"The Greek Experience in using EU Structural Funds for increasing the energy performance of buildings"

by Costis Stambolis, AA. Dipl. (Grad.), Executive Director IENE
and Eva Athanassakou, M.Sc, Head, Energy & Buildings Unit,
Institute of Energy for S.E. Europe (IENE)

BPIE Roundtable on
"Financing energy efficiency in Romanian buildings"
Bucharest, March 16th , 2012

INSTITUTE OF ENERGY
FOR SOUTH-EAST EUROPE

Presentation Outline

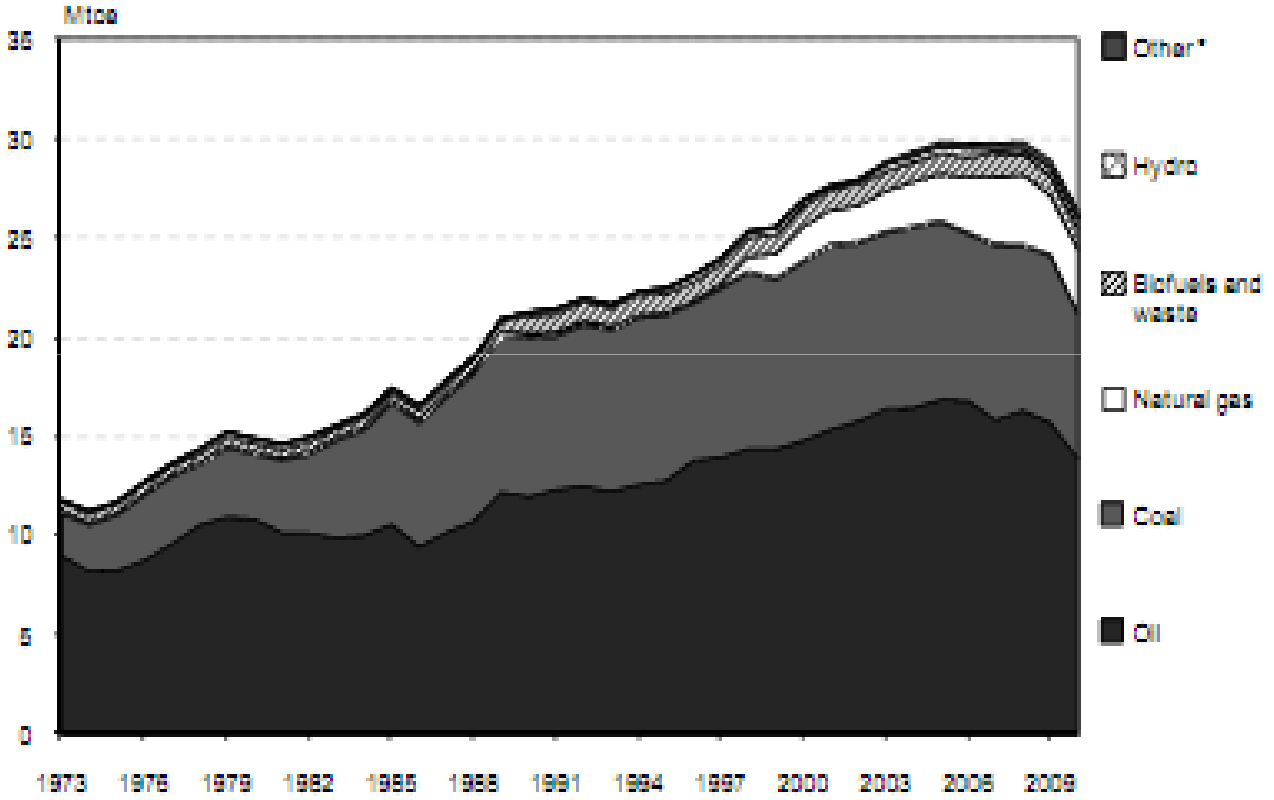
- Basic facts on Greece
- Physical environment – climate zones
- The built environment: Old and New
- Origins of present day building construction model and the apartment building
- Greece's energy mix and the role of the building sector
- The case for improved energy efficiency in the building sector
- Legislation in Place

- Building Certification
- The role of building inspectors
- EU funded Energy Efficiency promotion programmes
  - Exoikonomo (save)
  - Exoikonomo kat' econ (energy saving at home)
  - Prassina Domata (Green roofs in public buildings)
- Examples of solar energy applications in buildings
- Conclusions

Capital	Athens
Official language	Greek
Government	Parliamentary republic
President	Karolos Papoulias
Prime Minister	Loukas Papademos
Area	131,957 sq km
Population	11.2 million (UN, 2009)
GDP (PPP) Total	USD 341.688 billion [IMF 2008]
Per capita	USD 29,248.625 [IMF 2007]
GDP (nominal) Total	USD 357.548 billions [IMF 2008]
Per capita	USD 28,145 [IMF 2007]
HDI	0.942 [2007]
Currency	Euro (€)

Basic Energy Facts on Greece

Total primary energy supply, 1973 to 2010

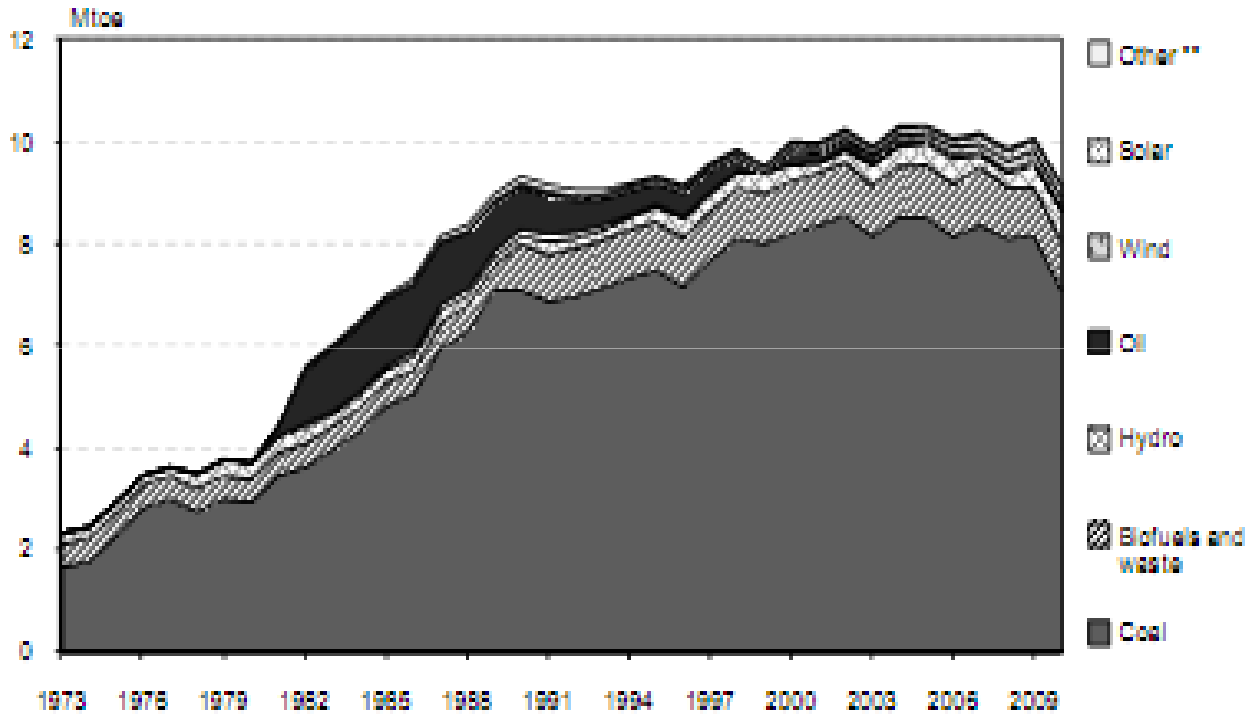


* Estimates for 2010.

** *Other* includes wind, solar, geothermal and ambient heat used in heat pumps.

Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2011.

Energy production by source, 1973 to 2010

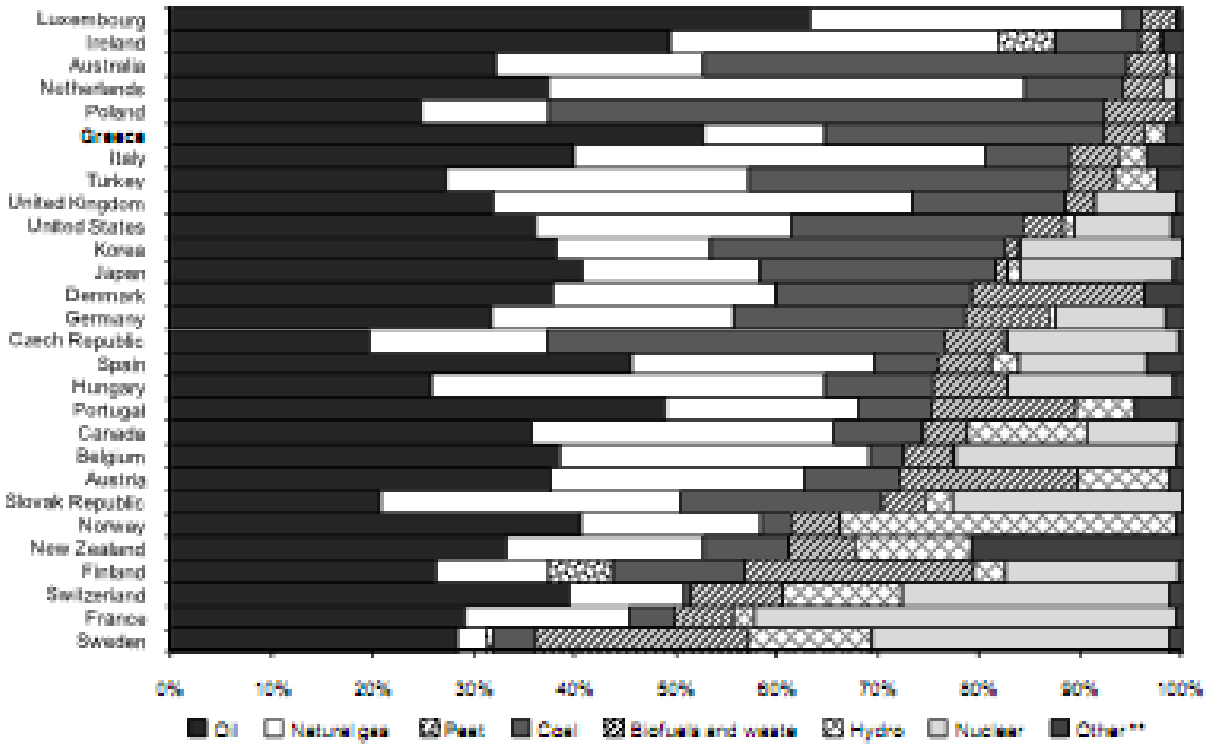


* Estimates for 2010.

** Other includes natural gas, geothermal and ambient heat used in heat pumps (negligible).

Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2011.

Breakdown of total primary energy supply in IEA member countries, 2010

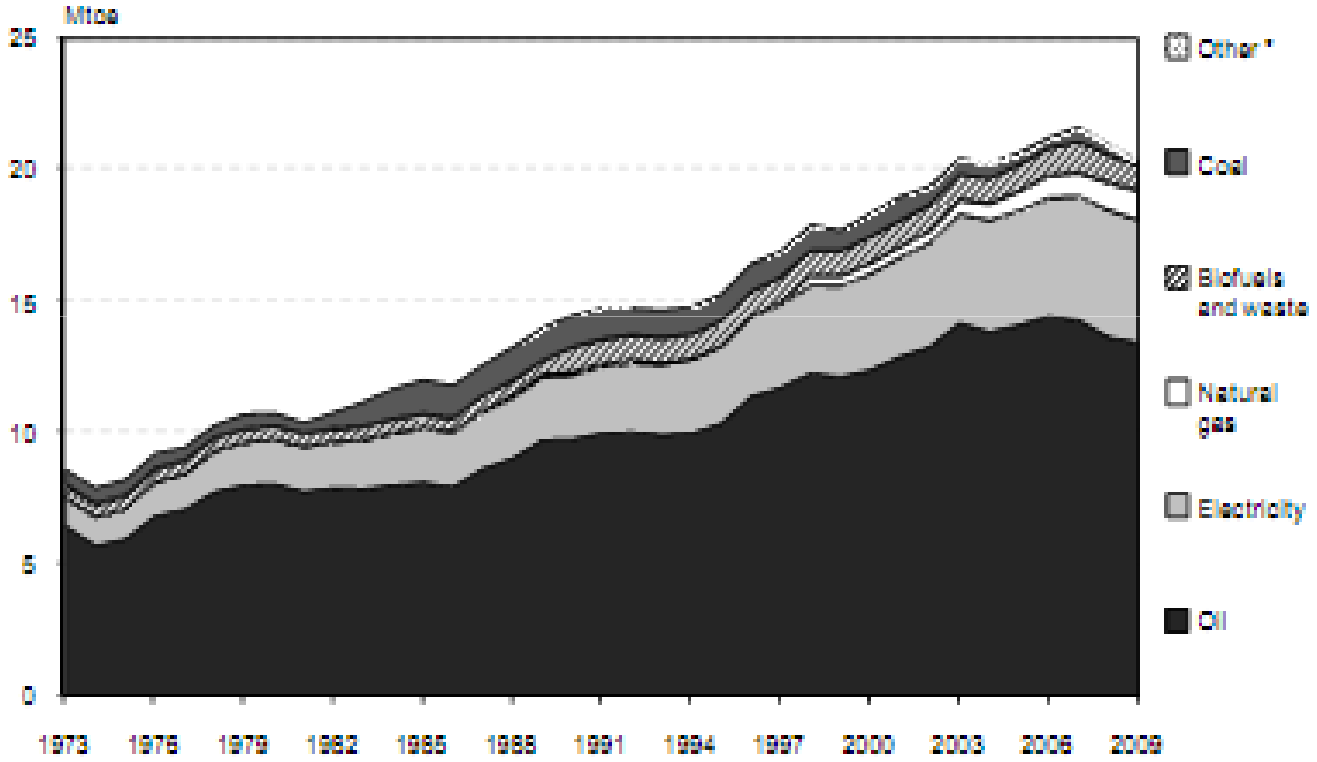


* Estimates.

** *Other* includes geothermal, solar, wind, and ambient heat production.

Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2011.

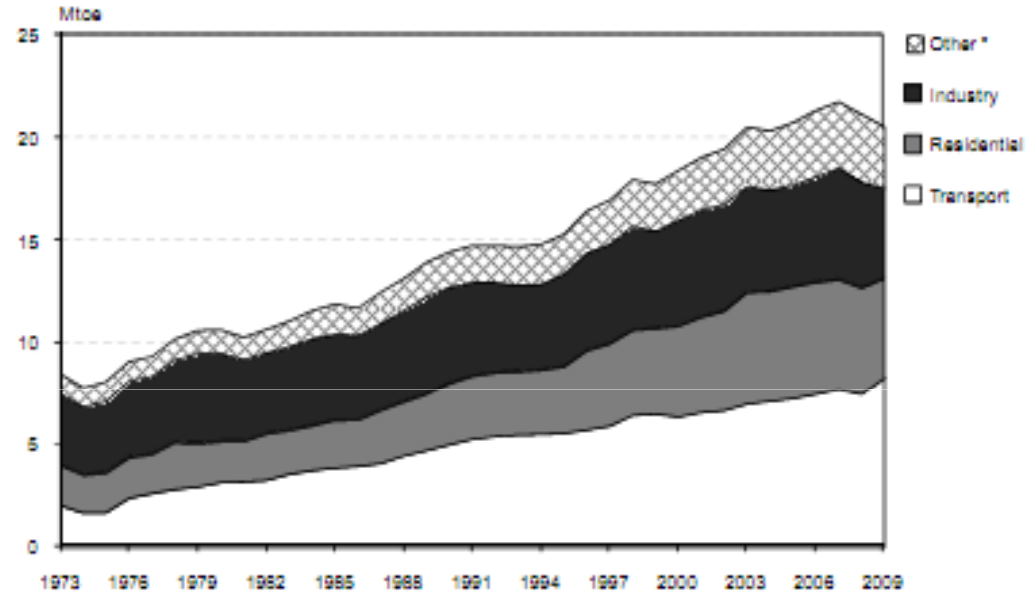
Total final consumption by source, 1973 to 2009



* *Other* includes solar, geothermal and heat (negligible).

Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2010.

Total final consumption by sector, 1973 to 2009



* Other includes commercial, public service, agricultural, fishing and other non-specified sectors.

Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2010.

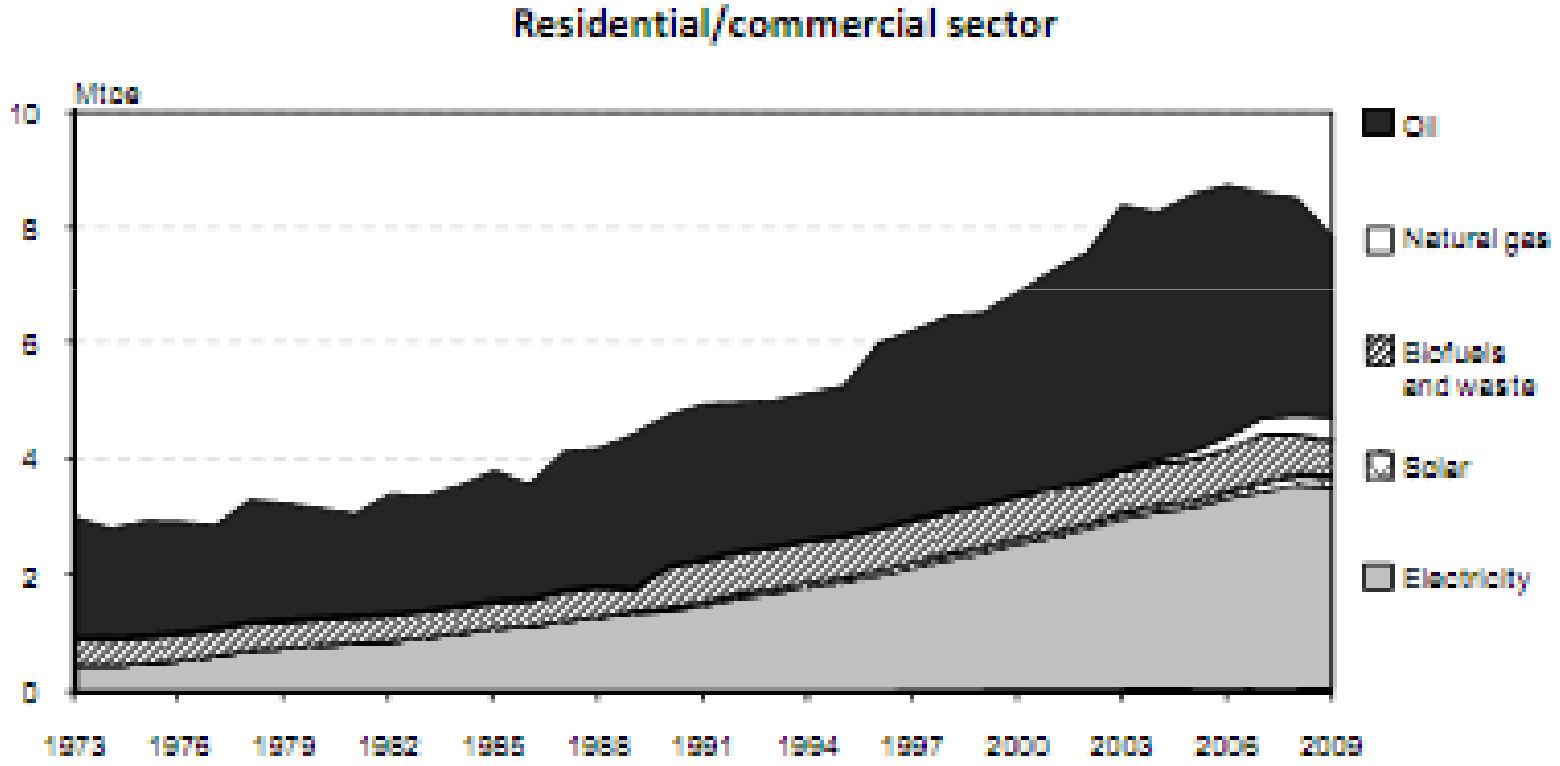
Key data (2009)

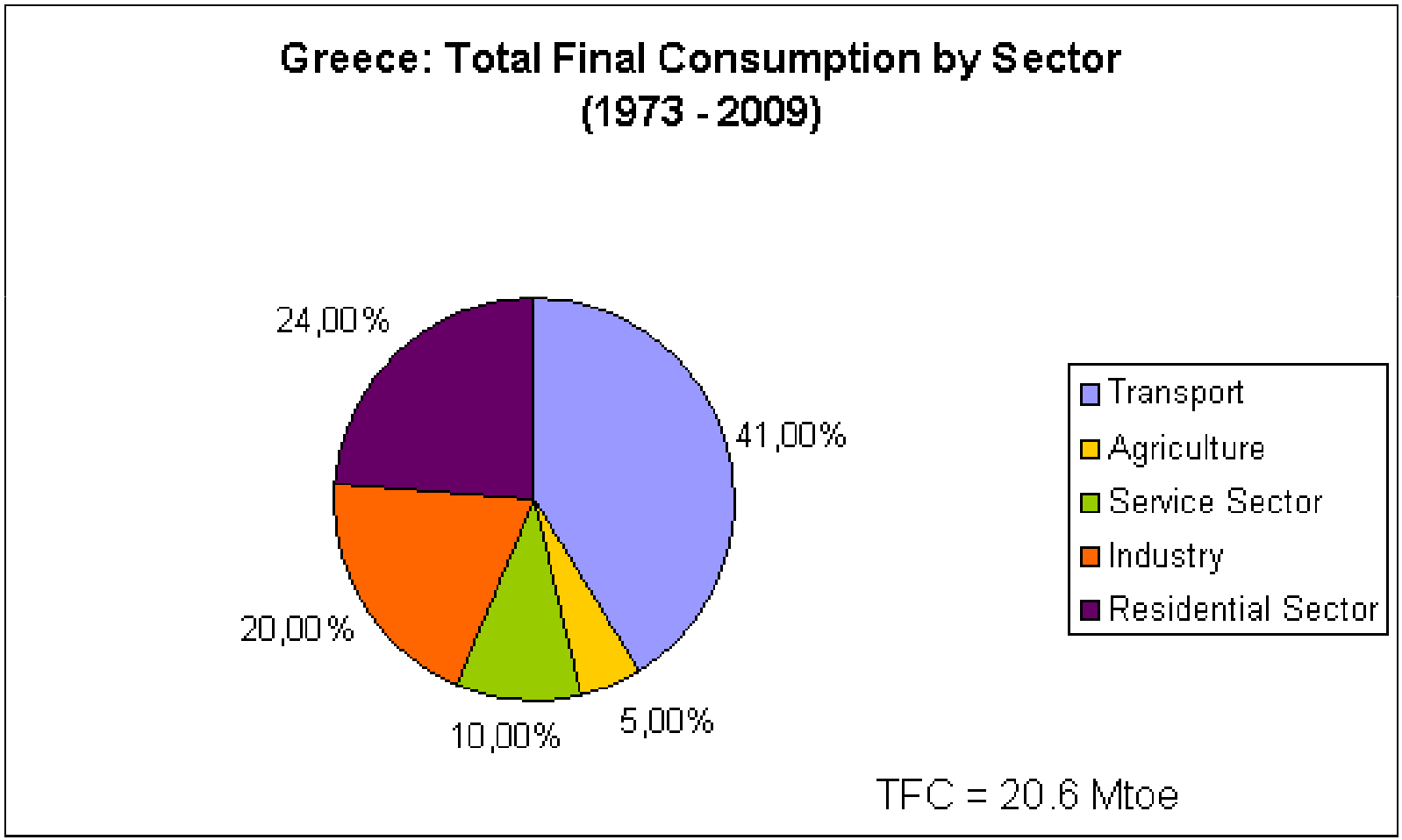
Energy use per capita: 2.4 toe (OECD average: 4.4), -3.5% from 2000

Energy intensity: 0.11 toe per 1 000 USD (OECD average: 0.16), -21.1% from 2000

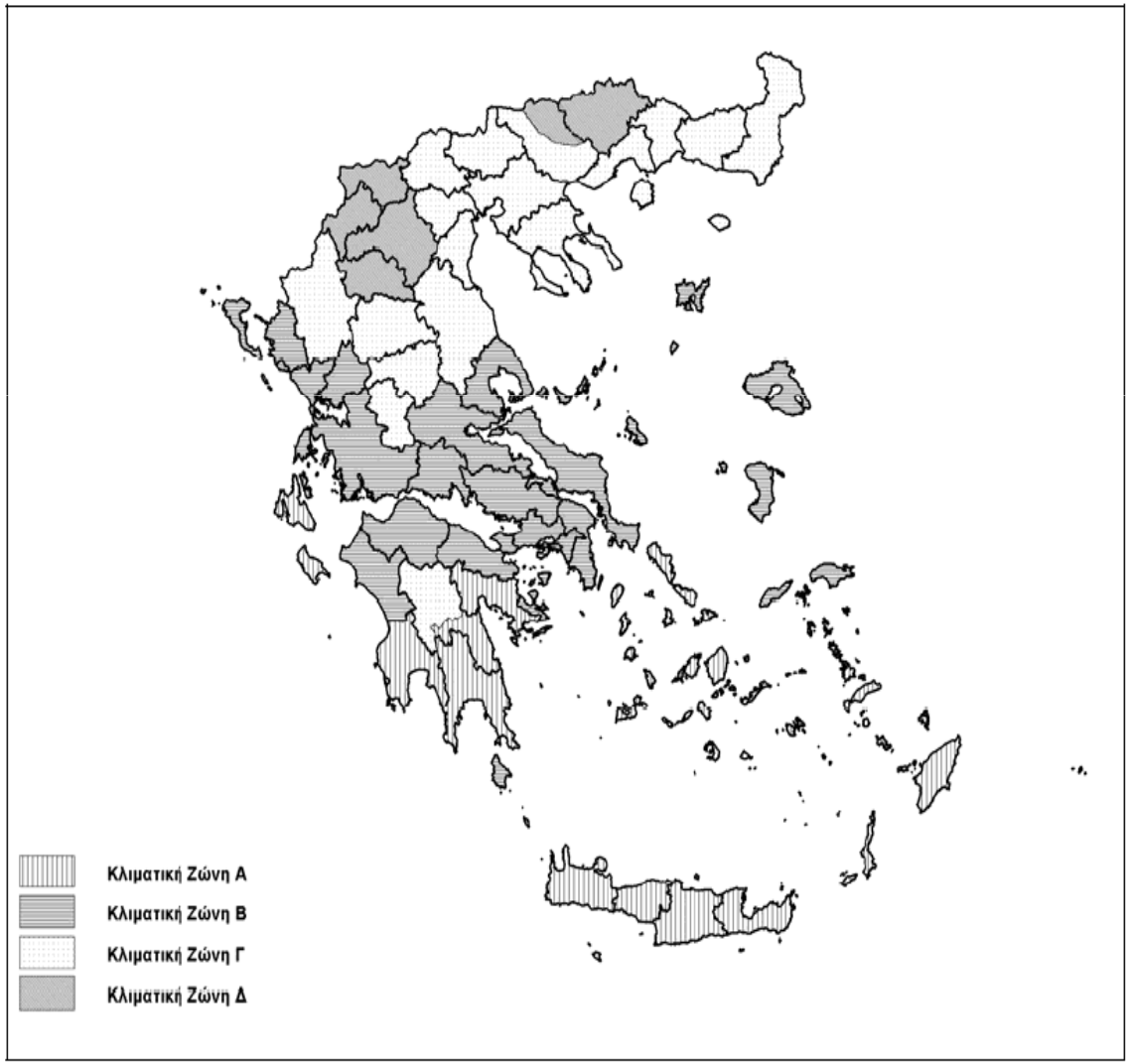
Total final consumption: transport sector 41%, residential 24%, industry 21%, services and agriculture 15% (OECD average: transport 33%, industry 31%, residential 20%, other 16%)

Total final consumption by sector and by source , 1973 to 2009



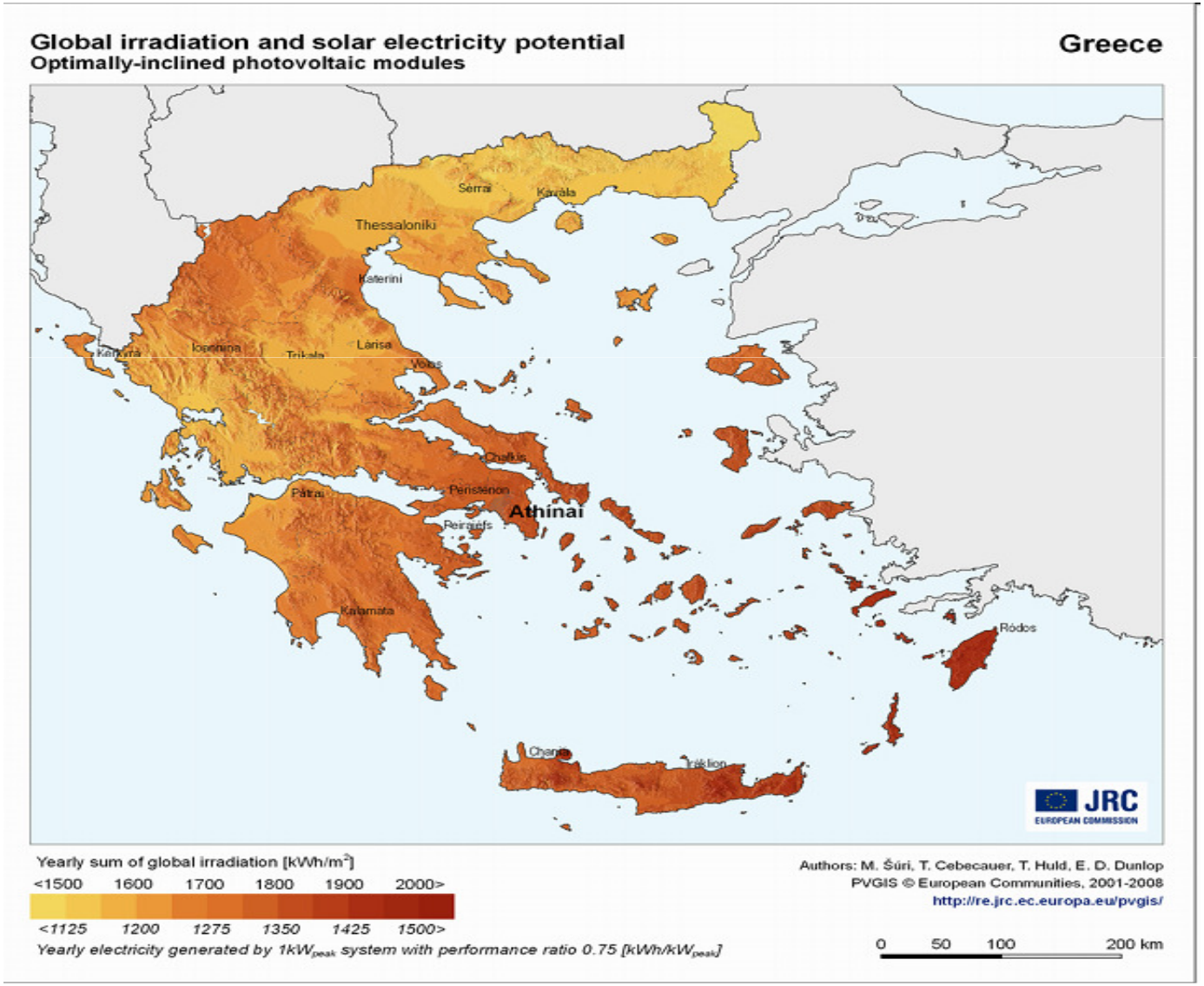

Greece: Total Final Consumption by Sector
(1973 - 2009)
24,00%
41,00%
20,00%
10,00%
5,00%
Transport
Agriculture
Service Sector
Industry
Residential Sector
TFC = 20.6 Mtoe

Physical Environment – climate zones (i)



The country is divided in four climate Zones based on heating degree-days as shown in the map.

Physical Environment – climate zones (ii)

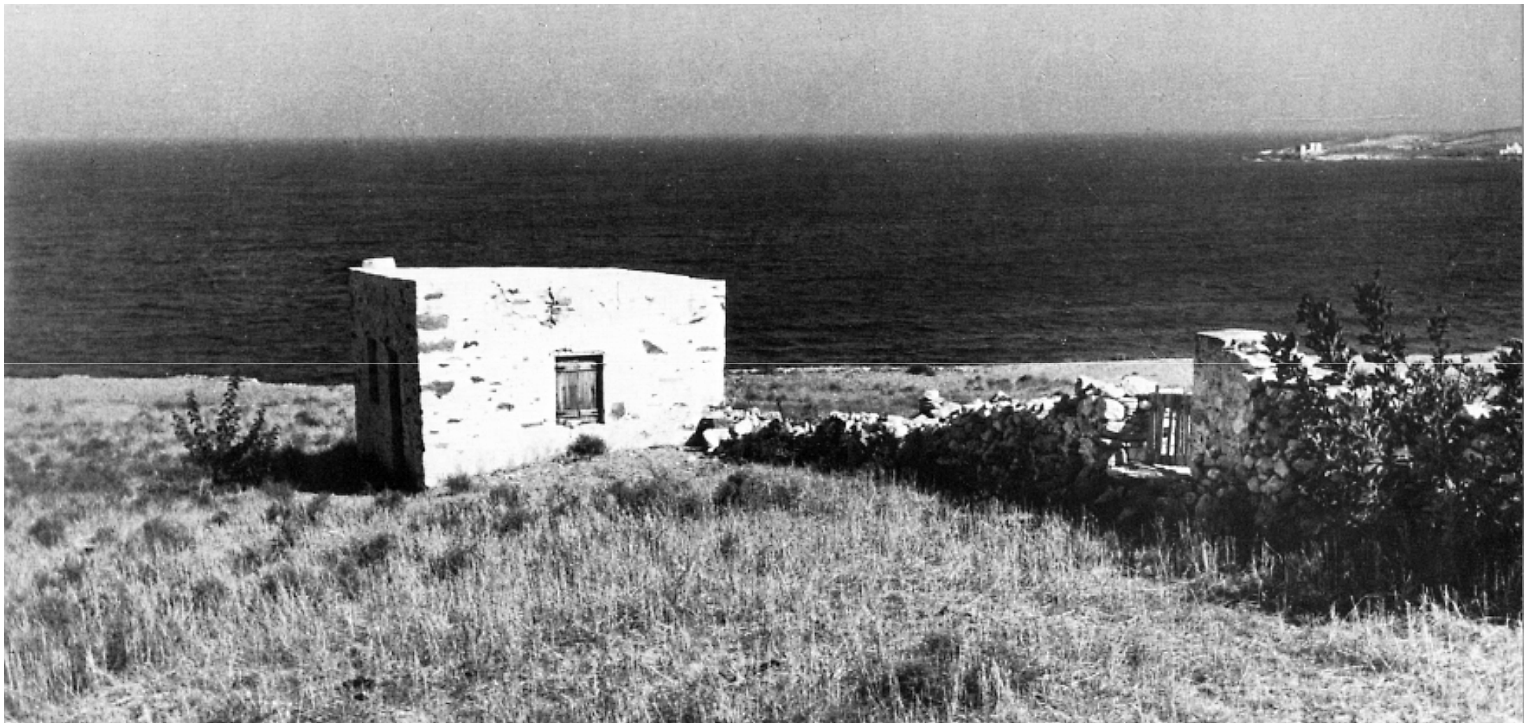


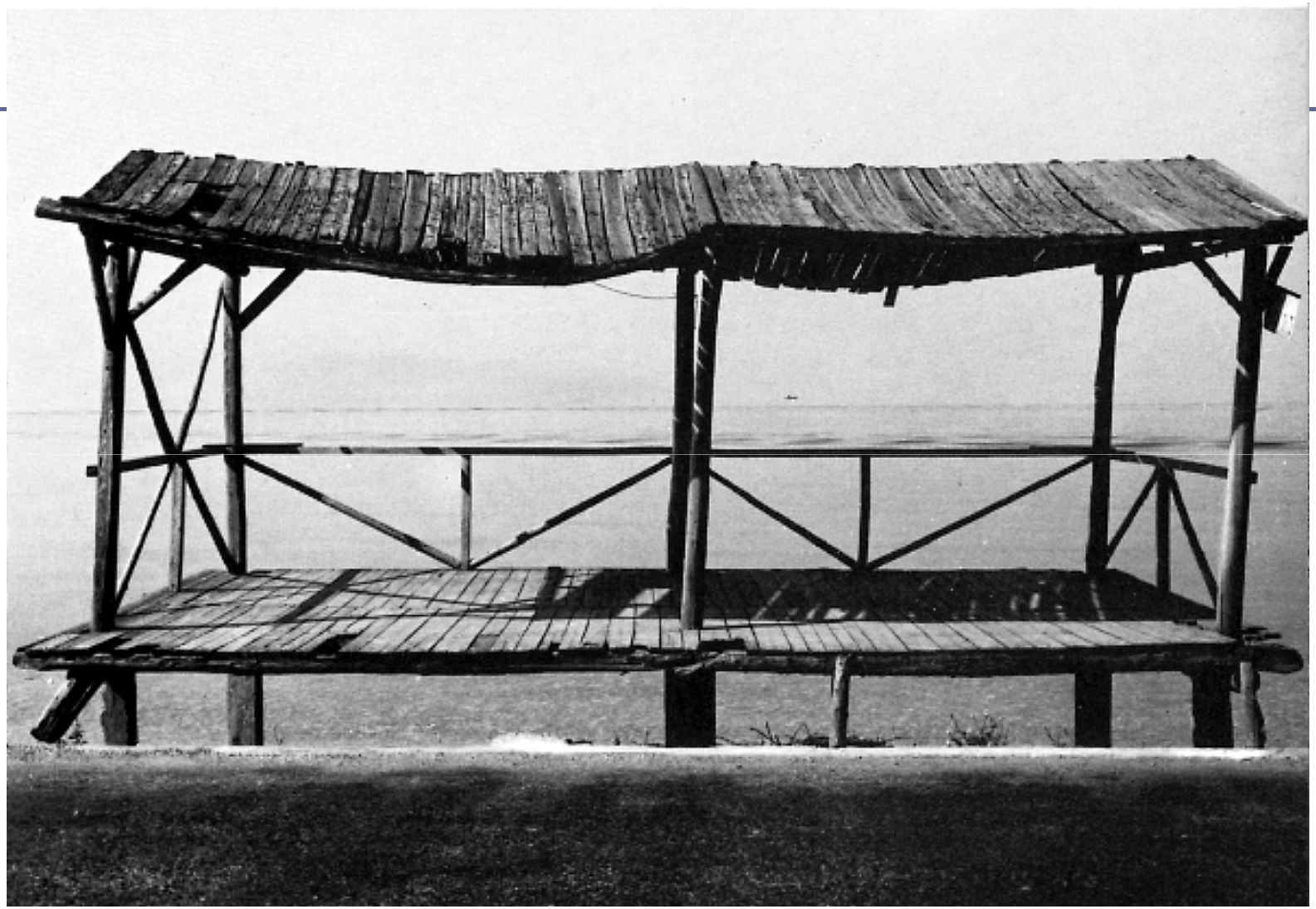
The Built Environment in Greece

- 4.3 million buildings stock of which 78% corresponds to houses
- 75% were built before 1981
- 1% - 2% new buildings per year, until 2008
- Less than 0.5% after 2009
- Energy efficiency efforts should focus primarily on existing stock

The Built Environment in Greece
Old and New Buildings

For thousands of years, buildings in Greece were built mostly taking into consideration natural phenomena and physical parameters. Minimisation of heat losses in winter, prevention of excess heating during the summer and cross ventilation were achieved through careful and wise design and construction methods. Post WWII building construction in Greece, largely influenced by the internationalist – modernist movement and based on reinforced concrete techniques, ignored systematically the traditional concepts found in vernacular and neoclassic architecture. Now we have to re-invent long forgotten and established practices.

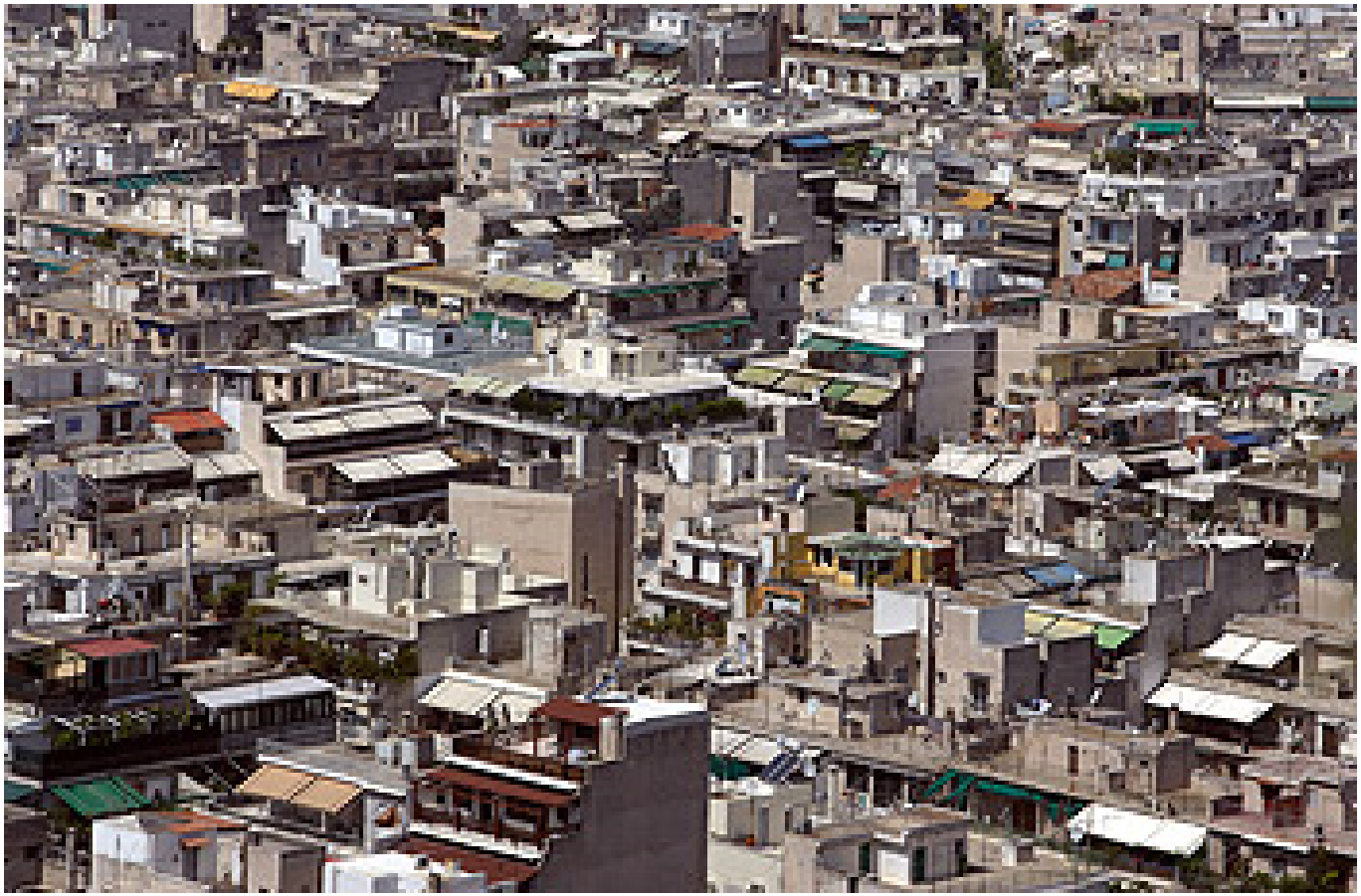




ALPHA BANK
© Miltos & Co

Origin of Present Day Building Construction Model

- New construction practices emerge in early 1950's
- Need to rebuilt ruined areas following WW II and provide housing on large scale
- Government unable to fund new housing needs
- Commercial contractors devise "Land Granting" scheme with land owners offering lots in exchange of apartments
- "Land Granting" becomes a widespread phenomenon
- Almost all apartments blocks all over Greece are built on this model
- Apartment building becomes the norm in all new constructions
- Construction of individual buildings is strictly limited to second, homes in villages and holiday houses.



The Built Environment in Greece

The Built Environment in Greece

The Built Environment in Greece

The typical apartment building

The Built Environment in Greece

Lock open green space is characteristic of Greece's urban areas

Legislation in Place

- EU Directive 2002/91/EK – concerns Energy Performance Building Directive (EPBD)
- Greek law 3661 / 2008 concerning measures for the reduction of energy consumption in buildings and related matters (this law substituted previous legislation of 1979 for the “Thermal insulation of buildings)
- Ministerial decision 407 / April 2010 for the “Regulation of Energy Performance of Buildings” (KENAK)
- Presidential Degree of October 2010 concerning energy auditors

Certification of Buildings

- Reference building methodology is introduced for the first time. The reference buildings is defined as having the same geometry, orientation, use and operational characteristics as the building under consideration. Its difference is that it has a set of predefined thermal properties for the building shell, and a set of characteristics for the heating and cooling instillations, hot water production and lighting (in the case of the tertiary sector)
- The actual calculation procedure is based on the monthly methodology of EN13790, and a set of national parameters have been defined where necessary. The methodology covers heating, cooling, hot water for all buildings, plus lighting for commercial buildings. The assumptions and basic parameters calculation are described in a number of Technical Guidelines, published by the Technical Chamber of Greece in October 2010. These guidelines also include the climate files that should be used in the calculations, and thermal properties of buildings materials

Certification of Buildings

- Buildings are classified in 9 classes according to the scale shown in Table A. The category B corresponds to the minimum accepted category of new buildings and those undergoing major renovation. E.A. refers to the total primary energy consumption of the existing building and K.A. refers to the total primary energy consumption of the reference building. The reference building is defined as a building with the same geometrical characteristics as the building under consideration, which has specified characteristics for the U values of all the structural elements, as well as for the energy efficiency of heating, cooling and lighting installations.

- Building certification is obligatory for all new buildings

- Required also for old buildings in the case of purchases and renting

Table A1 – Definition of energy classes

Category	Limits
A+	E.A. ≤ 0,33K.A.
A	0,33 K.A. < E.A. ≤ 0,50 K.A.
B+	0,50 K.A. < E.A. ≤ 0,75 K.A.
B	0,75 K.A. < E.A. ≤1,00 K.A.
Γ	1,00 K.A. < E.A. ≤ 1,41 K.A.
Δ	1,41 K.A. < E.A. ≤ 1,82 K.A.
E	1,82 K.A. < E.A. ≤ 2,27 K.A.
Z	2,27 K.A. < E.A. ≤ 2,73 K.A.
H	2,73K.A. < E.A.

E.A.: Primary Energy Consumption of the building under consideration
K.A.: Primary Energy Consumption of the Reference Building

Table A2

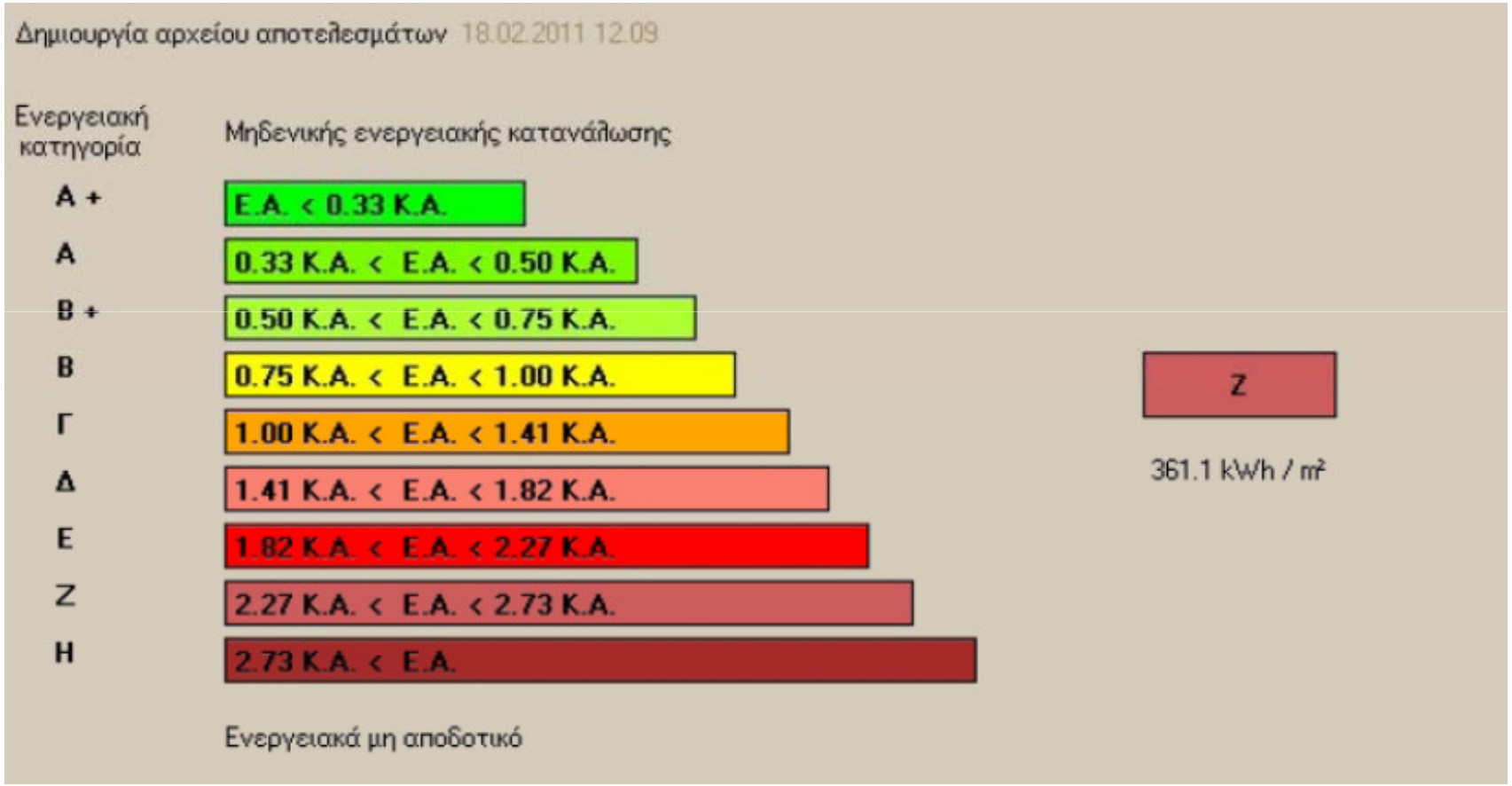
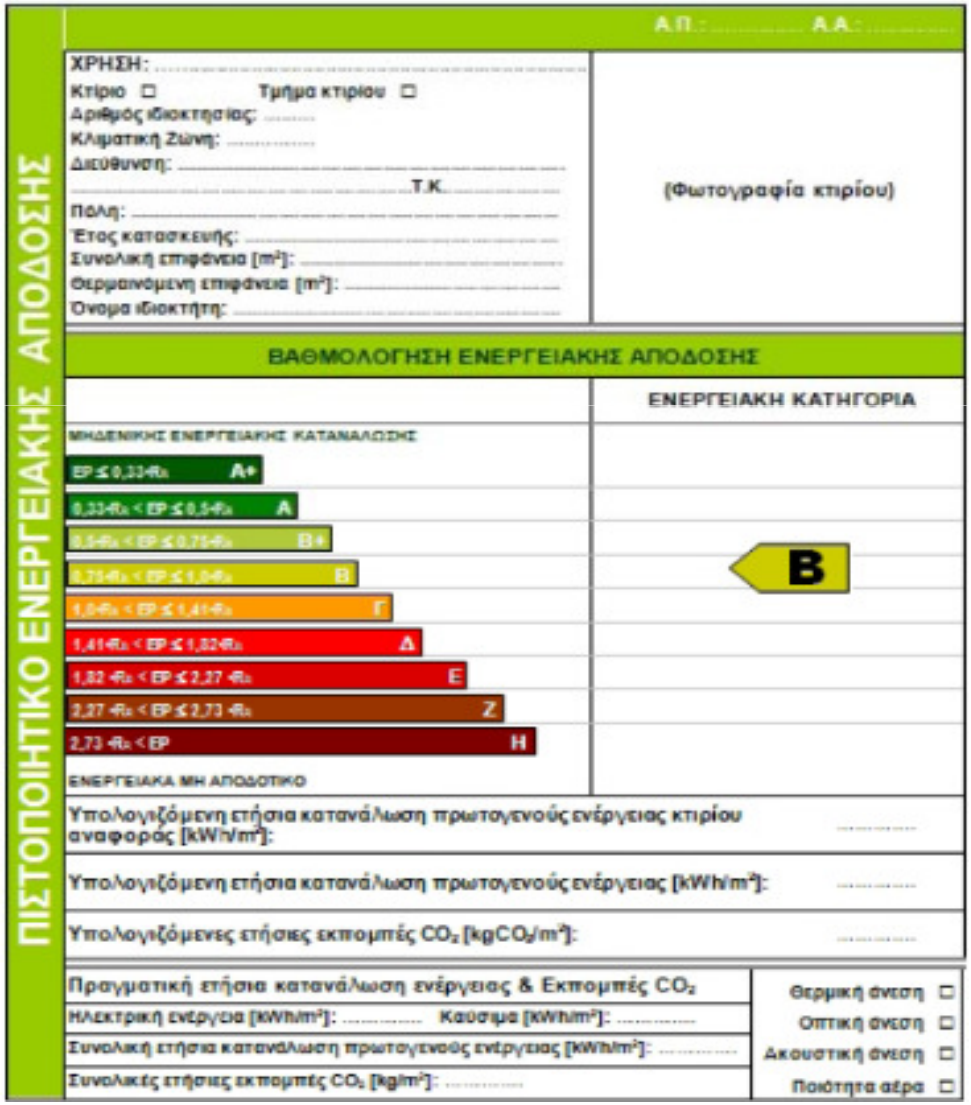

Δημιουργία αρχείου αποτελεσμάτων 18.02.2011 12:09
Ενεργειακή κατηγορία
Μηδενικής ενεργειακής κατανάλωσης
A +
E.A. < 0.33 K.A.
A
0.33 K.A. < E.A. < 0.50 K.A.
B +
0.50 K.A. < E.A. < 0.75 K.A.
B
0.75 K.A. < E.A. < 1.00 K.A.
Γ
1.00 K.A. < E.A. < 1.41 K.A.
Δ
1.41 K.A. < E.A. < 1.82 K.A.
E
1.82 K.A. < E.A. < 2.27 K.A.
Z
2.27 K.A. < E.A. < 2.73 K.A.
H
2.73 K.A. < E.A.
Ενεργειακά μη αποδοτικό
Z
361.1 kWh / m²

Table B – Building Energy certificate form



ΠΙΣΤΟΠΟΙΗΤΙΚΟ ΕΝΕΡΓΕΙΑΚΗΣ ΑΠΟΔΟΣΗΣ

Α.Π.: ..... Α.Α.: .....

ΧΡΗΣΗ: .....

Κτίριο ☐ Τμήμα κτιρίου ☐

Αριθμός ιδιοκτησίας: .....

Κλιματική Ζώνη: .....

Διεύθυνση: .....

.....Τ.Κ.....

Πόλη: .....

Έτος κατασκευής: .....

Συνολική επιφάνεια [m²]: .....

Θερμαινόμενη επιφάνεια [m²]: .....

Όνομα ιδιοκτήτη: .....

(Φωτογραφία κτιρίου)

ΒΑΘΜΟΛΟΓΗΣΗ ΕΝΕΡΓΕΙΑΚΗΣ ΑΠΟΔΟΣΗΣ

	ΕΝΕΡΓΕΙΑΚΗ ΚΑΤΗΓΟΡΙΑ
ΜΗΔΕΝΙΚΗΣ ΕΝΕΡΓΕΙΑΚΗΣ ΚΑΤΑΝΑΛΩΣΗΣ	
EP ≤ 0,33·R_h A+	
0,33·R_h < EP ≤ 0,5·R_h A	
0,5·R_h < EP ≤ 0,75·R_h B+	
0,75·R_h < EP ≤ 1,0·R_h B	B
1,0·R_h < EP ≤ 1,41·R_h Γ	
1,41·R_h < EP ≤ 1,82·R_h Δ	
1,82·R_h < EP ≤ 2,27·R_h E	
2,27·R_h < EP ≤ 2,73·R_h Z	
2,73·R_h < EP H	
ΕΝΕΡΓΕΙΑΚΑ ΜΗ ΑΠΟΔΟΤΙΚΟ	

Υπολογιζόμενη ετήσια κατανάλωση πρωτογενούς ενέργειας κτιρίου αναφοράς [kWh/m²]: .....

Υπολογιζόμενη ετήσια κατανάλωση πρωτογενούς ενέργειας [kWh/m²]: .....

Υπολογιζόμενες ετήσιες εκπομπές CO_2 [kgCO_2/m²]: .....

Πραγματική ετήσια κατανάλωση ενέργειας & Εκπομπές CO_2

Ηλεκτρική ενέργεια [kWh/m²]: ..... Καύσιμα [kWh/m²]: .....

Συνολική ετήσια κατανάλωση πρωτογενούς ενέργειας [kWh/m²]: .....

Συνολικές ετήσιες εκπομπές CO_2 [kg/m²]: .....

Θερμική άνεση ☐

Οπτική άνεση ☐

Ακουστική άνεση ☐

Ποιότητα αέρα ☐

The Role of Buildings Inspectors

- This is a new concept introduced by law 3661/2008 in order to enforce its provisions since energy inspections for buildings becomes obligatory
- The training of experts to carry out Energy Audits and the issue of Energy Performance Certificates (EPC's) are outlined in new Regulation
- EPC's are required for new constructions and also when buying or relating a flats a house of business premises
- Training courses and exams are foreseen and already being implemented
- National Registry of Energy Experts organized by CRES (started in 1Q 2011)
- National database for EPC's and inspection reports already in place
- 8,000 Provisional Building Inspectors have been accredited so far
- Approx 25,000 Building energy inspections have been completed so far (February 2012)

Legal Level

Legislation

Current Legislation:

1. Law 3661/2008 National official journal A' 89

2. Building Energy Efficiency Regulation (KENAK, FEK B'407)

3. General Building Code Law 2831/200 FEK A' 140

4. Law 3851 04/06/2010, National Official Gazette A', 85.

Enforcement:

MINISTRY OF ENVIRONMENT, ENERGY & CLIMATE CHANGE, YPEKA

Responsibility of:

MINISTRY OF ENVIRONMENT, ENERGY & CLIMATE CHANGE, YPEKA

Summary:

Law 3661/2008, transposes the 2002/91/EC Directive in the Legislation of the country. Currently all articles of the Directive have been transposed.

KENAK (Regulation for Energy Efficiency in Buildings) is a Ministerial Decision that sets new insulation standards for the buildings (for the new built and major renovations) and provides the physical model for the calculation of the overall energy performance of the building.

The General Building Code has changed to accommodate articles facilitating the extra insulation on existing buildings and the integration of passive solar and renewable energy systems.

Law 3851 04/06/2010, transposes the recast Directive in to the Greek legislation.

Implementation of EU Directives: Directive 2002/91/EC on the Energy performance of Buildings implemented by 3661/2008,

Legal requirements

Energy performance: (e.g. what requirements are set in relation to the energy performance of buildings, how these are compared with old requirements from previous years)

The law cover provides the following:

All new buildings and existing buildings subject to major renovation, must meet the minimum energy efficiency requirements.

For new buildings under renovation and Energy Study is submitted.

Energy Performance Certificate for new and radically renovated buildings, as well as the rental or sale of buildings. Restricted to a maximum of 10 years.

Regular inspection of boilers and heating installations.

Regular inspection of refrigeration and air conditioning.

Certification: (e.g. how long has the certification scheme been in place, for what type of transactions certificates are required, who is in charge, what are the specific requirements etc.)

All new and substantially renovated buildings must be energy Yield the same or better than Class B.

REFERENCE VALUES

The categories of energy rating (A +, A, B +, B, etc.) determined by a range of consumption energy used for each building and climate zone. The Classification of the building is based on the estimated total energy consumption [kWh/m2].

REFERENCE BUILDING

The reference building occupies always Class B energy rating, while other categories are defined as a percentage energy consumption of building reference. The ranking is based on building's estimated consumption of primary energy [kWh/m2]. The reference building has the same geometry orientation, mode profile and climatic data as the study building.

- **The scheme is in place since 11 January 2011 (only a few months).**
- **Up to 7000 certificates have been issued.**

Inspections: (e.g. what the legal requirements are with respect to inspections of AC/Heating systems, how often they should take place, etc.)

Inspections of AC/Heating systems is required for buildings above 50 m².

TABLE C. Frequency of heating system inspection

Heating system power	Fuel	Frequency
20-100 KW	Liquid or fossil fuels	Every 5 years
>100 KW	Liquid or fossil fuels	Every 2 years
>100 KW	Natural Gas	Every 4 years
>20 KW & more than 15 year old	All fuels	One time

Currently Running Energy Efficiency Promotion Programmes in Greece supported by EU funds

I. "Exoikonomo" (Save) with 70.0 million Euros committed from EU Structural Funds
II. "Exoikonomo kat' Econ" (Energy Saving at Home) with 270 million Euros from EU Structural Funds
III. "Prasina Domata se Dimosia Ktiria" (Green Roofs in in Public Buildings) with 17.0 million Euros from EU Cohesion Fund

EU Funded Energy Efficiency Promotion Programmes in Greece

I. Programme "Exoikonomo" (Save)

(a) Programme Description

- Programme was launched in first half of 2009 and is addressed exclusively to Local Authorities and Municipalities
- Its covers Public Sector buildings, Public Services and Public Areas
- In the building sector the programme includes schools, office buildings, auditoriums administrative complexes
- CRES was appointed by the government as the intermediary management agency
- Funding is provided by EU's structural funds (70%) and by the applicants (30%)
- Total EU funds committed so far amount 70.0 million Euros

Programme "Exoikonomo" (Save)

(b) Programme Objectives

- Reduction of every consumption, especially peak loads
- Improvement of habitation conditions in buildings and in towns
- Reduction of CO_2 emissions and Climate Change mitigation
- Urban environment improvement and curtailment of city thermal islands
- Mobilization of market forces and promotion of investments for sustainable development
- Increase of environmental awareness and change of daily energy related habits

Programme "Exoikonomo" (Save)

(c) Programme Timetable

- June2009 – Submission of Proposals to CRES
- 2010-2011 – Implementation of Projects (original schedule)
- January 2012 – Selection of successful projects
- June 2012 – Finalization and signing of contracts between CRES and Local Authorities, Municipalities
- July 2012 – Implementation of Projects

(d) Project Evaluation

- Out of 191 submissions only 106 were accepted and approved for funding
- Total amount of project budgets approved amount 83.4 million Euros (corresponding to 59.01 million Euros of EU funding)

Programme "Exoikonomo" (Save)

(e) Observations

i. Programme was seriously delayed at the evaluation stage

ii. Although there was an initial warm response from LA many of them were unable or not willing to cooperate with CRES during evaluation stage

iii. Current financial difficulties in Greek government funding created serious administrative problems at both LA's and CRES

iv. Project rescued by January 2012 government decision (i.e. YPEKA) for final project selection and new timetable for project implementation

EU Funded Energy Efficiency Promotion Programmes in Greece

II. Exiconomo kat' Econ (Energy Saving at Home)

(a) Programme Description

- Programme was launched late 2010
- It is addressed to house/ flat owners
- It provides direct subsidies (30%) and low rate bank loans (for the remaining share of the investment) for the renovation and energy performance improvement of existing buildings
- An EPC is required before the implementation of measures and one after the implementation in order to prove that the EP rating was improved by two categories (i.e. a flat rated as H should be E after the implementation of measures).
- Initial target for 1.0 billion KWh's saving per year
- The subsidies are provided by EU's structural funds
- Applications are made to selected banks which act as the intermediary agencies
- Programme covers all 13 Administrative Regions of the country
- Total EU's funds committed to this project amount to 270 million euro until the end of 2013 with total project budget of 396.0 million euro

Exiconomo kat' Econ (Energy Saving at Home)

(b) Programme Objectives

- Reduction of energy consumption and increase of overall energy efficiency
- Improvement of habitation conditions
- Increase of house owners energy awareness

(c) Programme Timetable

- There is no set timetable
- Applications are submitted on a continuous basis

Exiconomo kat' Econ (Energy Saving at Home)

(d) Project Evaluation

- This starts with inspection of premises by building inspector
- Inspector submits report to the bank
- Bank approves subsidy and loan and signs agreement with house owner
- Upon completion of improvement works energy inspector issues EPC
- Bank makes final payment

(e) Observations

- A total of 20.500 initial approvals to applications submitted has been granted (December 2011)
- 15.000 EPC's have been issued
- 12.000 applications have been incorporated into the programme
- 5.000 loan agreements have been concluded to corresponding to 79 million Euros overall house improvements budget
- A total of 5.5 million euro have been paid
- There has been an initial slow response to the programme but applications and approval have accelerated over the last 4 months

EU Funded Energy Efficiency Promotion Programmes in Greece

III. Programme "Prasina Domata se Dimosia Ktiria" (Green Roofs in Public Buildings)

(a) Programme Description

This programme involves the design and implementation of pilot/demonstration projects and the construction of green roofs on public buildings in Greece. This programme is designed to slow and finally reverse climate change at urban level.

Programme "Prasina Domata se Dimosia Ktiria" (Green Roofs in Public Buildings)

(b) Programme Objectives

- energy saving in public sector
- reduction of air pollution
- slowing and reversing climate change in urban areas
- encouragement and dissemination of RES through demonstration projects
- improve the thermal, optical and environmental conditions in public buildings
- promotion of sustainable regional development
- reducing the intensity of energy consumption in selected buildings with high energy running costs
- support of energy independence and security of energy supply on Mount Athos using RES
- improve the microclimate at regional level
- increase urban and suburban green
- getting people acquainted with the techniques, advantages and features of Green Roofs

Programme "Prasina Domata se Dimosia Ktiria" (Green Roofs in Public Buildings)

(c) Programme Funding

- Funded by the National Strategic Reference Framework (ESPA) and the "Environment and Sustainable Development" operation programme (EPPERAA)
- The Intermediate management Agency of the programme is CRES
- The total programme budget amounts to 20.0 million euros.
- The programme is co-funded by the European Union and especially from the Cohesion Fund and through national funding resources
- The financing of the Cohesion Fund amounts to 85% of the programme and corresponds to the amount of 17.0 million euros

(d) Project Timetable

- The timeline for the implementation of a project may not exceed thirty (36) months and should not exceed the September 30, 2015.
- Deadline for submission of proposals: 30/4/2012

Green Roofs

Programme "Prasina Domata se Dimosia Ktiria" (Green Roofs in Public Buildings)

(c) Beneficiaries

- Municipalities
- Administrative Regions
- Government Ministries
- Public Entities
- NGO's

(d) Project Evaluation

The evaluation will be undertaken by a Committee, consisting of experts on bio climatic and environmental issues. The evaluation process to include:

- Proposal adequacy
- Evaluation of proposals by groups of criteria
- Classification of evaluated proposals
- Informing beneficiaries of the evaluation results
- licensing of beneficiaries
- Announcement of final decision

S.E. Europe Renewables – Solar Thermal Market

Installed capacity of solar collectors in 2008 and cumulative capacity

No	Countries	Installed capacity in 2008		Cumulative capacity, end 2008	
		in m^2	in MWth	in m^2	in MWth
1	Bulgaria	6,000	4.2	62,000	43
2	Cyprus	40,550	28	665,300	465
3	Greece	300,000	210	3,550,000	2,485
4	Romania	10,000	7	79,600	56
5	Turkey	NA	NA	12,000,000	8,400

Solar Photovoltaic Installed Capacity in SE Europe (2010)

Country	Installed Capacity (MW)
Bulgaria	25.0 (e)
Cyprus	6.0 (e)
Greece	300.0
Romania	2.0 (e)
Turkey	5.0 (e)
Total	**348.0**

Examples of solar energy applications in buildings

15/05/2010 15:02

FYROGENIS
FYROGENIS
FYROGENIS
www.xanthiotis.com.gr

Conclusions

- Energy Efficiency in Buildings is relatively a new notion in Greece coming to replace thermal insulation
- Law 3661/2008 is central in introducing the “Energy Efficiency” concept and provides the basis upon which EU Directives can be applied in Greece
- There has been a slow and shy reception of the new law’s requirements but as the necessary tools become gradually available acceptability is accelerating
- Energy Audits for buildings and Energy Building Inspectors are key for the application of “Energy Efficiency” measures and for realizing sizeable energy conservation benefits at national scale on a long term basis
- Public education on energy efficiency ideas and techniques and on Building Energy Performance in general is needed. Suitable programmes in this direction should be devised.
- Greece’s current difficult economic predicament and the availability of organized programmes and some funding subsidies from EU, provide an excellent opportunity for introducing Building Energy Performance criteria and implementing house/offices energy efficiency measures.
- The large scale introduction and application of energy efficiency in the building sector is expected to have a long term positive impact for the economy and the urban and physical environment of the country.

-

THANK YOU
FOR YOUR ATTENTION

Costis Stambolis

cstambolis@iene.gr