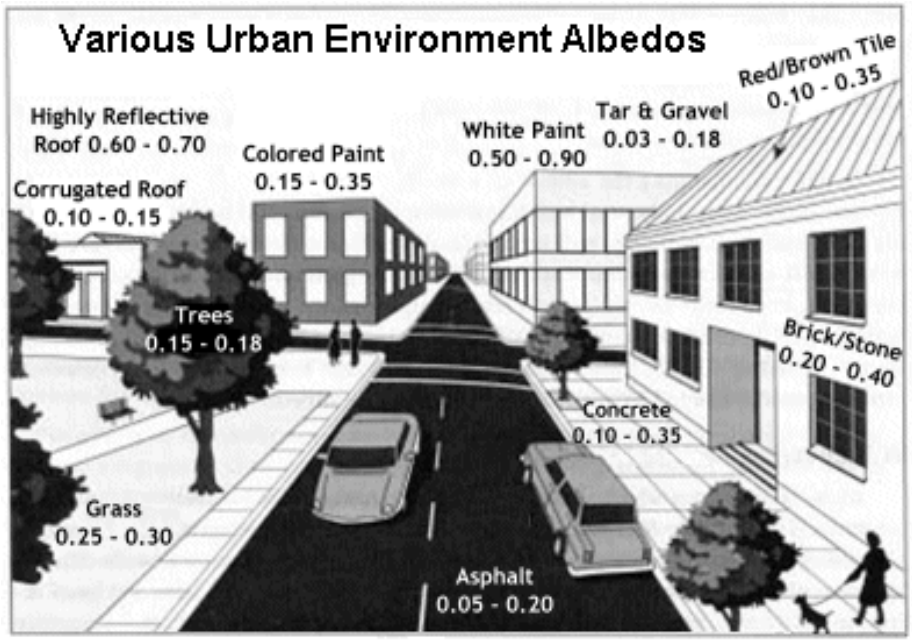


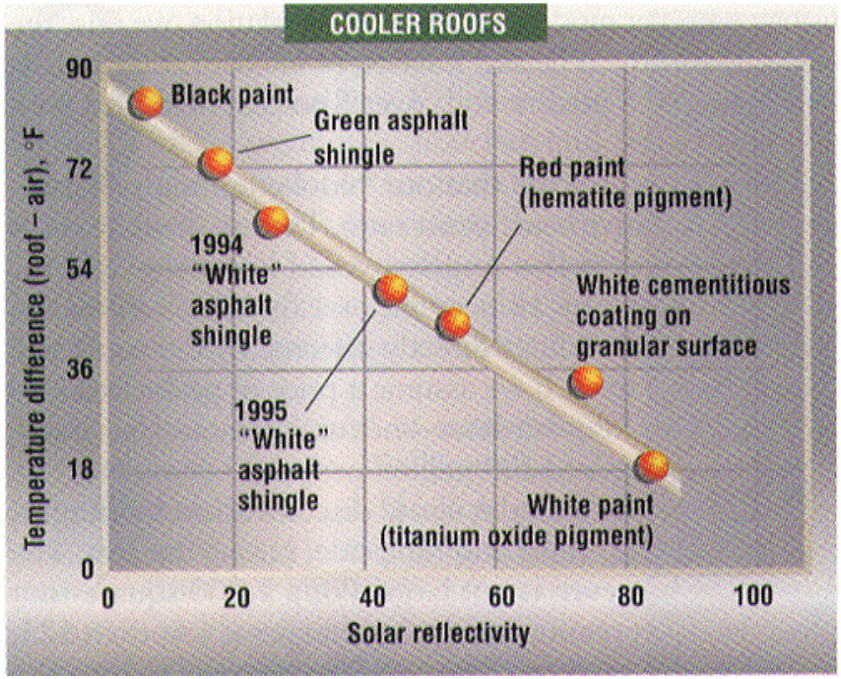
AG (top garage) H:W 0; ψ_s 1,00 SPEA - H:W 0,26; ψ_s 0,87 SB - H:W 0,79; ψ_s 0,62

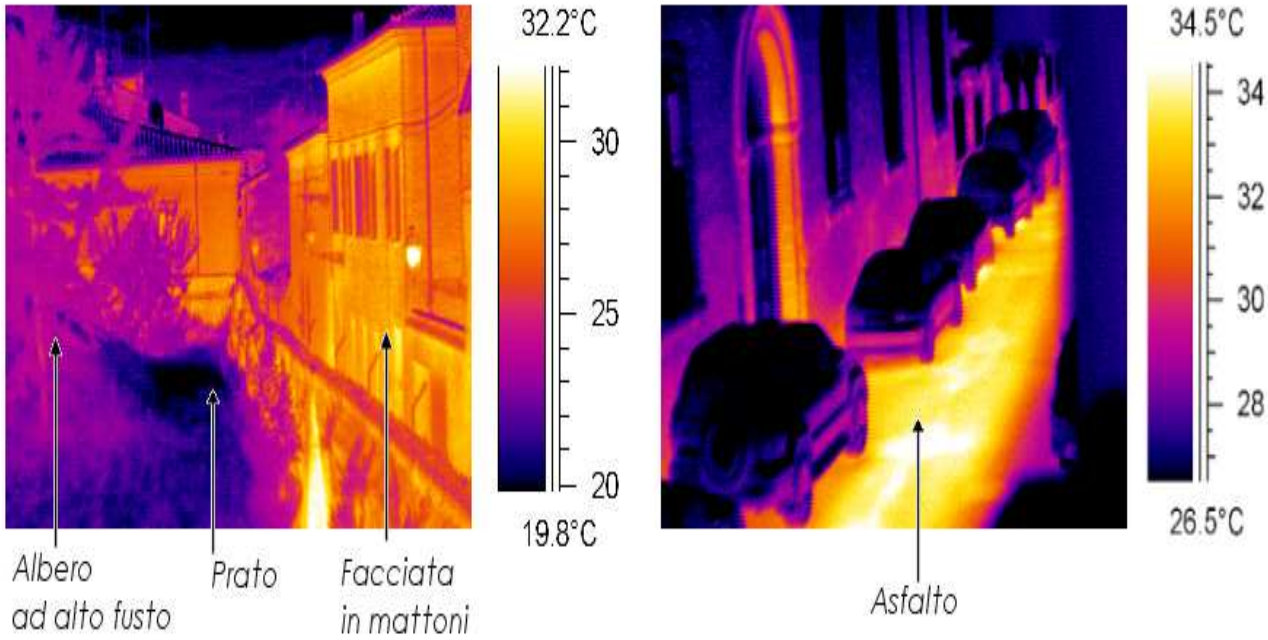
KW – H:W 0,85; ψ_s 0,59 HPER - H:W 1,17; ψ_s 0,47 WR – H:W 1,43; ψ_s 0,42

MX – H:W 1,12; ψ_s 0,42 BJ – H:W 1,56; ψ_s 0,41 JL – H:W 2,09; ψ_s 0,28

B1 – H:W 2,89; ψ_s 0,22 SW – H:W 3,94; ψ_s 0,18 MUS – H:W 5,18; ψ_s 0,14

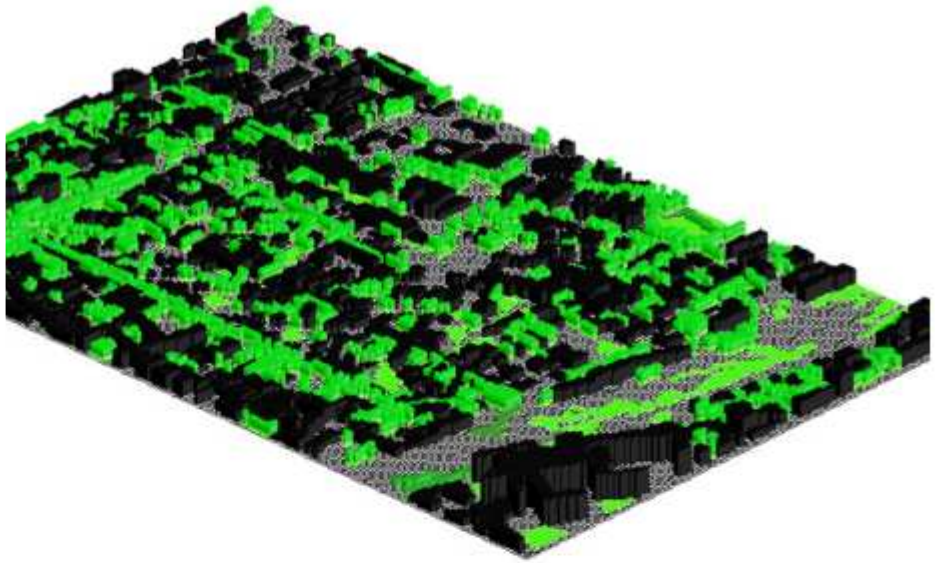

Various Urban Environment Albedos
Highly Reflective Roof 0.60 - 0.70
Corrugated Roof 0.10 - 0.15
Colored Paint 0.15 - 0.35
White Paint 0.50 - 0.90
Tar & Gravel 0.03 - 0.18
Red/Brown Tile 0.10 - 0.35
Trees 0.15 - 0.18
Brick/Stone 0.20 - 0.40
Concrete 0.10 - 0.35
Grass 0.25 - 0.30
Asphalt 0.05 - 0.20

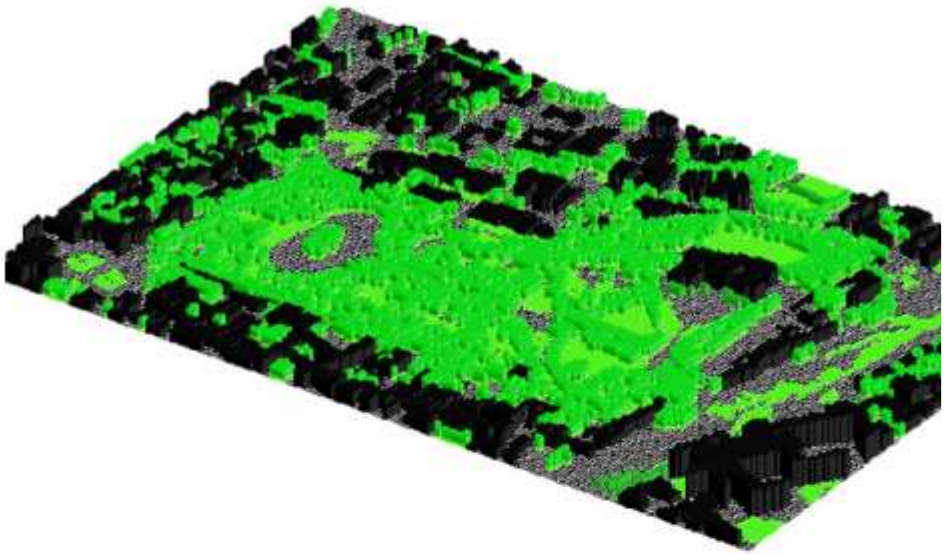

COOLER ROOFS
Temperature difference (roof – air), °F
90
72
54
36
18
0
Black paint
Green asphalt shingle
Red paint (hematite pigment)
1994 "White" asphalt shingle
White cementitious coating on granular surface
1995 "White" asphalt shingle
White paint (titanium oxide pigment)
0
20
40
60
80
100
Solar reflectivity

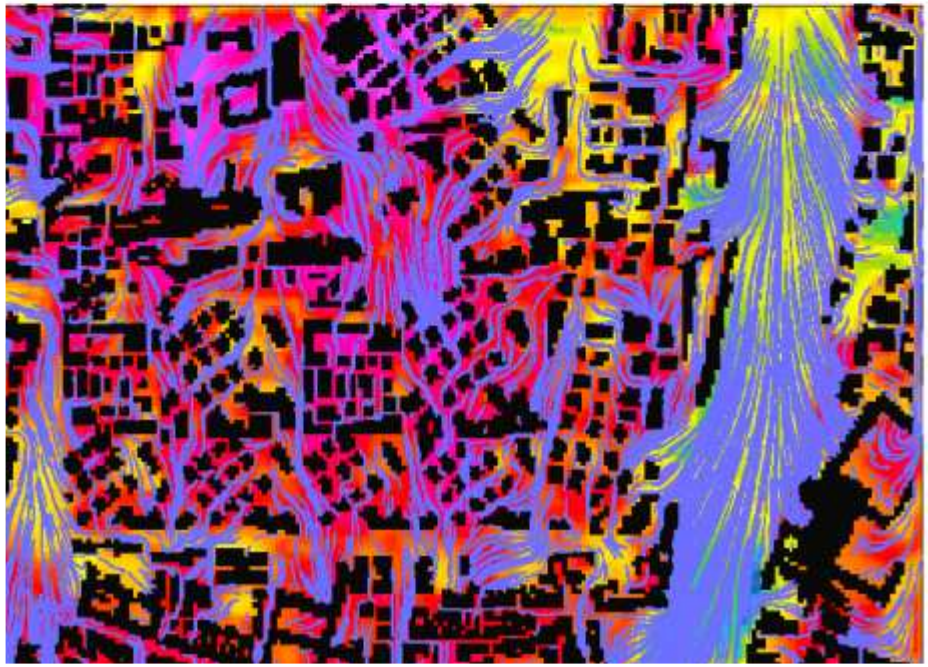

32.2°C
30
25
20
19.8°C
Albero ad alto fusto
Prato
Facciata in mattoni
34.5°C
34
32
30
28
26.5°C
Asfalto

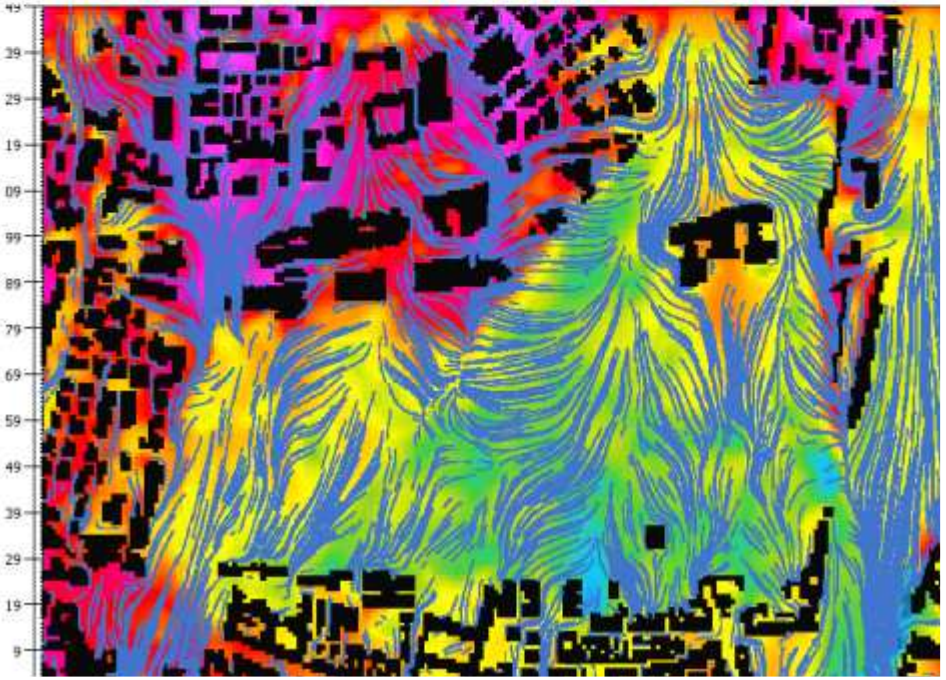

PIANTA
della Città
di
PARMA
Castello


Colorno le ville

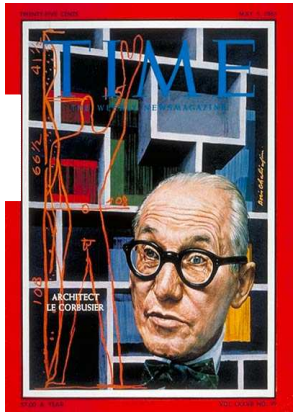


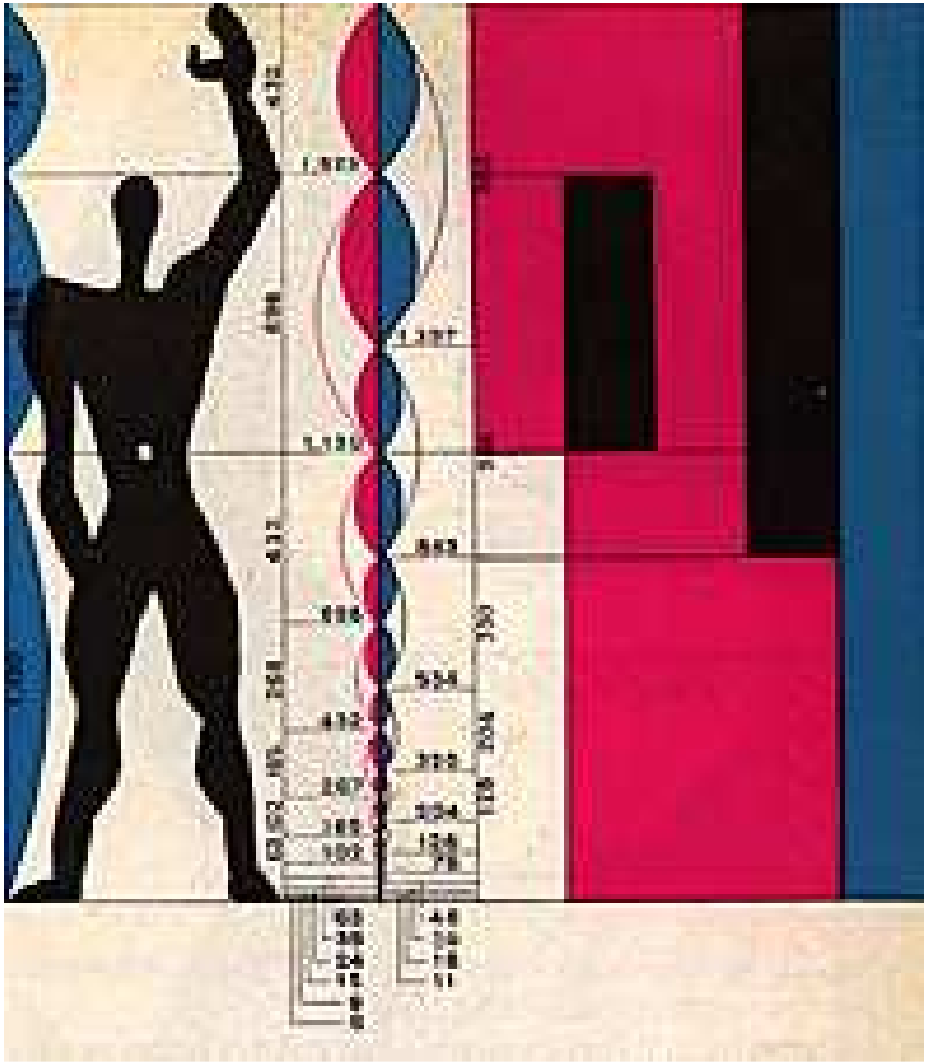


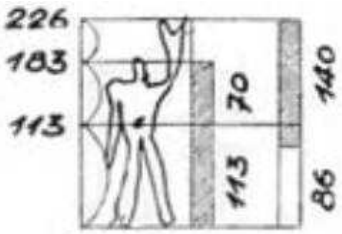


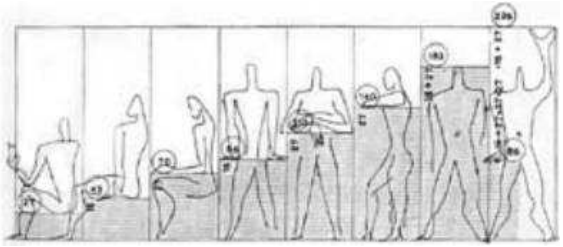


- ***"Les matériaux de l'urbanisme sont le soleil, le ciel, les arbres, l'acier, le ciment dans cet ordre et dans cette hiérarchie."***
- Le Corbusier









Le Modulor

Une nouvelle mesure humaine