Energy and Environmental Problems of Low Income Population in Greece and Europe

'Vulnerable People' by Michael Leunig

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The Actual Situation

Official statistics show that almost 80 million people in the European Union, or 16,4% of the total population lives below the poverty line in 2010, (Eurostat, 2012).

In parallel, around 23 % of the population is considered to be at risk of poverty or social exclusion.

The Actual Situation

The term energy poverty is used to describe a situation of a household not able to satisfy socially and materially the required levels of energy services in the house.

Energy poverty is mainly a result of a combination of low income together with inappropriate and non efficient housing.

The Actual Situation

Energy and fuel poverty is an increasing problem in the European Union.

Although the specific conditions vary from country to country the drivers defining fuel and energy poverty are similar in all Europe.

The specific levels of fuel and energy poverty in the various European countries differ as a function of the indicator used to identify and define the problem.

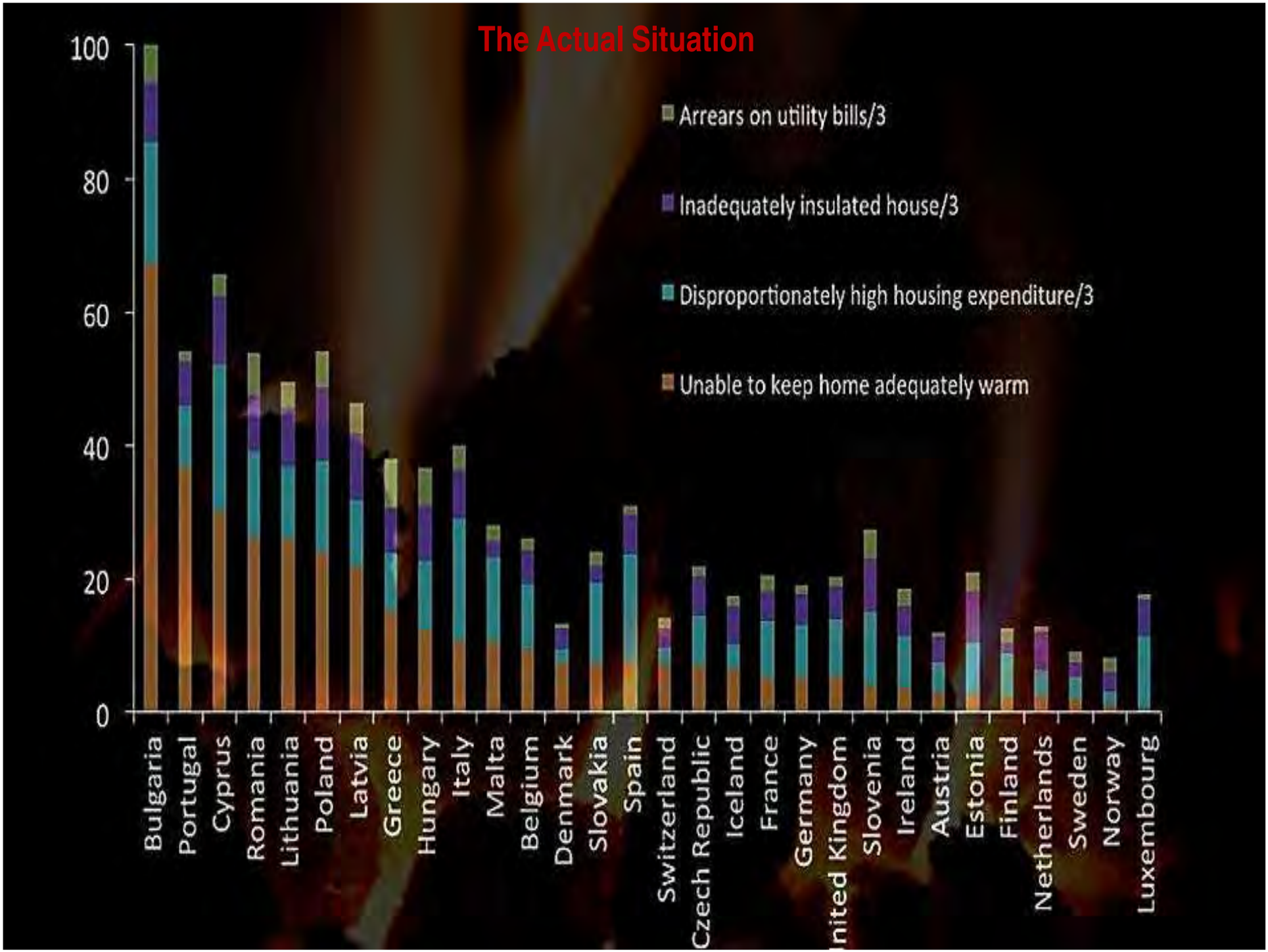
The Actual Situation

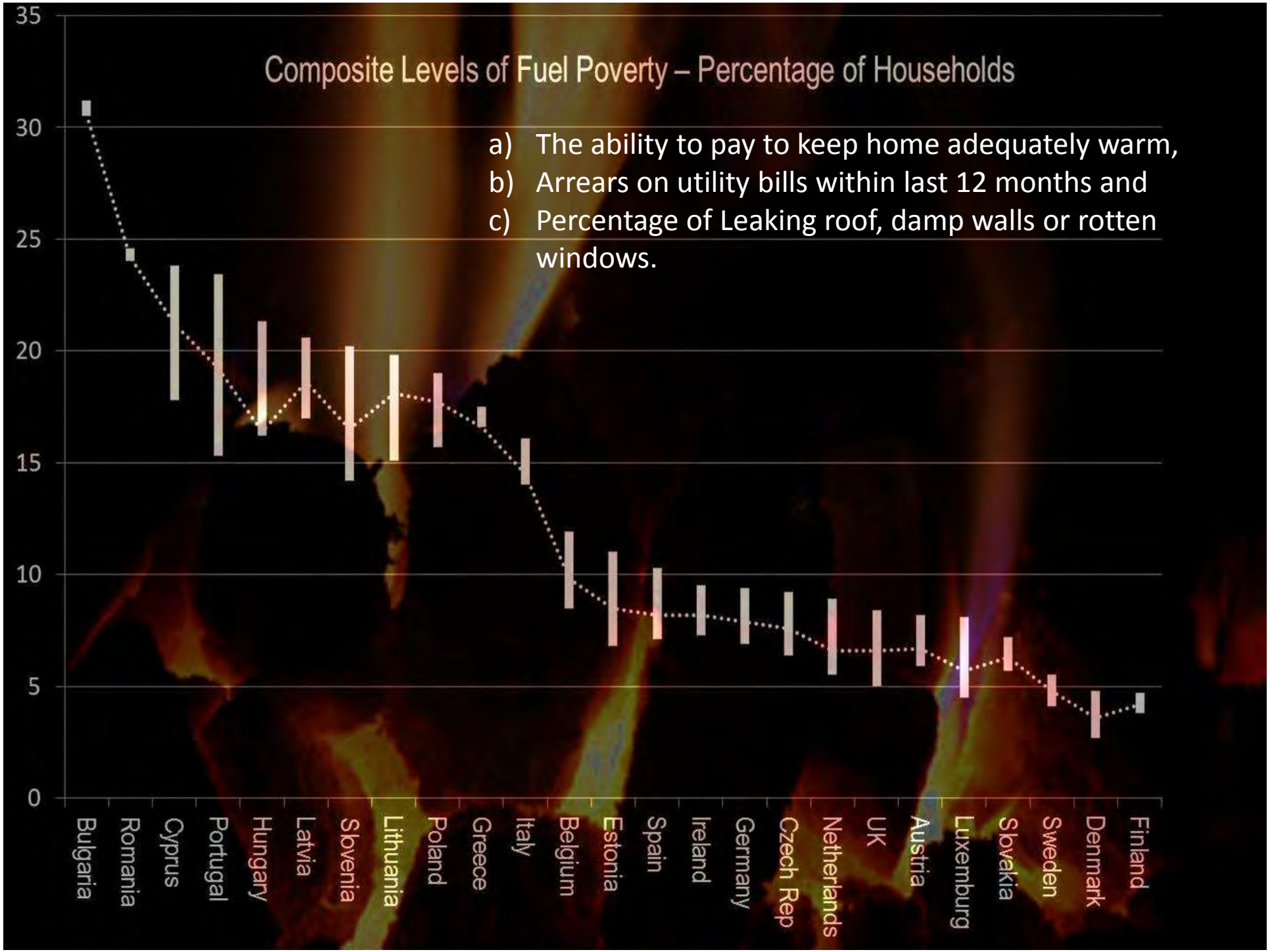
Two approaches are used: The expenditure approach where fuel poverty is calculated as a function of the energy spent or a consensual approach using subjective indicators

Subjective indicators may be the possession of a central heating system, the existence of insulation, etc.

The use of the expenditure approach is used currently in UK and it is highly criticized as it does not provide information on the deprivation and social exclusion elements of fuel poverty

The Actual Situation




Composite Levels of Fuel Poverty – Percentage of Households
a) The ability to pay to keep home adequately warm,
b) Arrears on utility bills within last 12 months and
c) Percentage of Leaking roof, damp walls or rotten windows.
35
30
25
20
15
10
5
0
Bulgaria
Romania
Cyprus
Portugal
Hungary
Latvia
Slovenia
Lithuania
Poland
Greece
Italy
Belgium
Estonia
Spain
Ireland
Germany
Czech Rep
Netherlands
UK
Austria
Luxemburg
Slovakia
Sweden
Denmark
Finland

Energy Poverty has a serious Impact on :

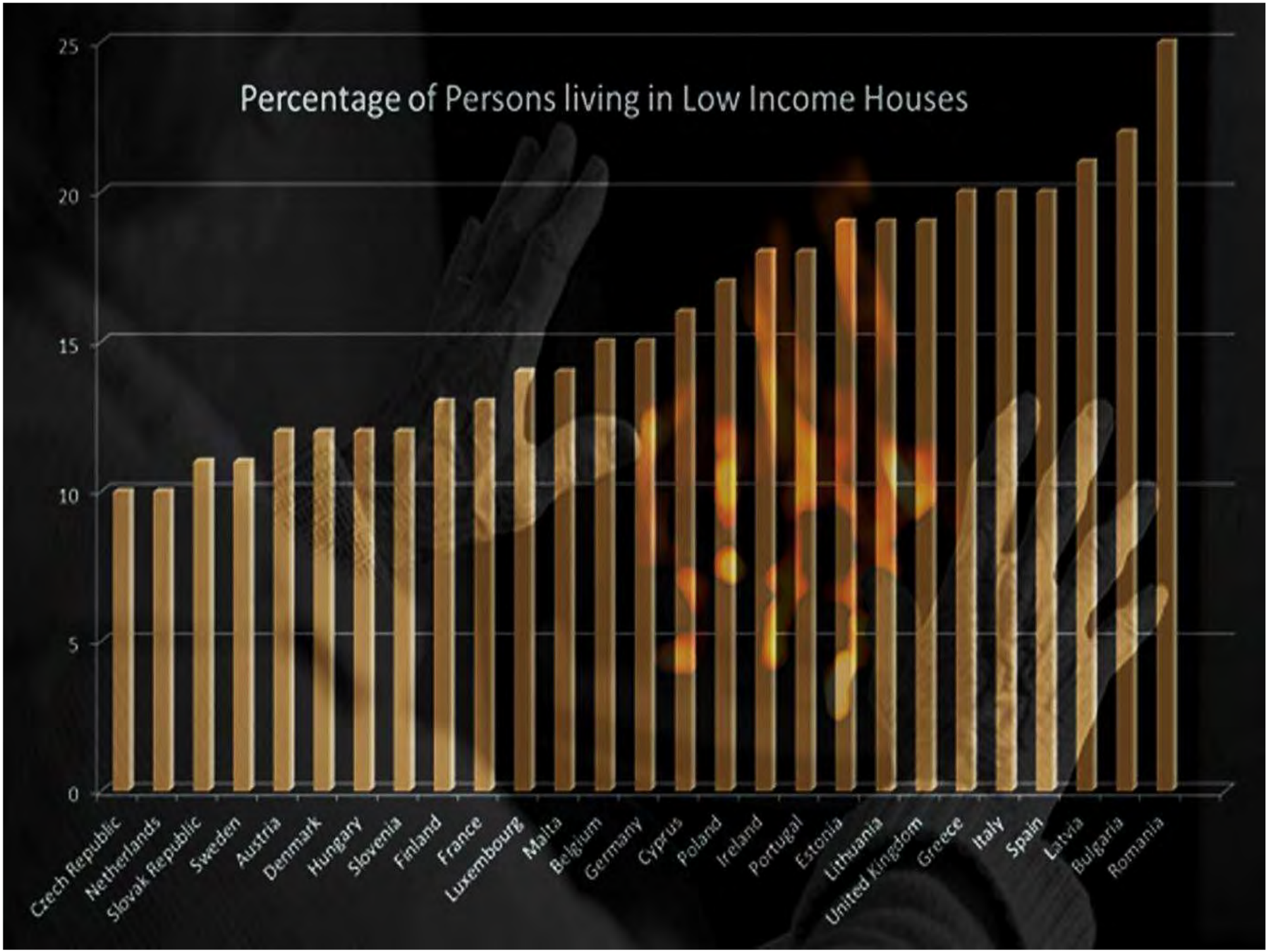
Thermal Comfort

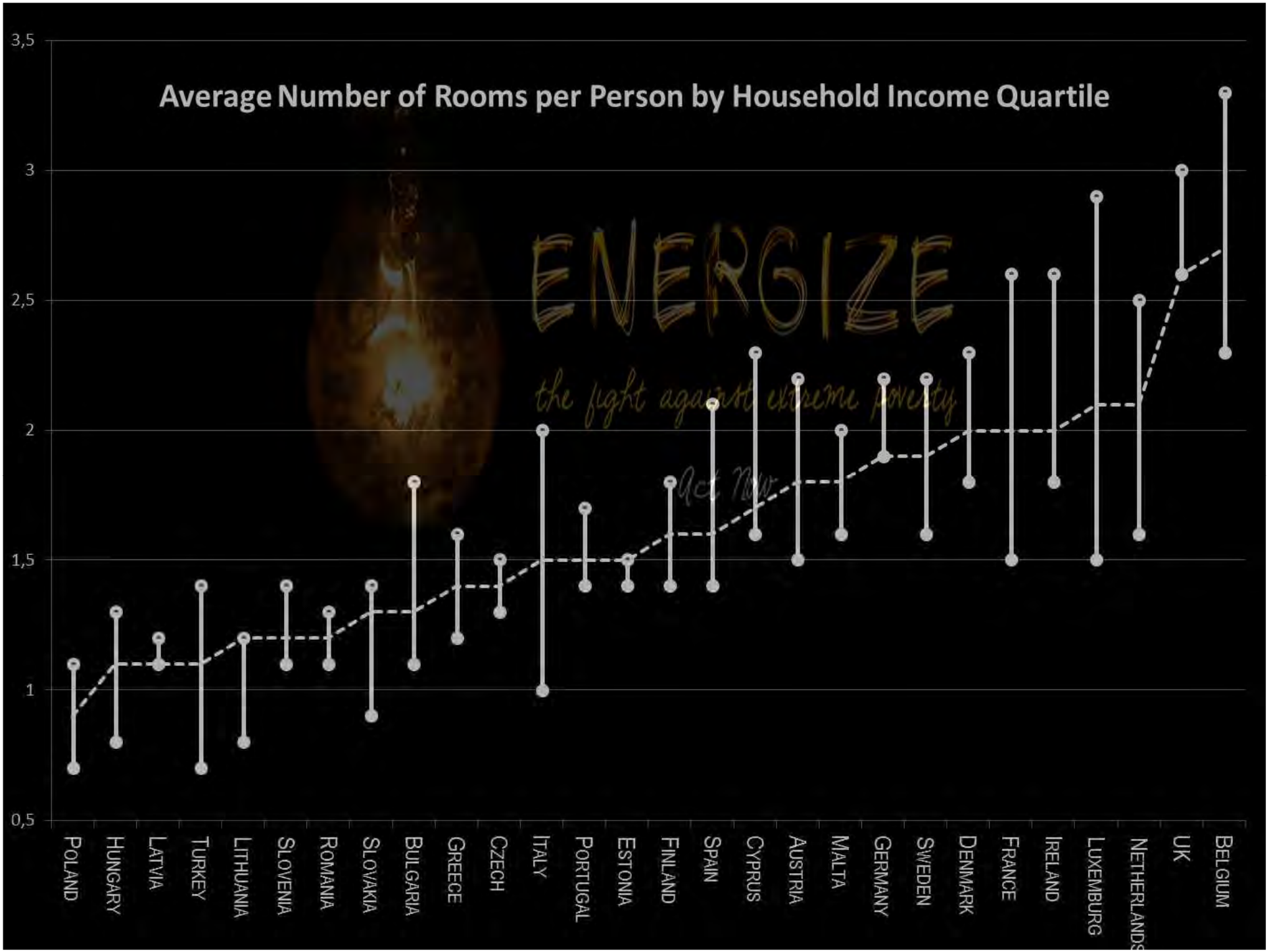
Health

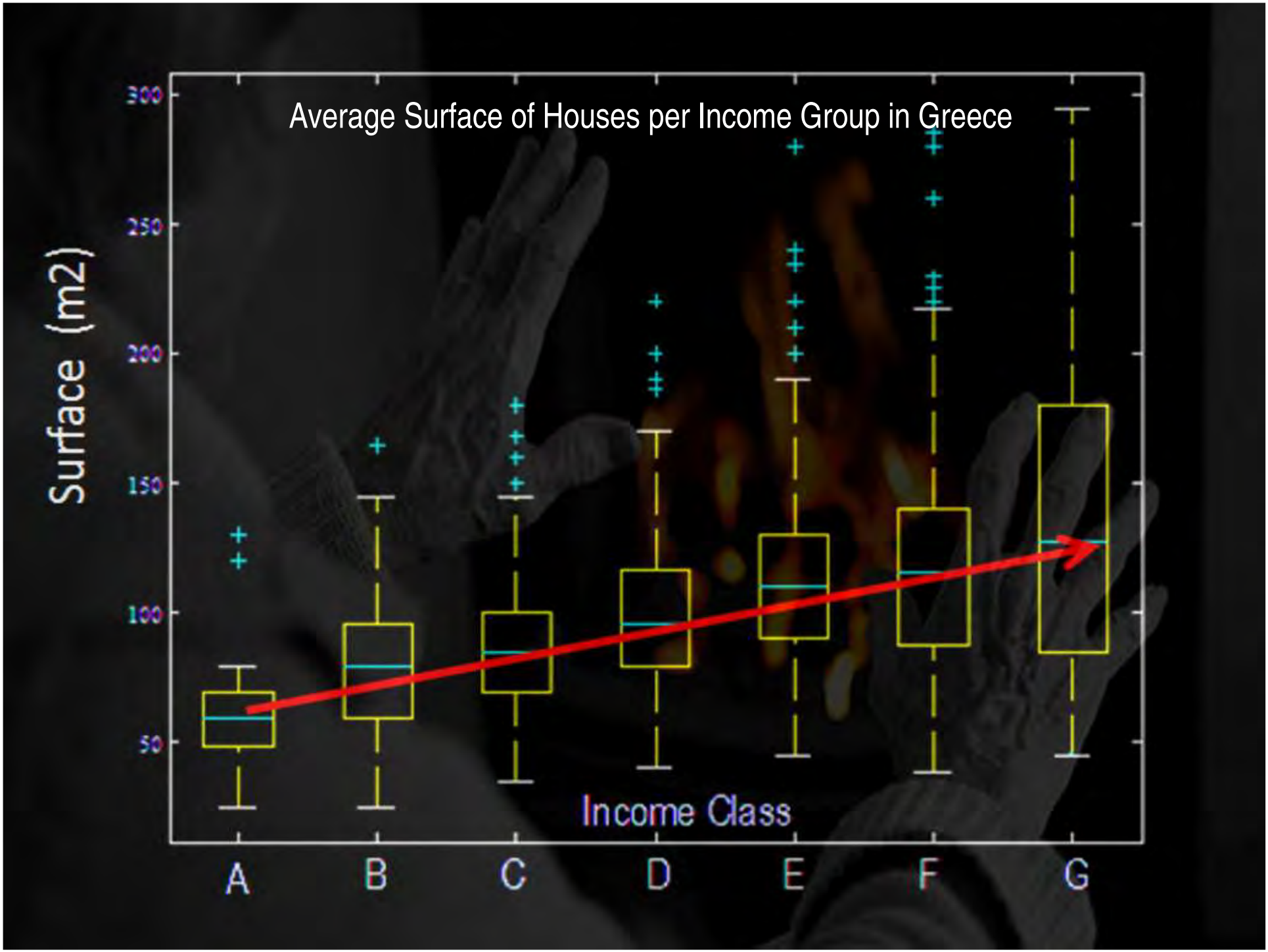
Energy

Economy

Quality of Life

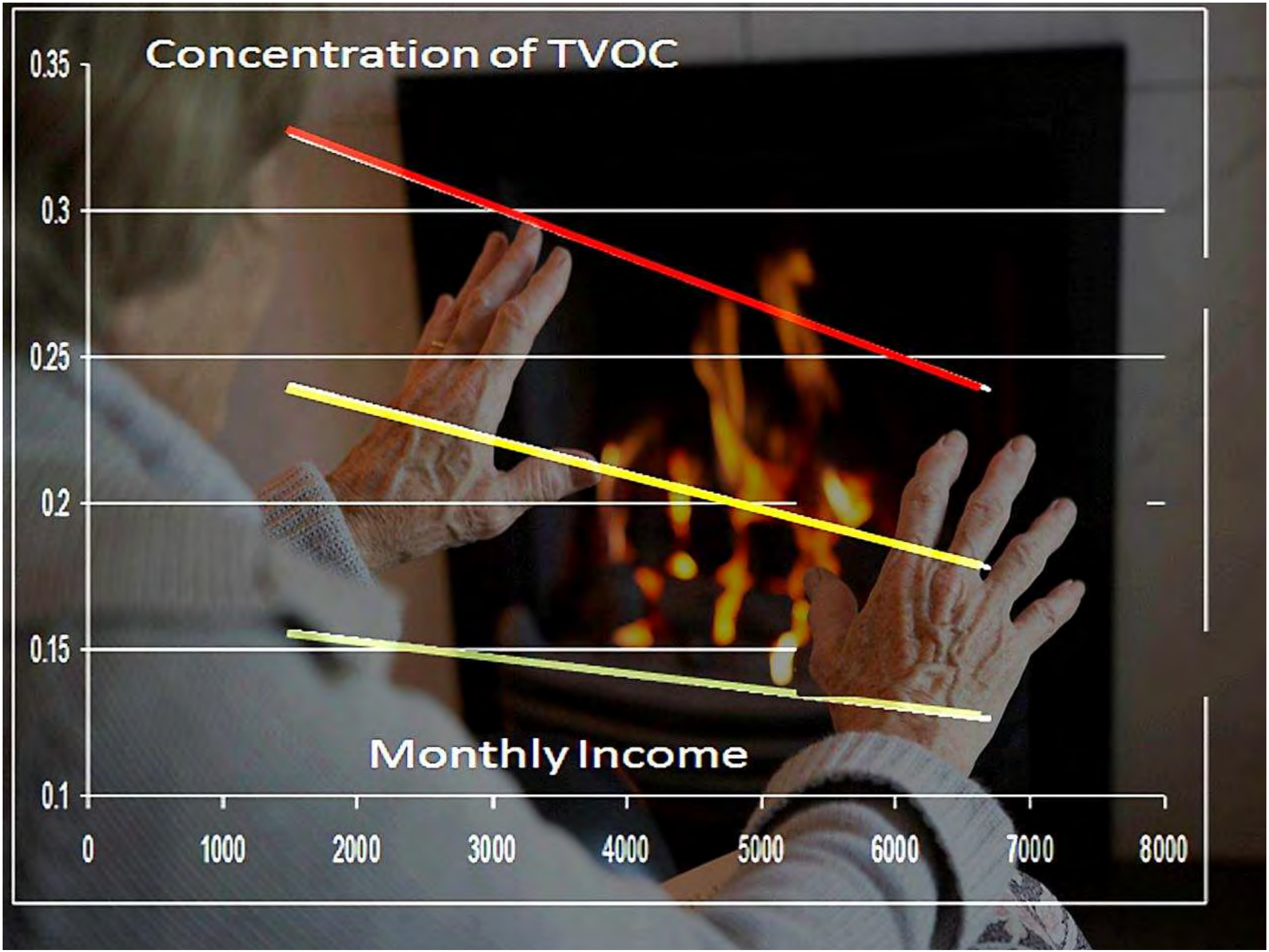

Percentage of Persons living in Low Income Houses
25
20
15
10
5
0
Crech Republic
Netherlands
Slovak Republic
Sweden
Austria
Denmark
Hungary
Slovenia
Finland
France
Luxembourg
Malta
Belgium
Germany
Cyprus
Poland
Ireland
Portugal
Estonia
Lithuania
United Kingdom
Greece
Italy
Spain
Latvia
Bulgaria
Romania

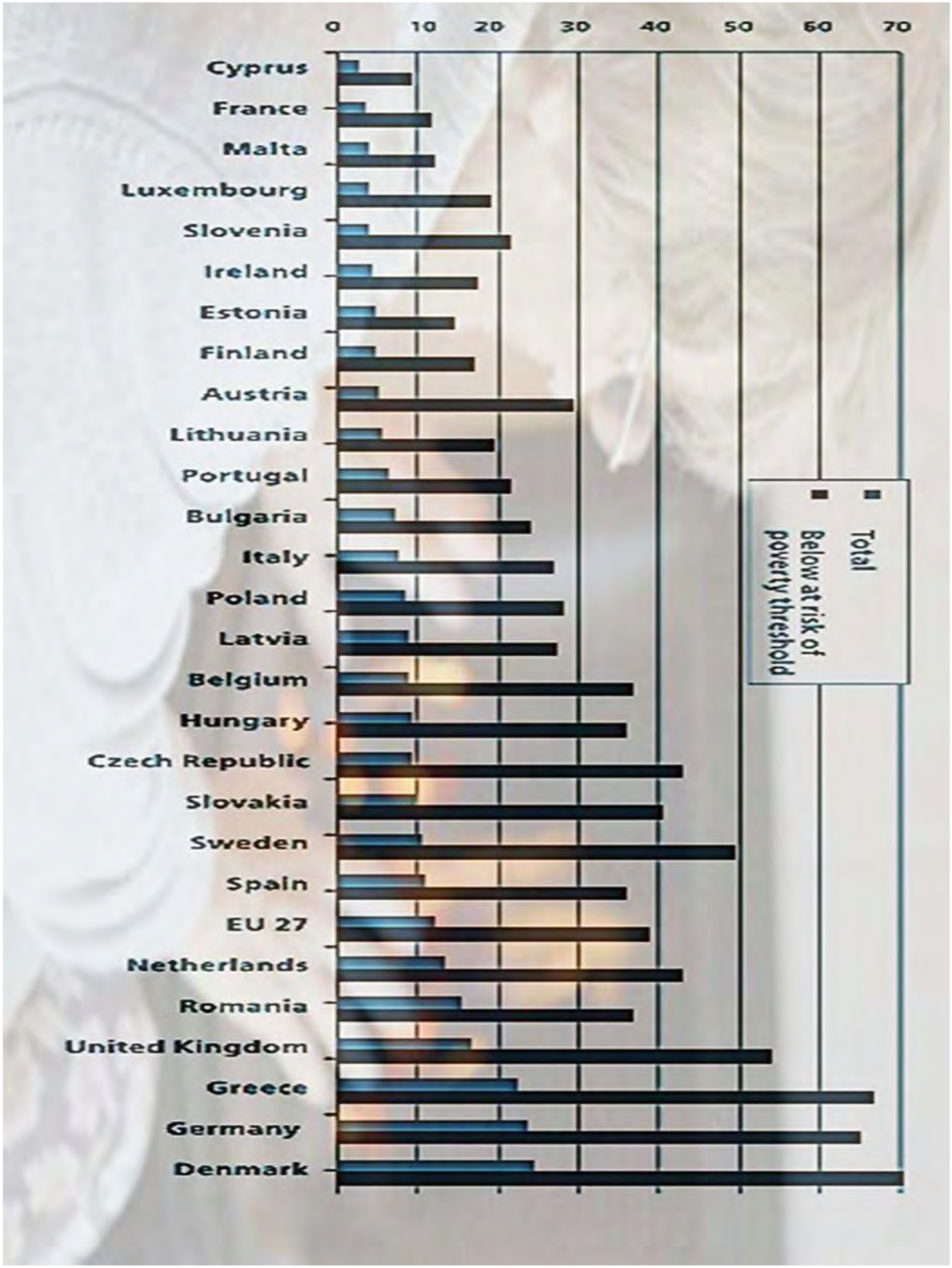

Average Number of Rooms per Person by Household Income Quartile
3,5
3
2,5
2
1,5
1
0,5
ENERGIZE
the fight against extreme poverty
Act Now
Poland
Hungary
Latvia
Turkey
Lithuania
Slovenia
Romania
Slovakia
Bulgaria
Greece
Czech
Italy
Portugal
Estonia
Finland
Spain
Cyprus
Austria
Malta
Germany
Sweden
Denmark
France
Ireland
Luxemburg
Netherlands
UK
Belgium

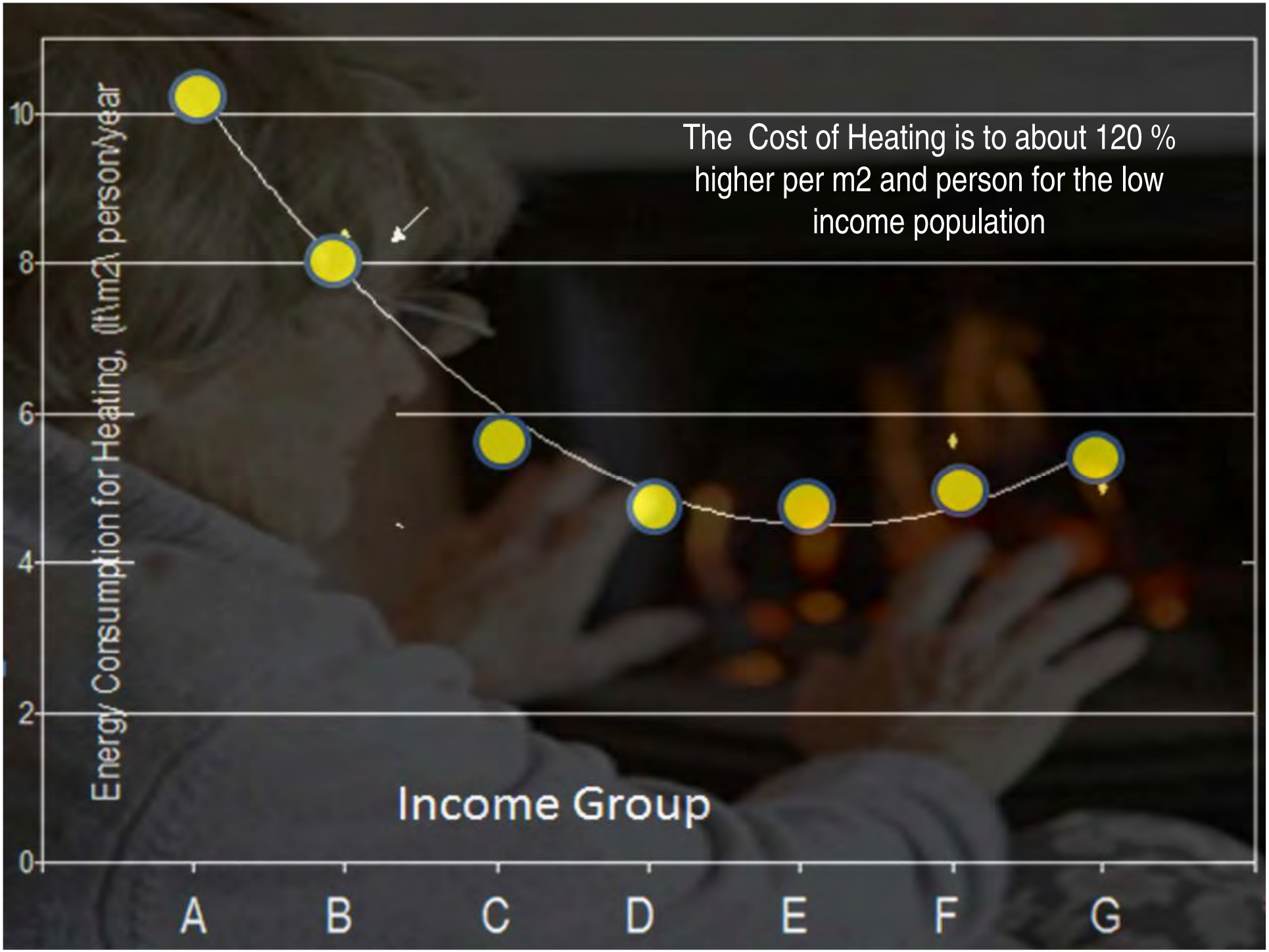

Average Surface of Houses per Income Group in Greece
Surface (m2)
300
250
200
150
100
50
Income Class
A
B
C
D
E
F
G

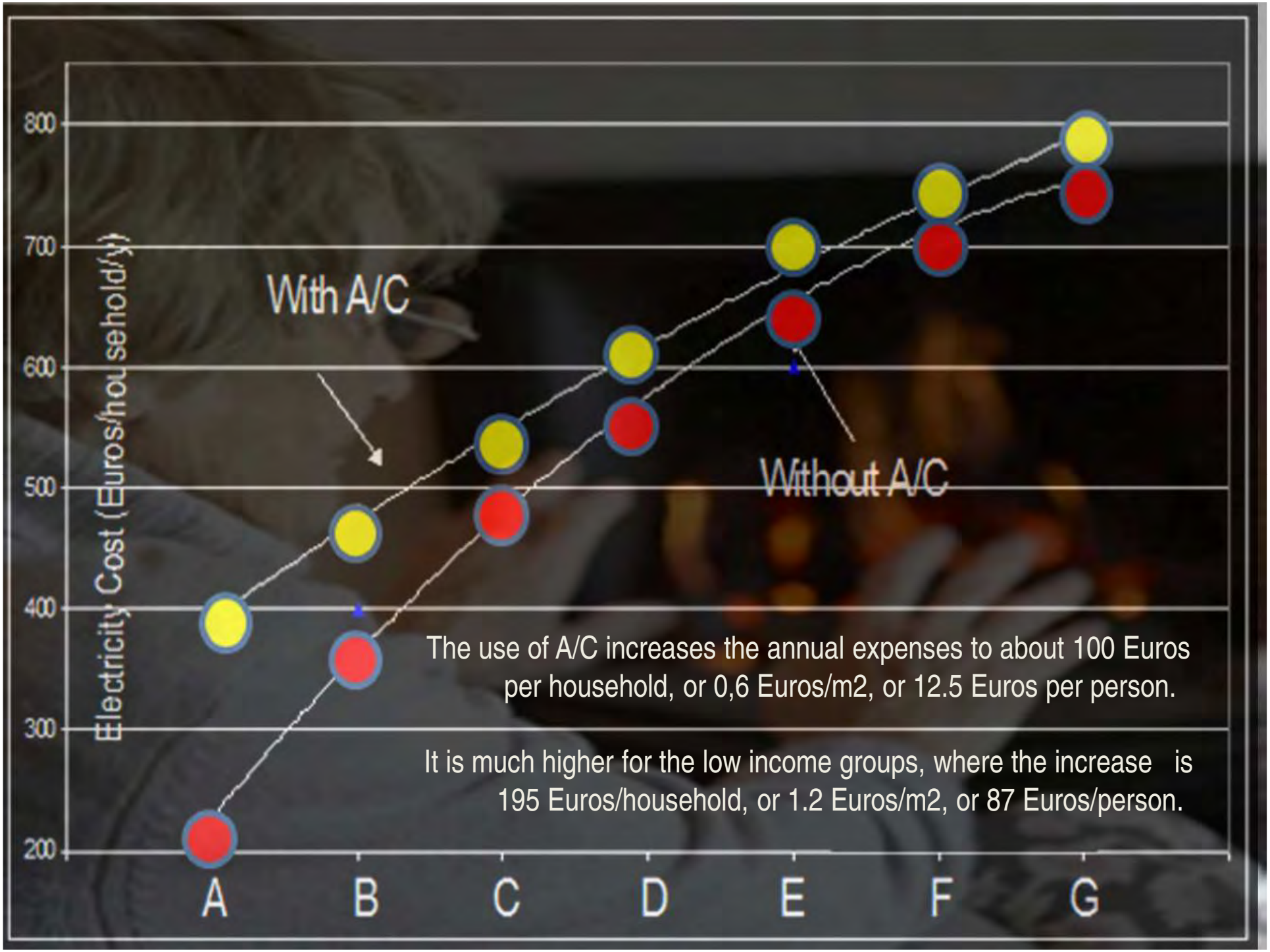

Percentage of Population Living in Houses with Leaking Floors, walls and Roofs or Presence of Rot in Window Frames
Low income Population
All population
50
45
40
35
30
25
20
15
10
5
0
Finland
Sweden
Slovakia
Switzerland
Denmark
Ireland
Iceland
Malta
Norway
Czech Rep
Luxemburg
Germany
France
UK
Austria
Netherlands
EU 27
Greece
Italy
Estonia
Spain
Lithuania
Poland
Croatia
Belgium
Portugal
Bulgaria
Romania
Latvia
Cyprus
Slovenia
Hungary

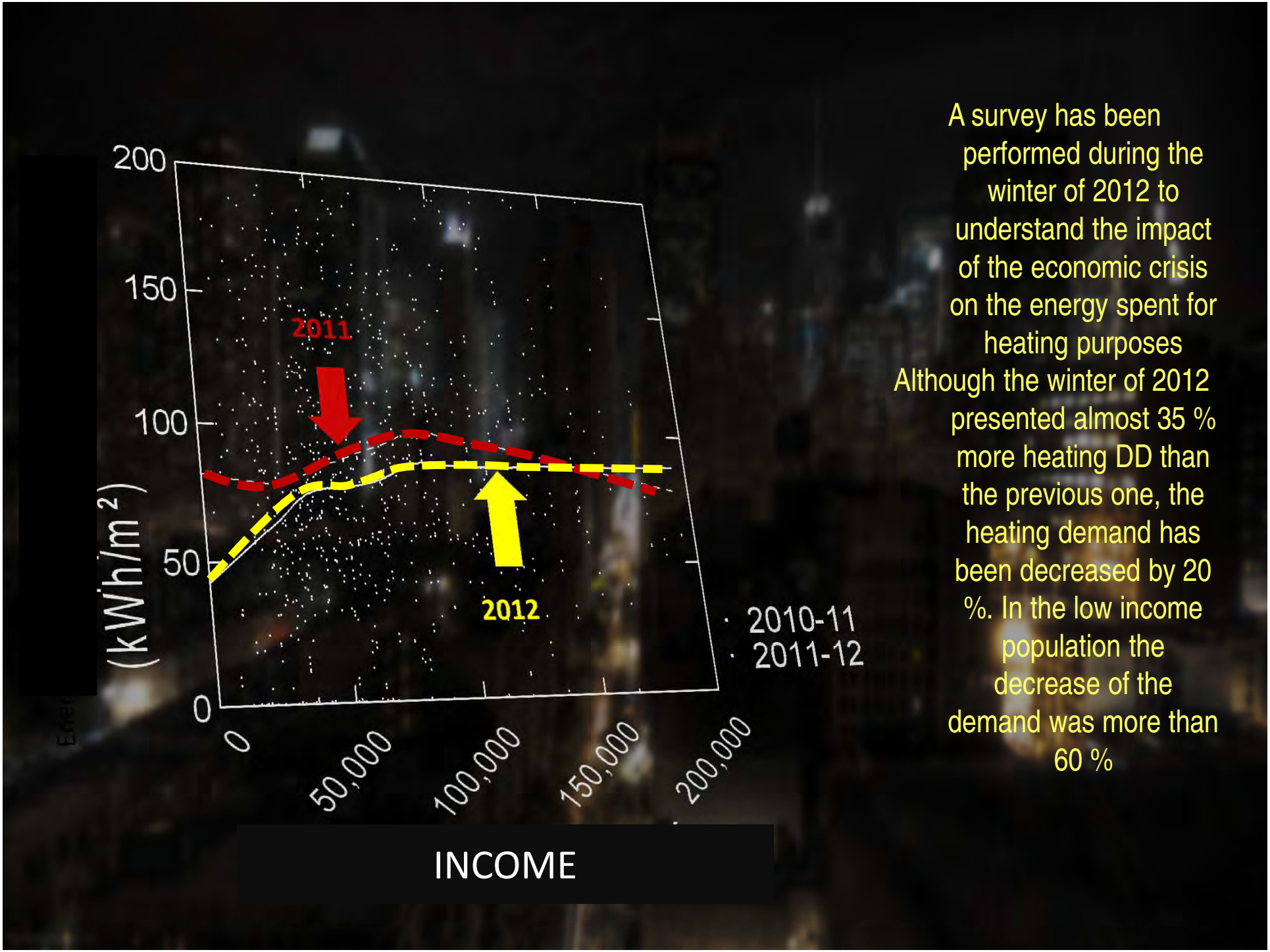

Percentage of Households living in Insulated Houses
80
70
60
50
40
30
20
10
0
Α Β Γ Δ Ε Ζ Η
Percentage of Houses Living in Houses with Double Glazing
80
70
60
50
40
30
20
10
0
Α Β Γ Δ Ε Ζ Η
Percentage of Households living in Houses with Double Glazing and Insulation
70
60
50
40
30
20
10
0
Α Β Γ Δ Ε Ζ Η


Concentration of TVOC
0.35
0.3
0.25
0.2
0.15
0.1
Monthly Income
0
1000
2000
3000
4000
5000
6000
7000
8000


0
10
20
30
40
50
60
70
Cyprus
France
Malta
Luxembourg
Slovenia
Ireland
Estonia
Finland
Austria
Lithuania
Portugal
Bulgaria
Italy
Poland
Latvia
Belgium
Hungary
Czech Republic
Slovakia
Sweden
Spain
EU 27
Netherlands
Romania
United Kingdom
Greece
Germany
Denmark
Total
Below at risk of poverty threshold

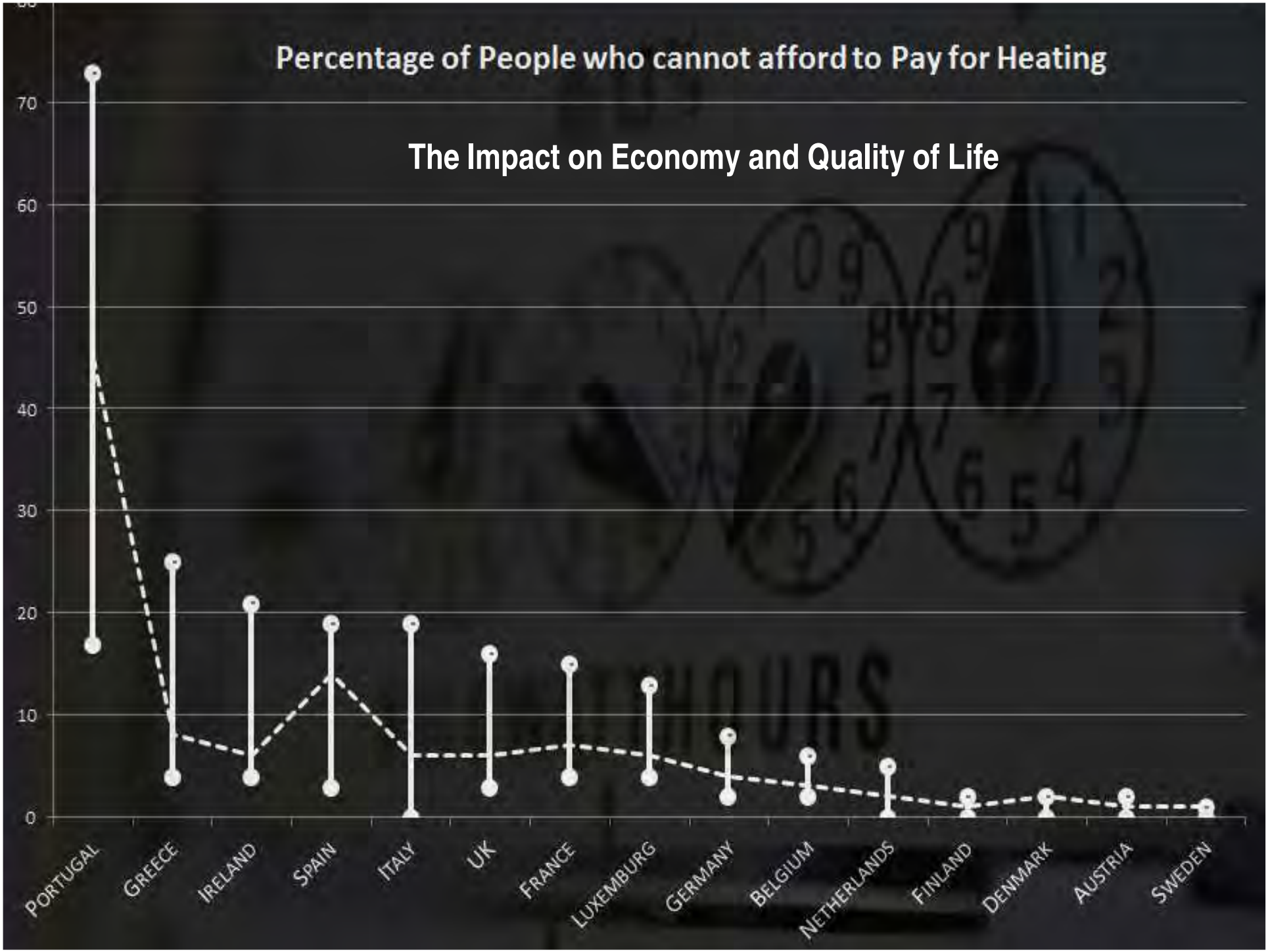

The Cost of Heating is to about 120 % higher per m2 and person for the low income population
Energy Consumption for Heating, (lt\m2\ person\year
10
8
6
4
2
0
Income Group
A
B
C
D
E
F
G

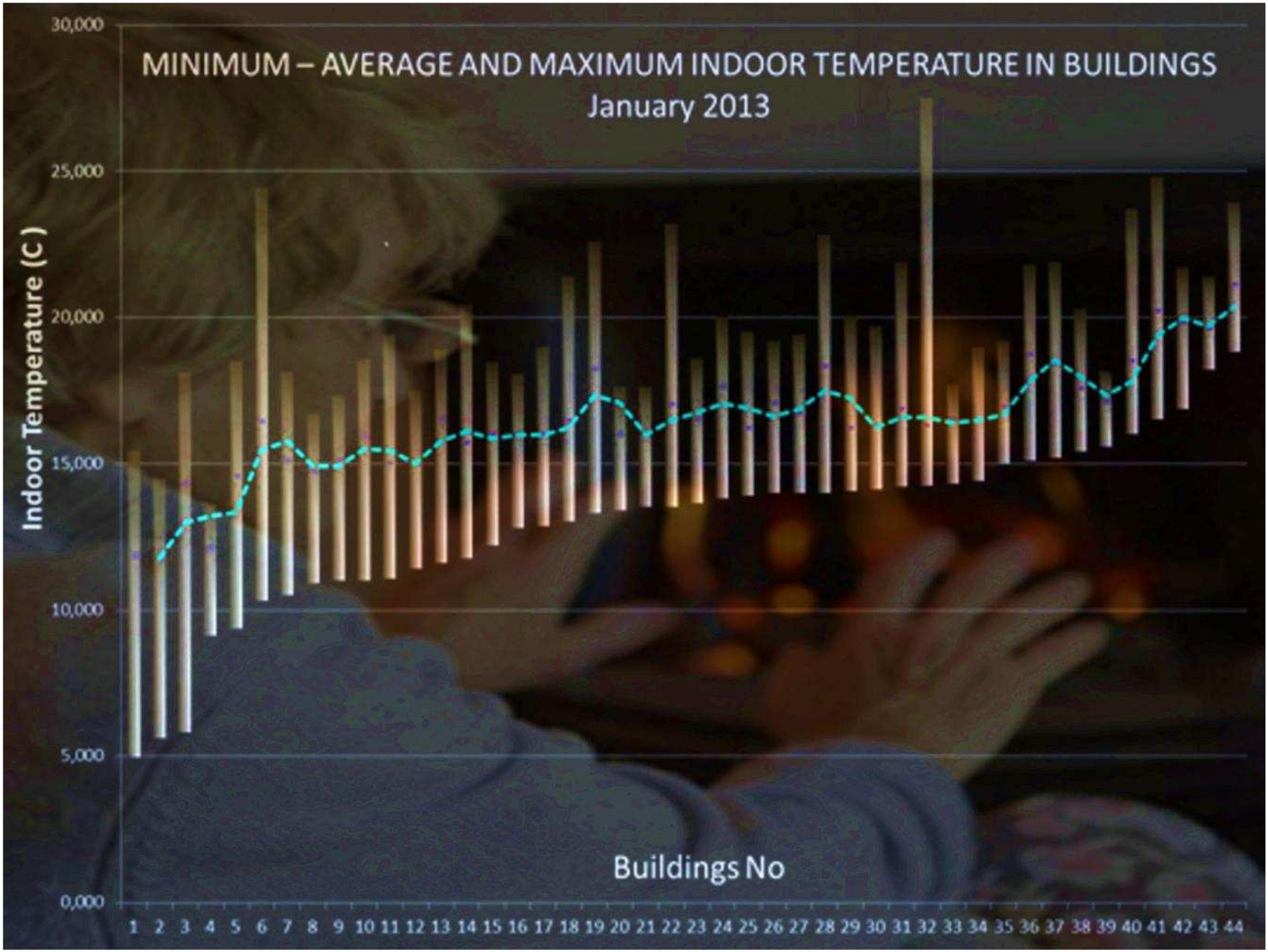

800
700
600
500
400
300
200
Electricity Cost (Euros/household/y)
With A/C
Without A/C
A
B
C
D
E
F
G
The use of A/C increases the annual expenses to about 100 Euros per household, or 0,6 Euros/m2, or 12.5 Euros per person.
It is much higher for the low income groups, where the increase is 195 Euros/household, or 1.2 Euros/m2, or 87 Euros/person.

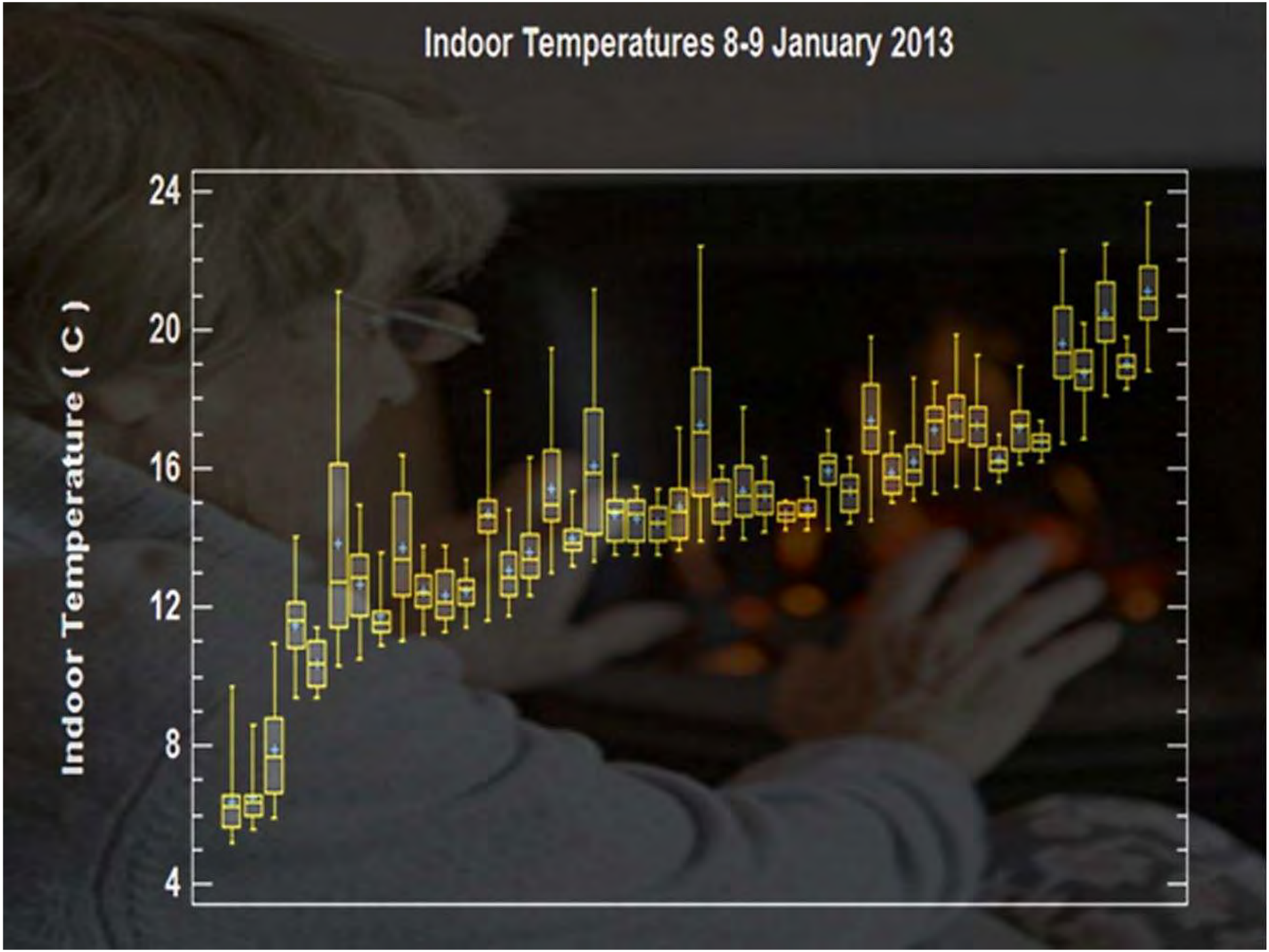


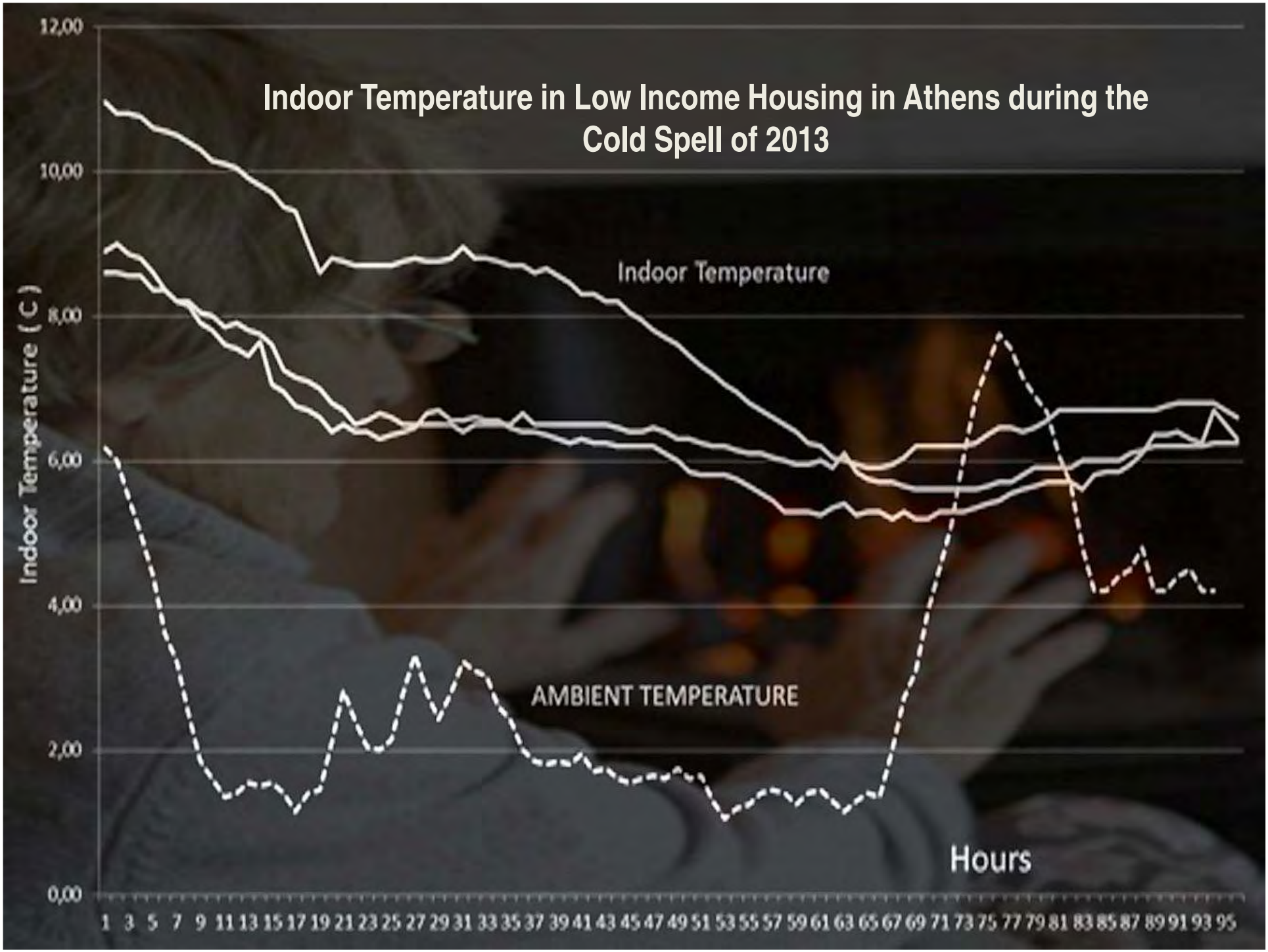
A survey has been performed during the winter of 2012 to understand the impact of the economic crisis on the energy spent for heating purposes

Although the winter of 2012 presented almost 35 % more heating DD than the previous one, the heating demand has been decreased by 20 %. In the low income population the decrease of the demand was more than 60 %


Percentage of People who cannot afford to Pay for Heating
The Impact on Economy and Quality of Life
70
60
50
40
30
20
10
0
PORTUGAL
GREECE
IRELAND
SPAIN
ITALY
UK
FRANCE
LUXEMBURG
GERMANY
BELGIUM
NETHERLANDS
FINLAND
DENMARK
AUSTRIA
SWEDEN

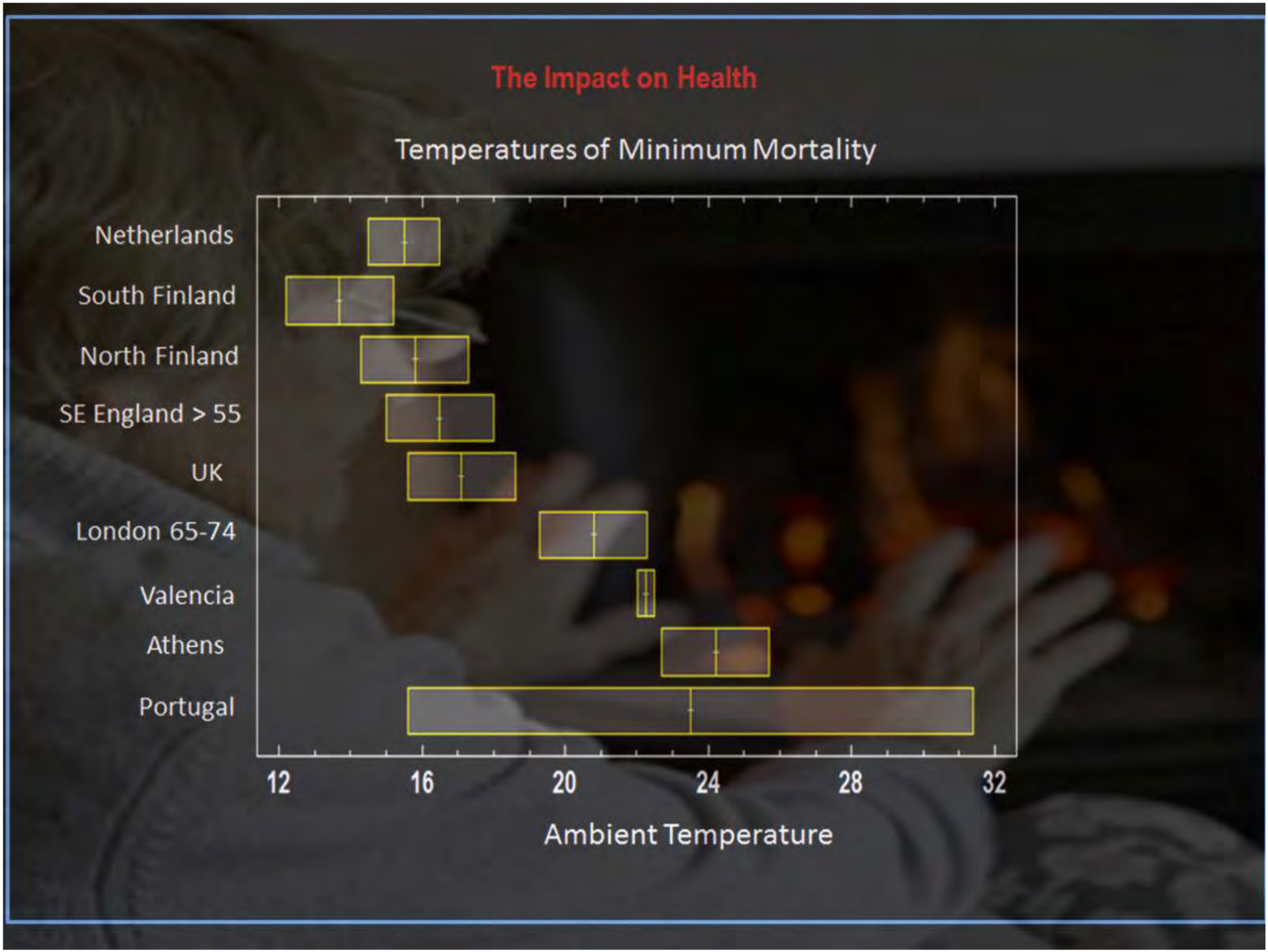

MINIMUM – AVERAGE AND MAXIMUM INDOOR TEMPERATURE IN BUILDINGS
January 2013
Indoor Temperature (C)
30,000
25,000
20,000
15,000
10,000
5,000
0,000
Buildings No
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44


Indoor Temperatures 8-9 January 2013
Indoor Temperature (C)
24
20
16
12
8
4

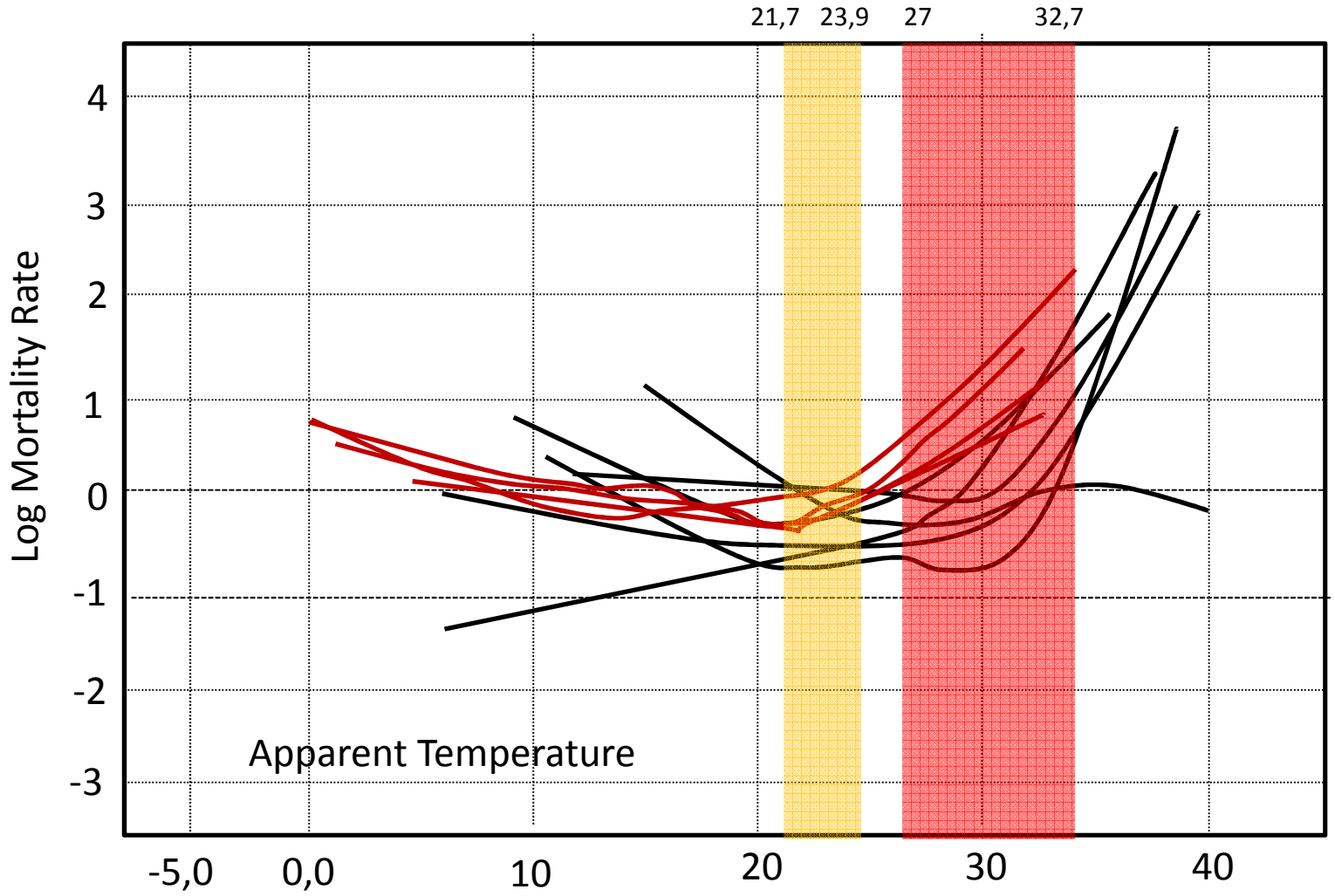

Indoor Temperature in Low Income Housing in Athens during the Cold Spell of 2013
Indoor Temperature
AMBIENT TEMPERATURE
Indoor Temperature (C)
Hours
12,00
10,00
8,00
6,00
4,00
2,00
0,00
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95


Indoor Temperature in Low Income Housing in Athens during the Heat Wave of 2007
40
35
30
25
0 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48 51 54 57 60 63 66 69 72 75 78 81 84 87 90 93 96 99 102 105 108 110

The Impact on Health



The Impact on Health

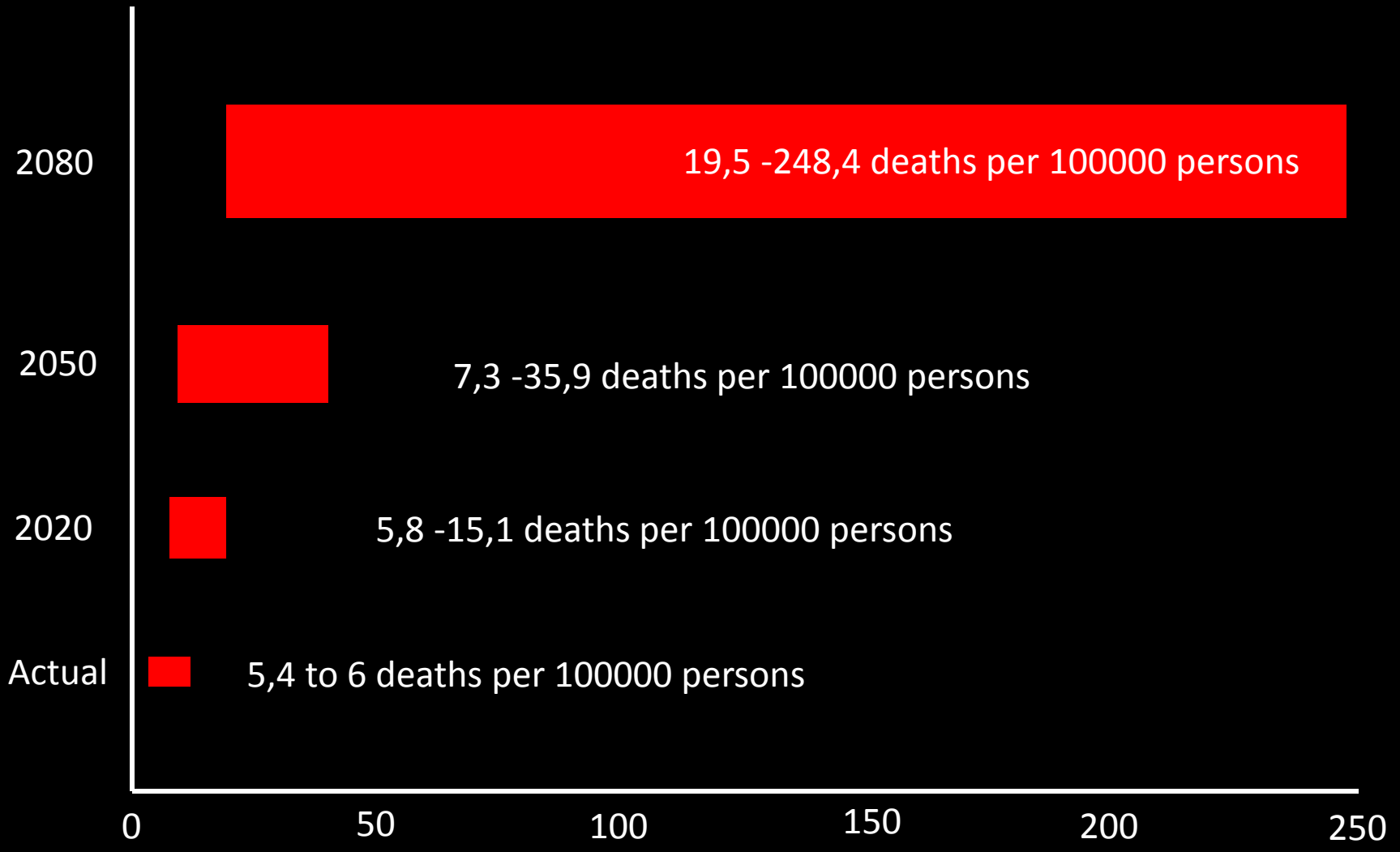


Athens	Milan	Rome	Turin	Valencia	Barcelona	London	Helsinki	Praha	Stockholm
32,7 C	31,8 C	30,3 C	27 C	28,2 C	22,4 C	23,9 C	23,6 C	22,0 C	21,7 C

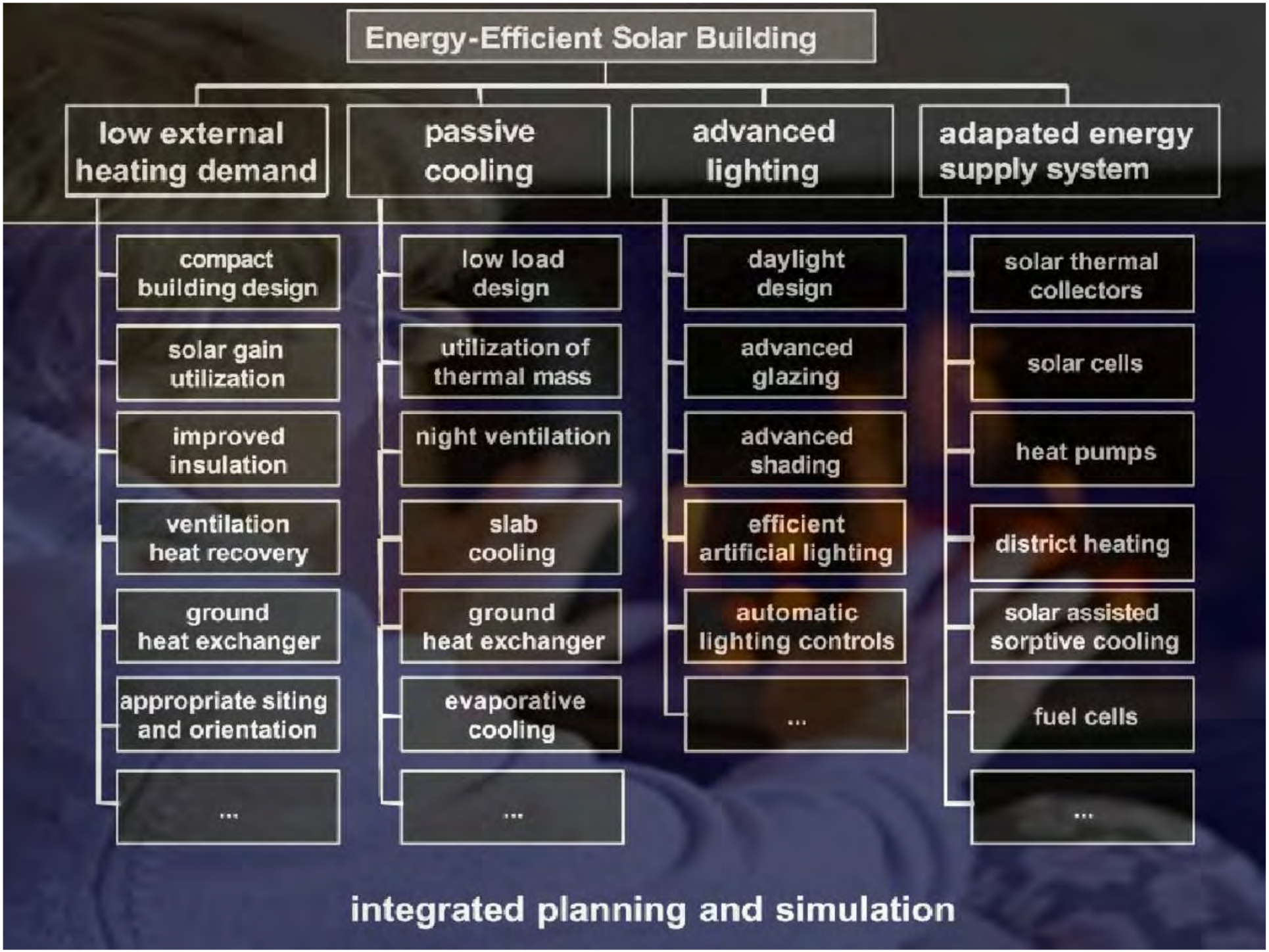

The Impact on Health
Ratio of Mortality of Low to High Educated People
2,1
1,9
1,7
1,5
1,3
1,1
0,9
Prostate Cancer
Other circulatory
Cardiovascuaral Overall
Ishaemic Heart Desease
Cancer overall
Cerebrovascular
Total Mortality
Other
External Causes
Pneumonia
Other Diseases
lung Cancer
Chronic Pulmonary Desease

The Impact on Health

Expected Deaths per 100000 persons in Portugal because of the Overheating



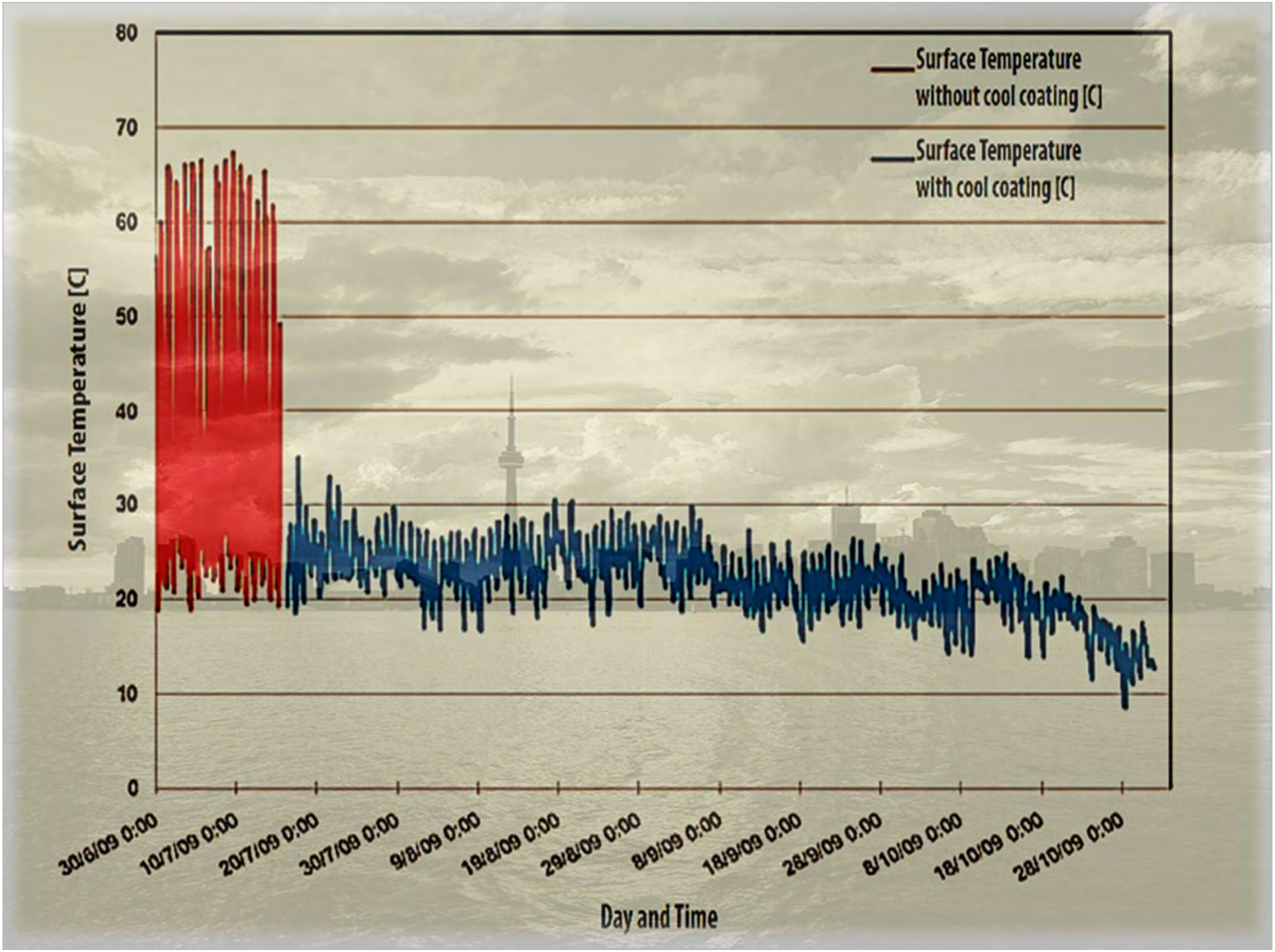
Source : Dessai, S., 2003: Heat stress and mortality in Lisbon. Part II. An assessment of the potential impacts of climate change. Int. J. Biometeorol., 48, 37-44.

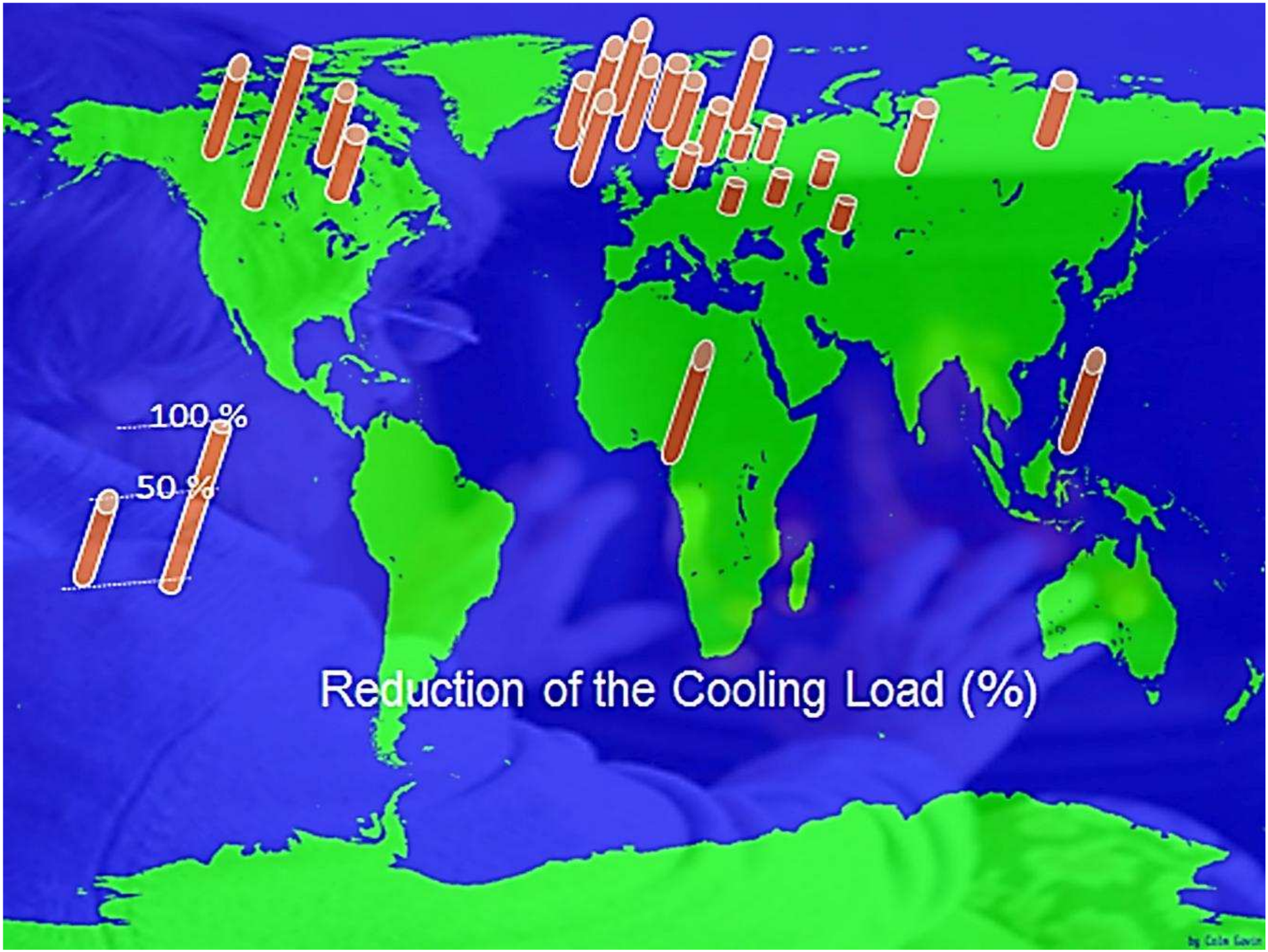

Energy-Efficient Solar Building
low external heating demand
passive cooling
advanced lighting
adapated energy supply system
compact building design
solar gain utilization
improved insulation
ventilation heat recovery
ground heat exchanger
appropriate siting and orientation
...
low load design
utilization of thermal mass
night ventilation
slab cooling
ground heat exchanger
evaporative cooling
...
daylight design
advanced glazing
advanced shading
efficient artificial lighting
automatic lighting controls
...
solar thermal collectors
solar cells
heat pumps
district heating
solar assisted sorptive cooling
fuel cells
...
integrated planning and simulation

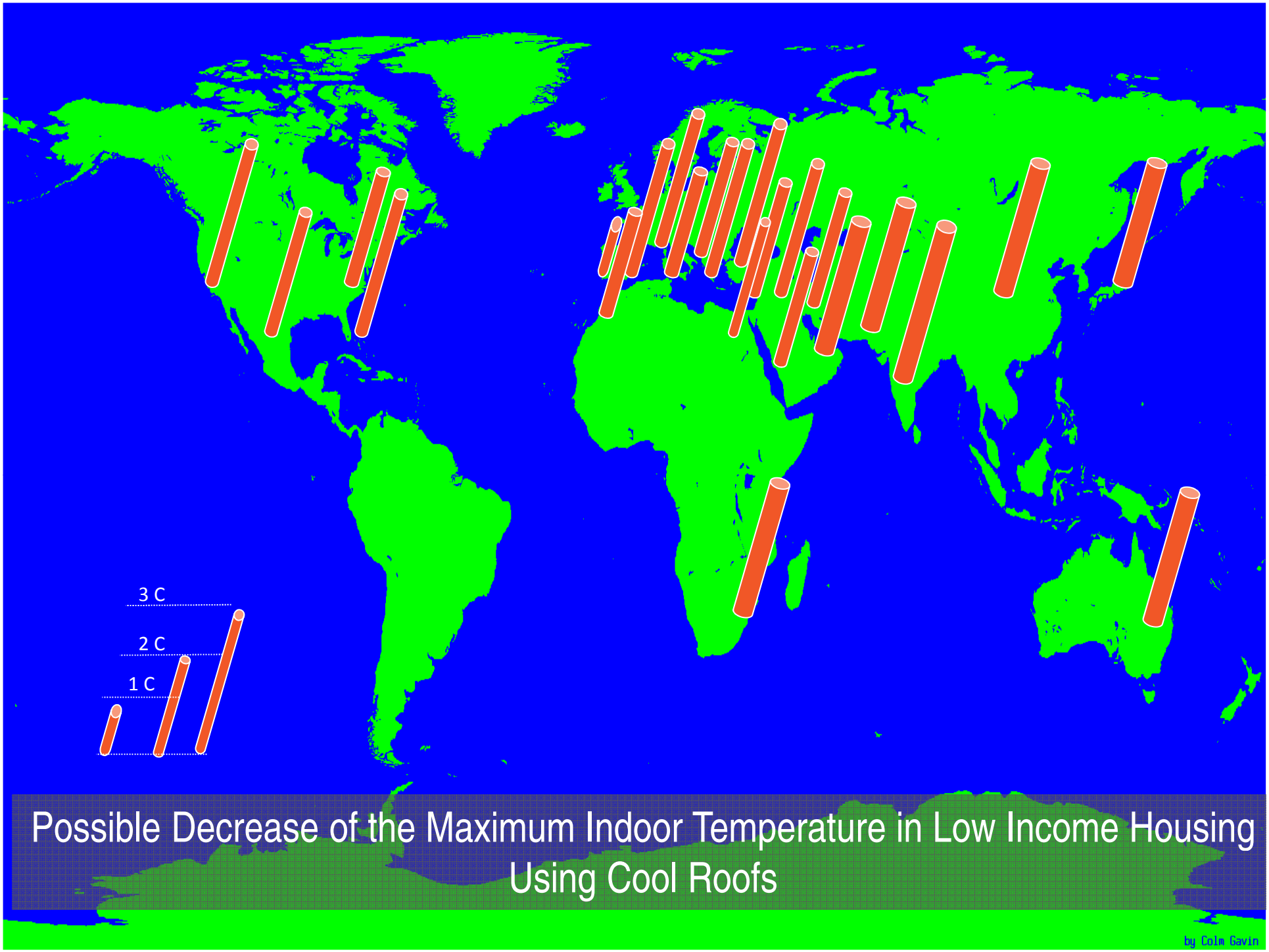
1. PROTECTION FROM HEAT GAINS : Landscaping, Building form, Layout and External Finishings, Solar Control, Thermal Insulation, Control of Internal Gains

2. MODULATION OF HEAT GAINS : Use of the thermal capacity of the building.

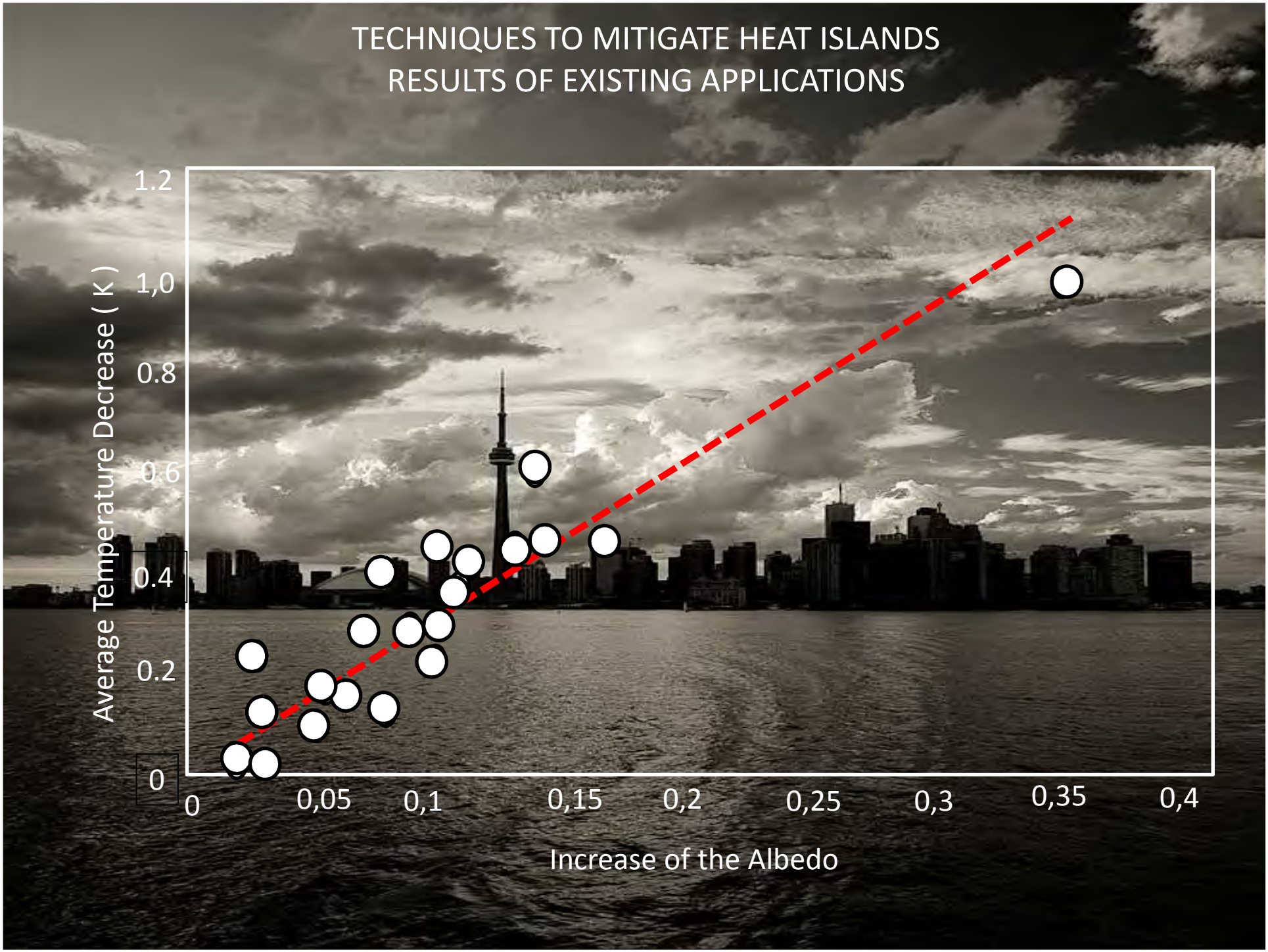
3. HEAT DISSIPATION : Rejection of the excess heat to an environmental heat sink, (Evaporative, Convective, Ground)

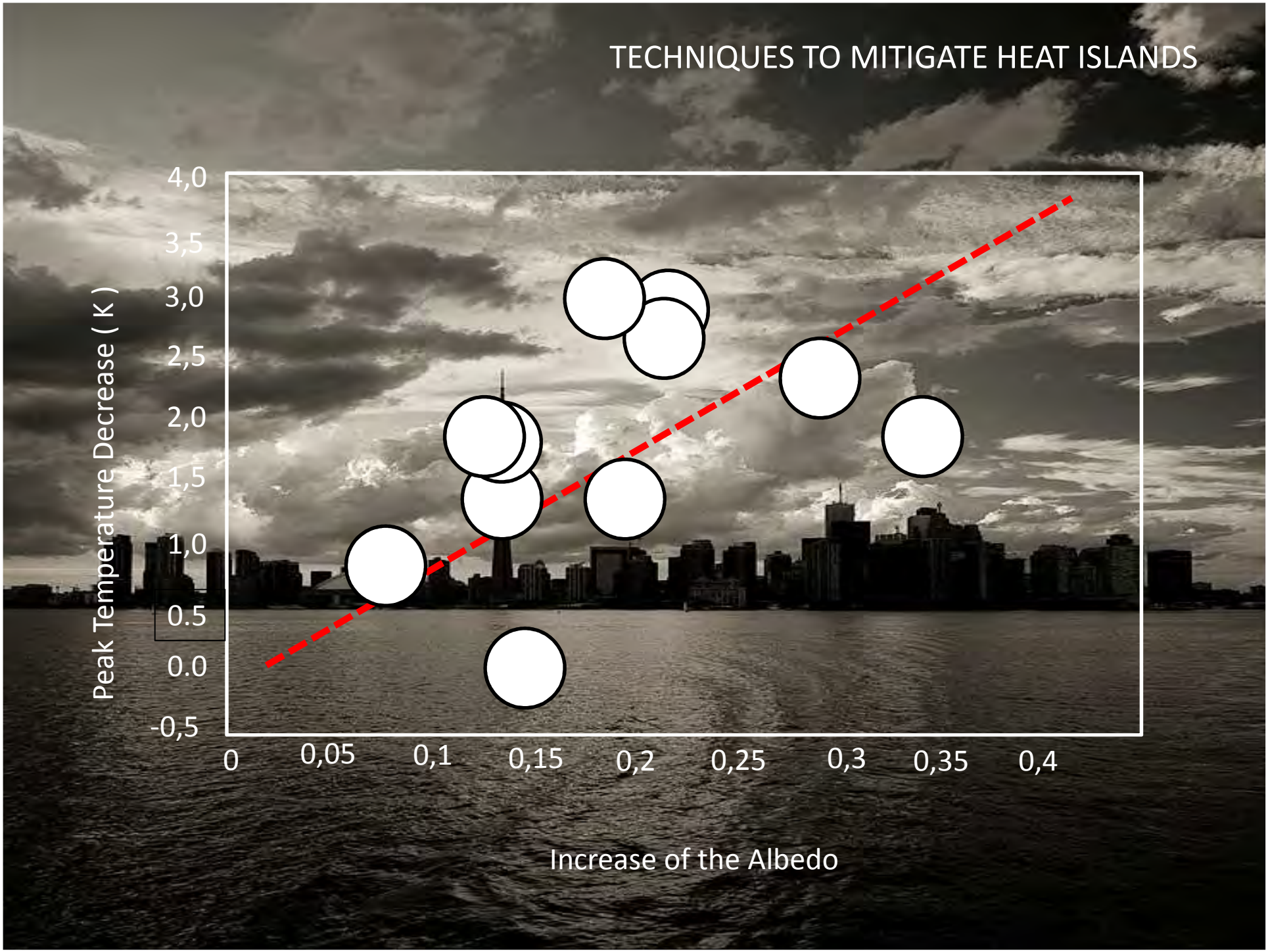

Surface Temperature without cool coating [C]
Surface Temperature with cool coating [C]
Surface Temperature [C]
80
70
60
50
40
30
20
10
0
30/6/09 0:00
10/7/09 0:00
20/7/09 0:00
30/7/09 0:00
9/8/09 0:00
19/8/09 0:00
29/8/09 0:00
8/9/09 0:00
18/9/09 0:00
28/9/09 0:00
8/10/09 0:00
18/10/09 0:00
28/10/09 0:00
Day and Time


100 %
50 %
Reduction of the Cooling Load (%)


3 C
2 C
1 C
Possible Decrease of the Maximum Indoor Temperature in Low Income Housing Using Cool Roofs
by Colin Gavin

TECHNIQUES TO MITIGATE HEAT ISLANDS
RESULTS OF EXISTING APPLICATIONS




TECHNIQUES TO MITIGATE HEAT ISLANDS
Peak Temperature Decrease (K)
4,0
3,5
3,0
2,5
2,0
1,5
1,0
0.5
0.0
-0,5
0
0,05
0,1
0,15
0,2
0,25
0,3
0,35
0,4
Increase of the Albedo

Conclusions

Low income population in Greece lives in badly protected houses that need a quite high energy load to heat and cool.

Previous studies have shown that low income population has to spend much higher energy amounts per capita and area compared to high income population as their houses are improperly insulated and thermally protected.

It is also known that the serious decrease of the financial income caused by the economic crisis had a serious impact on the energy spent for heating purposes by low income population and has tremendously decreased the heating bills.

This new financial situation has an important impact on the indoor environmental quality in the houses as the lack of resources does not allow the achievement of proper indoor temperatures.

Conclusions

Europe shows trapped in in a reality that is characterized by a permanent increase of poverty combined with a very significant climatic change.

This fact dramatically rises the percentage of vulnerable population influenced directly by poverty and the temperature increase.

Unfortunately the first victim of climatic change is the low income population that is unable use additional energy and advanced technology to compensate poverty and increased temperatures and achieve thermal comfort.

There is a real need for appropriate technologies improving the survivability of vulnerable population

Buildings have to be adapted to the local climate and should respond to the extreme weather conditions.

Appropriate techniques have achieved a high maturity. Given the low cost they present can really contribute highly to improve the quality of life of vulnerable population and increase survivability.