

## 5. TERRITORIAL DISSIMILARITIES IN ENERGY AND CLIMATE CHANGE

*Francesco Bonsineto <francesco.bonsineto@unirc.it>  
Dipartimento di Patrimonio, Architettura e Urbanistica  
Università degli Studi Mediterranea di Reggio Calabria (Reggio Calabria, Italy)*

*Angelo Cannizzaro <angelo.cannizzaro@unirc.it>  
Dipartimento di Patrimonio, Architettura e Urbanistica  
Università degli Studi Mediterranea di Reggio Calabria (Reggio Calabria, Italy)*

*Enzo Falco <enzo.falco@uniroma1.it>  
Dipartimento di Design, Tecnologia dell'Architettura, Territorio e Ambiente  
Università degli Studi di Roma — La Sapienza (Roma, Italy)*

*Barbara Lino <barbara.lino@unipa.it>  
Dipartimento di Architettura  
Università degli Studi di Palermo (Palermo, Italy)*

*Giuseppe Modica <giuseppe.modica@unirc.it>  
Dipartimento di Agraria  
Università degli Studi Mediterranea di Reggio Calabria (Reggio Calabria, Italy)*

### 5.1. Introduction

The EU2020S, with regard to the sustainable growth pillar, primarily envisages that the European economy should maintain its leadership and its competitiveness in the world, through the delivery of new green processes and technologies (by means of low-carbon technologies and the development of renewable sources of energy) that allow climate change to be combated and the achievement of energy efficiency. The EU2020S acknowledges that such an approach will prevent environmental degradation, biodiversity loss and unsustainable use of resources.

These issues have been investigated through the identification of several indicators capable of expressing the patterns and trends of countries and regions relatively to the achievement of objectives related to the sustainable growth pillar. These indicators have been graphically represented within 17 maps in total produced with a clear link with the EU2020S in order to make conceptual sense within the Project. The criteria to choose indicators was to

get indicators directly considered as headline targets by the EU2020S, ones indirectly linked to EU2020S and other documents, and other ones quoted by flagship initiative “Resource efficient in Europe”. The majority of the maps (11) are related to the headline targets that have been agreed for the European countries to measure progress in meeting the EU2020S goals. Under the sustainable growth pillar, there are 3 headline indicators focused on:

- Reduction of greenhouse gas emissions by at least 20% compared to 1990.
- Increasing use of renewables to 20% of total final energy consumption.
- Cutting energy consumption by 20% that means reducing the resource intensity of what we use and consume.

The other 6 maps are related to the indicators that serve to identify the new challenges of the green economy that play an essential role for climate regulation. These indicators are focused on industries with high energy spending, commuting, municipal waste collection, waste water treatment, protected areas under Natura 2000 and biodiversity loss. The maps regard themes that have assumed great significance in the last decade such as climate change, global warming, environment conservation, green economy, energy efficiency and biodiversity loss. They are environmental issues with strong “economic value” because it is increasingly clear the importance of the linkage between ecological, economic and social dimensions in the growing discussion in light of the environmental global crisis.

Regarding this point, EU2020S has actually focused its pillar “sustainable growth” on economic growth rather than on the sustainability concept as widely conceived. As it is commonly recognised, there are different academic perspectives about ‘growth’ and ‘development’ (Daly, 1997) and usually ‘sustainable’ is referred to ‘development’ and not to ‘growth’ (Hopwood *et al.*, 2005). However, our approach has been to consider both the economic dimension of sustainability as intended by the EU2020S and the ecological and environmental dimensions which cannot be underestimated in the evaluation of the performances of countries and regions and also competitiveness and change.

The aim of our work was to critically review the role that global warming, resource scarcity, biodiversity loss and a growing European population are playing to shift towards a lower emissions and environmental friendly

economy. At this regard we have made a consistent geographical analysis with comments relatively to the maps to explain how regions and cities are far or near the EU2020S targets as well as the geographical patterns of existing problems or key strengths and potentials. The goal was to take a “picture” of the current situation in Europe. In conclusion, after this process, the final stage has been providing some useful guidelines and policy recommendations for the European regional decision-makers.

In this section, we will present the most significant maps which we believe to be paradigmatic to better understand the territorial dimension of the EU2020S and the territorial dissimilarities in energy and climate change.

## **5.2. Reduction of Greenhouse Gas Emissions as a European Priority**

The reduction of greenhouse gas (GHG) emissions is clearly the most important environmental issue intrinsically linked with the way we live. Climate change is very high on the international political agenda as the scientific proof of the human impact on climate change becomes stronger (IPCC, 2007a, 2007b) and as society is becoming aware of the potential consequences of climate change. Human activities and natural events have contributed for a long time to an increase in average global temperatures actually caused primarily by increases in GHG such as CO<sub>2</sub>. One of the biggest challenges related to global warming is due to the fact that greenhouse gases are produced, directly or indirectly, by almost all major industries and human activities. This means that it is an environmental issue with a strong “economic value”. For the reasons mentioned above, the energy and the climate change have become a strategic priority for European Commission that is elaborating many decisions and directives.

Climate change and global warming are ones of the great challenges facing European Union (and more in general humanity) directly related to the capability to achieve sustainable growth and economic progress without damaging our environment. The sustainable growth objective aims to enhance resource efficiency, to promote more water efficiency and the use of waste as a resource, to address the issue of climate change and strengthening the resilience of our territories to climate risks. Then the major goal is to help the EU prosper in a low-carbon world and in a more competitive economy, preventing environmental degradation and biodiversity loss. This includes the reduction of GHG emissions, the promotion of renewable energies and more efficient energy supply systems. Consequentially, the green economy and renewable energy are an ever more important issue in our lives. The SIESTA Project

recognised a great importance to this rationale by devoting a research line for climate change, green economy and energy. The focus of EU2020S and SI-ESTA Project on these issues reflects their importance as a key environmental priority, and the need to provide a path to renewed economic growth and job creation in response to the current severe economic crises facing Europe. Increasing the resource efficiency is the key to securing growth and jobs for Europe. It will bring major economic opportunities, improve productivity, drive down costs and boost competitiveness.

### 5.2.1. Geographical Strengths and Weaknesses Patterns of the Greenhouse Gas Emissions

Regional estimates of GHG emissions at NUTS2 and NUTS3 level are becoming increasingly significant to understand the contribution of cities to global climate change. Regions have different opportunities to embed adaptation and mitigation into their strategies, decreasing greenhouse gas emissions and adjusting their socioeconomic systems to a low carbon economy. The analysis of the regional differences serve several purposes as to identify the greatest sources of emissions within a particular region; to provide a basis for developing specific tools; and to contribute to trend analyses in the establishment of future goals and targets.

Regional distribution of GHG emissions across the Europe is heterogeneous enough. There is a clear metropolitan and non-metropolitan areas division equally spread in the new and in the old EU member states. It is clearly evident that the concentration of GHG coincides with the major metropolitan areas of Europe as Madrid, Barcelona, Milan, Rome, Paris, Berlin, and Bucharest.

The Mediterranean regions have medium level of GHG emissions above all in the coastal areas of Spain, France, and Italy. Among the NUTS3, Istanbul is the major emitter of GHG, with the highest level of emissions. In other words, Turkey is the country with the highest level of emissions. The two largest Spanish metropolitan areas of Madrid and Barcelona, together with the Italian ones of Rome, Milan and Naples, occupy the top five positioning for the highest level of emissions. Although the city's economy is primarily service based rather than manufacturing based, the electricity is mainly used for household air-conditioning systems. It is no coincidence that Italy and Spain have not yet reached their national EU2020S targets in GHG emission reduction.

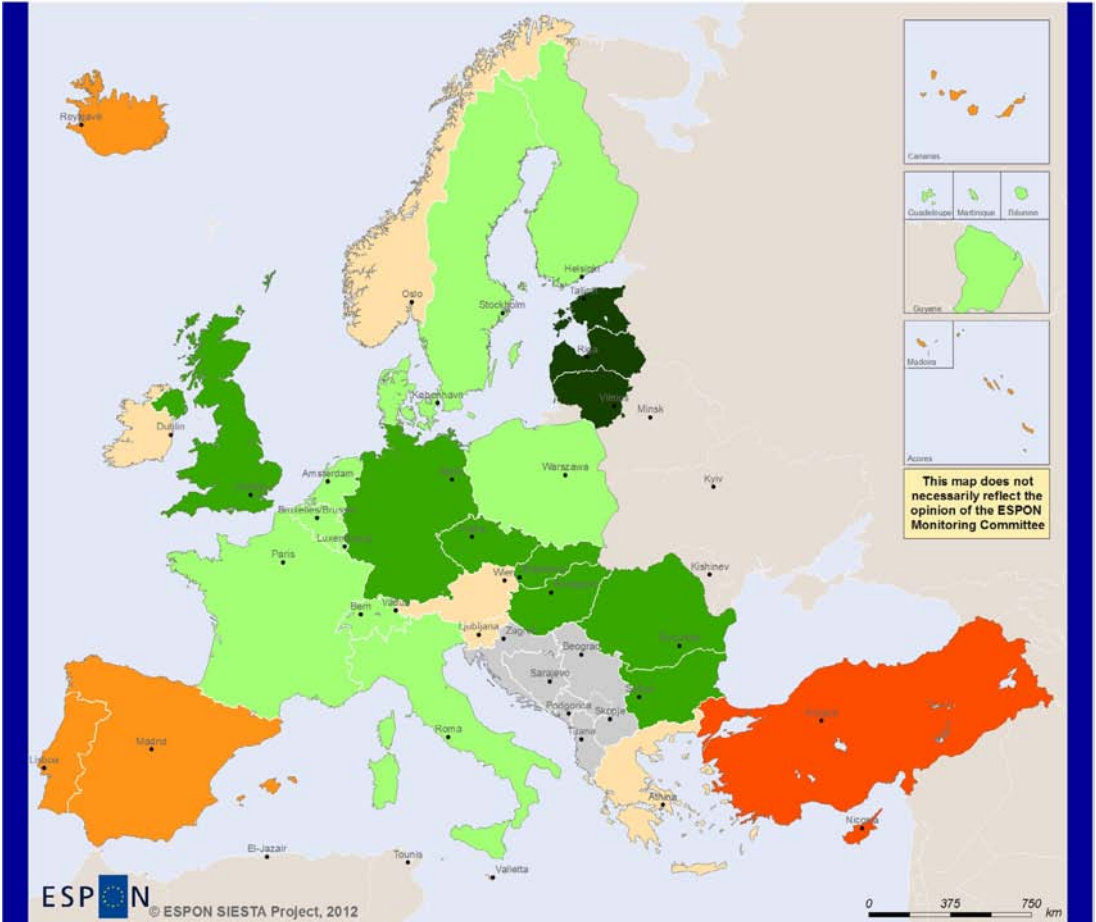
In the Balcanic area, Poland, the Czech Republic and Slovakia are the three countries that more emitted GHG in 2009. This is probably due to the

fact that their economy is still developing. Further North, Finland and Sweden have the highest level of GHG with NUTS3 in the urban areas whereas it was found that those levels were lower in the rural and mountain areas. Ireland has also medium to high levels of GHG mostly concentrated in the area of Dublin. On the other hand, it is important to say that the lowest levels of emissions are mostly located in the Mediterranean islands and the small urban areas of Germany, Austria, the UK and Denmark. This can be easily explained by saying that those are less dense populated areas.

EU27 countries are doing a great effort to reach the 2020 targets in the GHG emissions by sectors outside the ETS in 2009 compared to 2005. Indeed, the 2009 data highlight that the EU-wide emission reduction target will be reached by the EU as a whole in 2020. Some countries have already reached their target and only need to maintain this lower level of emissions. Among those, the UK achieved the highest GHG emissions reduction (-18.2%) even if it is the largest emitter (12.2%) of GHG after Germany that produces about 20% of the EU27 total or 919.6 million tons of CO<sub>2</sub> equivalents in 2009. EU15 states accounted for 80.6% of total GHG emissions within the EU27 in 2009, some 4.3% points above their corresponding share of 1990 base year.

Be that as it may, it must be said that among EU15, Germany (-26.3%) and the UK (-27%) reduced their GHG emissions massively recording the biggest reductions in absolute and relative terms (Map 5.1). One reason may be that the UK benefited by switching from coal to natural gas which is now largely in place, while Germany has certainly invested in GHG emission reductions, but has been helped in large part because of the reunification (East Germany, like much of Eastern Europe and former Soviet states had economic problems, hence less emissions at the time).

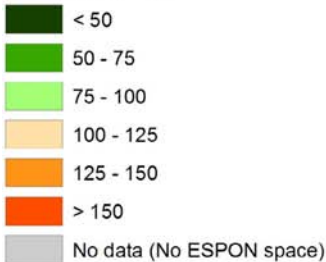
It is very interesting to note that the “block” of Eastern countries such as Latvia, Lithuania, Poland, Slovakia, Estonia, Hungary, the Czech Republic and Slovenia had committed to limit the increase in emissions, and actually they have achieved their national target. The same situation can be noticed for Portugal and Malta. Summarising, the majority of these member states are Eastern countries located in the Danube and Baltic Sea regions. Among these, a number of countries are way ahead of their target, like for instance Hungary and Slovakia which agreed to limit their emissions to no more than 10% and 13% respectively and where emissions actually decreased significantly (Hungary actually reduced emissions by 16.9% and Slovakia by 12%).



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

Regional level: NUTS0  
Source: EEA  
Origin of data: EEA, 2011  
© EuroGeographics Association for administrative boundaries

**Index 1990 = 100**



Notes:

The aggregated greenhouse gas emissions are expressed in units of CO<sub>2</sub> equivalents.

The indicator does not include emissions and removals related to land use, land use change and forestry (LULUCF); it does not include emissions from international aviation and international maritime transport. CO<sub>2</sub> emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national GHG totals.

The EU as a whole is committed to achieving at least a 20% reduction of its greenhouse gas emissions by 2020 compared to 1990.

This objective implies:  
 - Reduction of 21% in emissions from sectors covered by the EU ETS (emissions trading scheme) compared to 2005 by 2020;  
 - Reduction of 10% in emissions for sectors outside the EU ETS.  
 To achieve this 10% overall target each Member State has agreed country-specific greenhouse gas emissions limits for 2020 compared to 2005 (Council Decision 2009/406/EC).

*Map 5.1. National GHG emissions, 2009, compared to 1990.*

GHG emissions have approximately halved between 1990 and 2009 in each of the Baltic Sea Region countries, where Latvia and Estonia have recorded the largest decrease respectively -59.6% and -58.9% (Map 5.1). In

general, there were also significant reductions in Lithuania, Romania, Bulgaria and Slovakia. Very probably the main reason for these great reductions in the Baltic Sea and Danube regions was a decline in emissions from heavy manufacturing industries that were either closed or modernised as a result of restructuring measures. Also Portugal achieved a good result reducing 6.5% its GHG emissions. In the South of Europe, Greece committed to reduce the emissions by 4% compared to 2005 levels and had already cut them by almost 7% in 2009. Cyprus has also reduced emissions by 10.5%. Although they are not parties to the Kyoto Protocol, Cyprus and Malta have recorded significant increases in their emission levels.

The candidate country Turkey is recorded the largest variation of GHG emissions for 2009 compared to 1990. The Iberian Peninsula (Spain and Portugal) and Iceland are the other countries where an important increase in GHG emissions has been recorded.

On the other hand, some member states such as Ireland, Denmark and Luxembourg still need to cut their emissions by more than 10 percent to reach their target. In other countries, the target for emission reduction is not yet reached but the emissions have started to reduce, for instance in Sweden where the target was set to a reduction of 17% and the emissions have decreased by 11.8% compared to the levels of 2005. Among the member states which have not reached their target, as mentioned, the distance to target is the highest in Ireland, Denmark and Luxemburg. It is the lowest in Italy, Spain and Belgium where additional reduction of 0.7%, 2.2% and 4.5% are respectively required to meet the objectives. Geographically, the potential for further emission reductions is proportionally higher in poorer member states. Most of them are unlikely to reach their national 2020 climate target only with existing measures. EU cohesion policy can be an important instrument to mobilise the necessary public and private finance.

More efforts need to be undertaken by the majority of member states to increase energy efficiency and renewable energy development in order to decrease the amount of fuel burned in power plants, other industries, commercial buildings and households. The implementation of policy guidelines on GHG reduction should take into account not only the country level, but also the local and regional scales. Changes at the local and regional spheres, for instance focusing on land use planning and management, actively contribute to the overarching aims.

### **5.3. Renewable Energy as Crucial Sector towards a Low Carbon Economy**

Renewable energy is a crucial sector towards a low carbon economy and the use of renewable energy sources is a key element in energy policy, reducing the dependence on fuel, reducing emissions from carbon sources, and decoupling energy costs from oil prices. Therefore renewable energy is also a sector which offers interesting perspective for the development of new technologies and of new employment opportunities. As the *Energy 2020 Strategy* points out, it is estimated that achieving the EU target of renewable energy contributing 20% of final energy consumption by 2020 could provide about 410,000 additional jobs. Many of these will be close to where the investments are made (European Commission, 2010a: 9). In this framework regions and cities should accelerate investments in renewable energies and energy efficiency, according to their local energy potential (European Commission, 2010a: 8).

The independent 2010 Renewable Energy Attractiveness Index indicates that the US and China cities are at this moment as the best investment opportunities for renewable energy. New stimulus is needed; more than ever EU leadership is called upon to address these challenges (European Commission, 2010a). *Energy 2020 Strategy* highlights how EU infrastructure and innovation policies are supporting the renewable energy sector's development and invites member states to implement the National Renewable Energy Action Plans, streamline infrastructure planning regimes while respecting existing EU environmental legislation, make faster progress in developing the electricity grid, start integrating renewable energy into the European market and ensure that any reforms of existing national support schemes will guarantee the stability for investors, avoiding retroactive changes (European Commission, 2011a).

#### **5.3.1. Geographical Strengths and Weaknesses Patterns of Renewables**

The control of European energy consumption and the increased use of energy from renewable sources, together with energy savings and increased energy efficiency, constitute important parts of the package of measures needed to reduce greenhouse gas emissions and comply with the Kyoto Protocol to the United Nations Framework Convention on Climate Change, and with further Community and international GHG emission reduction commitments beyond 2012. Those factors also have an important part to play in promoting the security of energy supply, promoting technological development and innovation and providing opportunities for employment and regional development, especially in rural and isolated areas.

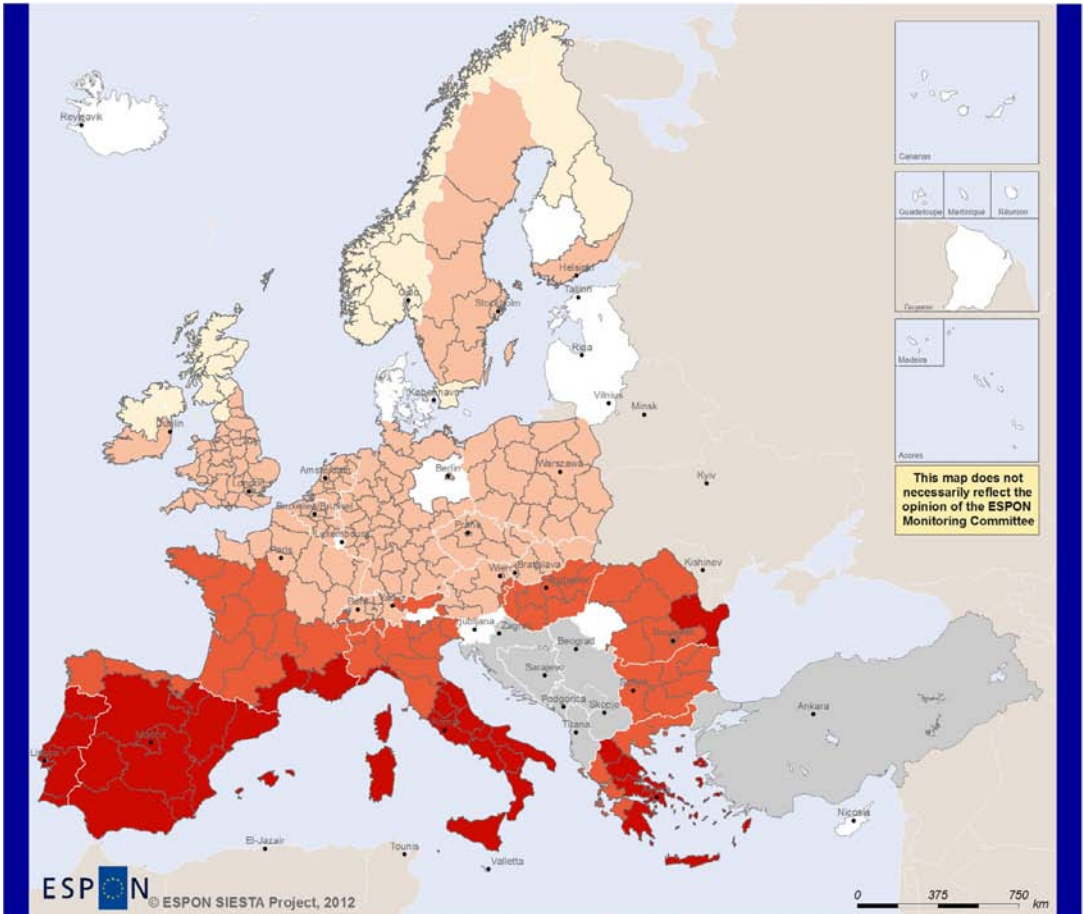
The political structure of the European Union, with 27 member states, is quite diverse and there is no unified approach towards renewable energies yet. However, during the European Council Meeting in Brussels on 8-9 March 2007, the Council endorsed a binding target of a 20% share of renewable energies in the overall EU energy consumption by 2020.

The regions with the highest potential of wind power stations are in the Atlantic Axis. They are primarily rural and have low population density. It may be considered irrelevant the contribution that could provide the urban and metropolitan areas and all regions interested in biodiversity conservation policies. This is essentially caused by high levels of environmental impact that wind turbines are still engaging in the concerned territories.

The maximum potential for electricity production from PV panels is instead concentrated on the Southern coastal regions, which have varying levels of urbanisation enabling the creation of large production facilities in rural areas, since the installation of small plants can ensure in urban areas, substantial amounts of savings on energy consumption of buildings (Map 5.2).

In 2009, energy from renewable sources contributed 11.7% of EU27 gross final energy consumption (see Map 5.3). The highest share of consumption from renewable sources was recorded in Norway that has a share of 64.9%, though outside the EU27. Sweden presents a share of 47.3%, Latvia of 34.3% and Finland of 30.3%. Austria, as one of the five countries with the highest share, has 29.7%. Lowest share was recorded in Malta (0.2%), Luxembourg (2.7%), the UK (2.9%), Netherlands (4.1%), Belgium and Cyprus (4.6%). In short, Map 5.3 shows that there is a remarkable division in European countries in share of renewable energy in gross final energy consumption. If North and Atlantic Axis have a higher share rates, the South and the Core have lower rates.

Under the EU2020S, EU member states have varying national targets for the share of renewable energy within their total energy generation adding up to the 20% overall target share of renewables on the EU27 level. Some member states are close to the target they set under the Climate and Energy Package. For instance Romania has to increase the share of renewables by another 1.6 points to reach its target of 24% by 2020. Sweden has to increase the share of renewables by another 1.7 to reach its target of 49% by 2020. And other countries are already close to their 2020 objective, like for instance Estonia, Slovakia and Austria which must respectively add another 2.2, 3.7 and 4.3 percentage points of renewables into final energy consumption for reaching their targets. For some, the distance to the target is far greater and additional efforts will be required to reach it on time. For example, the UK and Ireland want to increase

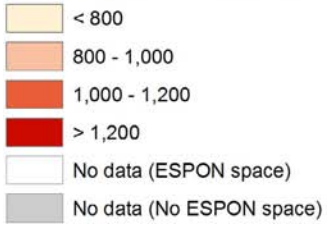


ESPON  
 © ESPON SIESTA Project, 2012

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

Regional level: NUTS2  
 Source: ESPON DATABASE  
 Origin of data: JRC  
 © EuroGeographics Association for administrative boundaries

**Potential production of electricity in kWh, 2005.**

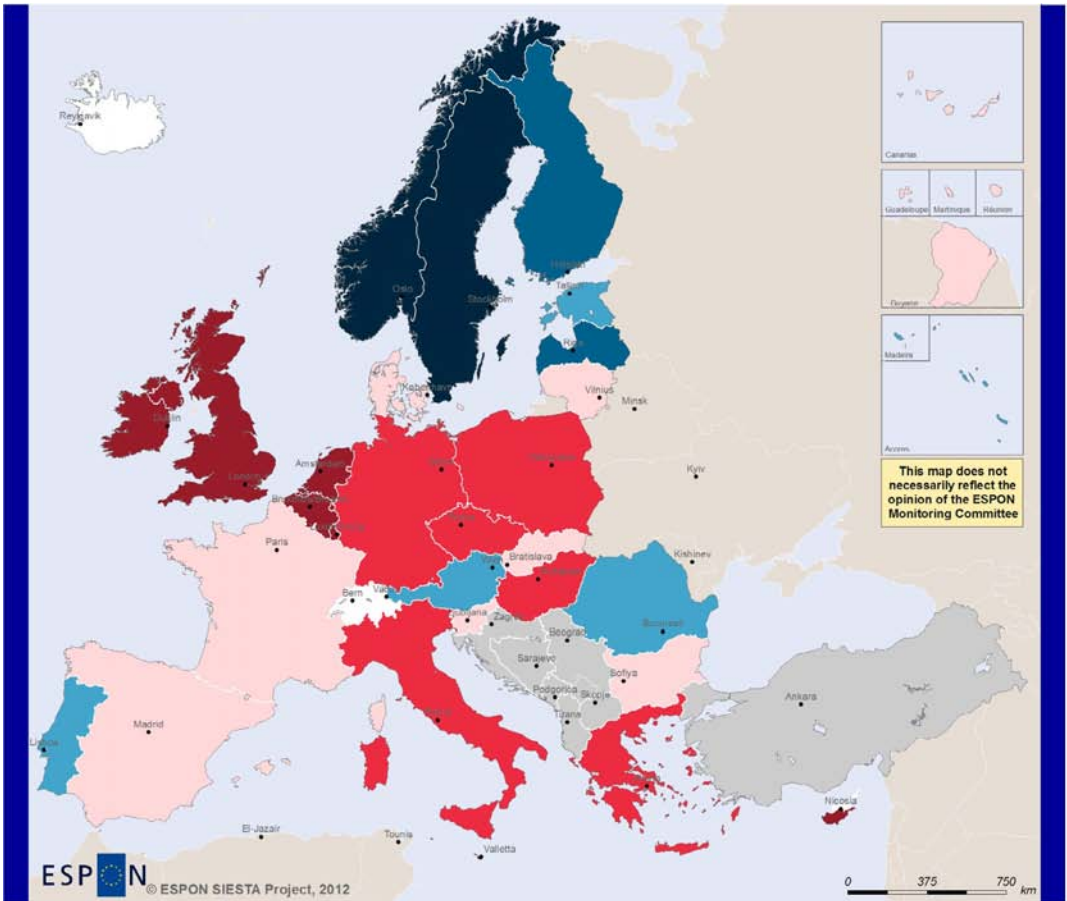


Source:  
<http://re.jrc.ec.europa.eu/pvgis/apps/radmonth.php>

*Map 5.2. Regional potential for electricity production from photovoltaic panels represented in kWh, 2005.*

their share of renewable by 12 and 11 points by 2020. Despite progress, a number of challenges still need to be overcome in order to foster the growth of renewables.

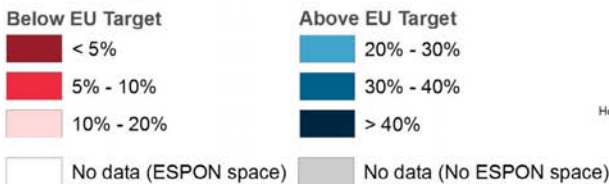
The lack of data at regional and local level reduces the possibility of assessing in detail the sector growth, but some considerations can be done.



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

Regional level: NUTS0  
Source: EUROSTAT,  
Origin of data: EUROSTAT, 2011  
© EuroGeographics Association for administrative boundaries

**Percentage of gross final energy consumption (%), 2009.  
EU 2020 Target = 20%**



Notes:  
This indicator is calculated on the basis of energy statistics covered by the Energy Statistics Regulation. It may be considered an estimate of the indicator described in Directive 2009/28/EC, as the statistical system for some renewable energy technologies is not yet fully developed to meet the requirements of this Directive. However, the contribution of these technologies is rather marginal for the time being. More information about the renewable energy shares calculation methodology and Eurostat's annual energy statistics can be found in the Renewable Energy Directive 2009/28/EC, the Energy Statistics Regulation 1099/2008 and in DG ENERGY transparency platform [http://ec.europa.eu/energy/renewables/index\\_en.htm](http://ec.europa.eu/energy/renewables/index_en.htm).

*Map 5.3. National share of renewable energy in gross final energy consumption represented as percentage, 2009.*

Almost all ESPON regions have a large production potential, not yet fully exploited. In recent years the rising cost of fossil fuels has prompted the production of renewable energies and technological development in continuous growing has made the production of renewable energy one of the strategic sectors of European industry in the next years. Public and private investments in renewable energy are steadily increasing and EU citizens' awareness about

the importance of using renewable energy sources is steadily growing. At the same time, in some regions, difficulties in assessing the real environmental impact of renewable technologies restrain development. The production amount of 24.6 GW is far below the anticipated contribution of sun-rich Mediterranean countries in order to reach the 2020 targets. Some regions with high production potential are far from the EU2020S targets because they are limited by rigid bureaucratic systems.

#### **5.4. A Two-Speed Europe in Energy Intensity of the Economy**

The energy intensity of the economy is a fundamental indicator which shows the energy efficiency of a country's economy. A reduced and efficient consumption of energy is of paramount importance to achieve climate change targets and lower impacts on the environment. However, the stress the EU places on the achievement of an energy efficient economy is within the National Reform Programmes where national targets are for the most part considerably lower than the EU 20% objective. As the Annual Growth Survey 2011 points out, in order to achieve a more energy efficient economy, there is a need for improved and less energy-consuming technologies within all sectors of the economy, especially supporting manufacturing and SMEs, and for a change in households behaviours and by assisting consumers to value resource efficiency (European Commission, 2011b). The EU2020S underlines that "meeting our energy goals could result in € 60 billion less in oil and gas imports by 2020" and that renewable energy sources targets coupled with energy efficiency targets could result in over 1 million new jobs (European Commission, 2010b: 13).

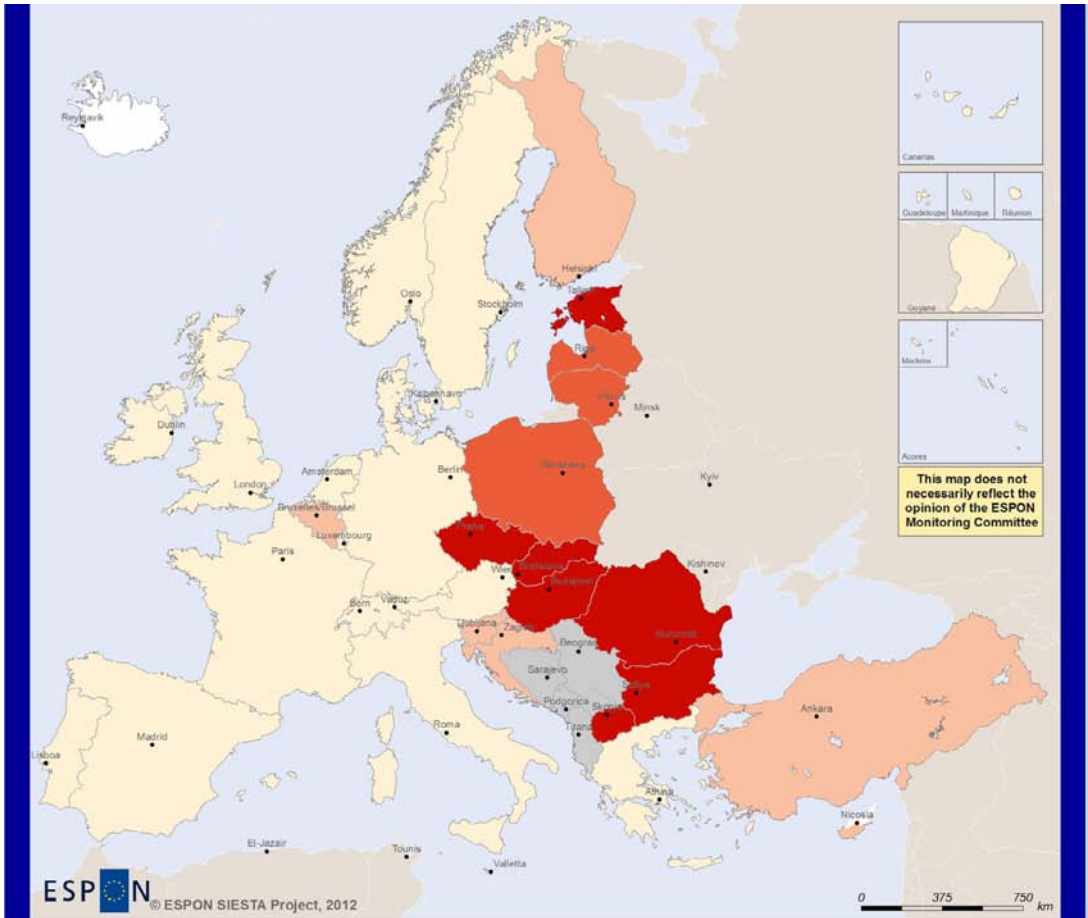
The indicator is able to point out the progresses, if any, made towards the reduction of energy consumption. Energy related targets within the Union are of paramount importance and underpin strategies and programmes undertaken and issued over time by the EU. The EU2020S underlines the importance of achieving a low-carbon society and economy through increased energy efficiency and greater use of renewable energy sources as well as the need to tackle climate change by reducing GHG emissions. The proposal for a new Energy Efficiency Directive earlier in April 2012 highlighted the need to put into effect new measures if the 20% energy efficiency target is to be achieved. The importance of this indicator is found within the two flagships "Resource-efficient Europe" and "An industrial policy for the globalisation era" where recommendations are made including technological improvements and innovations in industrial, agriculture and transport systems as well as a change in behaviours (European Commission, 2011c, 2010c).

#### 5.4.1. Geographical Strengths and Weaknesses Patterns of Energy Efficiency

The energy intensity of the economy indicator should guide action of all member states in achieving and delivering greater energy efficiency. The geographical pattern of the energy intensity indicator shows characteristics which are not surprising, highlighting a marked division between advanced and less developed economies. New member states such as Bulgaria, Romania and Estonia have very high energy intensity ratios, showing great potentials for large improvements continuing on the paths of steady reduction (Map 5.4). Good performances are reported by several old member states, above all Denmark, the UK, Italy, Austria and Ireland, which show ratios close to the lowest energy intensity economy of Japan. But old member states show potential to reduce the gap from Japan. In short, the geographical pattern shows a two-speed European Union: EU15 member states with a lower energy intensity economy and the rest of EU27 member states with higher energy intensity ratios, apart from a few exceptions.

The energy sector could deliver important economic and environmental benefits with the creation of new jobs and reduction of energy dependency from imports of energy and raw materials. Greater energy security for the Union will be delivered as a consequence if the target of 20% increase in energy efficiency is delivered. The stress of the Union on energy efficiency measures is great and it is understood to be one of the main and direct actions which is to be implemented being able to both reduce households' energy bills and increase industry competitiveness thanks to reduction of costs against competitors like the US, where the cost of energy is lower. Member states though are not following this path. The Energy 2020 Strategy in effect highlights that the quality of National Energy Efficiency Action Plans is poor and that the energy efficiency objective is a long way away (European Commission, 2010a).

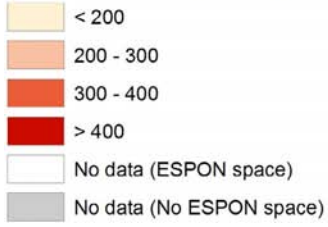
In fact, the current energy efficiency trends at national levels will deliver together an increase of energy efficiency of about 10% compared to the EU27 target of 20%. If action is not undertaken to invert this trend the achievement of the Union's energy targets could be jeopardised. This is evident in the National Reform Programmes which give not enough weight to the energy efficiency target having set much lower national goals. The failure in achieving the energy efficiency target might have wider impacts and affect the delivery of the GHG reduction target too. Within the EU2020S, industry plays a major role for economic growth and job creation (European Commission, 2010c). Innovation in energy intensive and manufacturing industries is of paramount importance to reduce consumption of energy. Thus, technology



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

Regional level: NUTSO  
 Source: EUROSTAT  
 Origin of data: EUROSTAT, 2012  
 © EuroGeographics Association for administrative boundaries

**Kilogram of oil equivalent per 1000 Euros, 2010.**



Notes:  
 EU27=167.99  
 This indicator is the ratio between the gross inland consumption of energy and the gross domestic product (GDP) for a given calendar year. It measures the energy consumption of an economy and its overall energy efficiency. The gross inland consumption of energy is calculated as the sum of the gross inland consumption of five energy types: coal, electricity, oil, natural gas and renewable energy sources. The GDP figures are taken at chain linked volumes with reference year 2000. Since gross inland consumption is measured in kgoe (kilogram of oil equivalent) and GDP in 1000 EUR, this ratio is measured in kgoe per 1 000 EUR.  
 The EU 2020 target is to improve the energy efficiency in 20%, i.e. a reduction of energy consumption in 368 Mtoe (million tonnes of oil equivalent).

*Map 5.4. Energy intensity of the national economy represented as gross inland consumption of energy divided by GDP, 2010.*

transfers in favour of new member states with higher energy intensity ratios are fundamental and may prove to be a challenge. SMEs need to be at the core of innovation policies having fewer resources to implement innovation programmes. Furthermore, there is a need for a generally higher awareness by the public opinion of the importance of energy efficient

cy. Households and individuals behaviours should be addressed towards greater efficiency.

The Energy Efficiency Plan and the proposal for a Directive on Energy Efficiency emphasise the need for different actions which should be put in place embracing investment in the following sectors: energy infrastructure, energy transmission networks, renewable energies and energy efficiency of buildings (European Commission, 2011a). In particular, among other actions, the Directive proposal requires member states to establish national energy efficiency obligation schemes and adopt national heating and cooling plans making sure that spatial planning regulations at the local level are in line with these plans.

### **5.5. Green Economy, Energy Efficiency and Climate Change: the Path to Sustainable European Cities and Regions**

The outcomes of our work show how the EU27, if it really wants to become greener, more sustainable and equitable, should address new global challenges in a coherent, consistent and efficient manner and needs to act collectively against climate change and for building a green economy.

As the maps show, on the one hand there are more advanced countries in renewable energy consumption such as Norway and Sweden, in municipal waste collection such as the old member states and in reduction of GHG emissions such as the UK and Hungary. On the other hand, there are countries that have to make an effort to improve their situation (such as the new member states and candidate members). The more “organised” countries should help other countries with knowledge and technology transfer as well as various governance models. In this way, the goal of sustainable growth can only be achieved with a concerted effort to improve the current situation and only with a collective action it will be possible to fight climate change and invert negative trends.

A green transition of Europe should be exactly the way to recover from the financial crisis, since green economy is a challenging opportunity for the European countries and provides economic potential in newer and older industries which should be exploited (European Commission, 2011d). Regions and cities see the challenge as an opportunity to take our societies out of the global economic crisis and transform them into more sustainable, low carbon, less resource intense and inclusive communities as well as to exchange experiences and increase regional skills and competitiveness towards a greener path of development. In this context, regions are particularly well placed for identifying the needs and the strengths of our societies in tackling climate

change. Clearly, the overarching concept of a green economy recognises that ecosystems, the economy and human well-being, and the related types of capital they represent, are intrinsically linked. At the core of these issues there are the continued challenges of improving resource efficiency whilst ensuring ecosystem resilience in the natural systems that sustain us.

Probably, the EU2020S is the only political response that may offer serious opportunities to enhance sustainability in a short time, address local challenges and respond to, or even reverse, damaging trends. In a few words, it should be the good chance for European regions to shift towards green economy. Addressing environmental concerns directly addresses economic problems. As it is known, Europe is facing a great financial crisis and problems of (urban) unsustainable development. Addressing climate change mitigation through the pursuit of sustainability pathways, it is increasingly necessary to build even stronger links between ecology and economy encouraging an integrated global approach that considers not only GHG emissions reductions, resources efficiency and climate change policies, but also the drivers of unsustainable patterns of production and consumption (Edwards, 2010).

We believe that these issues have to be addressed at regional and local levels. In this framework, Europe is strongly working to change the development model and move towards a more equal economy, balanced and respectful of a heritage to be passed on to future generations. Mostly, the fight to tackle climate change, improve resilience and to achieve the sustainable energy transition will be won or lost in cities because they generate around 75% of all CO<sub>2</sub> emissions and host a high share of the population and an even higher share of economic activities. This is why cities need to be at the forefront of the fight against climate change (Register, 2006). In addition, approximately in Europe 375 million people live in urban regions and around 56% of urban population — or 38% of Europe's population as a whole — lives in cities and towns of between 5,000 and 100,000 inhabitants. Consequently it is evident that sustainable growth and climate change have a strong urban characterisation with tremendous impacts on health, jobs, infrastructures, businesses and food. In this sense cities are competing with each other because they highly depend on other regions in Europe and beyond. In conclusion, the city level has to be a major focus of attention if we want to address the problems of environmental deterioration, global warming and climate change seriously.

## **References**

- Daly, H.E. (1997). *Beyond growth: the economics of sustainable development*. Boston, Beacon Press.
- Edwards, A.R. (2010). *Thriving Beyond Sustainability: Pathways to a Resilient Society*. Gabriola Island, New Society Publishers.
- Hopwood, B., Mellor, M. and O'Brien, G. (2005). Sustainable Development. Mapping Different Approaches. *Sustainable Development* 13(1), pp. 38-52.
- IPCC (2007a). *Climate Change 2007: Mitigation of Climate Change. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge / New York, Cambridge University Press.
- IPCC (2007b). *Climate Change 2007: Synthesis Report*. Geneva, Intergovernmental Panel on Climate Change.
- Register, R. (2006). *EcoCities. Rebuilding Cities in Balance with Nature*. Gabriola Island, New Society Publishers.

## **European Union Official Documents**

- European Commission (2010a). *Energy 2020. A strategy for competitive, sustainable and secure energy*. Brussels, 10.11.2010. [COM(2010) 639/3 final]
- European Commission (2010b). *A strategy for smart, sustainable and inclusive growth*. Brussels, 3.3.2010. [COM(2010) 2020 final]
- European Commission (2010c). *An integrated industrial policy for the globalisation era. Putting competitiveness and sustainability at centre stage*. Brussels, 19.11.2010. [COM(2010) 614]
- European Commission (2011a). *Renewable Energy: progressing towards the 2020 target*. Brussels, 31.1.2011. [COM(2011) 31 final]
- European Commission (2011b). *Annual Growth Survey: advancing the EU's comprehensive response to the crisis*. Brussels, 12.1.2011. [COM(2011) 11 final]
- European Commission (2011c). *A resource-efficient Europe — Flagship initiative under the Europe 2020 Strategy*. Brussels, 26.1.2011. [COM(2011) 21 final]
- European Commission (2011d). *Energy Roadmap 2050*. Brussels, 15.12.2011. [COM(2011) 885/2]