



# ESPON - ReRisk: Regions at Risk of Fuel Poverty

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# ReRisk: Regions at Risk of Fuel Poverty

## Aim:

Identify the most economically **vulnerable**  
**European regions**



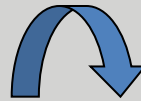
**impacts** from the **rising of energy prices** on the  
**development structure** of European regions



Policies to **enhance** the **Socioeconomic Base** of the  
most **Vulnerable EU Regions**

# ReRisk Methodology

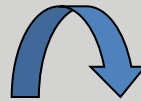
I. Identify Economic Vulnerability of EU Regions'



II. Clustering of the EU Regions



III. Building of Future Scenarios



IV. Policy Recommendations

# I. Vulnerability to Rising Energy prices

287 EU Regions (NUTS II - 2006)

## 5 Categories of Indicators

- Climate Conditions
- Economic Structure
- Transport Dependency
- Social Dimension
- Production Potential of Renewables

## In-depth analysis in 3 dimensions:

- Economic Vulnerability
- Transport Dependence
- Social Vulnerability

**Industry + Transport + Households = 84% of Total Energy Consumption**

## II. ReRisk Clustering of EU Regions

**Clustering:** Identification process of **groups of regions** with similar levels of vulnerability and development potential

*Used K-means procedure)*

Regions included: **237 out of the 287** NUTS II regions in EU 27

Not included: **50 regions** (missing data)

**Main Data Gaps:** Iceland, Denmark, Switzerland, Norway and the French Overseas Territories

## II. ReRisk Typologies - EU Regions

Typology 1a "Regions with problems and potential"

Typology 1b "Regions well-off, with trouble ahead"

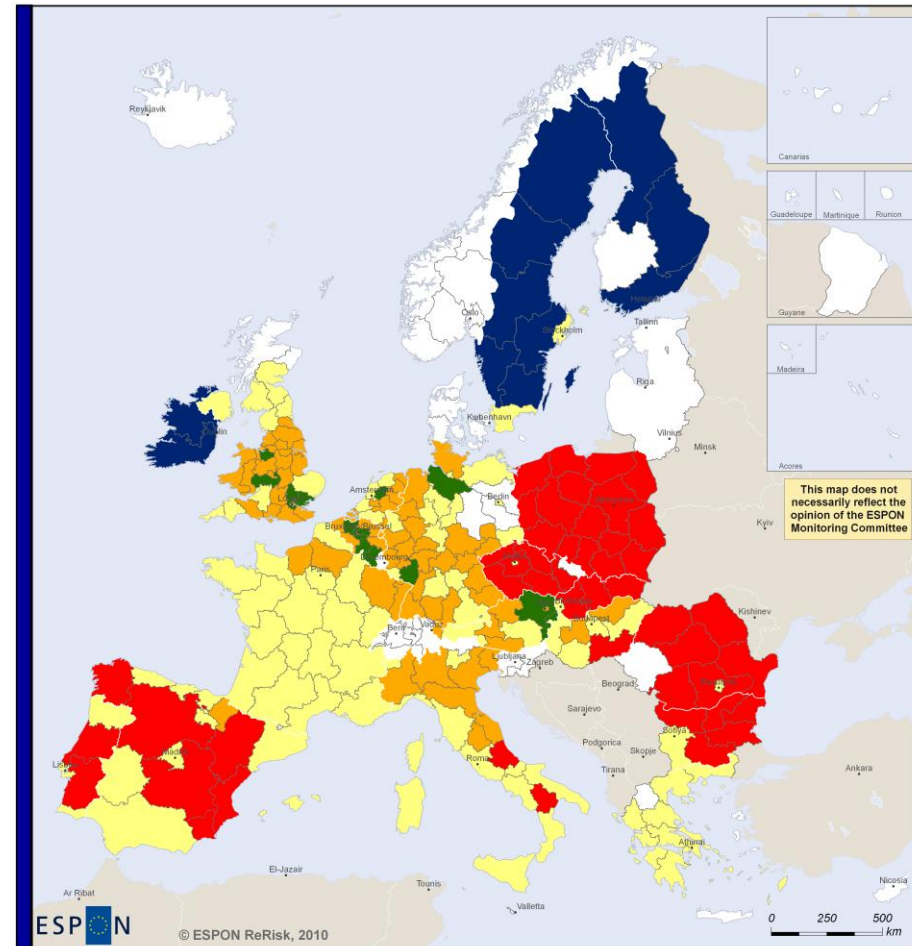
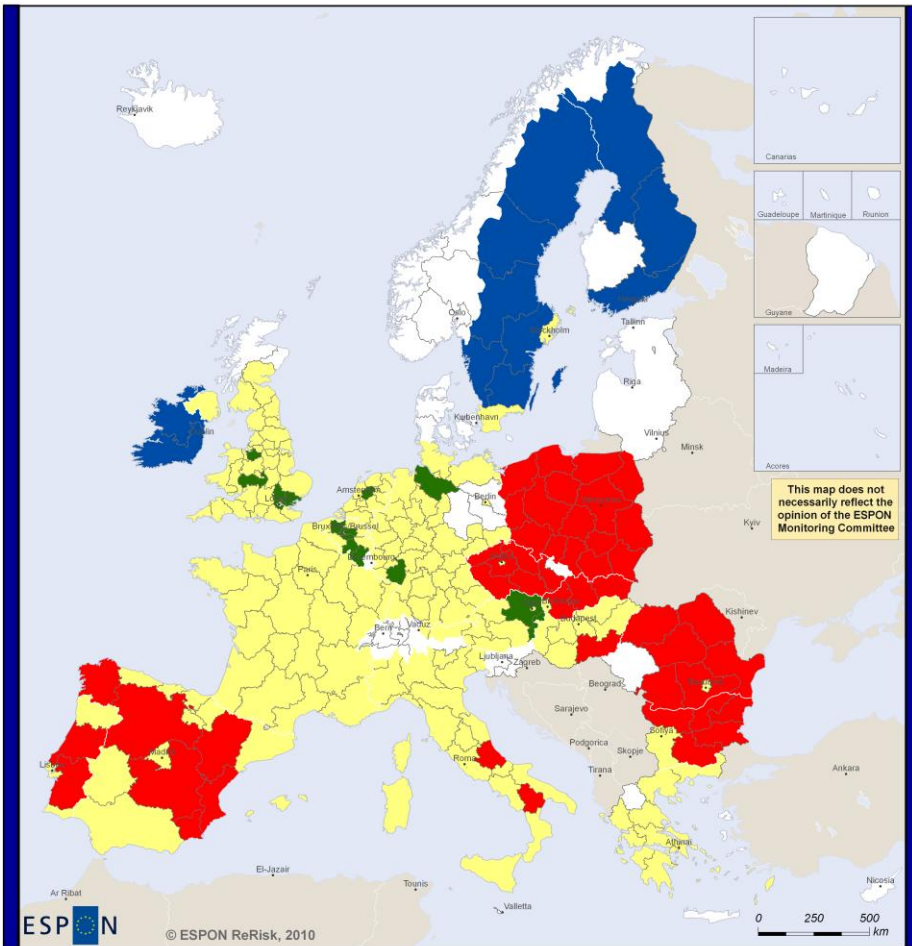
Typology 2 "Regions struggling, looking for jobs and a brighter future"

Typology 3 "Regions wealthy and commuting"

Typology 4 "Regions cool and windy but working"

## Regional Typologies of Energy Poverty

## Regional Typologies of Energy Poverty



EUROPEAN UNION  
Part-financed by the European Regional Development Fund  
INVESTING IN YOUR FUTURE

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Regional level: NUTS II  
Source: ESPON ReRisk, 2010  
Origin of data: Own elaboration, 2010  
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Source: ESPON ReRisk, 2010  
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### EU Regional Typologies: 4 Clusters

- Typology 1 "Well-off, with trouble ahead"
- Typology 2 "Struggling, looking for jobs and a brighter future"
- Typology 3 "Wealthy and commuting"
- Typology 4 "Cool and windy, but working"
- No Data

### EU Regional Typologies: 5 Clusters

- Typology 1a "With problems and potential"
- Typology 1b "Well-off, with trouble ahead"
- Typology 2 "Struggling, looking for jobs and a brighter future"
- Typology 3 "Wealthy and commuting"
- Typology 4 "Cool and windy, but working"
- No Data

# Typology 1a: Regions with problems and potential

## Regions with the lowest level of employment in industries with high energy purchases

- Economic structure rather robust
- Low exposure of industries to rising energy prices
- Higher than average unemployment rates in 2007
- Low energy intensity
- Low level of workers commuting to other regions
- Medium disposable income in the households
- High summer temperatures
- Moderate winter temperatures



# Typology 1a: Regions with problems and potential

## I. Service Oriented Urban Centres / Capital Areas

(Paris, Berlin, Rome, Budapest, Amsterdam, Madrid, Stockholm, **Bucharest**, Athens, Sofia and others)

Changes in Transport Patterns may appear  
(e.g. commuting)

## II. Semi-Rural / Tourist-Oriented / Coastal / Island Regions (South Europe)

High Photovoltaic (PV) Potential  
Medium-high Wind Power Potential

## Typology 1b: Regions well-off, with trouble ahead"

**Central-industrialized regions / industrial coastal - harbours / and Pentagon areas (around central Europe)**

- Medium level of employment in industries with high energy purchase
- High level of industrialization
- Long-term structural unemployment rates
- Alternative energy resources: low wind power and low PV and solar energy potential
- Medium level maximum summer temperature
- Warm mean temperatures in winter
- Rather low fuel costs

## Typology 2: Struggling, looking for jobs and a brighter future

### The most vulnerable regions (East and Southern parts of Europe)

- Geographically dispersed
- Large number of jobs in industries with high energy purchases
- Important share of GDP on fuel costs
- Low levels of commuting to other regions
- Low level of disposable income in households
- Wind and PV potential
- High summer temperatures requiring cooling appliances
- More centrally placed regions: hot summers and very cold winters
- Exposed to a very high level of long-term unemployment rates

## Typology 3: "Wealthy and commuting regions"

Regions belonging to the Pentagon "hinterland"

- High potential for polycentric development
- Low potential for wind power and PV and solar energy
- Medium level maximum summer temperature
- Moderate mean minimum wind temperature
- Very high level of workers commuting

# Typology 4: “Cool and windy but working”

Most of the regions in Ireland, Sweden and Finland

- Rural characteristics / Sparsely Populated Areas
- Heavy industrial base
- Large-sized regions
- Very high wind power potential
- Medium-high percentage of employment in industries with high energy purchase
- Average fuel costs
- Below average percentage of workers commuting to other regions
- Very low long-term unemployment rates
- Medium disposable income of households
- Low PV potential
- Extremely low max July temperatures
- Very low mean min Jan temperatures

## III. Scenario - Building Process

**Scenarios:** Images of the future+ Policy packages

**Images of the future for 2030:** plausible visions that shed light on the implications of different development trends on a system.

**Common hypothesis:** energy prices will remain at a high level, but the political response to this challenge is different

Elaboration with the help of external experts

# III. Scenario - Building Process

## Two Phases (Scenarios=Images + Policies)

### Construction of the Images

- Identification of
  - Drivers
  - Actors
  - Trends
- Setting Out the **Four Images**
  - Definition of Hypotheses
  - CCA
  - Selection & Validation by Experts

### Policy measures

# III. Scenario 1 "Green High-tech"

**Assumption: Quick Development of Renewable Energy Sources**

## Regions-H:

- gain greater influence on energy policy
- can specialize in certain types of renewable energy production
- gain from cooperation and shared networks

## Policies

### Energy-related policies

- Large-scale renewables connected by the European grid and small-scale renewables for local consumption
- Energy from waste and material recovery from recycling

### Other policy domains

- High investment in R&D and education
- ICT and infrastructure policies
- International climate change agreements on GHG
- Participatory planning processes

### Governance

- Increased autonomy for regions with regard to energy policy priorities

### Region with opportunities

- Regions with high PV and wind potential
- Rural regions with natural resources and access to large cities

### Regions experiencing threats

- Regions with high fuel costs
- Regions with industries with high energy purchases (need for adaptation)



# III. Scenario 1 “Green High-tech”

## Expected performance of regional typologies

### Typology 1a “With problems and potential”

Highly favourable for rural and coastal regions with high solar and wind potential

### Typology 1 b “Well-off, with trouble ahead”

Need for developing renewable resources others than solar and wind

### Typology 2 “Struggling, looking for jobs and a brighter future”

Possible positive impact if resources for the development of renewables can be found

### Typology 3 “Wealthy and commuting”

Strong opportunities for polycentric development

### Typology 4 “Cool and windy, but working”

Strong positive impact on Nordic and Irish regions with high wind potential



# III. Scenario 2 "Energy-efficient Europe"

Assumption: **greater use of natural gas by 2030 while trying to keep Europe's energy dependency within limits through important efficiency gains in all sectors and a move towards more regionalized economies**

## Regions-H:

- at high risk of supply interruptions when depend on gas supplies from only one producer
- economic development will probably follow a fairly balanced and more sustainable path

## Policies

### Energy-related policies

- Energy efficiency all along the chain
- Nuclear phase-out
- Large-scale renewables
- Increased gas imports

### Other policy domains

- Technological development in efficient technologies (R&D)
- Regionalisation of economies, polycentric development
- Hybrid / electric cars and car-sharing
- Binding environmental policies in

planning

## Governance

- National energy efficiency strategies implemented on local level

## Region with opportunities

- Regions with energy-intensive industries but with clean technologies and access to secure gas supplies; agricultural regions

## Regions experiencing threats

- Regions dependent on long-distance freight transport (islands, remote..) and commuting



# III. Scenario 2 “Energy-efficient Europe”

## Expected performance of regional typologies

### Typology 1a “With problems and potential”

Negative for the most peripheral coastal areas

### Typology 1b “Well-off, with trouble ahead”

Strong positive impact on the competitiveness of the more industrialized Pentagon areas

### Typology 2 “Struggling, looking for jobs and a brighter future”

Highly positive if affordable clean energy technologies can be accessed by industries in these regions

### Typology 3 “Wealthy and commuting”

Living standards could be negatively affected in these areas due to increased costs on car ownership

### Typology 4 “Cool and windy, but working”

Strong positive impact on the competitiveness of industrial strongholds in the North, but possible negative impacts of increased transport costs

# III. Scenario 3: Nuclear Energy for Big Regions

Assumption: present plans are actually implemented in a large number of Member States to expand the use of nuclear energy

## Regions-H:

- The power sector will remain highly centralized (few players are able to carry out the needed investment)
- Logical consequence: "go electric" both in industry and transport
- Decisions little influenced by local and regional policy makers

## Policies

### Energy-related policies

- Grid extension
- High level of investment in nuclear energy and security
- Renewables take off, but stagnate

### Other policy domains

- Moderate investment in R&D and education
- No international agreements on GHG but European climate change policies
- Electrification of the transport system

## Governance

- Centralized (national and EU level)

## Region with opportunities

- Regions with industries with high electricity consumption and central urban regions

## Regions experiencing threats

- Regions with high l/t unemployment rates and/ or low disposable income
- Peripheral regions

# III. Scenario 3 “Nuclear Energy for Big Regions”

## Expected performance of regional typologies

### Typology 1a “With problems and potential”

Favourable for Metropolitan and Pentagon regions with high levels of employment in the knowledge economy

### Typology 1 b “Well-off, with trouble ahead”

Need for accelerating transition to more service-oriented activities

### Typology 2 “Struggling, looking for jobs and a brighter future”

Increased burden on households, due to rising costs for heating and fuel purchases

### Typology 3 “Wealthy and commuting”

Favourable, due to increased electrification of transport systems

### Typology 4 “Cool and windy, but working”

Favourable only for industries with high electricity consumption

# III. Scenario 4 "Business as Usual?"

**Assumption:** choosing (clean) coal to fill the gap of dwindling oil reserves

## Regions:

- benefit of mining and harbour regions
- large number of urban areas, will face severe social problems over longer periods of time (increases in consumer prices)
- coal power plants' production will become more expensive when technologies after widely deployment of carbon capture and storage (high energy prices provoke continued backlashes in a world economy that is not able to function "as usual")

## Policies

### Energy-related policies

- Increased use of coal and gas for electricity generation
- Phase-out of nuclear Lack of investment in the retrofiting of buildings and local networks

### Other policy domains

- Low R&D
- Low investment in education
- No agreements on GHG, removal of European ETS
- Inadequate urban planning

## Governance

- Protectionist (national and EU)

## Region with opportunities

- Medium-sized cities surrounded by resource rich areas
- Coal and harbour regions

## Regions experiencing threats

- Urban regions with l/t unemployment rate and lowest income
- Regions with energy-intensive industries
- Tourism-dependent regions

# III. Scenario 4 "Business as Usual?"

## Expected performance of regional typologies

### Typology 1a "With problems and potential"

Increasing poverty and overcrowding in metropolitan areas

### Typology 1 b "Well-off, with trouble ahead"

Weaker impact on harbour regions, danger for industrial areas to slide into the category of struggling regions

### Typology 2 "Struggling, looking for jobs and a brighter future"

Job opportunities for Eastern coal regions, but "no way out" for the re

### Typology 3 "Wealthy and commuting"

Deteriorating infrastructures in cities and urban sprawl

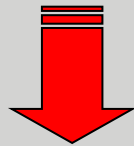
### Typology 4 "Cool and windy, but working"

Strong risk of losing industrial base and employment

# IV. Policy Recommendations

## Actions to be taken on:

- Local level
- Regional level
- National level
- European level



- Reduce vulnerability
- Grasp opportunities



# IV. Policy Recommendations

## General Policy Recommendations (Good Governance)

- Promote energy solidarity between regions and territories
- Strengthen regional and local networks
- Fund and stabilize transnational research agencies
- Promote awareness among regional policy makers on the impact of rising energy prices and the need for economic diversification
- Define a vision for a regional energy model 2050
- Push municipal leadership in public-private partnerships

## Spatial Planning Policies and Strategies to Promote Renewable Energy Sources

- Develop integrated spatial planning instruments
- Establish urban planning principles for solar energy use
- Implement Urban Metabolism procedures
- Promote industrial symbiosis and/or industrial eco-parks

# IV. Policy Recommendations

## Environmental Protection and Risk Prevention

- Sustainable use of biocrops
- Prepare for climate change impacts in the regional energy infrastructure

## Policies to Accelerate Deployment of Renewable Energy Sources

- Evaluate the feasible potential of all renewable sources in the region
- Incorporate solar and wind facilities in urban areas
- Accelerate the transition to non-fossil fuels in the aviation industry

## Policies to Promote Energy Efficiency

- Improve the data on energy use and efficiency in Europe
- Involve end users in energy efficiency programmes and policies
- Create a market for energy efficiency
- Improve efficiency of office design and work arrangements
- BAT (Best Available Technologies) for industrial energy efficiency

# IV. Policy Recommendations

## Policies to Fight Energy Poverty

- Improved transparency and information on energy consumption
- Consumer Awareness and Education; involvement of end-users
- Social policies

## IV. Relevance of Policy Measures for Regional Typologies

Policy measures have a **different priority** in each region typology and under different scenario assumptions.

**Regions with unfavourable economic structure and high demand for heating and cooling (typology 3)**

- industrial diversification strategies in order to conserve competitiveness
- construction of efficient networks

**Regions with high level of commuting (typology 3) or at the periphery (mainly typology 1a and 4) with important dependence on air travel**

action in the field of mobility and freight transport

## IV. Relevance of Policy Measures for Regional Typologies

Regions of typologies 1b and 2 and under the assumptions of the "Business as Usual?" scenario

- Social policies
- innovative financing measures on municipal level

Regions with low disposable income but considerable PV potential

- urban solar planning tools (necessary information to achieve the greatest deployment of these technologies at the lowest cost possible)
- building new nuclear plants (large baseload capacity - electricity that is being produced 24 hours a day)

*A critical question in this context is acceptance and consumer preferences, for example for "green tariffs".*

# RERISK Greek Results

NUTS2_2006	Region	Typology
GR11	Anatoliki Makedonia, Thraki	1a
GR12	Kentriki Makedonia	1a
GR13	Dytiki Makedonia	no data
GR14	Thessalia	1a
GR21	Ipeiros	1a
GR22	Ionia Nisia	1a
GR23	Dytiki Ellada	1a
GR24	Stereia Ellada	1a
GR25	Peloponnisos	1a
GR30	Attiki	1a
GR41	Voreio Aigaio	no data
GR42	Notio Aigaio	1a
GR43	Kriti	no data

*\* The regions of Dytiki Makedonia, Voreio Aigaio and Kriti are not included in the classification due to the lack of data in one variable. All the other regions are included in Typology 1a.*



# RERISK Greek Results

NUTS2_2006	CLIMATE DATA		ECONOMIC STRUCTURE	TRANSPORT DEPENDENCE	
	Mean Min Temperature January (°C, 1994-2008)	Mean Max Temperature July (°C, 1994-2008)	% Employment in Industries with High Energy Purchases	Fuel Costs in Freight Transport	% Commuting
GR11	-6.7	36.4	1.13	3.56	0.18
GR12	-6.1	37.8	1.36	3.55	0.16
GR13	-10.7	36.4	1.59	3.39	no data
GR14	-6.4	38.8	3.68	2.88	0.48
GR21	-4.5	36.1	3.80	2.73	0.41
GR22	-0.6	35.4	1.60	1.02	0.22
GR23	-5.4	36.1	2.73	3.27	0.26
GR24	-5.3	37.7	4.13	3.44	0.56
GR25	-4.6	37.1	1.07	2.42	0.16
GR30	-0.5	37.8	2.93	1.10	0.07
GR41	-1.6	35.3	2.27	0.53	no data
GR42	4.5	35.3	1.86	0.43	0.00
GR43	3.5	36.5	2.42	1.00	no data

# RERISK Greek Results

NUTS2_2006	SOCIAL DIMENSION		RENEWABLES	
	Long-term Unemployment Rate	Disposable Income in Households	Wind Potential	PV Output
GR11	55.88	11,393.40	56124.40	1126.76
GR12	54.51	12,403.70	15148.28	1182.29
GR13	62.97	12,137.10	5704.96	1259.39
GR14	48.13	11,280.70	2753.22	1205.07
GR21	59.78	10,985.70	1779.41	1193.03
GR22	27.91	7,210.90	10411.00	1180.95
GR23	51.64	10,180.80	2711.04	1197.45
GR24	49.78	12,923.70	27276.92	1284.08
GR25	54.05	10,263.90	18975.68	1271.13
GR30	49.95	16,241.60	28988.88	1338.30
GR41	40.88	11,156.30	42065.60	1339.20
GR42	21.86	12,560.90	47282.40	1388.88
GR43	28.74	11,613.30	61745.60	1346.39



# RERISK Greek Results

## Correlation Analysis between Regional Energy Consumption and Employment in Industries with High Energy Spending

Further analysis carried out on **consumption data** for Slovakia, the Czech Republic, Belgium and **Greece** confirmed that:

Where **detailed information** on industrial energy consumption is available, the **ReRisk estimates** of the regional industrial energy spending can largely be **confirmed**. Some **slight distortion** with regard to the actual **industrial energy demand** in the region may occur in countries with **large price differences** for the fuels used by industry.

As a **consequence of market liberalization**, comparable data on prices and consumption on regional level is even more difficult to obtain than before, which constitutes a serious problem for sectoral and regional policy initiatives aimed at reducing energy demand.

## GREECE: Typology 1a

### Regions with the lowest level of employment in industries with high energy purchases

- Economic structure rather robust
- Low exposure of industries to rising energy prices
- Higher than average unemployment rates in 2007
- Low energy intensity
- Low level of workers commuting to other regions
- Medium disposable income in the households
- High summer temperatures
- Moderate winter temperatures

## GREECE: Typology 1a

**I. Service Oriented Urban Centres / Capital Areas**  
(Paris, Berlin, Rome, Budapest, Amsterdam, Madrid, Stockholm, Bucharest, **Athens**, Sofia and others)

Changes in Transport Patterns may appear  
(e.g. commuting)

**II. Semi-Rural / Tourist-Oriented / Coastal / Island Regions** (South Europe)

High Photovoltaic (PV) Potential  
Medium-high Wind Power Potential

# RERISK Greek Results

## Structural Characteristics of the Regional Groupings

### *Central Macedonia*

- Strong overall policy **focus on efficiency and environmental protection** and **less on security** of supply
- High priority for renewables
- Relatively high priority on coal within the energy mix
- Moderate emphasis on sub-national scales of energy governance
- Low diversity of economic activities and a higher energy intensity of the economy

### *Crete*

- Relatively low policy focus, emphasizing security of supply and efficiency rather than environmental protection
- Relatively low prioritization for renewables
- A strong emphasis on nationally-governed energy policy
- Low diversity of economic activities and higher energy intensity of the economy

# RERISK Greek Results

## Case Examples of Regional Energy Governance

### Κεντρική Μακεδονία, Ελλάδα:

As a unitary state, Greek energy policy is formulated nationally and disseminated to the individual regions. One result of this is that **administrative challenges tend to engrain national interests of security of supply and economic growth**, and these have hindered the development of locally bound green energy initiatives [IEA, 2007].

Consequently, the energy intensity of Central Macedonia is notably high. The perception is that many local energy savings programmes are run by **municipal authorities**, which decide to **"go on alone"** with their own green energy schemes [Konstantinou 2010].

However, these actors wishing to pursue environmental initiatives appear to be limited in their actions due to a lack of available resources from senior political scales.

# Need for Further Research

The **main limitation** of the analysis carried out in the ReRisk project is related to the fact that it is **based on 2005**, i.e. pre-crisis data.

Some of the indicators elaborated in this project are appropriate to measure the economic and social impacts of the present recession and should be recalculated when more recent data becomes available. This will make it possible to draw a pre- and after-crisis profile for the NUTS II regions.

**Issues that** should be explored in more depth through focussed research on **NUTS 3 level**, using data from regional and national sources, are the **actual extent of poverty and the transport modes used for commuting**.

The regional profiles elaborated in this project could be completed as comparable data on renewable energy resources other than solar and wind becomes available.

# Ανάγκη για επιπλέον έρευνα (II)

**Θέματα** που θα μπορούσαν να ερευνηθούν σε περισσότερο βάθος μέσω στοιχειοθετημένης έρευνας σε μικρότερη κλίμακα (**επίπεδο NUTS 3**), χρησιμοποιώντας δεδομένα από τοπικές και εθνικές πηγές, είναι **η πραγματική διάσταση της φτώχειας και τα πρότυπα μετακινήσεων που χρησιμοποιούνται για λόγους εργασίας.**

Τα προφίλ των περιφερειών που επεξεργάστηκαν στο ReRisk θα μπορούσαν να συμπληρωθούν με άλλα συγκρίσιμα δεδομένα που αφορούν σε Α.Π.Ε., εκτός του αιολικού και ηλιακού δυναμικού παραγωγής ενέργειας (όταν τα δεδομένα αυτά θα είναι διαθέσιμα).



**THANK YOU**