



**PEDL**

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## BIOCLIMATIC INTERVENTIONS' EVALUATION OF URBAN NEIGHBORHOODS

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Common goal.....



## National and European Initiatives for environmental and energy upgrade of urban neighborhoods

- Eksoinomw I, opened in 2009. The Municipalities submitted 191 proposals which were evaluated and 106 were approved and their implementation began in 2012.
- Eksoikonow II, opened in 2012. Since then 139 proposals were submitted. The results of the participating Municipalities' evaluation are expected by the end of 2014.
- Projects for Renewable Energy Sources Development and Energy Reservation in existing Public Schools of Primary and Secondary Education. The program opened in 2011.
- Projects for Renewable Energy Sources Development and Energy Reservation in Public Buildings. The program opened in 2010.
- Green Roofs in Public Buildings, opened in 2011.
- Bioclimatic Interventions of Public Open Spaces, opened in 2011.

# The Covenant of Mayors

Country	Signatories	Population covered	Submitted SEAP
Austria	12	1 922 064 (23%)	9 (75%)
Belgium	118	4 742 310 (44%)	54 (46%)
Bulgaria	28	2 583 764 (35%)	13 (46%)
Croatia	59	1 926 206 (46%)	44 (75%)
Cyprus	24	497 981 (58%)	15 (63%)
Czech Republic	5	332 244 (3%)	5 (100%)
Denmark	38	3 342 118 (64%)	28 (74%)
Estonia	6	549 173 (43%)	2 (33%)
Finland	9	1 871 457 (36%)	6 (67%)
France	117	15 831 030 (26%)	68 (58%)
Germany	55	17 092 320 (21%)	50 (91%)
Greece	90	3 881 195 (36%)	64 (71%)
Hungary	25	2 718 074 (27%)	19 (76%)
Ireland	6	1 404 659 (32%)	5 (83%)
Italy	2966	35 615 774 (61%)	1 972 (66%)
Latvia	19	1 095 776 (50%)	17 (89%)
Malta	24	114 081 (28%)	24 (100%)
Netherlands	19	3 963 120 (24%)	14 (74%)
New Zealand	1	360 000 (9%)	1 (100%)
Norway	8	1 350 139 (31%)	7 (88%)
Poland	34	3 590 618 (9%)	28 (82%)
Portugal	98	4 922 286 (47%)	57 (58%)
Romania	57	6 215 450 (30%)	39 (68%)
Serbia	3	118 064 (1%)	0 (0%)
Slovakia	4	566 961 (10%)	4 (100%)
Slovenia	31	650 318 (32%)	11 (35%)
Spain	1529	25 781 211 (58%)	1 040 (68%)
Sweden	50	4 133 732 (47%)	41 (82%)
Switzerland	9	819 913 (11%)	8 (89%)
Turkey	7	4 011 552 (5%)	5 (71%)

- 90 Greek Municipalities have signed the Covenant of Mayors (in total of 5.422 signatures) and 64 of them have submitted SEAPs.
- Italy and Spain count for 2.966 and 1.529 signatures
- Relevant action is the Smart Cities project. In this action two Greek cities, Patra and Larisa, are participating among other 77 European cities.
- More than 15 European projects in the last decade in the field of sustainability for municipalities and cities.

## European actions in Municipalities and cities (1/2)

- *Transparent Energy Planning and Implementation (TRANSPLAN)*, **Duration:** 9/2007-2/2010. **Main Objective:** The energy planning for local and regional communities that lack financial resources.
- *Pathways to Renewable and Efficient Energy Systems (PATH TO RES)*, **Duration:** 11/2007-4/2010. **Main Objective:** The development of a seven-step assessment tool based on real data from local and regional energy systems, by studying and assessing a number of case studies in European Countries.
- *Partnership Energy Planning as a tool for realizing European Sustainable Energy Communities (PEPESEC)*, **Duration:** 1/2008-6/2010. **Main Objective:** The support of European sustainable energy communities, calling on local community planning for the efficient supply, distribution and use of renewable energy sources and improved management of conventional energy.
- *Sustainable Energy Communities – Benchmarking of energy and climate performance indicators on the web (SEC-BENCH)*, **Duration:** 11/2007-4/2010. **Main Objective:** The development of a web-based tool to help Municipalities to realize their potential in terms of energy savings and conversion to renewable energy sources.
- *Novel and Integrated Model of Sustainable Energy Communities (NIMSEC)*, **Duration:** 1/2008-2/2010. **Main Objective:** Trying to resolve a series of locally identified problems related to energy efficiency and renewable energy sources. This program targets more than twenty local communities in four European regions (Bulgaria, Croatia, Spain, Slovenia).

## European actions in Municipalities and cities (2/2)

- *Management of Domains related to Energy in Local authorities (MODEL)*, **Duration:** 9/2007-2/2010. **Main Objective:** Helping 34 local authorities from 8 new EU Member States and candidate countries to become energy models for citizens and other municipalities. The partners assist these Municipalities with planning, implementing and evaluating activities to improve local energy efficiency, focused on their overall process management.
- *Sustainable Energy in Tourism dominated Communities (SETCOM)*, **Duration:** 10/2008-3/2011. **Main Objective:** Building up and promoting 10 communities from 10 countries as pioneers for sustainable energy use in the tourism sector. Target groups include all tourism stakeholders, including companies, administrations, employees and tourists themselves.
- *European Sustainable Energy Communities – effective Integrated Local Action Today (SUSTAINABLE NOW)*, **Duration:** 9/2008-8/2011. **Main Objective:** Building local capacity development for integrated energy management and implementation of local energy action plans. It will strengthen the role of local and provincial governments and political and administrative bodies, while guiding communities in the sustainable energy transition period.
- *Sustainable Energy Communities Historic Urban Areas (SECHURBA)*, **Duration:** 9/2008-2/2011. **Main Objective:** Development of ways to encourage energy efficiency practices and renewable energy systems in historic urban areas as well as best practice examples to encourage other communities, local actors and policymakers to follow suit.

## Environmental assessment tools

## BREEAM for sustainable urban neighborhoods and buildings (1/2)

- European Environmental Rating Systems
- The most mature Environmental Rating System compared to others (LEED, HQE, Green Star, CABEE)
- Global awareness
- Compatibility with national legislation, ISO and CEN standards (ISO 14001, ISO 14040-14043, ISO 21931-1:2010, CEN / TC 350)
- Significant application in buildings

BREEAM certifications based on buildings age

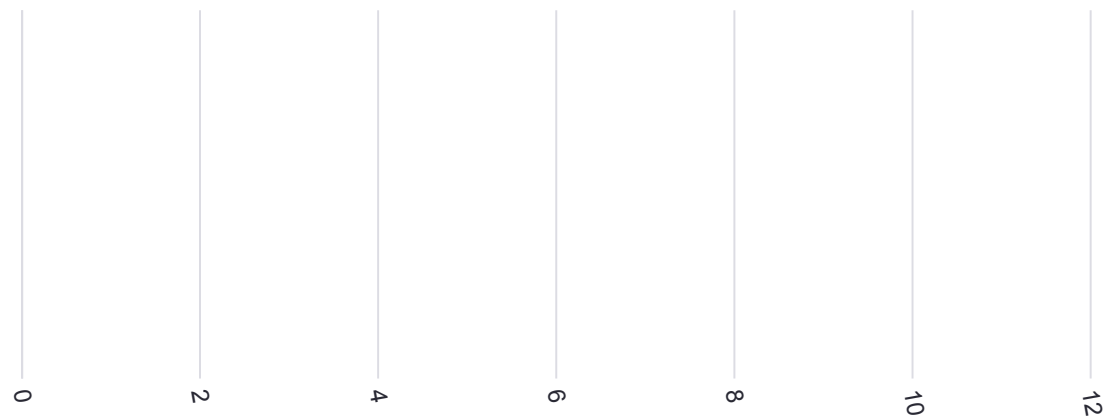


## BREEAM for sustainable urban neighborhoods and buildings (2/2)

### BREEAM certifications per building type

- Energy
- Waste management
- Transport
- Land use and Ecology
- Health and well-being
- Materials
- Innovation

### Rating per environmental aspect for office buildings





## Refurbished of open public spaces and public buildings (1/3)

Measures selected by Municipalities concerning the upgrade of open public spaces aimed at reducing the impact of the urban island effect.

Municipalities	Reduction of the Urban Island Effect				
	Vehicle speed reduction	Encouraging drivers to more environmental friendly transportation	Improvement of the road to benefit the Pedestrian Users	Increase of surfaces exposed to sun during the winter	Other (cool pavement materials)
Peristeri			x		x
Piraeus			x		
Pavlos Melas			x		x
Rethymno		x	x		
Almyro			x		x
Thiva		x	x		
Thessaloniki	x	x	x		
Serres		x	x		x
Ilida		x	x		x
Amaroussion		x	x		x
Kordelio-Evosmos			x		

## Refurbished of open public spaces and public buildings (2/3)

Measures selected by the Municipalities for the renovation of open public places in order to achieve an upgrade of the area.

Municipalities	Upgrade of open spaces				
	Evaporative Cooling	Greening the area	Cool Materials	Increase shaded surfaces during the summer, using natural or artificial means (plants, shades)	Other (reduced consumption for lighting-use of photovoltaic systems)
Peristeri		x	x	x	
Piraeus	x	x	x	x	x
Pavlos Melas		x	x		x
Rethymno	x	x			x
Almyro	x	x	x	x	x
Thiva		x	x		x
Thessaloniki	x	x	x	x	x
Serres	x	x	x	x	x
Amaroussion		x	x	x	x
Kordelio-Evosmos	x	x	x		x
Glyfada		x	x	x	x



## Refurbished of open public spaces and public buildings (3/3)

Measures suggested by the Municipalities for the upgrade of the public buildings in order to achieve energy saving.

Public Buildings	Energy Saving in Buildings				
	Use of external shading	Green Roof	Cool Materials	Use of solar panels for DHW	Other (architectural design on a new constructed building-insulation-windows-lighting)
3rd Primary School of Moschato				x	x
2nd High School of Moschato				x	x
Primary & Secondary Education School Buildings of the Municipality of Chaidari		x		x	x
3rd Junior High School of Kozani		x		x	x

# Evaluation of indicative proposed interventions by category of interest

Category of Interest	Interventions	Hot-Humid Climate	Hot-Dry Climate	Cold-Humid Climate	Cold-Dry Climate
Reduction of the Urban Island Phenomenon	Vehicle speed reduction	3	3	3	3
	Encouraging drivers to more environmental friendly transportation	3	3	3	3
	Improvement of the road to benefit the Pedestrian Users	3	3	3	3
	Increase of surfaces exposed to the sun during the winter	2	2	3	3
Energy Saving in Buildings	Use of external shading	3	3	1	2
	Green Roof	3	3	2	1
	Cool Materials	3	3	2	2
	Use of solar panels for DHW	3	3	3	3
Upgrade of open spaces	Evaporative Cooling	2	3	1	2
	Greening the area	3	3	3	3
	Cool Materials	3	3	2	2
	Increase shaded surfaces during the summer, using natural or artificial means (plants, shades)	3	3	2	2

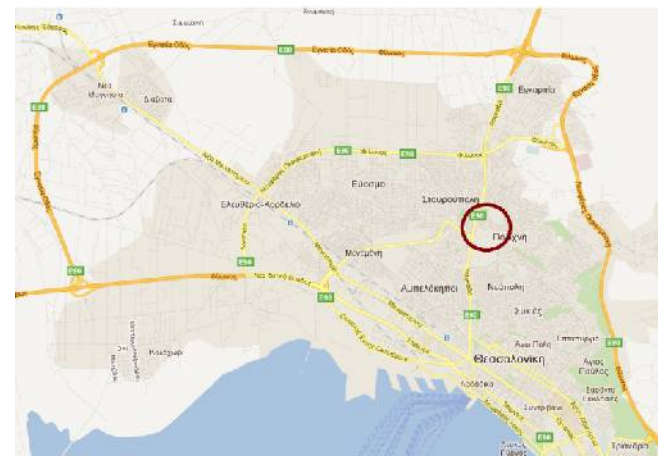
## Indicative cost

Open Spaces	Cost	m2	€/m2
Peristeri	3.760.000,00	28.085,00	133,88
Pavlos Melas	2.864.017,30	60.000,00	47,73
Rethymno	4.310.968,90	23.756,00	181,47
Almyros	4.343.719,71	22.000,00	197,44
Thiva	1.859.971,54	20.950,00	88,78
Thessaloniki	5.522.152,84	106.000,00	52,10
Serres	3.803.821,51	31.155,00	122,09
Amaroussion	5.683.313,84	50.660,00	112,19
Kordelio-Evosmos	3.439.233,06	22.894,58	150,22
Chalkida	1.279.326,75	5.717,53	223,76
Larisa	4.868.789,10	25.000,00	194,75
Glyfada	5.985.000,00	54.000,00	110,83

In case of public buildings the measures set are referring to energy saving in buildings. An average cost for the implementation measures per square meter is 185,22 €/m2.

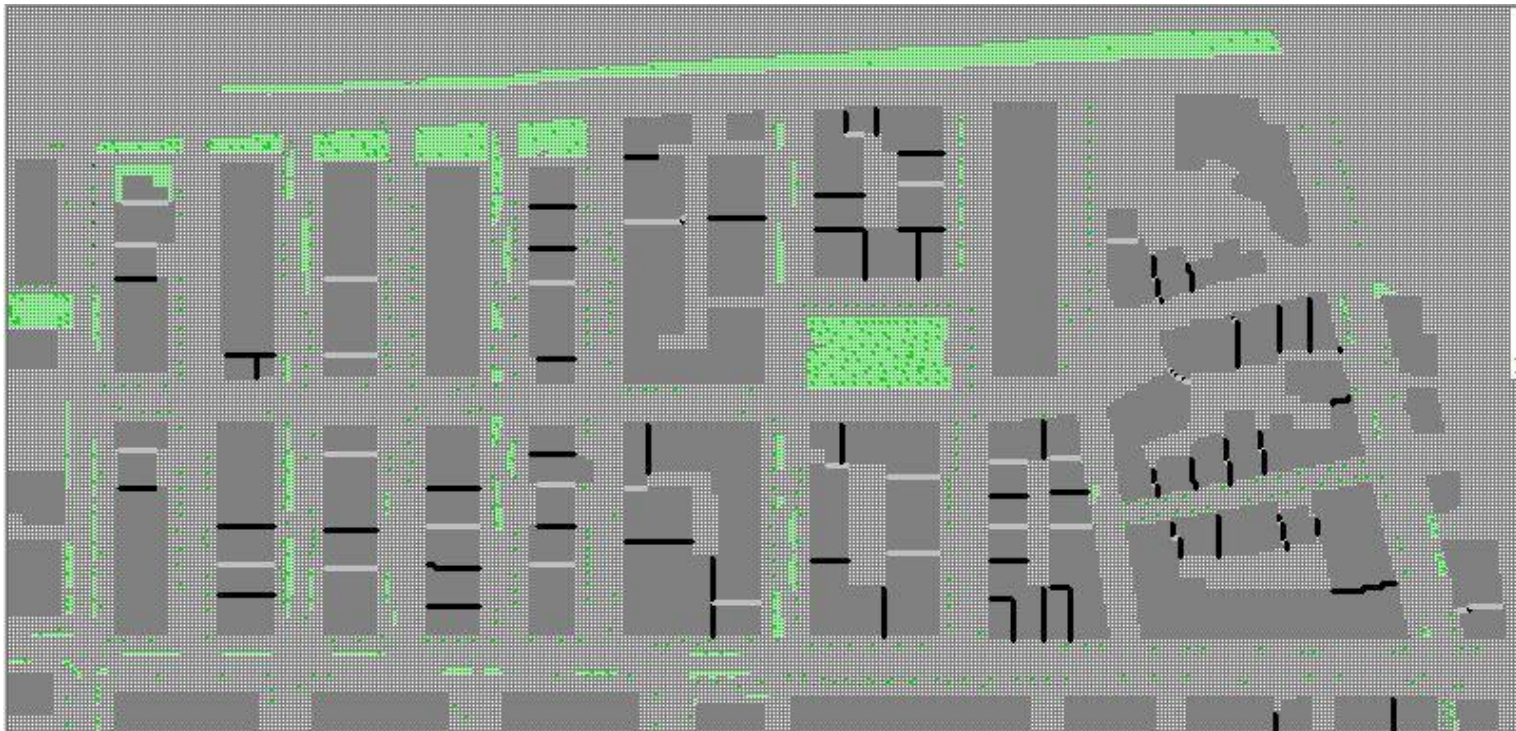
## Example: The bioclimatic rehabilitation of the Neoktista area in Pavlos Melas municipality, Thessaloniki (1/6)

- located in the greater area of Thessaloniki in Greece
- between a former military camp on its southern border and the Psychiatric Hospital on its northern border, in the Municipal Community of Stavroupoli in Thessaloniki, Greece.



## Bioclimatic rehabilitation of Pavlos Melas (2/6)

- lack of urban greenery
- building materials with high thermal storage and low reflectivity (asphalt, paving and concrete)





## Bioclimatic rehabilitation of Pavlos Melas (3/6)

- strengthening of urban greenery
- extensive use of cool materials (cool asphalt, cool cement tiles and cool granite for sidewalks)
- transformation of street to pedestrian areas

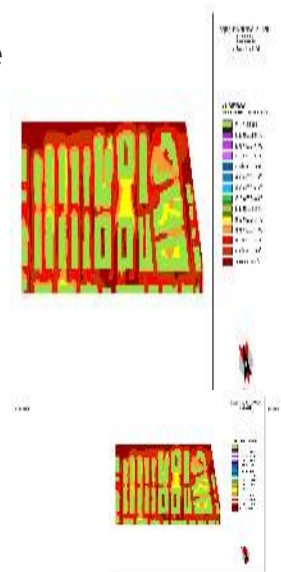


# Results - Air temperature at z=1.80 m at 14:00 (4/6)



Existing situation

Air temperature  
**34.60 °C - 38 °C**



Situation after the upgrade

Air temperature  
**29.35 °C - 31.6 °C**



## Bioclimatic rehabilitation of Pavlos Melas (6/6)

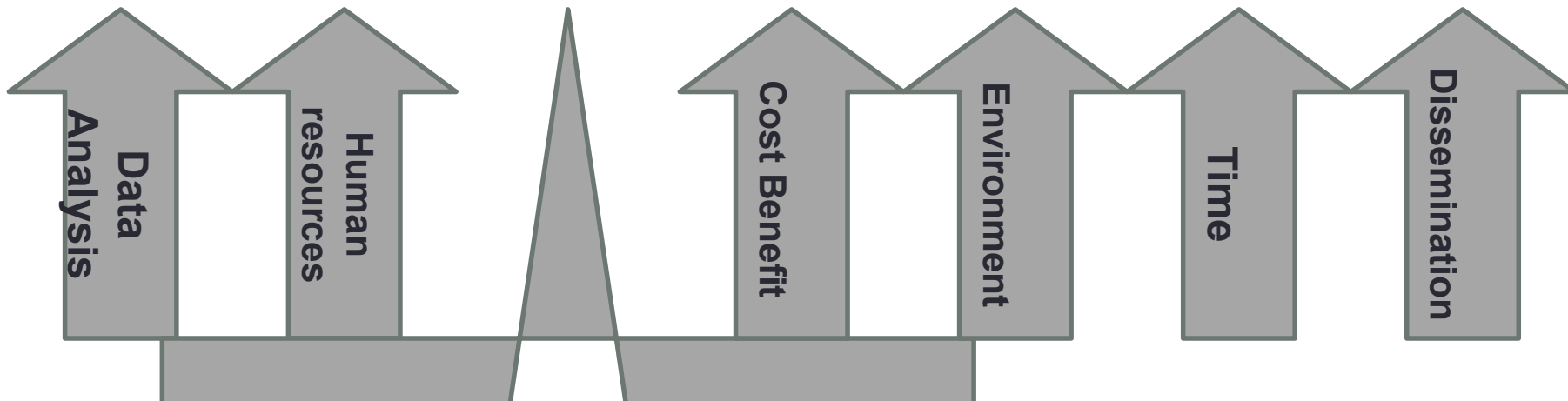
- A functional, friendly, aesthetically and quality enhanced environment is achieved
- Improved levels of thermal comfort and hence living standards in the region are achieved
- The urban green space is enhanced
- Significant energy savings in the surrounding buildings are achieved as the thermal loads are decreasing

The project, with a budget of 4,5 million Euros, will commence in early 2013, co-financed by the “Bioclimatic urban rehabilitation action”, ΕΠΠΕΡΑΑ

Design team: Dr. N.Soulakis & associates, Architectural Design  
Prof. A.M.Papadopoulos & associates, Bioclimatic  
Study  
Directorate of Technical Services, Municipality of Pavlos  
Melas

## Conclusions (1/3)

### Energy Planning towards Sustainability



## Conclusions (2/3)

- The most important interventions to achieve the environmental and social goals are divided into three categories: reducing the impact of the urban heat island effect, upgrading the open spaces and saving energy in buildings.
- The most popular measures according to the applications that have been made at the Municipalities are relative to the urban island phenomenon, the improvement of the road condition for the benefit of users and the use of cold materials at the pavement.
- The most popular measures for the upgrade of open spaces are the establishment of green areas, the use of cold materials and the use of proper systems in order to reduce electricity needs of the space.

## Conclusions (3/3)

- In case of energy saving in buildings, the most frequently applied measures are the installation of solar collectors for domestic hot water production and the energy upgrade of the building using thermal insulation and energy efficient windows.
- Regarding public areas the observed cost ranges 170-190 €/m<sup>2</sup>, which is elevated compared to the ranges recorded for open areas. In case of open spaces' interventions, costs range between 45 and 200 €/m<sup>2</sup>-, compared to the average expected cost of 133,80 €/m<sup>2</sup>.