GREECO
Territorial Potentials for a Greener Economy

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Vol. 1.2 Main Report

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This report presents the final results of an Applied Research Project conducted within the framework of the ESPON 2013 Programme, partly financed by the European Regional Development Fund.

The partnership behind the ESPON Programme consists of the EU Commission and the Member States of the EU27, plus Iceland, Liechtenstein, Norway and Switzerland. Each partner is represented in the ESPON Monitoring Committee.

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List of abbreviations

CAP	Common Agricultural Policy
CO2	Carbon dioxide
CSF	Common Strategic Framework
DMC	Domestic Material Consumption
EC	European Commission
EEA	European Environment Agency
EGSS	Environmental Goods and Services Sector
ESDP	European Spatial Development Perspective
ETS	Emissions Trading System
EU	European Union
GHG	Greenhouse Gas
GDP	Gross Domestic Product
IGETP	Index of Green Economy Theoretical Potentials
IPCC	Intergovernmental Panel on Climate Change
NUTS	Nomenclature of Territorial Units for Statistics / Nomenclature of Units for Territorial Statistics
OECD	Organisation for Economic Co-operation and Development
RES	Renewable Energy Sources
R&D	Research and development
SEAP	Sustainable Energy Action Plan
SME	Small and medium sized businesses
UN	United Nations
UNEP	United Nations Environment Programme

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1. Project objectives

The European Union's ten-year growth *Strategy for Smart, Sustainable and Inclusive Growth*, known as the **Europe 2020 Strategy**, sets ambitious goals to progress in the direction of smarter, more sustainable and more inclusive growth for the EU (EC, 2010). These include: (i) employment, (ii) education, (iii) research and innovation, (iv) social inclusion and poverty reduction, as well as (v) climate/energy targets. The Europe 2020 Strategy thus acts as a bridging policy concept at the interface of the economy, the environment and society. Whereas the Europe 2020 Strategy reflects that economic growth is crucial to increasing Europe's competitiveness, it also stresses that growth needs to be sustainable. It thus calls for "smart, sustainable (green) and inclusive growth" to simultaneously propel a long-term and sustainable vision of development for the EU. In particular, the **Sustainable Growth** priority aims at promoting a more resource efficient, greener and competitive economy (EC, 2010).

In parallel, the revised **Territorial Agenda of the European Union 2020** rests on the idea that the objectives defined in the Europe 2020 Strategy, including those related to sustainable growth, can only be achieved if the territorial dimension of the strategy is stressed (EU, 2011). This principle was reinforced during the Polish Presidency of the EU, which made the links between the Territorial Agenda and the Europe 2020 Strategy explicit and operational (Böhme, Doucet, Komornicki, Zaucha, & Świątek, 2011).

Likewise, the EU Structural and Cohesion policy is also aligned with the sustainable growth principles of the Europe 2020 Strategy (DG Regio, 2011; EC, 2011a). The Article 8 of the new **EU Cohesion Policy 2014-2020** states that "the objectives of the CSF Funds shall be pursued in the framework of sustainable development and the Union's promotion of the aim of protecting and improving the environment, as set out in Article 11 of the Treaty, taking into account the polluter pays principle, giving priority to investments in low-carbon economy in all sectors, climate change adaptation and risk prevention and management, environmental protection, resource efficiency, sustainable transport and adequate network infrastructures" (EC, 2013a).

Nonetheless, the sustainable development goals of the Europe 2020 Strategy are currently challenged by the **financial and economic crisis** – the economy –, major **environmental threats** such as climate change, energy scarcity and ecosystem degradation (the environment), as well as by **social imbalances** – the society – and **territorial cohesion concerns** – the territory–. In many respects, all these challenges also provide opportunities for a transition towards more sustainable and resilient economic development models, as recognised in the Territorial Agenda of the European Union 2020 (EU, 2011).

These contextual, overlapping and mutually-reinforced challenges and opportunities stress the need for new, alternative and innovative approaches to sustainable development tackling all these issues simultaneously. Among these novel approaches, the **green economy** has emerged and consolidated as a win-win strategic area expected to help Europe recovering from the economic and financial crisis while maintaining – and taking advantage of – Europe's environmental assets (EC, 2011b, 2011c; EEA, 2013). Seen from a territorial perspective, the shift towards a green economy

mainly entails unleashing territorially-bound assets to leverage territorial potentials in a way that higher levels of economic efficiency and environmental resilience are achieved at the regional and local levels, resulting in stronger territorial cohesion over the long run.

Under this *green economy scenario*, new jobs will spring up in virtually *all* economic sectors. But some of them, mainly due to their more direct environmental links, would provide more employment opportunities than others. Among the promising sectors with higher expected contributions in terms of employment and growth those that are mostly mentioned are: renewable energy, agriculture, fishery, forestry, water management, waste management, tourism and transport (UNEP, 2011).

Against this background, the major goal of GREECO project has been to dig into the conceptual and operational dimensions of the green economy – seen from a territorial perspective – in order to (i) assess how far has Europe's regions and cities have progressed so far from a green economy perspective, and (ii) which are the territorial factors enabling the green economy at the regional and local levels – and how should such factors be operated from a policy perspective –. The **specific objectives** of the GREECO project have been:

- to provide an operational definition of the green economy from the territorial perspective;
- to provide explicit considerations in relation to which territorial dimensions are most relevant in pursuing of the green economy;
- to produce new metrics and territorial evidence at the regional level on the extent to which the green economy has progressed so far across Europe;
- to identify good practices of transition to green economy within a number of economic sectors and case studies;
- to analyse the key drivers and enabling conditions that operate at regional and local levels for the transition to a greener economy;
- to characterise the combined effect of such drivers and enabling conditions, yielding different types of territorial potentials for a green economy;
- to identify the role of regions and cities in driving a green economy development and base policy recommendations on them.

These objectives have been achieved by means of a series of complementary top-down and bottom-up research activities. The top-down activities include a comprehensive discussion of the (i) conceptual and (ii) territorial implications of the green economy, (iii) a full assessment of territorial performance, as well as (iv) a detailed characterisation of regional potentials for a greener economy. The bottom-up activities include, (v) nine assessments of green economy sectors and (vi) ten case studies. The lessons learnt within all the above mentioned research tasks were processed by a specific component of the GREECO project dealing with (vii) policy lessons and recommendations. The outcomes of all these activities are summarised in the following pages and presented as stand-alone documents for ease of reference (Vols. 2 to 5 delivered together with this report).

2. The green economy: a policy concept with strong social, territorial and environmental implications

2.1. 'Green economy': Sustainability principles made operational

The 'green economy' is a political rather than a scientific concept. It is defined by the **Rio+20 conference** 2012 in its final document *The future we want*: The green economy – "in the context of poverty eradication and sustainable development" – "should contribute to eradicating poverty as well as sustained economic growth, enhancing social inclusion, improving human welfare and creating opportunities for employment and decent work for all, while maintaining the healthy functioning of the Earth's ecosystems" (UN, 2012). Moreover, the final document emphasises "that fundamental changes in the way societies consume and produce are indispensable for achieving global sustainable development" (UN, 2012). Coherently with this approach, the EU defines the green economy as "an economy that can secure growth and development, while at the same time improving human well-being, providing decent jobs, reducing inequalities, tackling poverty and preserving the natural capital upon which we all depend" (EC, 2011c, p. 5).

The **EEA** has a somehow narrower perspective on the green economy. It defines it as one "in which environmental, economic and social policies and innovations enable society to use resources efficiently, thereby enhancing human well-being in an inclusive manner, while maintaining the natural systems that sustain us" (EEA, 2012, p. 5). It thus places the focus on ensuring ecosystem resilience of the natural systems, and on improving resource efficiency, to the detriment of the social dimension of sustainability. Likewise, other international organizations, such as the **OECD**, the **World Bank** and the **Global Green Growth Institute** use the expression 'green growth', putting an even smaller emphasis on the social dimension. For instance, the OECD defines green growth as one that fosters "economic growth and development, while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies" (OECD, 2011b, p. 146).

Something that all the above definitions have in common is that all of them depict a shared vision of a 21st century economy being a 'green economy'. This term denotes **an economy that is able to prosper without over-consuming in any of the economic, ecological or social dimensions**.

However, as argued within the Interim Report of GREECO project (ESPON & Tecnalia, 2013), the traditional three spheres of sustainability mentioned above (i.e. **environment**, **economy** and **society**) may be enlarged to include yet two additional dimensions where sustainability may be tested from a systemic perspective (see Figure 1 within the Executive Summary of this report – Vol. 1.1). The first one is the ***econosphere***, where the key structural elements of economic transformation are shaped against the environmental background. The econosphere takes account of the extent to which the physical structures of the economy are transformed to provide their services with a minimum of materials, energy and space consumption. The second one is the **territorial sphere**. Its inclusion rests on the principle that territorial equilibrium and cohesion are requisites for a *genuine* socio-economic development to take place, as recognised by the Treaty of Lisbon (Art. 3.TEU) and the Europe 2020 Strategy. The green economy should consequently contribute to strengthen the territorial balance too. The following simplified definition of the green economy presents all these ideas in a more structured way:

The green economy can be defined as the socio-economic development that takes place vis-à-vis a more sustainable use of natural resources, preservation of environmental capital and fewer environmental risks, while at the same time enhancing regional competitiveness and territorial cohesion over the long term.

Thus, the concept of the *green economy* does not replace the concept of *sustainable development*, but should rather be seen as **the *operationalization* of the sustainability principles**. The physical and institutional structures required for sustainable ecological, social, territorial and economic balances are to a high extent constructed by earlier generations and other areas. As such, the green economy transformations have intergenerational and inter-territorial perspectives too.

2.2. 'Green economy', 'green growth' and 'greening the economy'

The concepts of *green economy*, *green growth* and *greening the economic policies* are frequently used interchangeably in the literature and in the public debate. This is no wonder since they are not scientific concepts with clear and unambiguous definitions. Based on the review of literature, policy documents and the policy process itself that are fully described in Vol. 2.1 of this report, the definitions included in the following box seem to follow the logic established in policy discourse as well as in the scientific literature.

Box 1: *Green economy concepts made operational*

A *green economy* is an economy that is able to *prosper without over-consuming* in any of the economic, ecological, territorial or social dimensions. The notion of overconsumption implies that some balances should be kept in each dimension. They will inevitably be politically defined, but should – as far as possible – be science based. They apply to the economy as a whole, that is, at the macro level (EU, national or regional).

The *green transformation* is the transformation of the economy and its sectors to a green economy. If the green economy of the 21st century is structured differently from the 20th century growth model, then there must logically be a transformation of the latter to the former. An economy in ecological balance requires a different econosphere with flows of renewable energy instead of fossil – and in some countries nuclear – energy, flows of substances with low instead of high environmental impact, circular – recycling – rather than linear – source to sink – flows through the econosphere, reforming the use of land designated to economic and nature purposes and other transformations of the physical and territorial structures.

Green growth* is pursuing green solutions as business cases.** The change of the economy can be perceived as a myriad of green solutions being invented, developed and diffused into use. The pursuit of this innovation can be labelled as *green growth*. For firms the solutions represent business cases. Green growth in one sector, however, does not necessarily mean that the rest of the economy is reducing its overconsumption. Thus **green growth can occur even if the economy is not as a whole transforming to a *green economy.

***Greening the economic institutions* refers to the policy instruments available to governments.** The definition of budgets, targets and timetables is fundamental for effective policies. For the private sector, governments establish institutions as frameworks for the economic activities. Institutions such as the Common Agricultural Policy (CAP) or the tax system are being reformed to structures that support green growth and green transformations; governance principles of institutions with a transformative purpose such as those established by the renewable energy directive are adapted

and improved; for the public or tax financed sector, governments decide directly upon what to produce, consume or invest in. Greening of the institutions of the economy thus includes public investments and physical planning as well as development of institutional frameworks for private investments and innovation in a green economy.

In the GREECO project, it is found expedient to distinguish between 'green economy', 'green growth' and 'greening the institutions of the economy' as defined above, because they refer to different ontologies or objects of change. In the public debate, however, 'green economy' is often used as an all-embracing concept including all of the above as well as green perceptions of and attitudes towards the relation between the economy and nature.

2.3. Green growth versus the green economy: territorial and environmental implications

At the regional level, the investment in green transformations can have considerable impact on employment and income generation. However, as it is implicit on previous definitions, **an economy with high rates of green growth is not necessarily a greener economy**. This applies to regional as well as national economies and it is mainly due to the following reasons:

- From a production perspective, the value chain and division of labour of the goods and services that are commercialised could compromise the sustainability of such products or services. A given economy can, for instance, develop and produce electric cars or wind-turbines, but do so on the basis of a fossil energy system. Such an economy is not likely to prosper without over-consuming its carbon budget. From a territorial perspective, this takes place because economies enter the division of labour where the products of one economy are not necessarily installed in the economy itself, but imported from and exported to other economies. Similarly, other ***territorial and environmental externalities*** – and dependences – might derive from similar resource and waste management approaches (Curran, 1996; EEA, 2014a; Fava et al., 1991). This situation calls for designing green economy monitoring tools that base on a life-cycle approach and a **systemic conceptualisation of green transitions** (Kosoy et al., 2012).
- From a consumption perspective, it also has to be acknowledged that whereas innovation leads to, e.g., more fuel-efficient cars, the savings on the fuel bill, however, could be spent on a larger engine or an airplane trip to a southern tourist resort. Thus, the economic response to energy saving innovations might paradoxically lead to higher energy consumption that potentially neutralises the original energy savings. This is called the '**rebound effect**' or '**Jevons' paradox**' (Chitnis, Sorrell, Druckman, Firth, & Jackson, 2014; Polimeni & Polimeni, 2006; Santarius, 2012; Werner, 2014). This **calls for a transformational policy approach** that complements the progress in resource efficient innovations by other measures to guide consumption in the direction of more sustainable resource use. Such measures can include, e.g., carbon taxes, quotas or technical standards (UNEP, 2010).

2.4. Measuring progress towards a green economy

The vision of a green economy reflects an ambition of achieving territorial cohesion and prosperity in the economic, ecological and social dimensions and setbacks in none of them. Briefly put, it requires social progress being measured in quality and equality, for all three dimensions within specific territories, in order to take account of the territorial balance too. Thus, the principles of sustainable

development as well as the concept of a green economy represent a paradigm were the one-dimensional measure of GDP growth is replaced by a broader understanding of societal progress. In other words, **GDP growth cannot be considered societal progress if it is obtained by destroying the ecological, territorial and even financial balances on which it depends** (EC, 2009; J. Tobin, 1973; Stiglitz, Sen, & Fitoussi, 2009).

Against this background, the comprehensive review of green economy metrics and indicators performed in the GREECO project showed that the existing approaches to the assessment of progress in sustainable development and the green economy could be grouped in two broad categories:

The first approach relies on a **one-dimensional measure** as a weighted average of sub-indices representing all the balances (economic, environmental and social; and sometimes also territorial). These weights are difficult to obtain. They can be estimated by statistical methods (Singh, Murty, Gupta, & Dikshit, 2012), or retrieved from surveys of citizens or their political representatives, but they cannot be expected to be stable. This makes it difficult to compare over time and between countries or regions. More importantly, the weights used to compute these indexes are in effect relative measures of how much progress in one sub-index is needed to offset decline in another. Such an index would implicitly establish a measure of progress where environmental losses or increasing poverty would be considered social progress if the GDP growth rate was sufficiently high (Bossel, 1999). This misleading approach is, indeed, scientifically deprecated, as there is a growing consensus that **environmental, economic and social capital are not interchangeable** (see for example Ayres, van den Berrgh, & Gowdy, 2001; Rennings & Wiggering, 1997). Thus, most recent attempts to characterise the green economy transformation rely on a more robust, **multidimensional approach** to the metrics issue (Singh et al., 2012).

This multi-dimensional approach has been for example adopted by the **EU**'s Roadmap to a Resource Efficient Europe (EC, 2011d), linked the Flagship initiative Resource-Efficient Europe (EC, 2011b). This Roadmap proposes a subset of indicators for monitoring advance towards 2050 vision covering specific issues such as (i) natural resources availability, (ii) waste generation and recycling rates, as well as (iii) impacts on the environment and biodiversity by means of a dashboard of indicators (EC, 2011f). Similarly, the **EEA** has dealt with green economy metrics relying on a subset of environmental indicators for ecosystem resilience and resource efficiency, which according to the EEA are the two main structural elements that characterise transformations towards a green economy (EEA, 2012).

The **OECD**'s Green Growth Strategy launched on 2011 proposed a preliminary list of twenty-five stand-alone indicators (not all of which were measurable at that stage) to measure progress towards the green economy. The list includes (i) indicators monitoring the environmental and resource productivity of production and consumption; (ii) indicators describing the natural asset base; (iii) indicators monitoring the environmental dimension of quality of life, and; (iv) indicators describing policy responses and economic opportunities, which are complemented with generic indicators describing the socio-economic context and characteristics of growth. (OECD, 2011c).

The Green Economy Initiative held by the **UNEP**, first launched in 2008, also proposes a panel of indicators composed by more than 40 green economy indicators including (i) indicators for environmental issues and targets; (ii) indicators for policy interventions, and; (iii) indicators for policy impacts on well-being and equity (UNEP, 2012a).

Coherently with these international initiatives, the GREECO project has delivered a set of indicators at the NUTS-2 level for monitoring the green economy challenges, potentials and performance. Ideally, this means that each region can be compared to other regions by a selection of indicators relevant to the region in question and to the regions it compares to. Regretfully, though, for most of

the processes the collection and processing of primary data did not allow for comparative analysis at a regional level. Even at the national level data availability is limited. The GREECO project has, however, attempted to develop datasets for regional comparative analysis, including indicators of very different types. Table 1 on the Executive Summary provides an overview of the new indicators developed by the GREECO project, whereas Vol 2.2 describes the indicators collected or produced in the GREECO project.

2.5. Recovering from the crisis through green transformations?

The European economies are still in 2014 fundamentally out of balance. The rate of unemployment is historically high in many regions, particularly among the youth. A key factor in the cascading crises is the considerable drop in the rate of investment being a cause as well as an effect of the economic – and social – downturn. The rate of investment in the EU has dropped since 2008 symmetrically to the rise of unemployment to historically low levels. This situation has given rise to a debate on the role of a green transformation of the economy in the recovery from this crisis. **A first step towards the green transformation of the economy is investing in *green* rather than *brown* solutions**: Wind farms rather than coal power plants, e-mobility rather than petrol and diesel cars, waste water treatment rather than destroying ecological values. These types of investments hold potentials for restoring the level of investment that is required to restore the economic balances.

Many voices have advocated for advancing green investments that would otherwise take place later on in order to restore the investment demand in the economy under the headline of a *Green New Deal* (Edward B. Barbier, 2009; United Nations Environmental Programme (UNEP), 2009). The EU Commission put forward a recovery plan in 2008 (EC, 2008, 2013d), but the EU did and does not control the financial resources required for realising such ambitious plan. Some Member State government programmes, however, have promoted private investments – e.g., in energy retrofit of buildings –, and they have advanced planned investments in infrastructure and renewable energy. Generally, however, the programmes have been insufficient to counteract downward pressures on other final demand components.

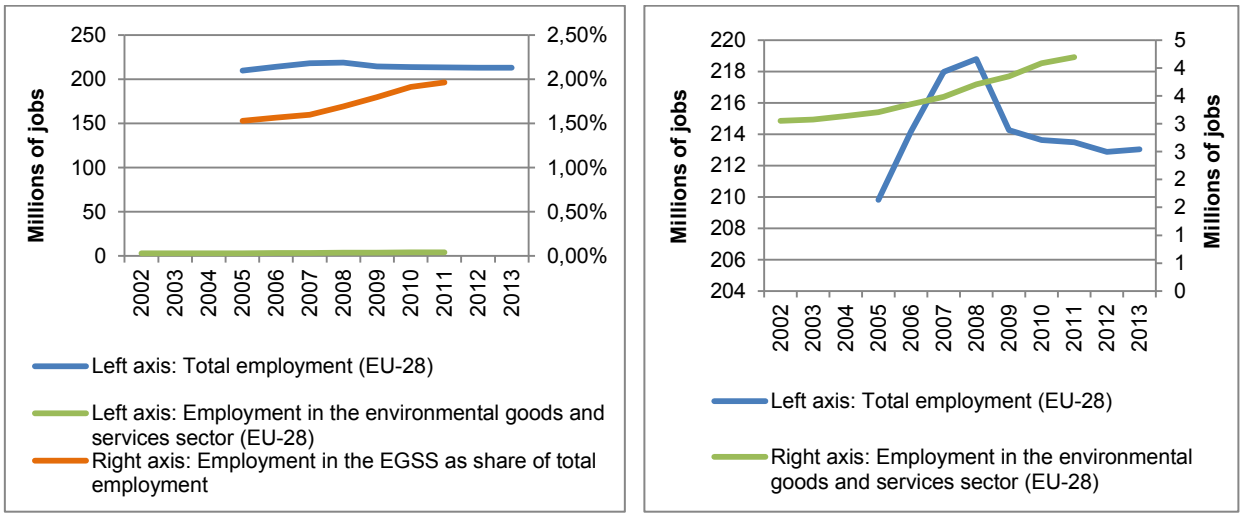
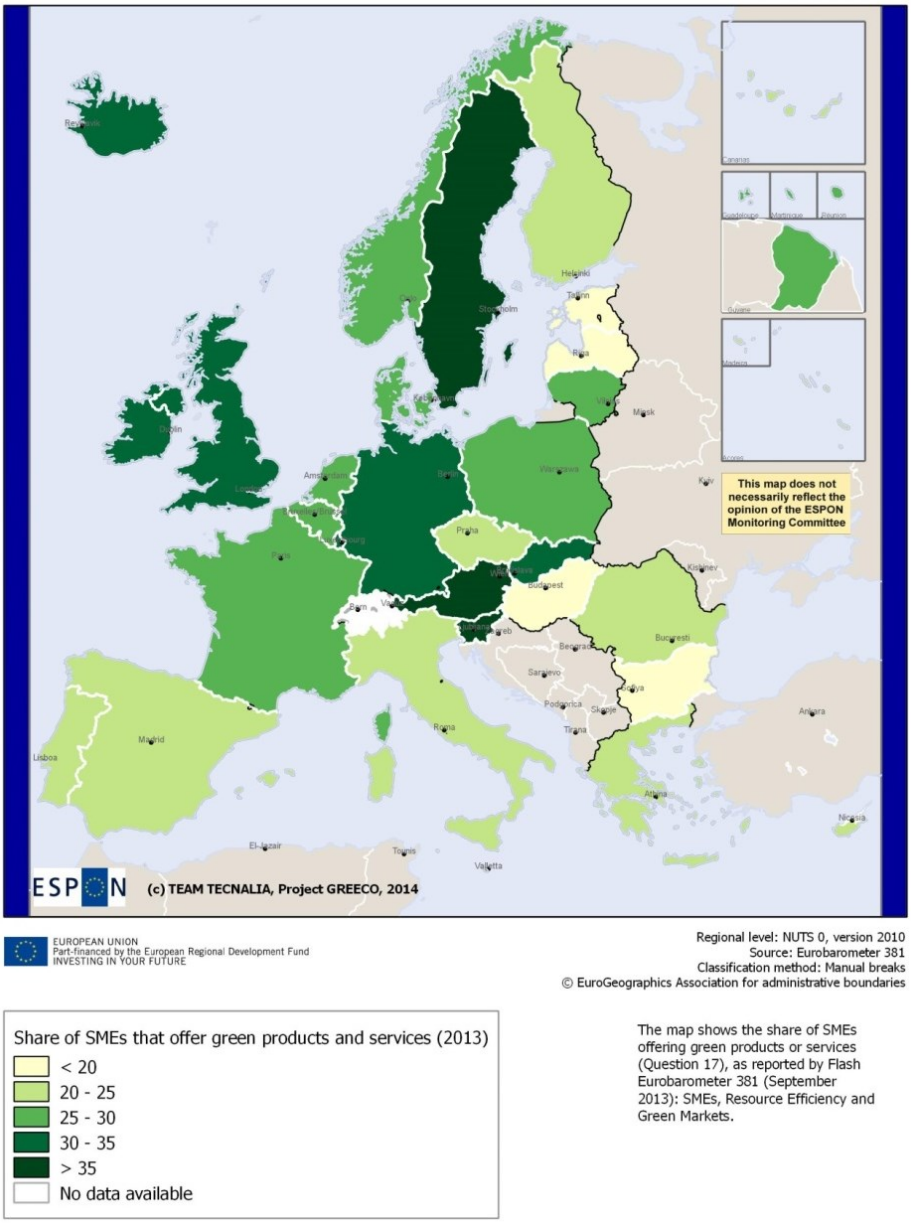


Figure 1: Contribution of the Environmental Goods and Services Sector to total EU-28 employment over the period 2002 to 2011

Source: Eurostat (EGSS data: env_ac_egss1; Employment data: lfsq_egan).

It is important to note that the economic balances will not improve due to higher investments in greening the economy if these are offset by reductions in other investments in net exports or in government and private consumption. This is well illustrated by Figure 1 that compares the behaviour of the Environmental Goods and Services sector (EGSS) – which are a core part of the green economy but not the whole green economy – with the entire EU-28 economy in terms of job creation over the period 2002 to 2011. Despite that the number of jobs created by the EGSS increased steadily over most part of the last decade (right graph), even during the economic recession, the EGSS still represent a very small portion of the entire EU economy both in absolute and relative terms (left graph). It is expected that this trend is going to last. For instance, the European Commission estimates that the decisions on the climate policies beyond 2020 in isolation will have limited impact on the level of employment in Europe (EC, 2014).



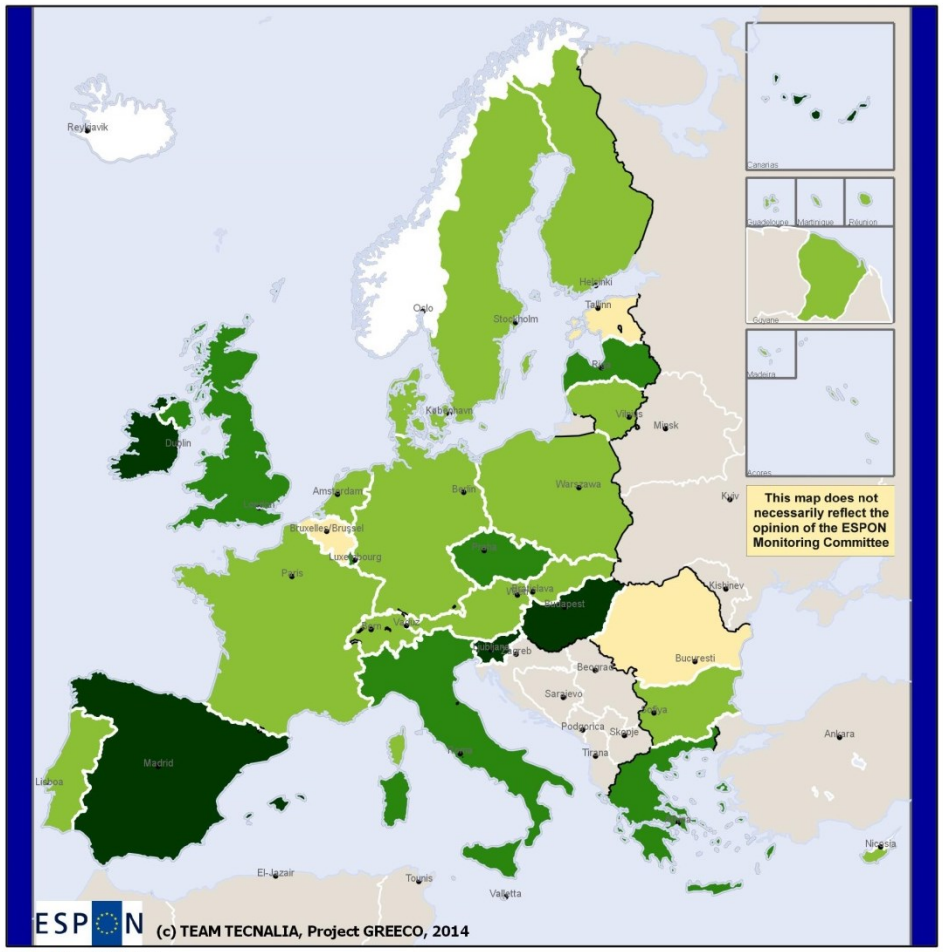
Map 1: Share of SMEs that offer green products and services

However, as shown in Map 1, the EGSS already play a relevant – and growing – role in many territories. For instance, in countries such as Austria, Slovenia, Sweden, Ireland, Luxembourg, Germany, Slovakia, United Kingdom and France, more than 30% of the small and medium sized businesses (SMEs) produce green products or services. SMEs from most European countries have steadily increased their commercial focalisation on EGSS in the last 5 years (EC, 2013c).

All the above implies that, **whereas investments in green solutions cannot restore the economic balances in Europe on their own, they can nonetheless be an important part of an economic strategy for its restoration.**

2.6. Economic delinking, regional carbon-budgets and actual emissions

The inability of the growth model of the 20th century to make progress in the economic dimension without abandoning important values in the ecological dimension has been in the focus of the academic and political debate since the 1960's (Mebratu, 1998; Olsson, Galaz, & Boonstra, 2014; Westley et al., 2011). The question was often phrased as a choice between growth and the environment. The global community replaced 'GDP growth' as the overriding societal priority with 'sustainable development' in the 1980's and 1990's (Redclift, 2005). This represented a shared vision of achieving simultaneous progress in the ecological and economic dimension (Vol. 2.1 within this same report includes a complete characterization of the conceptual and theoretical evolution of the sustainable development principle over the last decades).



Map 2: 2000-2011 change of resource productivity at Member State level expressed as Gross Domestic Product (GDP) divided by Domestic Material Consumption (DMC)

The prospects of the next two decades suggest that accelerated progress in **resource efficiency** is increasingly important for

economic prosperity (Behrens, Giljum, Kovanda, & Niza, 2007). This is particularly true for the EU, where industries competing with North American and Chines producers will face two to three times the energy prices faced by their competitors (OECD, 2013). Therefore, **local governments in regions hosting large energy intensive industries face large challenges to deal with these prospects**, particularly in regions where industries plan to downsize. In such regions alternative industrial development becomes more urgent and retraining and other supporting measures in large scale can be required.

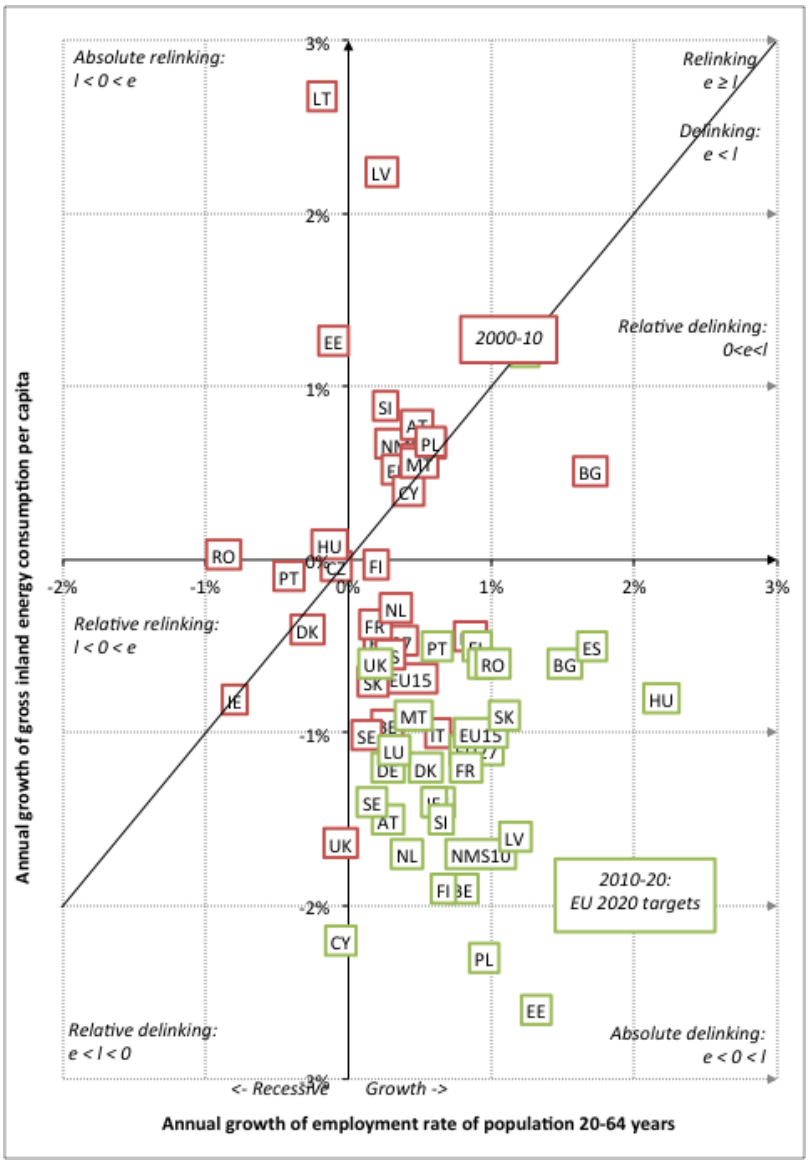


Figure 2: Delinking of final energy consumption from employment growth in 2000-10 and the implicit EU 2020 delinking targets

Source: Roskilde University based on Eurostat data.

Figure 2 to the left shows the relative position of Member States in terms of delinking their final energy consumption from employment growth over the period 2000-10. The average annual growth rates of the employment rate and gross energy consumption per capita are denoted *l* and *e*, respectively. The growth rates required to reach these goals from 2010 through 2020 are calculated based on the actual energy consumption and employment rates in 2010. The targets for many Member States differ slightly from the overall EU target and this is reflected in the employment growth requirements.

The red boxes in Figure 2 represent the delinking performance of each country in 2000-10, a period that was characterised by an economic boom followed by a severe recession. The green boxes represent the delinking targets that must be obtained in the period 2010-20 for reaching the goals of the EU 2020 strategy. Figure 2 can thus be used to compare where countries *lay* and where countries *should lay* in order to achieve Europe 2020 Strategy targets.

The position of the countries in the figure also illustrates the **delinking performance** of each country in the period 2000-10. Over this decade the split between relinking countries – those laying above the diagonal line – and delinking countries – those laying under the diagonal line – was about 50-50, but many with a very small margin. In general terms, EU15 countries dominated the delinking side whereas many New Member States relinked. Some countries experienced a reduction of final energy

use alongside with a reduction in employment, but this cannot be characterized as sustainable development. These countries are labelled as being under *relative-delinking* or *relative-relinking*, depending if annual employment rates grew more or less than energy consumption, respectively. Some countries suffered a decline in employment annual growth rates and a simultaneous increase in final energy consumption. These countries were facing *absolute-relinking*.

Another relevant dimension of economic efficiency with obvious links to the Europe 2020 climate targets are **CO2 emissions**. To a certain extent, this dimension may be characterised from a regional perspective.

The policy that operationalises the 20% reduction of greenhouse gas emissions target set by the Europe 2020 Strategy is controlled by the EU Emissions Trading System, which monitors the consumption of each member-state of the capacity of the environment to absorb greenhouse gasses. The carbon-budget is defined for the EU economy as a whole and reduced year by year to 80% of the 1990 emissions in 2020, probably 60% in 2030 and 5-20% in 2050. The overall carbon-budget is broken down in two sectors: the energy intensive industry sector (the ETS-sector) and the rest of the economy (non-ETS sector). A carbon-budget of the non-ETS sector for each year in 2013-2020 and for each member-state has then been defined (EC, 2013b).

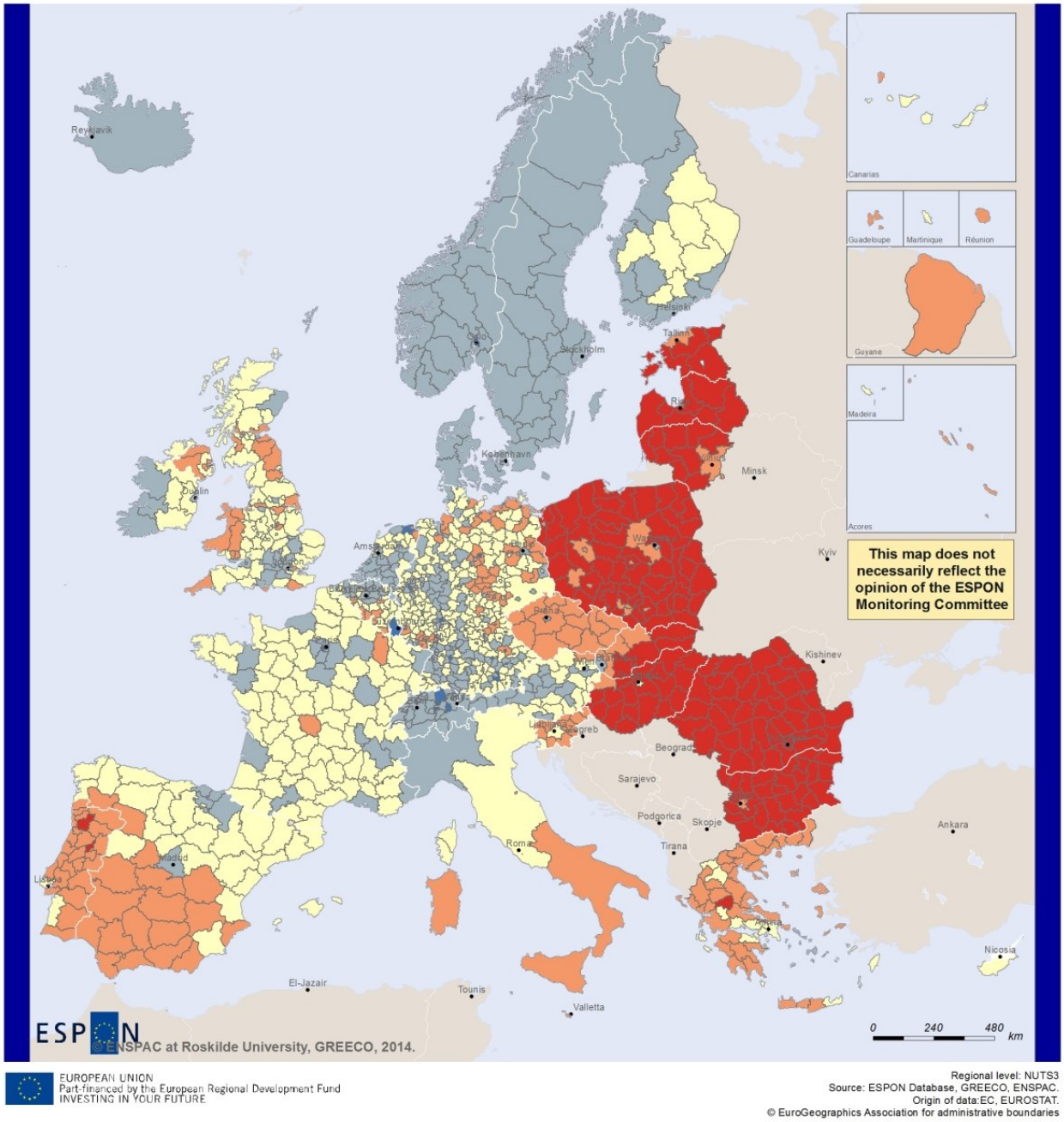
The EU carbon-budget is shared by the Member States according to their per capita GDP. The EU15 (the old Member States with higher per capita GDP) except Portugal are assigned gradually decreasing carbon-budgets until 2020, whereas the New Member States with lower per capita GDP (except Cyprus) are allowed to increase their emissions. This is because economies with a lower GDP per capita are expected to grow faster than countries with a higher GDP per capita.

Even in countries with less reduction targets than the 20% cities, many municipalities and regions have voluntarily committed to reduce emissions from their territory by at least 20%. This is done within the framework of The Covenant of Mayors, which now has 5500 signatories representing 182 million inhabitants (March 2014). They submit their carbon-budget in a Sustainable Energy Action Plan as a voluntary emission reduction target. In principle, it covers all emissions from the territory: the energy sector as well as other production sectors, transport and the residential sector. The signatory, however, may exclude ETS emission sources from the plan.

The level of CO2 emissions from Member States is the product of five factors: The level of economic activity (GDP), the final energy intensity of GDP (final energy use/GDP), the primary energy use per final energy use, the fossil share of primary energy use (1 – the share of non-fossil primary energy use) and the CO2 emissions per unit of primary fossil energy. The GREECO project has estimated the first two of these. Unfortunately the available data are not sufficient to determine the other factors at the regional level.

However, the data that are allowable shows that the discrepancy between the national and the regional or municipal carbon-budgets is considerable. This could suggest that **the methodology used for allocating the general EU carbon-budget might underestimate the potentials for green transformation in many countries**. The allocation of the non-ETS budget follows the variation in per capita GDP, but does not take the potentials for emission reduction into account.

Map 3 below shows the annual rates of reduction of the carbon-budget for NUTS3 regions when relating the *regional* carbon-budget reductions to per capita GDP in the same proportions as the *national* carbon-budgets are related to per capita GDP. All the regions of Scandinavia and Finland would have gradually reduced carbon-budgets. In the new Member States all regions would have increasing budgets. In the rest of Europe, countries would have regions with increasing as well as regions with decreasing carbon-budgets.



Map 3: Annual carbon-budget change for regional indicative carbon–budgets following national effort-sharing patterns. Per cent per year, 2013-20

However, it has to be kept in mind that the regional carbon-budgets cannot be legally binding like the budgets for Member States. They are rather benchmarks or indicative budgets. They may also be

redundant in some regions were fossil fuel combustion has to be reduced faster due to health risks of air pollution. The underlying hypothesis of high GDP growth due to low GDP per capita level is debatable within a 10-year horizon and at the regional level even more so. A possible interpretation of this fact is that carbon budgets should rather be adjusted according to the *actual* growth of population, employment and production, rather than to GDP per-capita. Regions in decline do not need increasing carbon-budgets as some growth regions do. The same argumentation holds for other resource-efficiency targets, if such targets are finally set, as the European Resource Efficiency Platform suggests to do (EREP, 2014).

3. Understanding green growth: a sector approach

In the GREECO project a series of sector investigations of the green economy have been carried out with the purpose to understand the green growth process within each sector, the current state and greening performance, and to identify sector-specific drivers and enabling conditions for a green growth. The sector analysis also studied the territorial relations of the sectors, identified the communalities, as well as the most important linkages and interdependencies between the sectors studied. In line with previous assessments (OECD, 2011c; UNEP, 2011), the five sectors under analysis in GREECO have been selected basing on their relevance for the green economy as a whole. The selected sectors are: **Bio-economy** (sub-divided in Agriculture, Forestry and Fishery), **Manufacturing**, **Renewable Energy**, **Tourism** and **Transport**. Four additional sectors, which cross-cut the above sectors and possess clear territorial dimensions have also been considered. These include: **Water Management**, **Waste Management**, **Building and Construction** and **Green Research** activities encompassing the implementation of clean technologies such as carbon capture technologies. Vols. 3.1 to 3.11 deliver a complete characterization of the greening processes active within these sectors.

3.1. Main findings from sector analysis: Greening patterns within individual sectors

With regard to the **agricultural sector**, a rapid growth in sustainable farm and land management practices (i.e. organic farming) was observed in the Member States over the last decades, which resulted in a decline in the greenhouse gas (GHG) emissions and the use of environmentally harmful inputs, as well as increases in the overall productivity. However, the share of renewable energy in on-farm energy consumption is still relatively small. Petrol and diesel are still prevalent. Moreover, land use pressure is growing in many Member States, as the amount of agricultural land has diminished while production intensity increased.

About 21% of the total forest area in the EU belongs to Natura 2000 sites, which represents a significant contribution to the preservation of the biodiversity, particularly in the forests. Also the certification schemes (PEFC) has a major contribution to greening of the **forestry sector**. The share of PEFC certified forest ranges from 0% in Hungary, Greece and Romania to more than 90% in Norway and Finland. Among the main challenges in the forestry sector are deforestation, forest degradation, biodiversity loss and unsustainable production of energy from biomass. Please refer to Vol. 3.2 for further details on the agricultural and forestry sectors.

Most of Europe's commercial fish stocks are over-exploited due to increased quantity and technical

and physical power of the fleet, but also increased consumption of fish in general. A high rate of discards is another factor impacting the sustainability of the **fisheries** today. While fishing for specific species by-catch of other species may be thrown away in order to be able to focus on high value species. Among the positive trends it should be mentioned the increased focus on the concept of sustainable fisheries where discard is avoided and that all fished species should be converted into useful food for humans. Vol. 3.3 provides a detailed description of the fishing sector.

Many countries have managed to improve energy and resource performance of the **building sector** due to construction of greener buildings with higher energy performance and as a result of retrofitting activities of existing buildings. However, variations across the EU countries in terms of performance of the buildings are still significant, which suggests that there is still a long way to go for the building sector to become greener. Vol 3.4 provides a complete characterization of the sector.

The **Eco-innovation sector** in Europe is growing relatively rapidly, especially the eco-industry sub-sector. Eco-industries have been growing by around 8 % in recent years. However, the regional differences remain high – with higher innovation patterns in core-regions and lower performance in lagging regions. Please refer to Vol. 3.5 for a complete description of the Eco-innovation sector.

In general, the resource efficiency and sustainability of the **manufacture sector** has greatly improved over the past decades. Many industries today seize the opportunities related to a more sustainable production (primarily through reduced costs). Significant investments are being made in the environmental protection measures. Moreover, most EU countries are on their way for achieving absolute delinking of manufacturing in terms of decoupling GVA growth from energy use and waste generation. The manufacturing sector is described within Vol. 3.6.

A significant expansion of the renewable **energy** industry and increase in energy efficiency has been taking place in the EU since the beginning of the 90's. The share of renewable energy in the primary energy consumption grew by 143% from 1990 to 2010 and it corresponds to about 10% in the EU 27 today. However, more ambitious targets need to be introduced in some of the Member States in order to promote further increase of greener energy. Please refer to Vol. 3.7 for additional information on the energy sector.

The development of a more sustainable **tourism** has been increasingly prioritised in the EU. Increasing demand for more sustainable tourism has been reported and some segments of tourists are becoming more environmentally aware and engaging in ecotourism and other niche-products. Among the challenges today is that sustainability in tourism is difficult to track, as the greening initiatives are driven by various sectors. Overall, there are relatively few tourism operators and hotels that are establishing the programs to improve their environmental performance. Please refer to Vol. 3.8 for a complete characterization of the on-going trends within the tourism sector.

Passenger travel and freight **transport** accounts for one third of European energy consumption. Despite technological advances and other greening measures, transport sector's GHG emissions have increased by one third from 1990 and account for about 26% of all GHG emissions in the EU 27 today. The transport sector is fully described within Vol. 3.9.

The share of **waste** being recycled and reused, composted and incinerated has increased over the years. Due to avoided landfilling the reduction in GHG emissions and other environmental benefits have been achieved. Despite the overall slowing down of waste generation rates in the EU the quantities of waste are still increasing. That shows that despite an increased application of more sustainable waste management practices, the progress is insufficient. Vol. 3.10 provides a complete description of the waste management sector.

In several countries of the southern Europe the total **water** abstraction exceeds 20% of the total available annual resources (40% in Cyprus), which is considered the standard threshold for 'water stressed' areas. In future, the demand for water in Europe is expected to rise by up to 50% until

2010-2030 due to higher living standards and increased production. Population growth in certain regions (mainly urban centres) will put additional stress on the water resources. At the same time water productivity has been increasing in the EU through more efficient water consumption during the industrial processes. Over the last decades significant progress has been achieved in improving the ecological status of the water bodies due to reduced pollution, improved waste water treatment, reduced industrial discharges, and reduced use of fertilisers. Please refer to Vol. 3.11 for an in-depth assessment of the water sector.

3.2. Spatial distribution of economic sectors in Europe

A first overview of the spatial distribution of the economic sectors is shown below on the miniature maps1-3 and 4-6 on Figures 3 and 4, respectively. The miniature maps show the intensity of the six selected sector categories measured through the generated GDP per capita in the different regions.

The sectors included in **Figure 3** are:

- **Miniature 1:** Agriculture, forestry and fishing;
- **Miniature 2:** Selected NACE sectors (B: mining and quarrying; C: manufacturing; D: electricity, gas, steam and air-conditioning supply; E: water supply, sewerage, waste management and remediation activities) referred to as industrial branches;
- **Miniature 3:** Construction.

The sectors show a diversified and quite heterogeneous territorial pattern. The highest GVA of the industry sector is in the north of Sweden (mining activities), the south of Germany (automobile industry), Norway and Scotland (oil and gas industry). The GVA in building and construction activities is highest in the Nordic countries (especially Norway), Spain and some regions in the central Europe. The bio-economy sector plays an important role in the economies of the Nordic countries, primarily due to large forest reserves and fisheries, but also in Southern Europe. Besides the East-West divide, there is a clear territorial pattern depending on the urban development and population dynamics. In many capital regions across the EU the GVA of the building and construction sector is quite high, which documents that the processes of urbanisation and urban sprawl growing beyond the city borders and resulting in the GVA of the construction sector being higher outside the capitals.

The sectors included in **Figure 4** are:

- **Miniature 4:** Professional services encompassing the following NACE sectors (K: financial and insurance activities; L: real estate activities; M: professional, scientific and technical activities; N: administrative and support service activities);
- **Miniature 5:** Other sectors (G: wholesale and retail trade; H: transporting and storage; I: accommodation and food service activities; J: information and communication);
- **Miniature 6:** All GREECO branches included in both Figures 3 and 4.

The GVA of the professional services is the highest in the capital regions and is fairly high in the regions of the central and Southern Europe, which indicates the larger development of the tertiary sector of the economy here. The GVA of the trade, transport, accommodation, food services and information and communication sectors is quite high across the regions due to openness of the economies, high levels of accessibility, well developed ICT etc. The capital regions have the highest GVA of the sectors, followed by the regional transport hubs and attractive tourism destination such as along the Mediterranean coast. The importance of the latter activities is lower in largely uninhabited and sparsely populated regions in the North. And looking at the map combining the five maps together (GREECO branches) indicate that the Nordic countries are more innovative and prosperous in comparison to developing eastern and southern parts of the Baltic Sea Region.

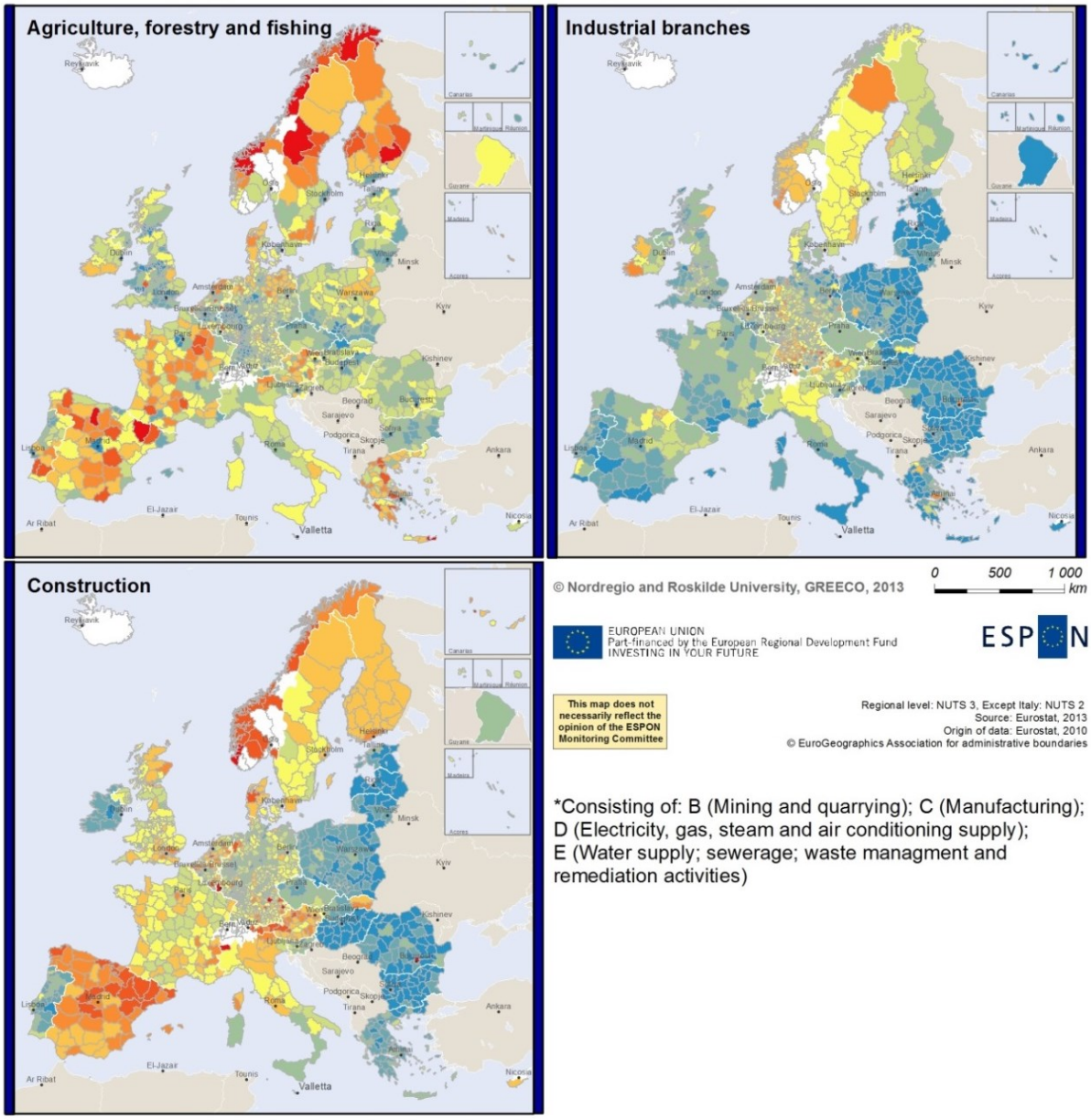


Figure 3: Regional economic specialisation (Miniature maps 1 to 3) showing GVA per capita among (1) the bio-economy, (2) industrial and (3) construction sectors

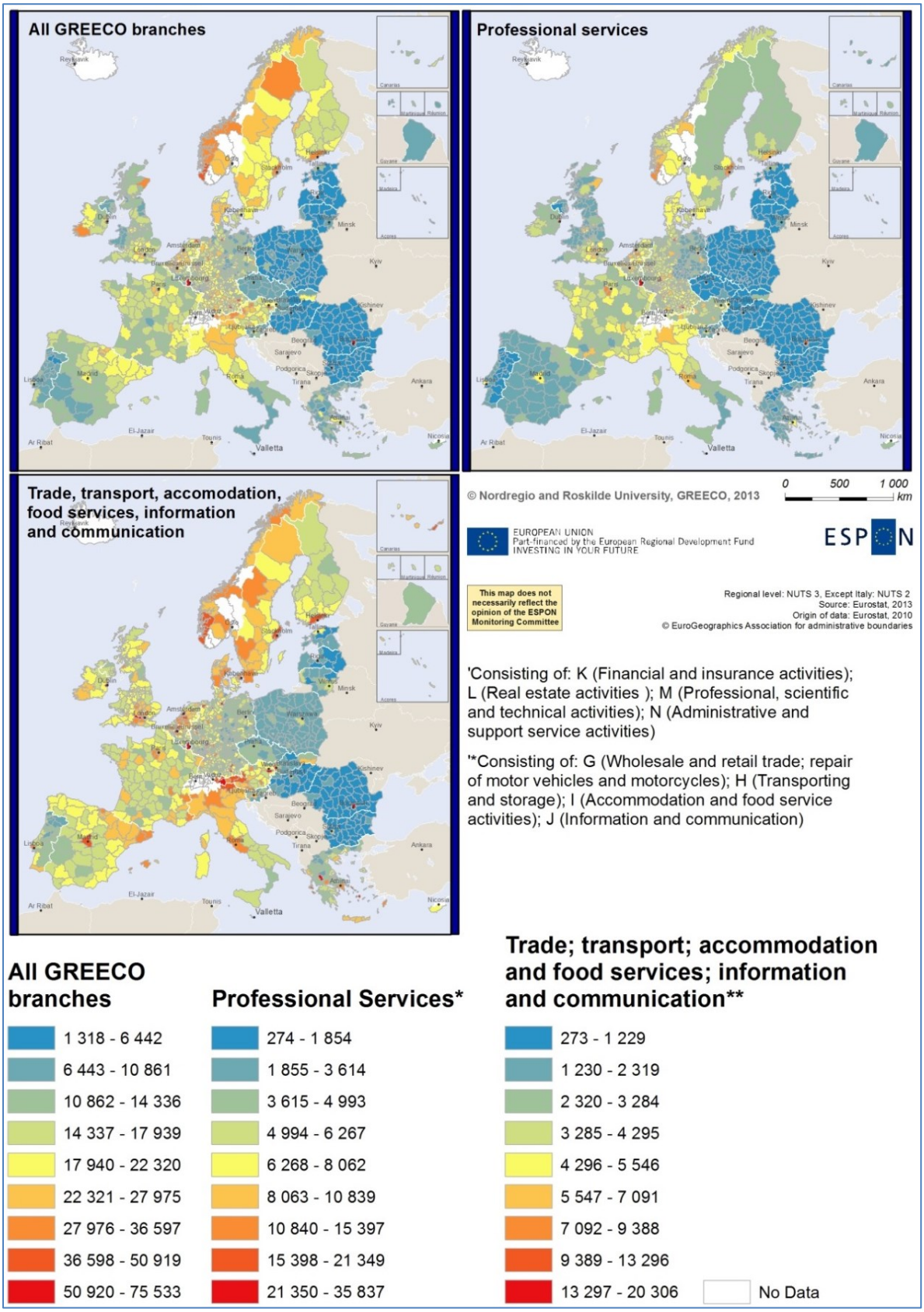


Figure 4: Regional economic specialisation (Miniature maps 4 to 6) showing GVA per capita among (4) trade, transport, accommodation and food services, (5) information and communication and (6) all GREECO branches

3.3. Territorial aspects and main conceptual elements in the greening of the sectors

The sectors chosen have explicit territorial bounds either on their own or in terms of linkages to each other which is indicated as diversity being overarching territorial characteristics. As a consequence the GREECO views the sectors in a 'hierarchy' of territorial-bound 'building blocks'.

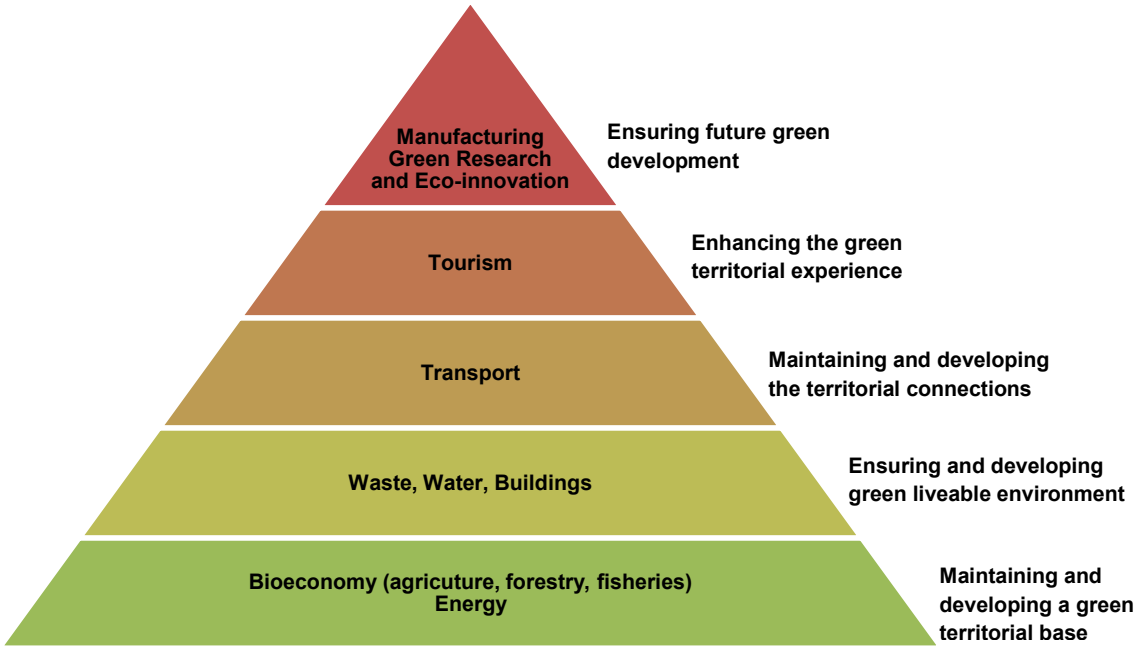


Figure 5: Territorially relevant sectors in the green economy and the main focus of the sectors

In the sector hierarchy triangle shown on Figure 5 above the sectors with the strongest territorial bounds are at the bottom. The bio-economy and energy sectors have the strongest ties to the territory as both sectors are making direct use of natural resources and are highly dependent on the available land resources, climatic conditions and territorial characteristics. The **territorial bounds** and land use characteristics also have an influence on how greening of the sectors is conceptualized for each sector. The main aspects relate to maintaining and developing the green territorial base. These sectors are the largest users of land, which often results in land use competition. A greening of these sectors addresses the land use **multifunctionality**, taking into account interconnections between economic, ecological and social values in producing food, renewable energy and recreational qualities. Consequently greening of the sectors addresses management inputs that have a relation to the land and resource base but may be alien to the environment such as reducing input of pesticides and fertiliser that in the long run has negative impact on the quality of the land base.

In the centre of the sector hierarchy triangle are waste, water and building sectors. These sectors are crucial for ensuring and developing a green liveable environment. They are also bound to a territory and require a significant amount of land but they are less dependent on the landscape features in comparison to the bio-economy and renewable energy development. The key aspects with regard to greening of these sectors are prevention and minimisation through *improving resource efficiency and the re-use of resources*. An important issue in this is cradle-to-grave management but furthermore promoting the cradle-to-cradle idea by making sure that the waste is considered as something valuable to re-generate and eventually extract energy or resources from. These issues are obviously closely linked to eco-innovation.

The key function of greener transport is maintaining and developing the territorial connections, which

among other things implies *more compact land use and energy efficiency improvement* – issues that comply with the question of **multifunctionality**. The base of tourism is the natural and cultural environment which forms the *attraction qualities* that attract the tourist to experience the place. Maintaining the ecological and socio-cultural functions of these areas is among the main aspects in relation to a greener development of the tourism sector. Manufacturing and eco-innovation have even weaker territorial relevance and the main concepts with regard to greening are linked to improving productivity and resource efficiency and technological development.

3.4. Linkages and interdependencies between the sectors

The sectors are highly dependent on the presence of the functions found in the levels both below and above of the sector hierarchy pyramid, which shows that there are strong cross-sector linkages both horizontally and vertically across explicit territorial bounds. Energy, water and waste sectors have cross cutting linkages with all sectors of the economy since almost any activity requires energy, consumes water and generates waste. In case of the tourism sector, a prerequisite of tourism is the presence of an well-functioning territorial base with attractive natural qualities (seas, forests, landscape, biodiversity etc.) and long-term maintenance of the base through for example waste and wastewater handling, nature protection etc. Tourism also depends on an attractive liveable environment (level 2 in Figure 5) with attractive cultural environments, buildings for tourists, energy supplies and manufactured products to supply the tourism sector. Furthermore, it is highly dependent on mobility and the transport connections linked to the territorial connections (level 3 in Figure 5) but tourism is also a high contributor to emissions – in particular through aviation.

In this context the interrelations between the Territorial Dimensions are operationalized by means of the territorial characteristics of the green economy. The territorial dimensions are identified and characterised through the analysis of each sector and resulting in a bottom-up 'reality' of each dimension. As such, the two-stage process of completing analysis on the territorial dimensions is at the heart of the top-down meeting the bottom-up research process on sectors and the entire territorial definition of the green economy. It requires that we comprehend, plan and conceive policy while explicitly considering the spatial distribution of key ingredients of the green economy - the distribution of people, activities, resources consumed and distributed as inputs into socio-economic production. And in this context it is important to emphasize how places in Europe are comprised of very different constellations of locally-specific factors and interaction between sectors shaping both the processes of transition and outcomes of greening the economy.

4. Understanding Green Growth: A territorial approach

4.1. Understanding 'territory' in the context of the green economy

A key issue within the GREECO research framework has been to provide explicit considerations in relation to which territorial dimensions are most relevant in pursuing of the green economy, and how. To facilitate this process a set of **eight overarching territorial factors** (each with three to four sub-factors), and **seven overarching territorial outcomes** have been identified as the main processes

influencing on or resulting from the pursuit of a greener economy[1]. It enables synthesizing the findings into how the GREECO project interprets the relationship between territory and the green economy by focusing on these objectives:

- Combining the conceptual understandings of Territory and the Green Economy to a Territorial concept of the green economy;
- Defining and explaining how each territorial dimension is relevant to the green economy based on a synthesis of the insights gained within the sector assessments;
- Combine both perspectives and thereby identifying ways in which the territorial dimensions both strengthens and questions a top-down approach to defining the relevant territorial concept and its associated dimensions.

A territorial concept and its associated dimensions are applied to the sector assessments and their top-down territoriality approach. This is done in order to define, characterize and elaborate the territorial dimensions from the bottom-up and to identify which complementarities or inherent conflicts are presenting themselves when pursuing the green economy across the range of sectors that deliver growth in reality.

The research approach, which is described in detail in Vol. 2.4 of this report, shows how the top-down and the bottom-up research processes are brought together through a series of straightforward steps:

1. At the top, the **Territorial Definition** is the cumulative result of the work completed in the entire task, and in the analysis of the territorial dimensions within the analysed sectors. As such, it is simultaneously the heading of the task and a term that represents all of the findings through the subsequent steps drawing on the fact that a territorial definition of green economy cannot be a single statement, but must be multi-faceted in order to reflect the diversity of both the European regions and their economies, but also their varied material bases.
2. Next follows the application of the **Territorial Concept** which is the essence of the top-down exercise – as how notion of territory is seen in relation to the notion of the green economy. This acts as a basis to identify the key territorial dimensions of the green economy.
3. Consequently, **Territorial Dimensions** follow from the territorial concept as themes that are operationalizing a territorial definition of the green economy. The dimensions themselves are identified vis-à-vis the territorial concept (from the top-down) while the individual dimensions (the factors and outcomes, as mentioned below) are then analysed through generic preliminary tables that are filled out in relation to each sector assessment. The results are then synthesized to define and elaborate each territorial dimension, thereby providing the bottom-up 'reality' of each dimension. As such, the two-stage process of completing analysis on the territorial dimensions is at the heart of the top-down meeting the bottom-up research process and the entire territorial definition of the green economy.

4.2. The territorial factors and outcomes

Territorial dimensions are distinguished in terms of factors and outcomes. **Territorial Factors** are territorial dimensions that drive, enable or hinder the development of the green economy in European regions. Being territorial, they are place-based – as in non-uniformly distributed in space and depending on the local societal, cultural and political context. This means that they account for the

[1] While all eight dimensions characterize possible factors, only seven of them have been analysed in terms of territorial outcomes. The dimension 'Consumer Relations' is not territorial per se, but it seeks to establish if, and how, territorial issues are important factors structuring the development of the market for different green products and services. It is therefore considered as a factor, but not a territorial outcome of the green economy.

basis of how European regions differ in their pre-conditions for a transition towards a green economy. **Territorial outcomes** are territorial dimensions, -as new or existing territorial phenomena - that are accentuated in one way or another by pursuing the green economy. They answer the question: for achieving some greening of the economy in a given or a set of sectors, what territorial outcomes can be expected to take place? This means that they account for the basis of how European regions differ in their 'possible effects' for a transition towards a green economy.

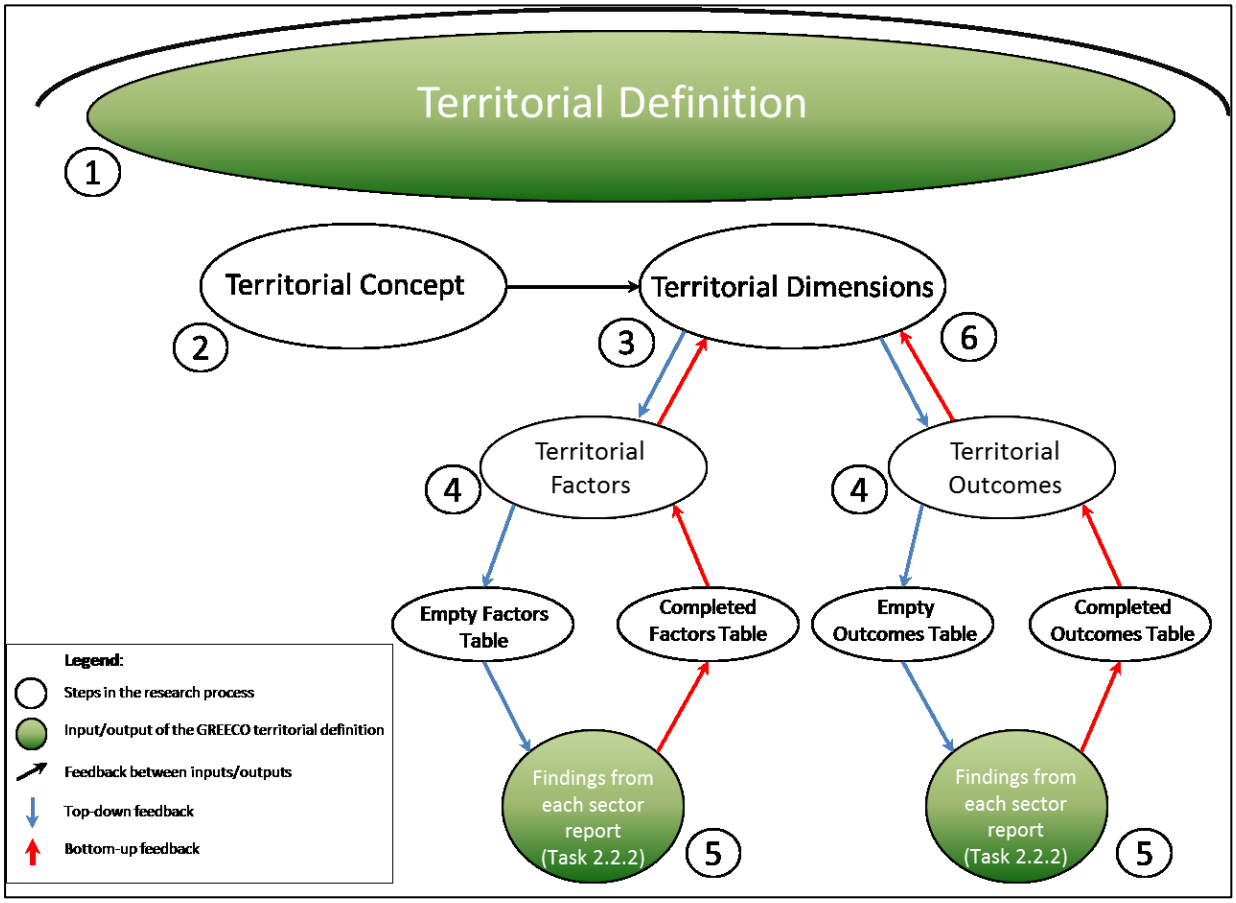


Figure 6: Schematic of the research flow for developing the territorial dimension within the GREECO project

The contributions from each sector have been analysed in parallel to identify the key territorial factors and outcomes of the green economy through responding to the following questions:

- What are **the most important territorial dimensions** that need to be acknowledged in order to achieve policy-led development of a greener economy?
- To what degree are the territorial dimensions **sector-specific or crossing sectors?** As a point of departure, this will be done by counting whether each factor, sub-factor and outcome was identified as having relevance across all of the sectors.
- What **territorial factors appear to complement the development** of the green economy in *multiple* sectors?
- What territorial factors are **conflicting** - in that they show conflicting trade-offs - between promoting green development in one or more sectors while restricting green development in one or more other sector(s)?
- To what extend are **place-based or a space-blind**, sector- and framework-driven economic

development model best suited to address regional growth challenges?

- What are the territorial **implications of a paradigm shifts** for instance **from 'brown' to 'green' development**?

4.3. Combining territory and green economy

The important emphasis is how the notion of territory has been used to accentuate the role of the institutional structures in shaping how policy mobilizes place-based possibilities for development. In our current political and economic development paradigm – stretching since the period of industrialization, and consequently coinciding with the development and rationales of the brown economy - the European territory has continued to be increasingly defined through political/administrative structures. Prior to the development of the EU this was very much linked to the formation and dynamic evolution of nation-building, but since then we have actually seen a parallel increase in the roles of the EU (as a Super-state) and of regions (as Sub-states). The latter of which is clearly reflected in the concept of 'Europe of the Regions'. Either way, the role of space - of the physical distributions of people, objects (resources) and activities – has been continually minimized in favour of government derived boundaries, structures and preferences.

By focusing on the connections between the material world and economic growth, the green economy provides the opportunity to reinvigorate the importance of spatial distributions beyond the traditional contexts of their embedded political/administrative structures. In these terms, the territorial concept in a green economy perspective could speak of a paradigm shift in terms of how we view the relationship between administrative regions, territory and space.

The GREECO's territorial concept therefore responds to the essence of the green economy through both an economic (monetary) growth and as the underlying structure of society through a more aware and sustainable use of material resources. As such it requires that we comprehend, plan and conceive policy while *explicitly* considering the *spatial* distribution of key ingredients of the green economy - the distribution of people and activities (where resources are consumed) and the distribution of resources (which are used as inputs into socio-economic production and reproduction). And by acknowledging that places in Europe are comprised of very different constellations of locally-specific factors that will shape both their process (transition) and outcomes (economic activities and spatial impacts) of greening the economy. The following sections provide an overview of all these elements, which are described in more detail in Vol. 2.4.

4.4. Territorial Dimensions of the green economy

Territorial Dimensions are identified as often-interrelated Territorial Factors and Territorial Outcomes, which operationalize the concept with 'researchable' perspectives in other project tasks, especially the sector assessments. While territorial factors and outcomes listed in their preliminary state are not sector-based, their bottom-up elaboration in the sector analyses becomes a benefit when comparing the territorial syntheses from each sector assessment.

4.4.1. Territorial Factors

Territorial Factors are territorial dimensions that drive, enable or hinder the development of the green economy in European regions. Being territorial, they are place-based (as in non-uniformly distributed in space) and they depend on the local societal, cultural and political contexts, as well as how these contexts interact with socio-economic and environmental dynamics and changes. This means that they account for the basis of how European regions differ in their 'pre-conditions' for a transition

towards a green economy.

These factors can be founded and interact between the physical/material/technological/spatial side of green production and consumption as well as also socially, in terms of information, economically, and politically; the latter through the goals of territorial cohesion and through the interplay between different levels of multi-level governance for policy making and implementation. The factors can act as drivers of the green economy in some or all sectors, hindrances to it in some or all sectors, and/or have differential effects between sectors.

Settlement types

The manner activities are settle in space has an impact on development across all sectors of the economy. Some sectors require rural landscapes of open, natural (or semi-natural) land, be it for cultivation, recreation or a combination of both. In contrast, other sectors require populations of scale in order to provide access to labour or improve efficiency. As a result, we distinguish between **urban areas**, **rural areas** and **urban-rural interactions** as important dimensions that can structure understandings of biophysical, economic, social and policy potentials of the green economy.

Land and land-based resources

This aspect acknowledges that nothing to do with developing an economy exists without some kind of necessary trade-off with land or land based resources. As such, this represents the territoriality of a heightened focus on (and connection between) the material world and a green economy. When coming up with specific factors, important key ingredients encompasses the ability to monitor and control our interaction with the material world, and not least, the importance that natural resource protection has for avoiding the consequences of environmental changes. Improvement of land quality/management and land based resources are therefore an important impact (outcome) of a greening of agriculture. And sectorial competition on land will not only intensify but new approaches on multifunctional land uses will evolve. Green approaches on land exploitation will furthermore place sustainability and the preservation of ecological services at the centre of energy related activities.

The most promising outcome of greening manufacturing would be to make it less resource intensive, make it more efficient, by means of re-use and recycling. For instance through cradle-to-cradle approaches, eco-design, industrial symbiosis, etc.

Place-based factors

The notion of ‘place-based’ is the essence of the term territory. It reflects that many of the fundamental components comprising economy - be it people, natural resources, partnerships and networks, knowledge, etc. – are located in space; and not only individually, but relative to each other. As such, we have introduced four additional perspectives that try to capture some more important place-based dimensions that can be used to interpret how certain areas can respond to potentials of the green economy. **Competitiveness** through strong local economies is potentially important for all sectors. Like the notion of the main heading ‘place-based factors’, this dimension very much embodies the essence of the territorial perspective. That is, to plan and realize economic activities that acknowledge the many locally embedded resources (including human ones, such as the previous emphasis on social capital) which are needed to achieve sustainable growth.

From a sector-based perspective, this dimension provides the opportunity to interpret the importance of **local factors and conditions** in achieving growth. The issue of **Multi-functionality** – especially important for all ‘space and resource-consuming’ sectors, i.e., bio-economy, building and construction, housing, waste and water – is closely connected to the previous factor on Land

consumption or dependence, the expression 'multifunctional land use' refers to land which serves different functions by combining its variety of qualities, i.e. that different material, mental, and social processes in nature and society take place simultaneously in any given area and interact accordingly. It therefore means the co-existence of ecological, economic, cultural, historical, and aesthetic functions.

By exploring the **connection between each sector** and its target market, this dimension seeks to establish if, and how, territorial issues are important factors structuring the development of the market for different green products and services.

Market relations (Production; consumption; export, import) and innovation

This dimension intends to capture the territorial dimension of the market structure in the key sectors of the green economy. Similar to the policy and governance dimension elaborated on below, it has been arranged in four sections based on territorial scale: thus according to the relevance of markets operating on the local and regional, national, EU, and finally, the global scales. From the policy provision perspective the focus is on which sectors share similar territorial patterns in terms of: supply of labour and inputs, location of primary market(s) and competition. The way how these market relations are situated in space can provide information on which spatial scale has the best opportunity to most provide policy provision, and which sectors may benefit most from consideration within territorial policy agendas.

It is to be expected that greening manufacturing and its products will raise consumer awareness, which in turn will push for even a greener production, in a virtuous circle. There might be a wider impact on bio-economy and markets if consumers start to consume more locally produced food products, and hence start to acknowledge/gain interest in consuming also other items locally. Innovation is a process, and regional innovation might obviously spill over on other sectors and have a larger impact in a region emphasizing an increased focus on issues of methods, quality and origin. It is furthermore of utmost importance to create and nurture markets for recycled waste and focus on innovation in terms of developing new water efficient technology, more water efficient production and sustainable consumption.

Inter- and intra-territorial relations

This theme emphasizes how no place based development happens in a vacuum. It is related to issues which are determined within territories reflecting on how a greening of the sector relates to/depends on place-based factors such as for instance economic relations, production- and consumption patterns, interaction characteristics, networks, social relations, and local cultures. These issues represent a network of organizations within an economic system that are directly involved in the creation, diffusion and use of scientific and technological knowledge, as well as the organizations responsible for the coordination and support of these processes. A key element in this connection is the concept of social capital, which is seen to develop in the community and the territory through processes of interacting, experiencing and learning, stressing how social capital refers to the values and beliefs that citizens share in their everyday dealings and which becomes an asset attained through membership of a community situated in a territorial context.

Accessibility and mobility

Issues of transport and accessibility have always been placed right at the centre of the territorial discourse of European development. One reason for this is its crucial importance in promoting regional development, for instance by providing accessibility to markets as well as access to labour force. This operates across a number of territorial spheres, ranging from intra-urban roads and local

public transit, connecting rural peripheries to urban centres of trade and commerce and connecting urban metropolises via rail and air networks. It also operates across a number of territorial development issues (including ones characterized here as territorial factors of the green economy) and its importance is also reflected in the fact it is considered as an important economic sector (both overall and in terms of its resource consumption and greening potential). But it has also been an important target of EU-driven investment because of its physicality – as investments that can be clearly observed and used in space. Generally speaking, this has also meant that transport infrastructure investments are considered rather fail-safe investments, perhaps leading to over-investment in certain cases. As a result, its territorial importance also rests in the fact that transport infrastructure has consistently been a focal point of EU policy investment for regional development.

Policy and governance by territorial level

This section lies very much at the heart of what is being investigated by the GREECO project. It emphasize that green economy is first and foremost a policy-driven development perspective for Europe, where the rollout of new technologies, regulations, products and services are transitioned into social, cultural, economic and institutional norms through policy. But this requires comprehensives sets of policies that are both arranged across various sectors and integrated among the collective competencies of different scales (levels) of government. As such, the territorial dimension is on one hand underlying – where policy provisions will come from different administrative scales depending on key sector-specific or territorial specific requirements. Here for instance, the subsidiary principle advises that policy and governance should be predominantly organized at the most local level possible in order to cater to territorial specificity. At the same time, territory is explicitly emphasized by also considering the relevance of EU territorial policy across the GREECO sectors: Scale of sector-based policy support acknowledges each sector's will have a unique division of labour in terms of policy vision as a key part of its territorial dimension.

4.5. From Territorial Factors to Territorial Outcomes

Conceptually, Territorial Factors and Territorial Outcome are very similar, and as a starting point the territorial outcome is basically a function of the territorial factors. Process-wise they differ as one being an input and the other the generated output. Territory, in its classic geographical sense, is generally perceived as being a more or less static outcome of a political process. They are, however, not related through simple determinism, but are inter-related through both iterative and recursive processes. They are recursive as a set of factors generates an outcome that eventually becomes a new set of factors characterised through distinct differences to the starting point. And it is iterative as there is no final or 'steady state' set of factors, but factors exposed to changes during the ongoing process. Territory is in the GREECO project seen as being dynamic as territorial change creates new spatial realities which are fed back into the political and decision making processes. What is even more important is to emphasise how two of them are per definition very active and taking very different positions in the process of greening the economy. While the policy and governance approaches at the territorial levels are aiming at formulating and implementation formalised public policies, programmes and projects for the development, the consumer relations are much more informal – to some extend even unpredictable - and closely connected to the concept of 'Soft location factors' that has increasingly been emphasized as an issue that needs to be included as factor of importance in the development process.

4.6. Synthesis of the territorial dimensions

The table shown in Figure 7 below provides a general overview of how the territorial dimensions were elaborated throughout the sector assessments. This keeps in mind that the task of the reports was to identify territorial factors and outcomes using the dimensions listed above as inspiration and thereby determining which of the dimensions are relevant for each sector.

	Agri culture and forestry	Fisheries	Energy	Waste	Water	Building	Transport	Tourism	Manu-facturing	Eco-innovation
1. Settlement types	70	47	58	36	48	36	39	32	41	30
i. Urban areas	13	22	29	21	21	25	17	11	27	21
ii. Rural areas	31	13	11	8	18	5	13	14	6	5
iii. Urban-rural interactions	26	12	18	7	9	6	9	7	8	4
2. Land and land-based resources	97	103	80	18	34	71	51	61	56	43
i. Land consumption or dependence	32	28	16	12	-	20	15	14	8	4
ii. Material Consumption or dependence	18	21	23	3	4	13	8	9	14	13
iii. Energy consumption or dependence	21	19	27	3	19	28	17	22	28	21
iv. Management of ecosystem services	26	35	14	-	11	10	11	16	6	5
3. Market relations and innovation	70	77	65	19	45	56	33	56	68	55
i. Local/regional markets	12	25	11	5	14	25	-	12	9	5
ii. National markets	25	22	23	6	12	11	4	17	12	9
iii. EU markets	20	15	22	4	9	10	10	15	23	17
iv. Global markets	13	15	9	4	10	10	19	12	24	24
4. Inter- and intra-territorial relations	59	50	48	30	25	59	9	26	31	52
i. Within territories (place based; local cultures)	25	22	15	8	8	28	5	11	8	12
ii. Between territories (networks; competition)	18	15	19	15	9	18	2	8	11	17
iii. Across territories (cross-border supply and demand)	16	13	14	7	8	13	2	7	12	23
5. Place-based factors	52	66	54	18	23	74	-	53	46	38
i. Competitiveness through strong local economies	8	16	11	10	-	28	-	12	10	5
ii. Multi-functionality	17	18	22	-	14	11	-	18	7	-
iii. Tacit/experiential knowledge	5	10	7	-	-	11	-	12	2	7
iv. PROXIMITY	22	22	14	8	9	24	-	11	27	26
6. Consumer relations	45	49	42	16	12	48	18	36	35	41
i. Development and innovation consumer-demand driven?	21	22	11	8	6	26	6	12	16	14
ii. Are development and innovation producer driven?	16	11	18	8	6	13	12	12	11	16
iii. Development and innovation based on territory or on open access?	8	16	13	-	-	9	-	12	8	11
7. Accessibility and mobility	53	72	30	22	15	17	51	39	51	63
i. Transport connections (materials; labor)	16	32	5	8	6	5	22	12	19	16
ii. Regional Accessibility (markets; materials; services)	19	25	9	7	-	2	11	11	16	18
iii. Information connections	18	15	16	7	9	10	18	16	16	29
8. Policy and governance by territorial level	121	169	114	40	78	167	65	79	82	122
i. Scale of sector-based policy support	19	32	21	5	12	34	10	12	7	20
From the EU Level	20	31	11	8	13	14	17	9	9	17
From the national level	19	29	23	6	19	36	11	8	13	24
From the regional level	14	15	16	10	6	24	7	13	7	19
From the local/municipal level	14	14	8	5	10	20	8	13	5	5
ii. Role of other EU policies with territorial dimension	15	25	15	-	6	14	-	12	21	13
iii. Private versus public sector – led development.	20	23	20	6	12	25	12	12	20	24

Figure 7: Overview of incorporated territorial factors and outcomes[2]

[2] The numbers at the miniature bar graphs show for each of the overarching types (1 to 8) under each of the sectors the role of them in structuring the territorial characteristics of the sector. Each of the overarching types consists of 3-7 sub-categories. The numbers show for each of them how they contribute to the overarching category. They are color-coded according to the numbers, i.e. with green colours indicating low values, yellow colours indicating medium numbers, and red colours indicating high levels of contributions. In the research reports 2.2.1 and 2.2.2 as well as further below details on how the different categories relates to the sectors are explained supported by spider diagrams.

4.6.1. Identified factors and outcomes

The results show that many relevant factors and outcomes have been identified according to each of the proposed dimensions and sub-dimensions. It is, however, notable that even though many of the sectors responded with factors or outcomes based on each sub-dimension, this does not necessarily imply direct linkages between the sectors. Only by analysing more specific each response individually can we determine synergies and oppositions. Nevertheless, some additional points are identified by the results shown in the table, which can help structure a more in depth, sector-by sector analysis of the results:

- It is clear that all sectors have provided relevant findings in terms of settlement structure, particularly in terms of linkage to urban areas and urban-rural interactions. As such, the connections between the results should reveal which sectors complement each other, for instance, where urbanisation facilitates green development in certain sectors compared to others, or where opposition is found for instance where urbanization reduces the growth potential in certain sectors. This territorial perspective reiterates that socio-economic development, when seen from a territorial perspective, consists of balancing between positive and negative effects of development across a broad range of sectors.
- It is also provisionally notable (although not surprising) that it is the natural resource production sectors that reflect relevance in terms of 'rural areas'. From a territorial perspective, this should help to show what types of activities must be considered for promoting a balanced, multifunctional green economy in rural regions.
- All sectors show an importance toward both 'material consumption or dependence' and 'energy consumption or dependence'. The energy sector - while being an economic activity in its own right - is emphasized by the green economy as a transversal sector, both impacting and being impacted by developments in all other sectors.
- All sectors reflected relevance between a greening of the sector and the importance of local and regional markets. Similarly, all sectors were able to identify connections to each of the sub-dimensions under the heading 'Inter- and intra- territorial relations'.
- There are many notable differences in terms of the relationship between green development and policies coming from different territorial scales. For instance, greening of the agricultural sector are promoted overwhelmingly by policies (CAP) coming from the European level. Likewise, all sectors show that EU level policy provision is an important component of the policy mix. This is likely reflecting the emphasis that sectors depends on common standards to facilitate a balanced, fair development of the economy.
- With that being said, we clearly see differences in terms of the emphasis on policies derived from the regional and local levels, which will be not only interesting but also important to analyse further in the future. The eco-innovation sector as 'stand-alone' has not provided any territorial outcome, which is partly due to the fact that it is de facto already a green sector and a key tool for promoting the greening of other sectors. Instead indirect territorial outcomes of promoting eco-innovation are expressed in the territorial outcomes of greening the sectors in which eco-innovation measures are applied.

Some of the sub-dimensions are not identified as being relevant across all or a wide number of sectors. Not only because their role may be less significant. It must also be recognised that the method of asking the authors of each sector assessment to reflect on the proposed territorial dimensions leaves the process open to a high degree of subjectivity. However, based on the fact there is no established territorial basis of the green economy means that there is no possible way to systematically and precisely define the territorial perspectives of the green economy. This in turn places a high degree of emphasis on a sound, comprehensive analysis of key messages in all the

sector responses which have led to a combined set of qualitative and quantitative messages delivered in the reports.

4.6.2. The role of the identified factors and outcomes

Going through the sector assessments the use of references throughout the document reveals two important issues in relation to sectors and the territorial factors.

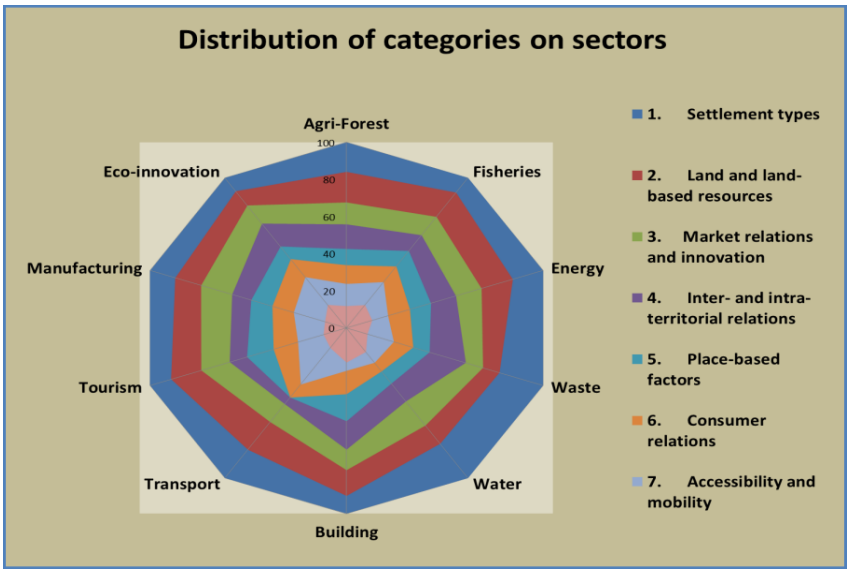


Figure 8: Distribution of references to territorial factors throughout the sector assessments

Figure 8 to the left is an account of the frequency of the different territorial factors in each sector assessment, and how the references have been qualified through the way their importance has been stressed. The representation of each factor has been accounted for and the total number of references and their qualifications has then been converted into percentage for each factor. This graph enables an overview of how the relative relations between the factors are showing sector-wise. Among the categories with the largest variations are for instance the Inter- and Intra- territorial relations and the place based factors. It is important to notice, however, that all factors are contributing to explaining the green aspects for all sectors. But it may be difficult to see the details which are discussed further in the scientific report where details on each factor are presented.

The next spider diagram (Figure 9) shows for each aspect how they are used in the different sectors. And here it is quite obvious how the different factors have been applied differently. Obviously with the factors 4 (Inter- and Intra-territorial relations), 5 (Place based factors) and 6 (Consumer relations) are the ones which have been less used in the sector approaches.

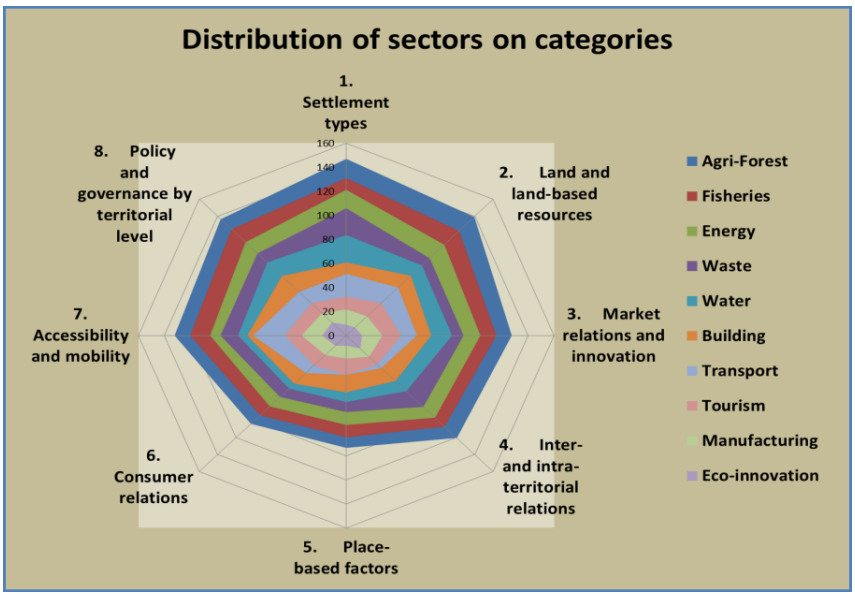


Figure 9: Distribution of references to sectors throughout the sector reports

To summarise, in the series of sector investigations of the green economy carried out in the GREECO project a focus has been on what could be characterised as 'the environmental dimension of sustainable development' where the interaction between regional development and

land and land-based resources, including ecosystem services, is emphasized. Likewise, the aspect of territorial analysis as being an important component of territorial cohesion is represented through and through within the sector approaches to the GREECO project. This aspect is represented in all of the spatial finding presented throughout the project, particularly ones that are able to harness regional differences within Member States. It has not the role of the GREECO project though to provide those finding directly, it is rather the opportunity to provide a series of novel messages or understanding that can be used to interpret territorial evidence.

And in this context it is first and foremost the notion of 'functional geographies' and moving beyond single sector and single scale governance that really provides an opening for conceptualizing territory in the perspective of the green economy. Certain statements noted in EU policy documents reflect that the placed-based perspective that **Territorial Cohesion** intends to operationalise in EU policy does not really differentiate between the concept of 'space' 'territory' and 'region'. For instance, by including the territorial dimension in Cohesion Policy the 5th Cohesion Report states:

> *'Taking a slightly different approach than previous reports, this chapter distinguishes between policies which have an explicit spatial (regional) dimension …. from those which have only a partial spatial dimension and those which are 'spatially blind', i.e., policies which do not distinguish between different parts of the EU'(p. 179).*

Not only does the sentence make no distinction between that which is 'spatial' and that which is 'regional'. It is furthermore quite clearly trying to emphasize the role of regions, as the existing administrative boundaries in the EU.

However, GREECO actually has positioned this distinction as an important element that can help to identify a territorial concept to be considered alongside the green economy concept. In this context, we define the *space/spatial* as reflections on the distribution of people, material objects (resources) and activities (processes) in space, in which the spatial scale does NOT relate to anything other than physical distances or areas. In contrast to this *territory/territorial* also reflects on the distribution of people, objects (including man-made and natural resources) and activities (including flows and processes) in space, but emphasise how the key difference is that the reflection is structured through a pattern of boundaries imposed by individuals or groups. This therefore mainly relates to the political sphere in terms of institutional and/or administrative boundaries that are agreed upon in order to manage people, objects (resources) and activities in space.

The territorial basis is therefore contingent on the clear recognition of the role that human constructions, including political and administrative jurisdictions, cultural values, etc., have in shaping the understanding of place-based potentials, including the *territorial* potentials for a greener economy.

4.7. 'Territorial' evidence from the ground: GREECO case studies

The GREECO project has sought to find territorial evidence on the greening processes active in ten different and diverse regions across Europe. These in-depth assessments are presented as case studies, which are delivered as stand-alone documents in Vols. 4.2 to 4.11 of this report. Additionally, Vol. 4.1 includes an integrated summary of all case studies that builds on the short summary presented in the following section.

Name	Country	NUTS	ESPON type	Geographical context	Cohesion policy type	Governance system	Strong sectors (focus of the case studies)
Navarra	Spain	3	Border, coastal, metropolitan, mountainous, industrial transition, intermediate (urban-rural)	Mediterranean	More developed	Decentralised	Renewables, Agro-food industries, Sustainable tourism, Environment and waste, Sustainable vehicle, Sustainable construction
Puglia	Italy	2	Coastal, metropolitan (Bari Taranto), industrial transition (Taranto), mostly intermediate	Mediterranean	Less developed	Decentralised	Energy, Green research and eco-innovation
Jämtland	Sweden	3	Border, Sparsely populated, mountainous, industrial transition, predominantly rural,	Northern Europe	More developed	Decentralised	Agriculture, Forestry, Transport and Tourism
Southern Estonia	Estonia	3	Border, coastal, intermediate (urban-rural)	Northern Europe	Less developed	Centralised	Building and construction sector, Agriculture, Forestry and Tourism
Ruhr Area	Germany	2	Metropolitan, predominantly urban,	Western Europe	More developed	Decentralised	Energy and Water
Burgenland	Austria	2	Border	Central Europe	Transition	Decentralised	Renewables and Transport
Zealand	Denmark	2	Border, coastal, some parts intermediate, some rural,	Northern Europe	More developed	Decentralised	Renewable energy, Manufacturing and Natural ecosystems
Cornwall	UK	2	coastal	Western Europe	Transition	Decentralised	Energy, Manufacturing and Natural ecosystems
South Transdanubia	Hungary	2	Mountainous, industrial transition, between intermediate and rural	Central and eastern Europe	Less developed	Centralised	Bio-economy, Energy production, Green innovation and research
Malta		0	Border, coastal, island, metropolitan, predominantly rural	Mediterranean	Transition	Centralised	Energy, Tourism and Water

Table 1: Analysis of the case studies according to selection criteria and focus

4.7.1. Short summaries of the ten case studies

Austria - Burgenland, NUTS-2 (AT11)

Burgenland is a NUTS-2 region with its own regional government (*Landesregierung*). It is interesting from a green economic perspective because of its path towards energy autarky based on renewable energy production including wind energy and biomass. There is a strong governmental support for development of renewable energies. The territorial capital here is huge: over 40 % of total area is occupied by agricultural land with high wind potential. Burgenland is a relatively polycentric region, with a network of six technology centres, one of them leading in renewable energy issues and European Centre for renewable energies (EEE). The Burgenland case study is presented in Vol. 4.2.

Denmark - Sjaelland, NUTS-2 (DK021, DK022)

The case study has analysed the energy sector, manufacturing and natural ecosystems link with tourism. Zealand consists of 17 municipalities. Municipalities are the main driving force but the region council has a strong coordinating role. The northeast part of the region serves as hinterland to the capital region with a relatively high level of education and income, unlike the western and southern parts. There is a relatively strong and further growth potential in renewable energy, bioeconomy and tourism. Likewise, the area holds very good wind energy potential, alongside clean-tech positions and growth potentials in the north-east. Almost all municipalities are signatories to the Covenant of Mayors and national green economy commitment arrangements and they pursue own climate and energy programmes. A comprehensive industrial development support programme Growth forum has a strong emphasis on 'clean-tech'. There have also been attempts to development of university network in the west and the south and to develop attractiveness for space-demanding green technology experimental innovation, in the south. The west has continued an industrial ecology development strategy with remarkable results. The Sjaelland case study is presented in Vol. 4.3.

Estonia - Lõuna-Eesti, NUTS-2 (EE008)

The case study has analysed the building and construction sector; agriculture; forestry and tourism. Southern Estonia is one out of five NUTS 3 regions in Estonia consisting of six counties. The administration in the country is centralized and the functions of the local governments in Estonia are relatively limited. It is the leading region when it comes to organic farming in Estonia. However, there are challenges related to the development of organic processing and marketing, which are lagging behind the development at farms. Forest biomass is the most important source of renewable energy in the region, accounting for 37% of the total primary energy consumption. Ensuring effective utilization of wood residues, raising awareness of environmental issues and popularization of the forest certification schemes among the private forest owners are among the main challenges on the way to a greener forestry sector. Nature and rural tourism in the region are on the rise. Small tourism enterprises are exploring positive synergies between organic agriculture and tourism activities. When it comes to green initiatives in the building sector, Estonia was successful in using the revenues from the trade of CO2 quotas in financing the refurbishment measures of the apartment buildings. The region has plenty of unused potential in terms of green economy. For example, due to low density of population there is a lot of unused land that is suitable for organic agriculture and the cultivation of energy crops. The Lõuna-Eesti case study is presented in Vol. 4.4.

Germany - Ruhr Area

Ruhr area consists of 15 NUTS-3 regions out of which 11 regions are large independent municipalities with widespread decision power, in particular on spatial development issues. The other four regions are counties each consisting of a number of municipalities. These 15 regions form the Regional Association Ruhr (RVR) - responsible for regional planning and several tasks in tourism and business development and development of open space. The Ruhr Area might serve as an example for a regional transition from and old and heavy industrial base to a modern high-tech and service oriented region with some focus on green economic development. The region has some 'natural' territorial capital, mainly in the rural parts (forests, agricultural land), but also in the high-density cores (open space, Ruhr landscape park). Brownfields can also be understood as territorial assets for development of green economic activities. Several eco-innovation clusters exist with a strong university base with high-tech orientation and attached technology centres and parks. These assets are combined by a high awareness among political and economic actors form the potential of a green economy strategy for the development of the region. The Ruhr Area case study is presented in Vol. 4.5.

Hungary - South Transdanubia (Dél Duantúl), NUTS-2 (HU23)

The case study has analysed the bioeconomy sector, energy and innovation and research. Hungary is a traditionally centralized country and regional policy making takes place at the national level. The role of the regions is only to provide inputs and signal the needs of the region for the national government. The South Transdanubian Region consists of three NUTS-3 countries which are further divided into a total of 24 micro-regions (NUTS-4 level). The region lags behind both of the national average and of the EU-27 on a range of development indicators. South Transdanubia is sparsely populated and is characterised by a large number of poorly accessible settlements and a relatively low share of manufacturing. Although starting from a low level, the region's innovation system has seen a positive development through R&D infrastructure- and inter-regional linkage building. R&D efforts exist in the field of bio- and life sciences & eco-innovation; information technology, and laser technology. The region has vast resources for biomass production and geothermal production that could lead a green economy transition. The South Transdanubia case study is presented in Vol. 4.6.

Italy - Puglia, NUTS-2 (ITF4)

The case study has analysed the energy sector and green research and eco-innovation. Puglia is a NUTS-2 region comprising five provinces. It is considered as the most dynamic region in Southern Italy and has a great potential for renewable energy, solar PV in particular. Puglia has important cultural assets and beach resorts, which facilitate the growth of the tourism. Recently, regional authorities have promoted initiatives in support of R&D and innovation, with a focus on the creation of technological districts and investment in human capital. Policy initiatives are developed with the support of the recently created Regional Agency for Technology and Innovation (ARTI). There is also a strong political agenda related to consumption patterns and recycling and recovery rates are growing accordingly. The regional administration recently took important steps in changing the regional innovation governance system that are aimed at rationalising policy development and implementation. Puglian pioneering experience in renewable energy (PV in especial) is often mentioned as a best practice that could be transferable to other regions with similar characteristics. For all the abovementioned reasons, Puglia ranks high in Italian classifications of green entrepreneurship. The Puglia case study is presented in Vol. 4.7.

Malta, NUTS-0 (MT)

The case study has analysed the energy, tourism and water sectors. Malta is a small but densely populated State. The country is not rich in natural resources and crucial resources like fresh water, limestone and land are insufficient. Coastal and marine areas are the biggest assets of Malta with a significant contribution to wealth generation through tourism and marine economy. Other key sectors with big greening potentials include RES, building sector, water management, waste recycling and organic forming. Although Malta has substantial solar and wind resources it is a late starter in the development of renewable energy sources (RES), but with a big potential. The potential of waste, wave energy and solar water heating for buildings is also considered. The main innovation challenges for Malta are those in relation to boosting financial and human resources in research and innovation, stimulating research and innovation in enterprises and promoting an innovation culture. The Malta case study is presented in Vol. 4.8.

Spain - Navarra, NUTS-2 (ES22)

The case study has analysed the energy sector, manufacturing (agro-food industries), tourism and waste sectors. Spain is a highly decentralised country and Navarra is a NUTS-2 region composed by one single NUTS-3 region. Navarra holds one of the most developed environmental legislative frameworks in Spain. In terms of territorial capital, Navarra's climatic conditions hold a great renewable energy potential, its landscapes and natural areas are a great touristic asset, the cluster presence in the region is high, which facilitates knowledge spill-overs. In 2010 Navarra adopted MODERNA, a strategic plan proposing a new model of economic development in the medium and long term. The strategy foresees investing in wind energy and eco-innovation as sectors having high potential for development. In addition, regional effort on RTD and innovation in Navarra has experienced a remarkable increase. Its regional R&D expenditure as a percentage of GPD has increased from 0.9% in year 2002 to 2.13% in year 2009. This can be attributed to a steady regional innovation support policy. Moreover, it also has a wide variety of sectors prone to become green(er). The Navarra case study is presented in Vol. 4.9.

Sweden - Jämtland , NUTS-3 (SE322)

The case study has analysed the agriculture, transport, forestry and tourism sectors. Jämtland is rich in resources and potential for developing both traditional and 'new' forms of activities within the green economy. Greening in a sparsely populated and peripheral county such as Jämtland is highly dependent on greening the transport sector. Greening the transport sector is of key importance for greening the tourism sector. It is also very active in structural funds programs and development of networks for regional development and innovation. The area holds a strong 'natural' territorial capital in the form of renewable stocks of biomass, agricultural land, water and wind. It also possesses less tangible assets like good business climate – the most small firms per capita in Sweden and some eco-innovation clusters with business and university. More predictable and stable national and EU level policies with long-term approach would better facilitate greening the economy in the county. At the same time the strong role of municipalities can in some cases hinder the implementation of national and EU policies at local level. It would be essential to take measures to increase the awareness of local decision- and policy-makers on the opportunities provided by greening the economy. The Jämtland case study is presented in Vol. 4.10.

United Kingdom - Cornwall and Isles of Scilly, NUTS-2 (UKK3)

The case study has analysed the energy, manufacturing and tourism sectors. The NUTS-2 and NUTS-3 region Cornwall and Isles of Scilly (unit: Council of Cornwall) consists of

the two LAU1 territories Cornwall and the Isles of Scilly. The economy in the region is specialised in experience economy (tourism and creative services) and bioeconomy (agriculture and fisheries), but less in the 'high value' industries financing, consulting and ITC. Cornwall already is a great tourism destination. About a fourth of the employment generated in the region depends on tourism. It also has a very good wind energy potential, but with possible conflicts with landscape interests. Cornwall is signatory to the Covenant of Mayors and it has done a strategic choice of 'low carbon' as a catalyst for economic development. It also supports renewable energy and environmental technologies using national and EU funding, while it has endorsed specific public sector procurement policies. Cornwall develops a university network supporting the innovative research environment and an adequately educated labour force enabling indigenous development of green solutions. Another focus area for green transformation in the region concerns the integration of natural ecosystems restoration in the planning of economic development and water basin management. The Cornwall and Isles of Scilly case study is presented in Vol. 4.11.

5. A tentative characterisation of regional green economic performance in Europe

The analysis of the regional green economic performance aims to shed light on how the regions in Europe are doing from a green economic perspective. The analysis is based on GREECO's conceptualisation and operationalization of the green economy and the indicator definition and collection. The objective of the analysis was to provide a quantitative profile of green economy at the regional level in Europe, i.e. it was attempted to give an answer to the question on how far we have already progressed towards a green economy in different parts of Europe. However, this objective can only be partly achieved due to fragmentation, gaps or non-availability of the necessary data. A detailed description of this analysis can be found within Vol. 2.5 of the GREECO final report.

5.1. Basic approach

The analysis of green economy regional performance is based on two different but interrelated research strands, a bottom-up approach and a top-down approach:

- The **bottom-up approach** is built on the GREECO analyses of economic sectors. For each of the sectors under study, one key indicator has been selected at the end of the sector analysis task. The main requirements for those indicators are that they have a certain representativeness for the sector and that they are available at regional level.
- The **top-down approach** is more comprehensive across individual sectors. This part of the performance analysis is based on the core dimensions of the green economy considered in the GREECO project (Environmental, Social, Territorial, Economic, and Econosphere). For each of these spheres, environment, society, diverse territories, the economy and its production and consumption aspects and the econosphere, quantitative profiles of green economic performance are given.

The different indicators in the two strands of analysis are presented and analysed one by one, i.e. the green economy regional performance is analysed by economic sector in the first part and by green economy spheres in the second.

Different approaches have been explored to aggregate from individual indicators to more abstract levels of analysis. According to the state of the art methods, a **multi-criteria evaluation** based technique has turned out to be most suitable for the aggregation of individual indicators (see for instance Adelle & Pallemaerts, 2009; Cabello, Navarro, Prieto, Rodríguez, & Ruiz, 2014; OECD, 2008; Singh et al., 2012). The output from this step is a tentative assessment of regional green economic performance across Europe and by selected territorial types. Finally, the green economy performance indicators have been related to non-green economy indicators. Green economic performance has been further compared with the overall regional economic performance. Please refer to Vol. 2.5 for additional details about the methods used to characterize green economic performance of the different regions and its interpretation.

One of the theoretical aspects when considering the question of the regional level of the green economic performance is whether there is a knowledge gain when going down to lower spatial levels with the analysis. Probably, many aspects of the green economy would get already a value added in spatial terms if NUTS-1 or even NUTS-0 data would be analysed. The topic of the green economy is so immature in every respect that an analysis at such aggregate spatial levels would bring huge new knowledge in spatial terms. This is supported by the fact that policies fostering the green economy are developed very often at national level or depending on the level of subsidiarity in different countries at NUTS-1 level, but not below.

However, more spatial detail is requested in ESPON and probably necessary for many aspects of the green economic performance. Consequently, the GREECO project has tried to go as deep as feasible in spatial terms. In any case, the analysis is first done at the spatial levels at which the data is available. This ranges from NUTS-0 down to NUTS-3. For the assessment of the regional green economic performance and potentials (see Section 6 below for additional information on potentials), data were transferred to a common territorial reference framework, i.e. NUTS-2. Regretfully, for a few variables this harmonisation had to be based on the simplest possible form of data disaggregation, i.e. the use of NUTS-0 or NUTS-1 data (shares, indices etc.) at NUTS-2 level, thus simply assuming that there is no spatial variation.

5.2. From green economy concept to performance indicators

The task of measuring regional green economic performance is closely related to the state of the spheres of the green economy, namely the environmental sphere, the **social sphere**, the **territorial sphere**, the **economic sphere** and the **econosphere**. Existing concepts from international sources that include an explicit indicator system for measuring the green economy or related transformations were reviewed (in particular the EC, 2011d, 2011e, 2011f; EEA, 2012; Green Growth Knowledge Platform, 2013; OECD, 2011c, 2014; UNEP, 2012b). Based on this review a set of headline indicators by which GREECO addresses the question of regional green economic performance was defined and implemented.

The conclusions from the review of existing indicator sets on green economy or green growth indicator systems developed by international organisations are:

- that indicator systems on green economy have to have a close relationship to the **theoretical conceptualisation** they are embedded in;
- that an indicator system on green economy should be organised in a **hierarchical way**, i.e. with major topics supported by headline indicators and a wider set of indicators in the background;
- that the indicator systems should deal with a **wider range of topics** than with the economy in a narrow sense only by addressing also aspects such as human well-

being, environmental aspects and in particular all kinds of resource efficiency;

- that it is reasonable to work with indicators on green economy side by side, but also that it might be meaningful to aggregate indicators to **synthetic indices**;
- that none of the indicator systems explicitly addresses **territorial differentiation** and that none of the indicator systems goes spatially below the country level.

Against this background, the indicator system for measuring the regional green economic performance in GREECO is closely related to the conceptual base of the project. On the one hand, there is a strand of indicators for green economy directly derived from the bottom-up approach, i.e. the sectoral analysis. The second set of indicators is more comprehensive, i.e. does not necessarily address individual economic sectors, and is strictly derived from the spheres of green economy as developed in previous sections of this report. Along these lines, both indicator sets on regional green economic performance of GREECO are organised along major topics which are either the economic sectors or the green economy spheres. The economic sectors are each represented by one headline indicator. The green economy spheres are decomposed each in some components which are represented by selected headline indicators and which again might be backed up by a series of corresponding indicators.

Table 2 presents the **headline indicators** for the bottom-up derived regional performance indicator set, i.e. the economic sectors analysed in GREECO. The headline indicators were proposed by the authors of the sector studies after finalisation of the reports and are meant to represent the sector in a single indicator with the additional requirement of being ideally available at regional level.

Economic Sector	Headline indicator
Agriculture	Organic area
Building and construction	Energy consumption in residential buildings
Energy production	Renewable energy
Green research and eco-innovation	Eco-innovation scoreboard
Manufacturing	Environmental protection expenditure
Tourism	Tourist overnight stay density
Transport	Motorisation rate
Waste management	Waste recycling
Water management	Waste water treatment

Table 2: Headline indicators for regional green economic performance of economic sectors

The indicators for the regional green economic performance based on the spheres of the green economy are organised along the five spheres defined in GREECO project. Table 3 below lists the **spheres, their components and headline indicators**. Data scarcity limited the analysis. That means that the indicator selected are sometimes a trade-off between what would be desirable and what is available.

Green economy spheres	Component	Headline indicator
Environmental sphere	Source function	Environmental and natural assets (EEA)
	Sink function	Emission of air pollutants
Social sphere	Health	Life expectancy
	Environmental risk	Exposure to air pollution
Territorial sphere	Territorial capacity	Renewable energy production
	Spatial efficiency	Land take per GDP unit

Economic sphere	Green supply	Green products and services offered
	Green technology	Green patents
Econosphere	Energy productivity	GVA per energy unit
	CO2 Productivity	GDP per CO2 unit

Table 3: Headline indicators for regional green economic performance of green economy spheres

The analysis of regional green economic performance was based on the array of indicators presented below:

- For the ***environmental sphere***, the source function and the sink function are the two main components to be addressed. The first headline indicator is a comprehensive indicator developed by the EEA on environmental and natural assets, which describes the overall situation of the environment in terms of availability of open space, biodiversity etc. (EEA, 2010). The second headline indicator reflects how much the sink function of the environment is being exploited; an indicator of air pollution is used for this.
- For the ***social sphere***, the first indicator reflects the impact of the economy on the well-being of population; life expectancy is used as a proxy for health. The topic of environmental risk can be expressed by the exposure of population to environmental risks such as air pollution.
- For the ***territorial sphere***, the concept of territorial keys developed in the background document of the Polish Presidency are used (Böhme et al., 2011). One important territorial key for green economy is 'Territorial capacities/endowment assets' for which one of the indicators of the document referred to above can be directly used, i.e. renewable energy production. A second indicator on land take per GDP unit can be seen as a proxy for the 'Wise management of cultural and natural assets' or, more generally, as a proxy of 'Spatial efficiency' reflected for instance through multifunctionality.
- For the ***economic sphere***, GREECO's intention was to address the 'greenness of economic activities' as far as possible. How far economic supply can be considered as green is reflected in a proxy indicator expressing the share of SMEs that offer green products or services. How far green technology is being developed by the regional economies is reflected in the number of green patents submitted to the European Patent Office (EPO). This indicator can also be considered a green economy driver, as it is strongly related to the green technological development of a given region and thus with its future capacity for green growth.
- The ***econosphere*** is covered by environmental and resource productivity indicators. The proposed headline indicators are energy productivity and CO2 productivity, i.e. measuring how much GDP is produced by an energy or CO2 unit.

The presentation and analysis of the green economy regional performance indicators as outlined above gives a comprehensive picture on Europe, its countries and its regions. This comprehensive picture allows depicting several aspects of green economy for different economic sectors and for the spheres of green economy as defined in the GREECO concept. This is a value as such as is allows to illustrate which regions are strong or weak in what aspect.

However, this green economic regional performance picture is not a single picture but a picture with numerous components, i.e. a set of individual pictures. A direct assessment of the overall economic regional performance of regions is not possible based on such a range of individual indicators. Therefore, different indicators were aggregated by multi-

criteria analysis techniques. This **aggregation** has first been done to the five spheres of the green economy defined in GREECO and eventually to one single indicator of regional green economic performance of European regions. It has to be stated that this is a very explorative task based on limited availability of appropriate data, i.e. the results can only be interpreted as a first tentative assessment of regional green economic performance. However, some sensitivity analyses have shown that the aggregate outcome of the indicators, i.e. the overall territorial pattern of regional green economic performance is rather stable when modifying indicators and weights by a modest degree. More information on this issue can be found within Vol. 2.5.

5.2.1. Agriculture: sample headline indicator for an economic sector

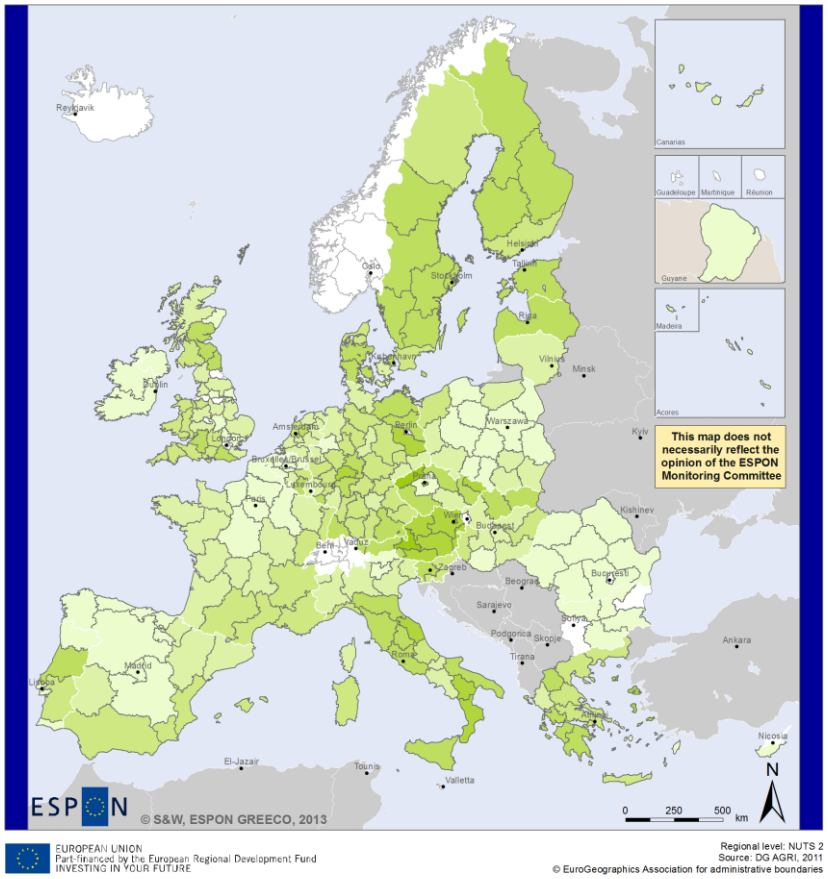
The headline indicator is the share of the total utilised agricultural area (UAA) under organic farming (see Map 4). This share was 3.7 % of UAA of EU-15 in 2002, up from only 1.8 % in 1998. In 2008 the share increased to 4.3%. Organic production accounted for 2 % of EU-15 total production of milk and beef in 2001, but less than 1 % of total production of cereals and potatoes. From the report 'An analysis of the EU organic sector' it is evident that the organic sector is developing at a fast pace in the EU. At farm level the rates of growth are rather impressive. Areas have increased by 6.5% per year on average in the EU-27 in the period 2000-2008, animal numbers have increased by the range of 6.1- 22.2% annually in the EU-15 depending on species groups. And in 2008 the organic sector represents a total area of 7.7 million ha with almost 190 000 farms. Italy has been for a long period the Member State with the largest organic area, exceeding one million ha since the beginning of the 2000s. However it is out performed by Spain in 2008 which reached an impressive 1.1 million ha. Some of the 'pioneers' in the sector such as Denmark, Finland, Sweden and Italy seem to have reached a plateau or display only slow growth. Among Southern EU, Greece, Spain and Portugal which have grown fast in the last years.

Looking at the share of organic production in each country gives another picture of which countries are developing this type of farming. In countries such as Switzerland, Austria Finland, Italy, Denmark and Sweden the share of organic land area is between 6 and 10%. As a contrast in countries growing fast and showing a large amount of hectares, there is still only a low share of land devoted to organic farming; e.g. in Spain (2.4%) and France (1.8%). In large agricultural countries like Greece and Poland the share of certified organic production was only 0.4% in 2004, showing a great potential to increase in the coming years. This has taken place in Greece, where in many regions the share is now up to 5-10%. In Poland the picture is the same as in 2004 with many regions still below a share of 1%. In many regions in Germany and Austria, the share is clearly above 10%.

5.2.2. Econosphere: sample headline indicator for a core feature of the green economy

The econosphere links the environment with the economy. This is usually covered by environmental and resource productivity indicators. Headline indicator used here is energy productivity. Map 5 shows the amount of economic output in terms of GVA being produced per unit of energy consumption. Although this indicator is much conditioned by the overall structure and specialization of regional economies, and thus spatial variations are not only related to the actual energy efficiency of production processes, the indicator can nonetheless provide some insights on the extent to which different regions are performing in terms of overall energy consumption in relation to their aggregated economic output.

Apart from Norway for which the high energy productivity is based on the oil resources, the most productive areas are the high-density service oriented agglomerations (or countries in the case of Switzerland); Madrid, London, Paris, Rome or Stockholm have highest energy productivity. Less urbanised areas in Western Europe, but also most regions in eastern Europe are producing much less economic output per energy unit. The gap between the most and the least efficient regions is enormous.



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Regional level: NUTS 2
Source: DG AGRI, 2011
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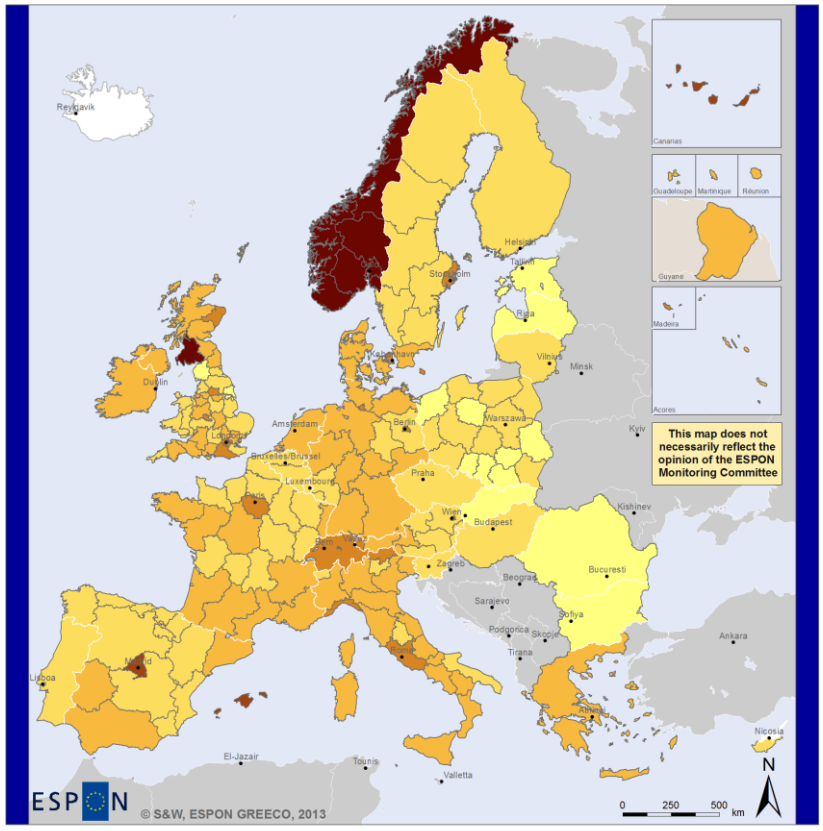
Share of organic farming in the utilised agricultural area (%), 2007

< 1.0	5.0 - 10.0	no data	
1.0 - 2.5	10.0 - 15.0		
2.5 - 5.0	> 15.0		

Map 4: Share of organic farming in total utilised agricultural area in 2007



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Regional level: NUTS 2
DE: NUTS 1
BG, CH, CZ, FI, GR, HU, IE, LU, NL, PT, RO, SK: NUTS 0
Source: GREECO database
© EuroGeographics Association for administrative boundaries

Final energy productivity (€ GVA/kJ)

< 100	300 - 500	no data
100 - 200	500 - 1000	
200 - 300	> 1000	

Map 5: Energy productivity: GDP per energy unit

5.3. Towards a comprehensive typology of regional green economic performance

The objective of the aggregation procedure is to allow some tentative and comprehensive statements about the regional green economic performance and thus allowing for a related **typology of regions**. The indicators used for this are the headline indicators for the five green economy spheres previously mentioned. The aggregation of single indicators into more comprehensive indices is done via multi-criteria analysis, as summarized below and explained in more detail within Vol. 2.5. The territorial reference system is NUTS-2 (version 2010).

The indicators are first transformed from their raw values into standardised green performance values which range from 0 to 100. Subsequently, indicators are aggregated to indices for the five spheres and for the overall regional green economic performance. The results of the regional green economic performance for the five spheres are presented in Figure 10. Such results can be summarized as follows:

- The performance in the ***environmental sphere*** shows Nordic and Alpine regions doing best which is an outcome of high environmental and natural assets combined with low emission levels. A similar situation is found in several coastal regions, the Baltic States and some regions in South-Eastern Europe and Spain. Some urban agglomerations, in particular in the UK, Belgium, northern Italy, Poland and Greece do worse, but there are also some more rural regions in Spain and Germany in those lower classes.
- In the ***social sphere***, most regions lying in a broad belt along the Atlantic from Portugal to the Nordic countries are doing fine based on low exposure to air pollution and relatively high life expectancy. Southern European regions suffer from high exposure to air pollution, and Eastern European regions from very low life expectancy.
- The ***territorial sphere*** sees Nordic and Alpine regions performing best, a combined result of high renewable energies and high land productivity. German and Italian regions do follow next. Low performance in the territorial sphere is mainly to be found in Eastern Europe, in particular in Bulgaria and Romania, and in some central parts of Spain.
- The ***economic sphere***, which is based on provision of green products and services by SMEs and the number of green patents per billion GDP, sees large differences in Europe. Southern Germany, Denmark and some individual regions in Spain (Navarra), Belgium, the Netherlands, northern Germany, Austria, Sweden and Finland are doing best. In those parts of Europe, the development of green technologies plays a larger role in the regional economy than elsewhere. At the same time, green products and services are offered in those countries by a higher share of enterprises than in other regions. Then, a large gap exists to most other regions in which the performance is rather low.
- In the ***econosphere***, Norway, some UK regions, Stockholm, Madrid and Paris and some individual regions in those countries, regions in southern Germany, Switzerland and Austria, Italy and Denmark are doing best, i.e. having high economic output per energy unit used and per CO2 unit emitted. Most regions in Eastern Europe, Finland and Sweden, Spain and some parts of the UK, France, northern and eastern Germany and Belgium are at the other end of the spectrum.

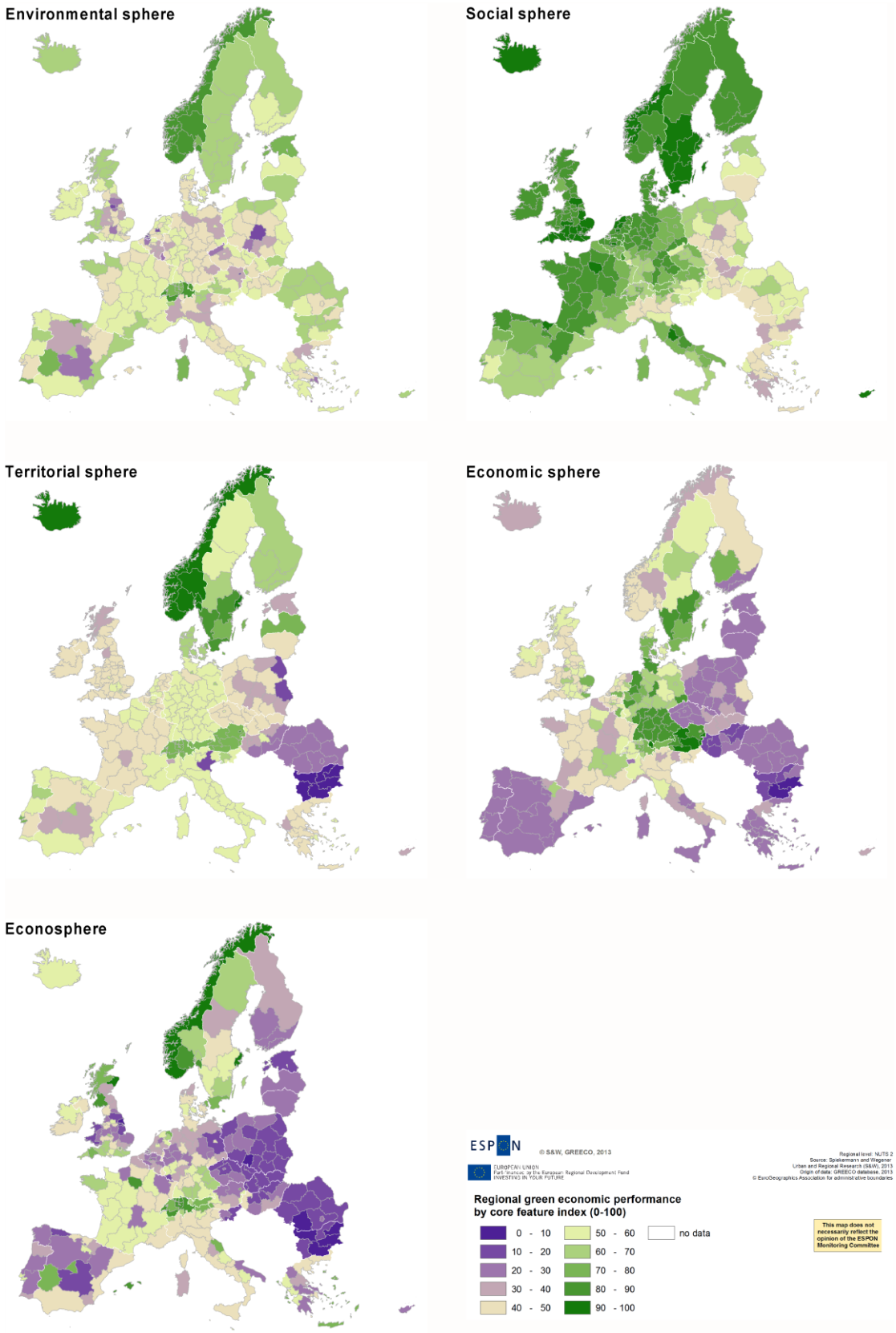
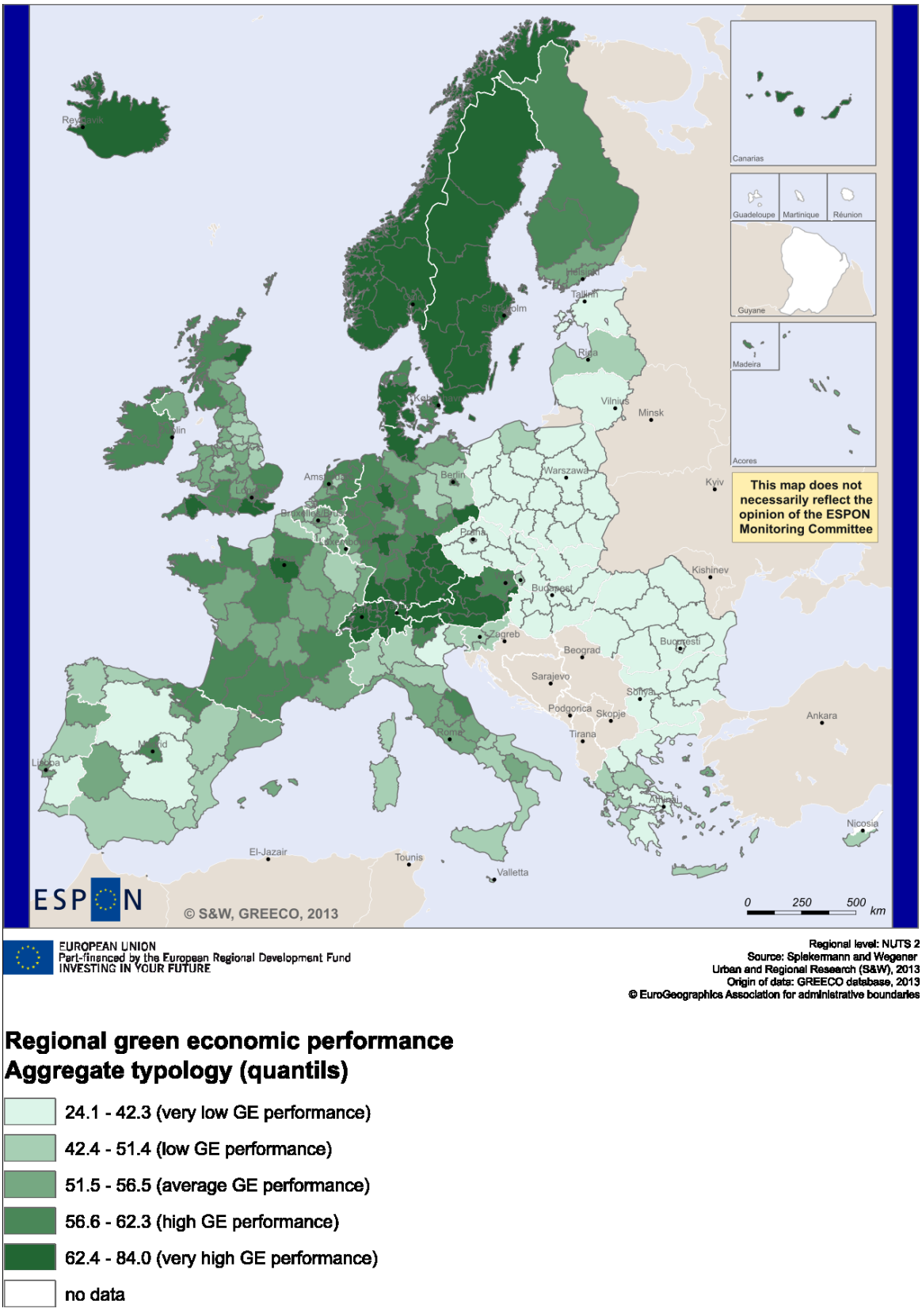


Figure 10: Standardised regional green economic performance of green economy spheres

The aggregation of the performance of the five spheres to one single regional green economic performance index is presented in Map 6. As there is no evaluation of the importance of the different spheres for green economic performance available, the weights assigned are equal, i.e. each core feature contributes 20 percent to the overall performance of a region. The map classes are composed of five quantiles which can be considered as an aggregate typology of regions with

respect to regional green economic performance. Regions with high and very high performance are mainly located in the Nordic Countries, Iceland, UK and Ireland, the Netherlands, France, Germany, Austria and Switzerland and Italy, and the Madrid region in Spain. On the other hand, most eastern European regions belong to the type of very low green economic performance because the performance in most of the five different spheres is clearly low.



Map 6: Typology of regional green economic performance

How does the green economic performance relate to different territorial types of regions? First, Figure 11 presents the five spheres of regional green economic performance to the urban-rural typology of DG Regio and ESPON. To do so, the NUTS-2 performance indicators were assigned to the NUTS-3 regions to match the resolution of the territorial typology; eventually the NUTS-3 performance values were aggregated by type using regional population as weight. In total, **the green economic performance of urban and intermediate regions is somewhat higher than that of rural regions**. However, the differences between territorial types at this aggregate level are relatively small. This indicates that there are very distinct degrees of green economic performances within a certain territorial type of regions.

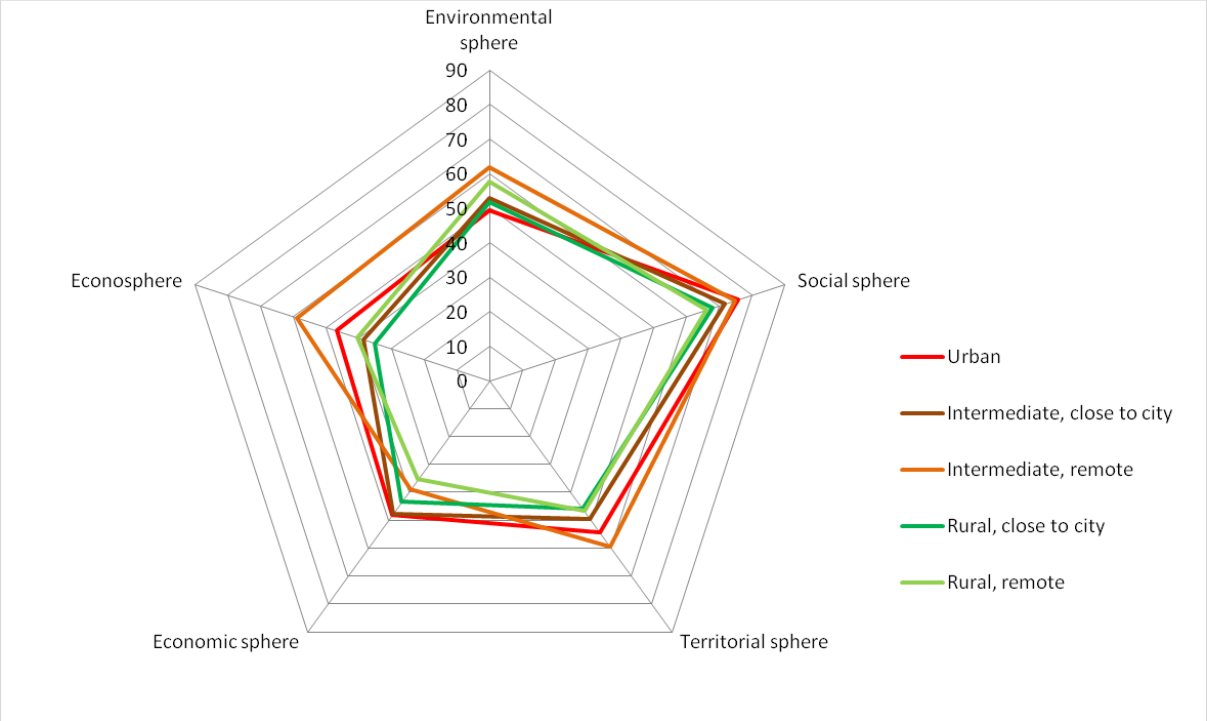


Figure 11: Urban-rural typology and regional economic performance

Using a different classification of regions, differences between regional types are much more pronounced. Figure 12 shows the green economic performance by an economic development typology. This typology groups regions according to their economic performance in less developed regions, transition regions and more developed regions. The typology has been developed by DG Regio in order to classify regions for Structural Funds (ERDF and ESF) eligibility for the period 2014 - 2020. In addition to the three types, Iceland, Norway and Switzerland were grouped into one unit as well. A clear territorial pattern emerges. **The degree of green economic performance is closely related to the economic development status of the territorial types**. The non-EU group of regions is performing best, followed by the more developed regions. Transition regions are in terms of green economic performance also in-between, the performance of less developed regions is lower except for the environmental sphere.

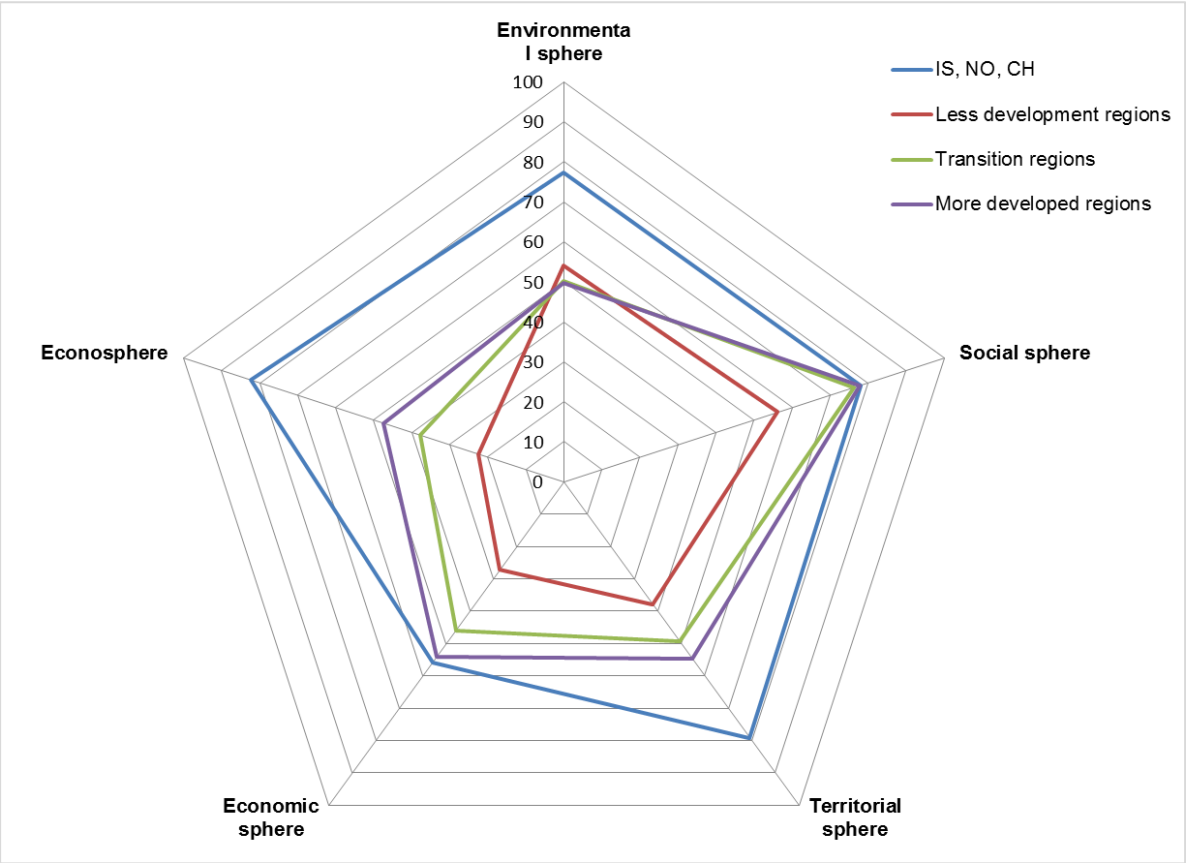


Figure 12: Economic development typology and regional economic performance

5.4. Regional green economic performance vs. regional economic performance

According to the previous relationship, **there seems to be a correspondence between the level of green economic performance and the overall regional economic performance**. One might also question **whether it does pay for a region to have a good green economic performance?** At the level of the five spheres, the relationship is rather weak for the environmental sphere ($R^2 = 0.08$), much more moderate for the social sphere ($R^2 = 0.47$) and the economic sphere ($R^2 = 0.46$), but fairly good for the territorial sphere ($R^2 = 0.62$) and the econosphere ($R^2 = 0.64$).

However, the aggregation of the performance of the five spheres of the green economy to the single comprehensive typology of regional green economic performance shows a relatively **high degree of relationship with the economic output of regions in Europe** (Figure 13). The distribution of the regions in the diagram gives a clear message supported by the correlation coefficient ($R^2 = 0.74$): Lagging regions are also low performing in green economic aspects, prosperous regions do display a high degree of green economic performance.

A similar trend is visible when linking the regional green economic performance to regional unemployment rates (Figure 14). However, the correlation is somewhat lower. Regions with lower unemployment rates tend to behave better in green economic terms. **Lower green economic performance seems to be accompanied by higher unemployment rates**.

This relationship between regional green economic performance and overall regional economic performance can be seen from two sides. On the one hand, one might argue that it requires a certain degree of economic output to be able to put also an emphasis on green issues. On the other hand, one might consider that investments in greening the regional economy in a broad

sense as understood in GREECO will also help in improvements in overall economic performance of such lagging regions.

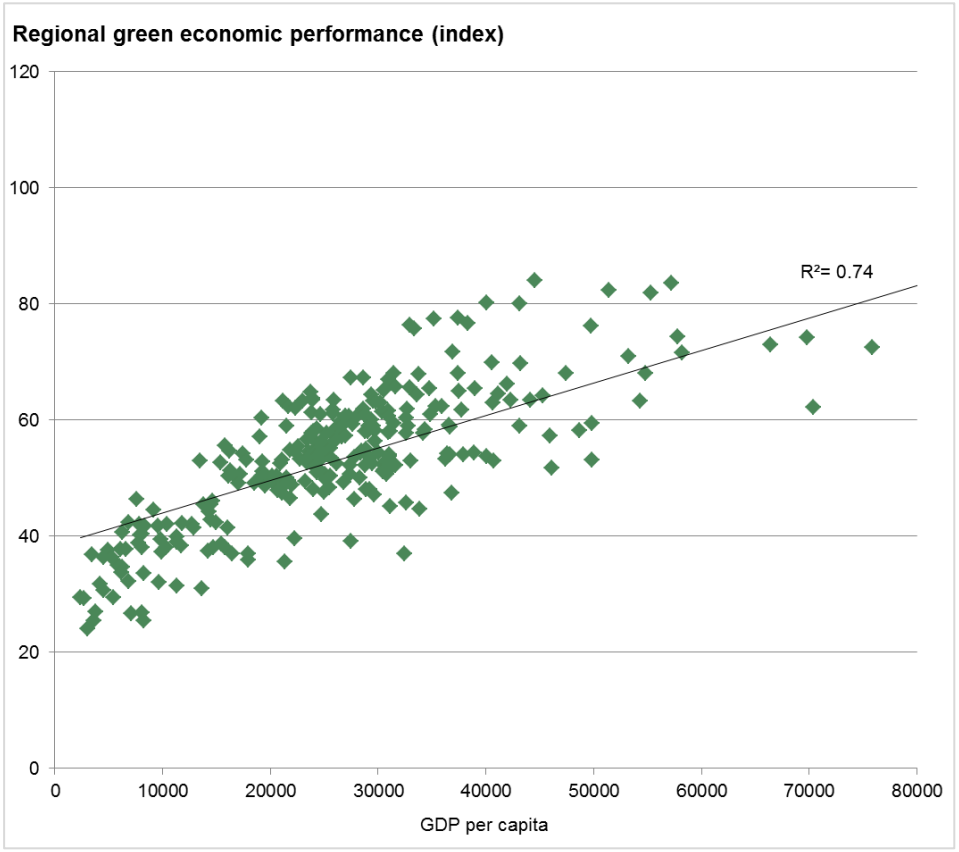


Figure 13: Typology of regional green economic performance vs. regional economic performance

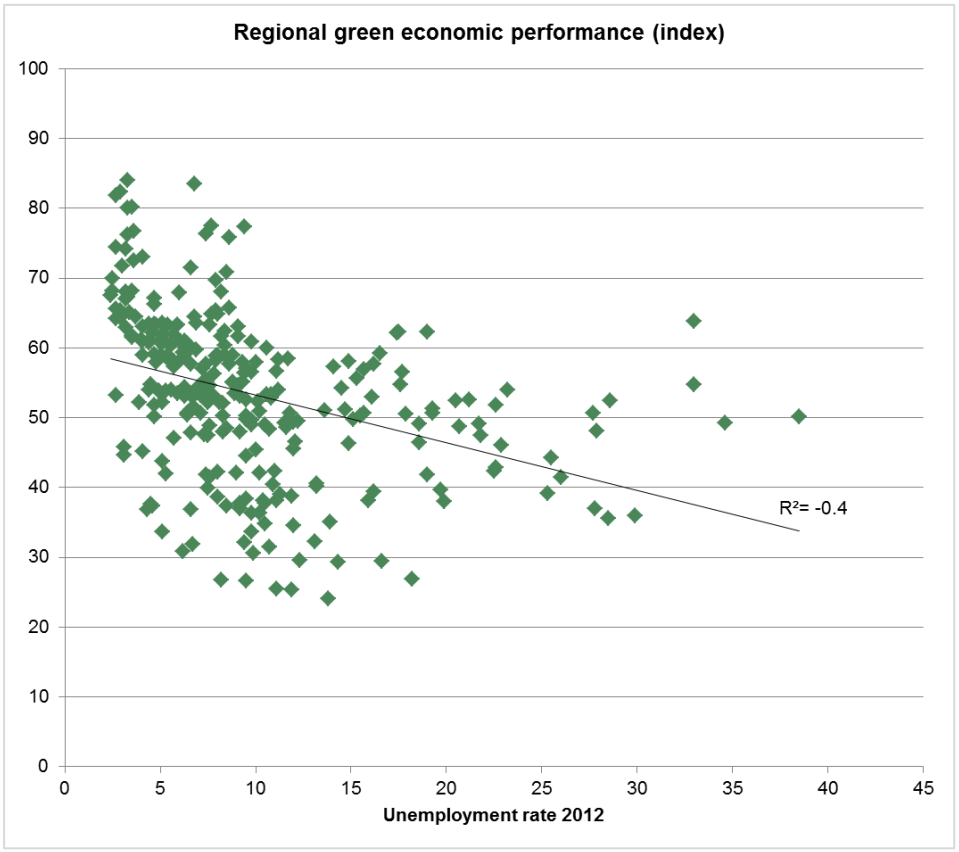


Figure 14: Typology of regional green economic performance vs. regional unemployment rates

6. Exploring the territorial potentials for a greener economy

6.1. Territorial potentials: a formal definition

The Oxford English Dictionary defines potential as "the latent qualities or abilities that may be developed and lead to future success or usefulness" [*mass noun*], and "the possibility of something happening or of someone doing something in the future" [*count noun*][3]. This definition develops along two different but correlated conceptual strands: the first one introduces the idea of some ***internal* qualities or abilities** that could be developed, whereas the second one projects those latent qualities into the future as a ***possibility of change***.

From a territorial perspective these two components should be complemented with a third additional ***external* dimension**. Places are endowed with a given array of socio-economic, cultural and natural assets, as well as some location advantages, technologies and traditions that influence their potential to perform and evolve in a given way. These are the 'latent qualities' mentioned in the definition above. Nonetheless, such *internal* factors, being a condition for 'something happening', are not necessarily enough to unleash change. Territorial potentials for implementing specific transitions or transformations depend also on *external* forces or, more precisely, on the *manifestation* of such external forces in a given territory, and how the external forces interact with local factors, giving place to stable or instable situations, thus decreasing or increasing the possibility of something happening, that respectively favour stagnation or change. Such combination of internal and external forces eventually determines 'the possibility of something happening' within those areas, and accordingly shape their *territorial potentials.* Lagendijk & Pijpers (2013) provide a good overview on the evolution of this debate on the contribution made by the internal versus external conditions for regional development.

As far as the green economy is concerned, the external forces might be global challenges like climate change or globalisation forces, rocketing energy prices, scarcity of raw materials, new green technologies developed elsewhere, etc. All these *grand challenges* and opportunities may have different local territorial implications depending on a wide array of local conditions, imposing burdens to some places, but also offering opportunities to others that are basically epitomised by *willingness and capacity to change* versus all forms of *path dependency*.

From this perspective, the main challenge in GREECO project has been to identify the most relevant internal and external factors that condition regional performance with regard to the green economy, as well as to characterise the – potentially contradictory – effects that emerge from the interaction of such factors, yielding different types of *territorial potentials for a greener economy*.

6.2. Overview of the driving forces and enabling conditions for a greener economy

As discussed in Vol. 2.6 of the Final Report, the GREECO project understands territorial potentials for a greener economy as the *combination* of all *factors* that encourage or prevent territories to successfully start or consolidate a transition to a green economy. Such factors (i.e. green economy drivers and enablers) are the policies, physical and non-physical assets, market conditions and other features that are proven to activate the concepts and improve current and future greening performance across Europe. In other words, the **regional potentials for green economy development have been characterised in GREECO project as the presence or manifestation (or otherwise absence) within regions of the green growth factors** identified by the literature review, case studies and sector assessments performed in the project.

[3] http://oxforddictionaries.com/definition/english/potential

Such key factors shaping the evolution of green economy are described in the following pages. Factors are presented in no specific order (i.e. order does not imply relative importance):

Figure 15: Main green economy drivers and enablers according to the GREECO project

6.2.1. Good governance: institutions, policies and regulations

Coherently with a number of previous studies that argue that quality of government is a significant factor contributing to environmental sustainability (Morse, 2006) and socio-economic development (Rothstein, Charron, & Lapuente, 2013), the territorial evidence produced in GREECO proves that, similarly to the contribution made to enable 'traditional development', **policies and institutions** also help to create favourable framework conditions for a greener economy, by reducing the cost of investments and increasing knowledge development (Charron, Dijkstra, & Lapuente, 2014).

All governance levels are important and it is difficult to single out one as more important than the other. GREECO sector reports (see Vol. 3.1 to 3.11) and case studies (see Vols. 4.1 to 4.11) showed that while EU and national policies and targets give the initial momentum and create the overall framework of operation, regions and municipalities are instrumental in translating this vision into regional and local realities. The significance of regions is bigger in larger, more decentralized countries such as Spain, Germany and Italy. Other countries like Sweden and Denmark have weaker regions with limited jurisdiction but do instead have strong municipalities. The regional/local role is harder to nail in smaller countries without strong regional administrative traditions such as Hungary and Estonia. It has to be noted that because of the Cohesion Policy, regions have gained importance especially as far as planning is concerned. In the example of the UK, regional structures have been dismantled or significantly reduced and demonstrates that the role of the regions also has political dimensions.

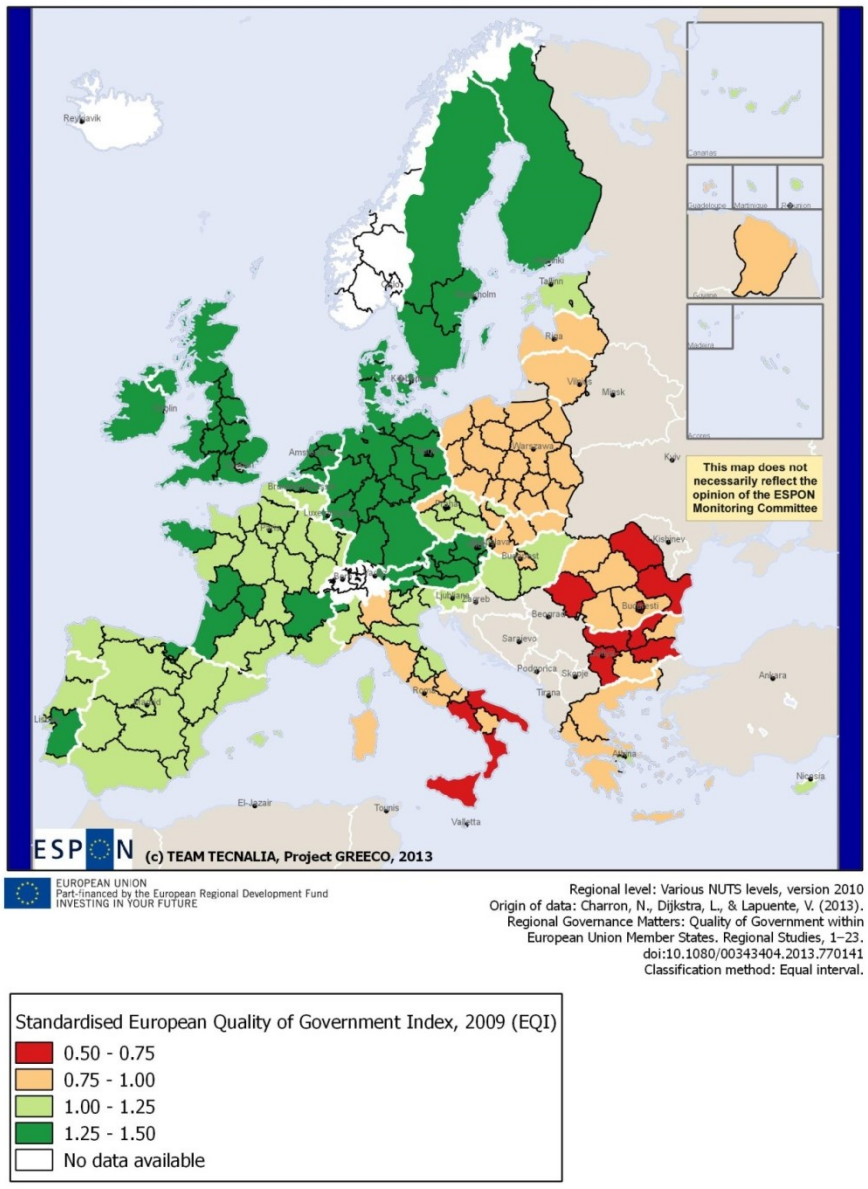
At all levels of policy implementation, **stability is crucial** for a sustained implementation of green economy transitions. In particular, ensuring the **continuity of strategic choices** such as adopted targets, financial commitments for greening the economy or simply having an *overall mindset* which is propitious to greening the economy is important to ensure successful implementation of long-term policies. **Navarra (Spain)** is a positive example in this respect. Here a persistent commitment to greening the regional economy has been translated into a widely consulted and agreed Regional Innovation Strategy – MODERNA.

Along these lines, all case studies in GREECO have demonstrated unequivocally that the **strategic vision** of a region is a major driver for greening the regional economy. This is especially the case if it has been achieved with the **participation** of a wide group of regional stakeholders – public, private, non-governmental sector and academia. The approach guarantees a shared understanding both of the benefits and challenges of greening the whole economy or a specific sector. The **Maltese Tourism Plan** is an example of a shared sustainable vision for one

particular sector.

Additionally, regions and municipalities have a powerful leverage through **spatial planning**, and **permitting and enforcement of legislation**. This is the case in **Zealand**, where integrated urban and transport planning makes easier to use bicycle-public transport combinations and park-and-ride commuting. These are good examples of local planning efforts key to the green economy transformation.

In parallel, other case studies show that the **diversity of regional institutions**, the synergies between them and with the private sector, as well as the quality of human resources in public organizations are strong factors for enabling the transition to the green economy. **Puglia** is a positive example in this respect, with a remarkable landscape of public and private institutions operating in the field of advanced technologies within RES, agriculture and nanotechnology that have enabled the leading role of the region in these fields.



Map 7: European Quality of Government Index (2009)

Against this overall framework, it is particularly challenging to differentiate those elements of good governance that are specific – or at least of special relevance – for the green subset of the economy, if any, from those that are rather unspecific and do not only apply to green transformations. Regretfully, gaining access to comparable territorial information on good governance and institutional settings in Europe is not an easy task, let alone gathering information specific for the green subset of the economy.

The best indicator available to depict the overall quality of government at the regional level in Europe is the 'European Quality of Government Index' (EQI) produced by the Quality of Government Institute[4] at The University of Gothenburg (Charron et al., 2014). This indicator, inspired by the World Bank Government Indicator (Kaufmann, Kraay, & Mastruzzi, 2008), provides a comparative overview of the quality of regional governance for 172 NUTS 1

[4] http://www.qog.pol.gu.se/data/datadownloads/qogeuregionaldata/

and NUTS 2 regions within 18 of the 27 countries of the EU.

The EQI was produced relying on a large survey of roughly 34.000 respondents in Europe collected back in December of 2009. The regional data combines 16 survey questions about quality of government in each region in relation to the following dimensions of (i) good governance: (1) public education, (2) public health care and (3) law enforcement, and (ii) criteria: (1) quality, (2) impartiality and (3) corruption. Thus, given its methodological soundness and relevance, even if not specifically oriented towards characterising regional governance settings as key enablers for enabling green transformations, the EQI is a good indicator of government quality that can be used in the context of the green economy.

Map 7 above presents the distribution of the EQI across Europe for the year 2009. The map shows clear spatial patterns. Regions ranking higher in terms of quality of government are those located in the Pentagon (with the exception of Northern Italian regions), plus the Nordic countries, British Isles, Austria, and some French, Spanish, Portuguese and some Italian regions neighbouring with Austria, Slovenia and France. Lower values are found in New Member States and the Italian Peninsula, particularly within regions located in the Italian Mezzogiorno, Romania and Bulgaria.

6.2.2. Key economic instruments: access to funding and financial support

Access to funding for businesses operating in green sectors is crucial for achieving a greener growth (OECD, 2011b; UNEP, 2011). Access to the economic capital is particularly important for R&D, the application of new technologies, RES penetration, and the creation of infrastructure for recycling, among others (OECD, 2014). This is due to the fact that such developments require high initial capital investments, which normally have a long pay-back period (DG Environment, 2006). Consequently, in order for green businesses to emerge and expand, adequate levels of private investment need to be available (Miranda & Larcombe, 2012). It may also be necessary to increase the availability of public funding to leverage local assets (Mehling & Best, 2010). In particular, **financial support** via the EU and national policies and funding schemes is a prerequisite for fostering green transitions (DG Regio, 2011; EC, 2011e; EEA, 2011).

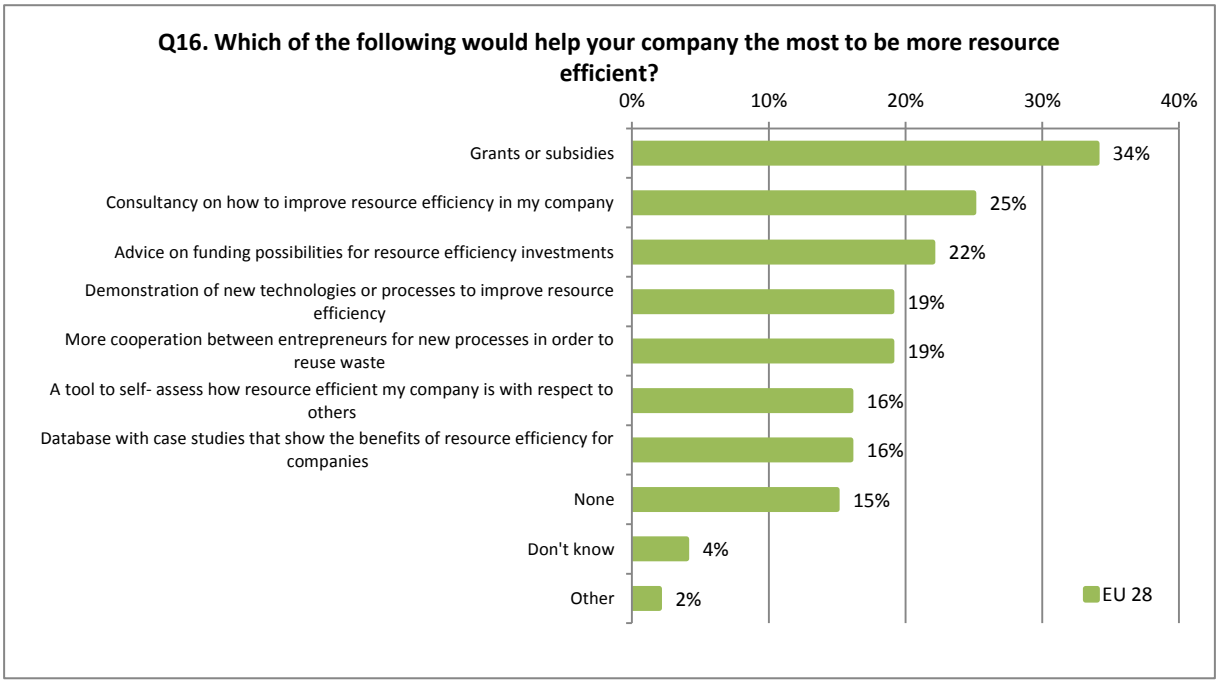


Figure 16: Relevance of different types of support for increasing resource efficiency within EU SMEs

Source: Eurobarometer 381 (European Commission, 2013).

A lack of financial support is seen among the limiting factors for greener growth in virtually all the case studies analysed in GREECO. Most regional actors contacted in case study regions stressed the importance of financial mechanisms and emphasise the need for increased public support. This also is confirmed by Flash Eurobarometer 381 that reviews the current state of the green market and the resource efficiency actions amongst Europe's SMEs, as well those in neighbouring countries and in the US (EC, 2013c). According to this survey, the financial incentives for new products, services or production process development are the most likely to assist SMEs to become more resource efficient, and launch or expand their green product or service offering:

- According to the poll results of Question 16 (EC, 2013c), shown in Figure 16, 34% of **all SMEs mention financial support (grants and subsidies) as the most desired support to make their company more resource efficient**. One quarter of all SMEs would prefer instead to receive consultancy support on improving resource efficiency, and a 22% would like to receive advice on funding possibilities for resource efficiency investments, which is also strongly related to funding support.
- According to the poll results of Question 27A (EC, 2013c), shown in Figure 17 (left graph), **almost half (46%) of the EU SMEs that already sell green products or services and a 29% of those that do not offer them yet (Figure 17, right graph) mention financial incentives for new product, services or production process development as the kind of support that would be most helpful to them to expand their green offering**. This kind of incentives are more likely to be mentioned than, for instance, assistance with identifying potential markets or customers (27%), technical support or consultancy for new product, services or production process development (22%), or consultancy for marketing or distribution (19%).

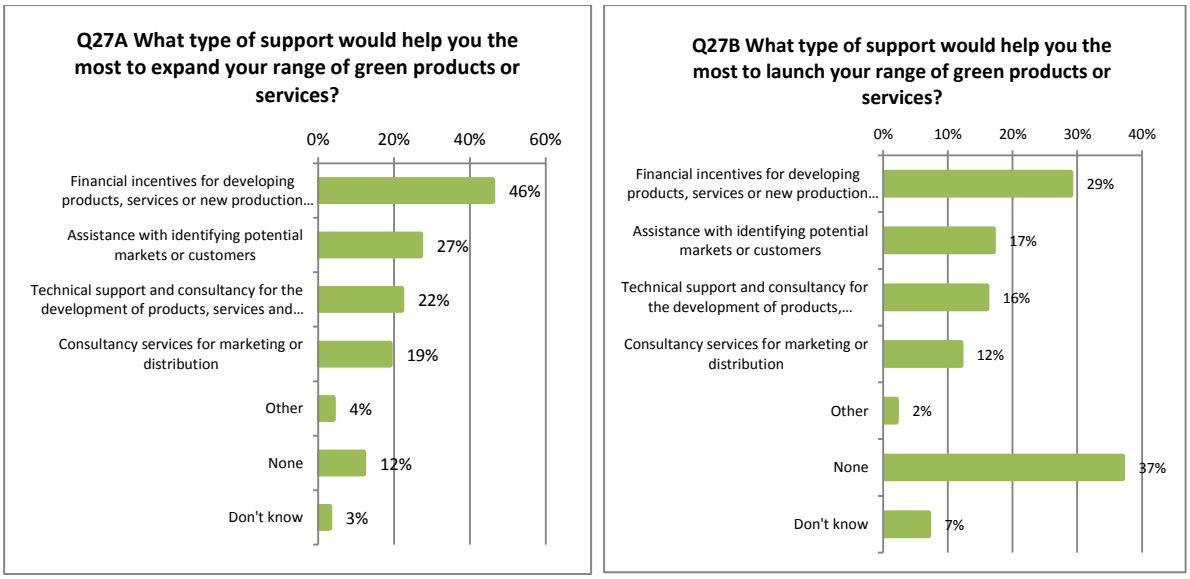


Figure 17: Relevance of different types of support for the production of green products and services by EU SMEs

Source: Eurobarometer 381 (European Commission, 2013).

Despite that most of the EU SMEs that took part in Flash Eurobarometer 381 survey (EC, 2013c) declared to use only their own internal financial resources when trying to be more resource efficient (60% of all respondents), or selling green products or services (58% of all respondents), **around one in five SMEs declared to take actions to be more resource efficient as a result of fiscal or financial incentives or other public support** (19%), or due to the competitive

advantage or business opportunities such actions provide (18%).

According to the same survey, **among those EU SMEs receiving external support to increase resource productivity, 28% received private funding, while 19% received public funding and 7% funding from friends or relatives**. Medium-sized enterprises are more likely than small and micro enterprises to rely on external support from public funding (27% vs. 18%-19%), whereas SMEs in the manufacturing sector are more likely than those in other sectors to rely on financial support from the public sector (28% vs. 16%-19%). It is also interesting to acknowledge that SMEs whose turnover has decreased in the last two years are less likely to be relying on public sector support (27%) than those whose turnover has stayed the same (38%) or increased (41%).

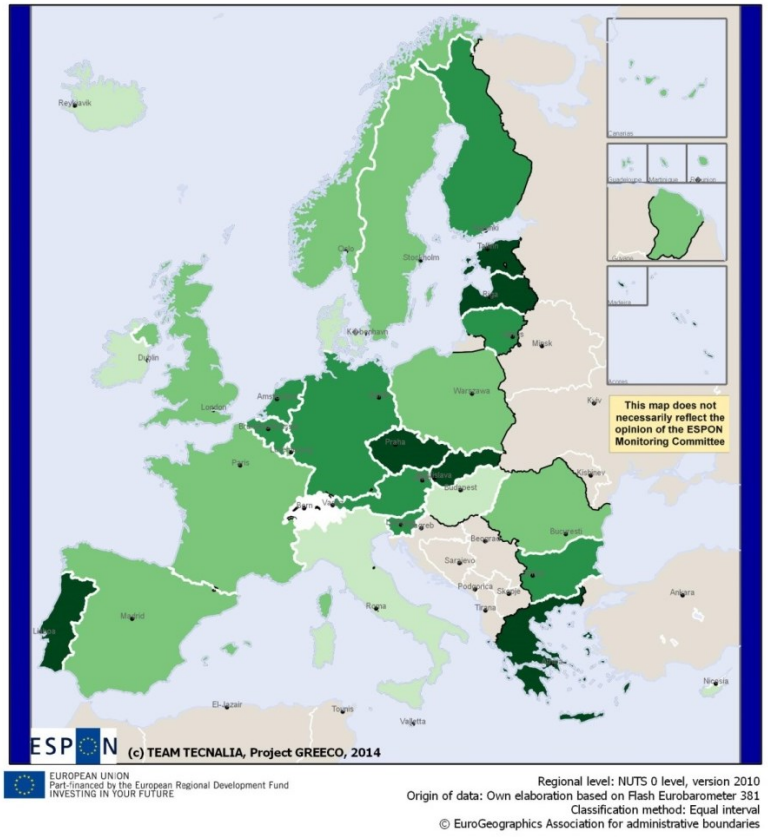
Most EU SMEs that sell green products or services rely on their own financial resources (58%) and/or technical expertise (55%) for production, although small enterprises are the least likely to rely on their own financial resources (55% vs. 58%-59%). On the opposite side, industry SMEs are the most likely to rely on their own financial resources (63% vs. 55%-57%). Thus, just over one in five (22%) SMEs that sell green products or services rely on external support to produce green products or services.

Q25 Which type of external support does your company get for the production of its green products or services?						
	Advice or other non-financial assistance from private consulting and audit companies	Advice or other non-financial assistance from business associations	Advice or other non-financial assistance from public administration;	Private funding (from a bank, investment company or venture capital fund)	Public funding (grants, guarantees or loans)	Funding from friends or relatives
EU 28	**36%**	**31%**	**18%**	**18%**	**14%**	**6%**
Company size						
1-9	34%	31%	16%	16%	13%	8%
10-49	39%	26%	22%	21%	9%	4%
50-249	44%	37%	25%	22%	32%	3%
NACE sectors						
Manufacturing (C)	28%	31%	16%	15%	15%	5%
Retail (G)	36%	32%	13%	15%	10%	6%
Services (I/J/K/H/L/M)	44%	28%	26%	23%	18%	10%
Industry (B/D/E/F)	30%	34%	17%	18%	14%	2%

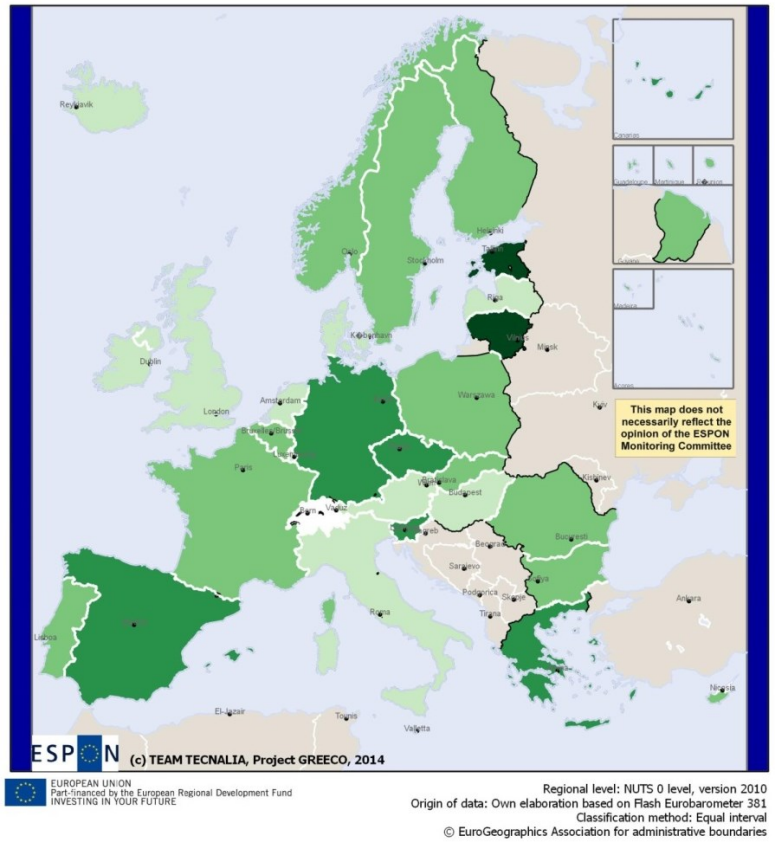
Table 4: Type of external support received by EU SMEs for the production of green products and services

Source: Eurobarometer 381 (European Commission, 2013).

Map 8 and Map 9 show the shares of companies that responded affirmatively to questions 13 and 25 of the Flash Eurobarometer 381. Question 13 inquired on the type of external support that SMEs received to increase resource efficiency within their production system, among those that reported to receive some. Question 25 inquired on type of external support that companies get for the production of its green products or services, among those that reported to offer at least one green product or service. The latter figures are also detailed in Table 4 above. According to these figures, most SMEs who rely on external support for production of green products or services are likely to get this in the form of non-financial assistance (EC, 2013c).



Map 8: Combined public/private financial support to SMEs (2013) for increased resource efficiency



Map 9: Combined public/private financial support to SMEs (2013) for the production of green products and services

6.2.3. Territorial assets and physical conditions

As shown by GREECO sector assessments included in Vols. 3.2 to 3.11, territorial characteristics and land use issues including the territorial preconditions and the availability of suitable land resources can be considered among the important enablers for a greener development of many sectors studied, especially those with the strongest territorial ties. Still, in-depth analyses within case studies have shown that whereas the importance of natural assets depends on the sector of the green economy, **the capacity to capitalise on the natural assets is strongly linked to other factors** such as the governance and strategic framework in a specific region, like in Camagni's definition of 'territorial capital' (Camagni, 2008).

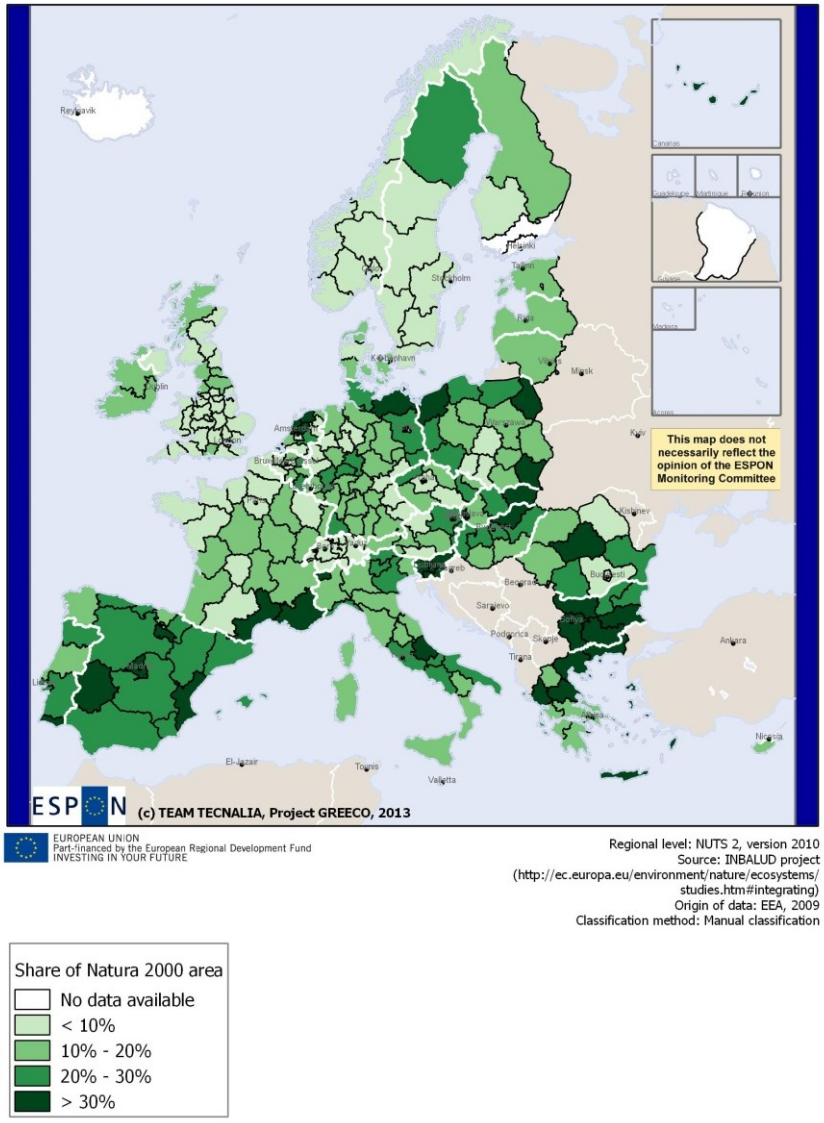
Take for example the transition to a greener energy sector through investments in RES. Despite that this transition is closely related to the availability of sun and wind, other non-physical conditions are also needed. This combination of physical and non-physical assets may explain why a country/region like **Malta** that has some positive conditions in this respect has not been able to develop the sector to its full potential. On the other hand, other areas like **Burgenland** and **Navarra** have fully profited from the abundance of wind and thanks to a strong leadership and the excellent legislation and planning they have become leaders in RES generation. Naturally, the lack of strong conflicting territorial interests from other sectors such as tourism is also a pre-condition.

A similar situation can be found in **Cornwall,** where a strong political leadership on the regional level, the availability of funding and the close collaboration between research institutions and the private sector has made it possible to develop technologies for generation of electricity from the waves. Naturally, the lack of strong conflicting territorial interests from other sectors such as tourism is also a pre-condition.

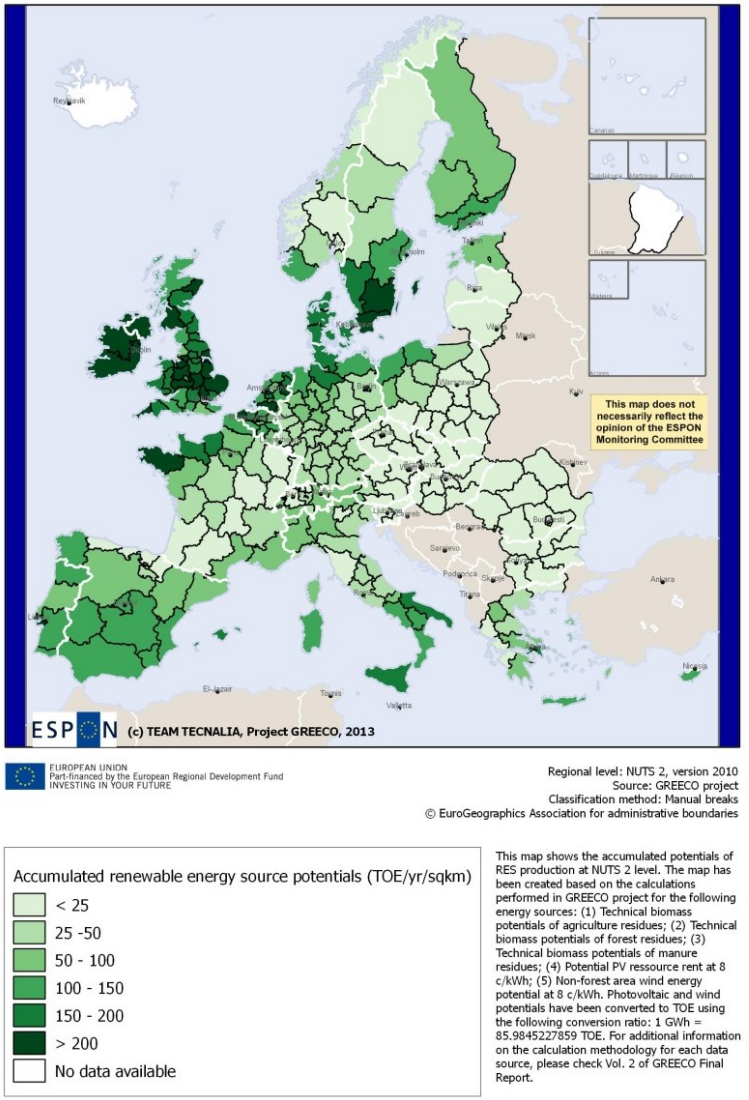
There is an interesting case of how lack of natural assets puts a pressure for greening certain sectors. Such is the case of the water sector in **Malta**, where extreme water shortage has been the trigger for innovative measures for greening the sector through technologies for water savings, appropriate pricing, fighting the illegal boreholes. Thus, Malta's water scarcity has been – and could be further – turned into an advantage by gaining an upper hand in water sector innovation capacity.

For the abovementioned reasons, rich natural assets can only be considered enabling conditions for green economy development if they are coupled with other essential factors. Moreover, a lack of natural resources can even be a trigger for greening and innovation as the need for sustainable management of scarce natural assets is critical. Accordingly, the influence of such assets must be interpreted with care.

According to GREECO case studies and sectoral insights, the two key territorial assets that should be unequivocally considered a core feature of the green economy, on the one hand, and contribute to create new opportunities for green growth – and thus increase green economic potentials in those regions where such factors are present –, on the other, are the **overall environmental quality** (Atkinson, 2013; OECD, 2014; UNEP, 2012a) and the **renewable energy potentials** of regions (Business Insights, 2012; IEA, 2013), respectively. These have been considered in the GREECO project by means of two proxy indicators, namely the Share of Natura 2000 area (shown in Map 10), for the environmental quality dimension, and the combined onshore wind, photo voltaic and biomass energy potentials (shown in Map 11), for the RES potential. These maps are presented below:



Map 10: Share of Natura 2000 area by NUTS 2 region (2009)



Map 11: Combined onshore wind, photo voltaic and biomass energy potentials (TOE per km^2 per year) at NUTS 2 level

6.2.4. Expected market demand

As for any other economic activity, **market demand is the ultimate force shaping the green economy** (EEA, 2014b; OECD, 2011b). Still, this dimension is very difficult to be assessed by means of reliable figures. Comparable data on green markets are not available at the regional level, and even at the national level statistics are rather scarce[5]. Additionally, the available market surveys on green products and services are much focused on concrete goods and are rather unspecific from the territorial perspective.

Moreover, in an open and unified market such as the EU common market it could not be argued that demand and supply for green products and services are spatially concurrent. In other words, **supply and demand can take place in different places and it is not possible to establish a closed relationship between a certain dimension of green markets in a given region and a higher degree of specialization in such industries**.

Nonetheless, it is pretty obvious that some sectors with stronger territorial bounds will necessarily initiate a transition to a greener economy as a response to local market demand. Local market growth can be totally spontaneous or follow the implementation of EU, national, regional and local greening regulations and strategies. Among the sectors assessed by the GREECO project, probably the building sector is the one that fits better within this rationale. In particular, this sector includes a number of economic activities for which supply and demand is mostly generated locally.

Against this background, an estimate of the annual CO2 emissions savings potential for the building sector in 2050 has been used in GREECO as proxy indicator of the market dimension of green economic potentials. Regional values of this specific indicator are based on allocating current national estimates of per capita emissions rates to forecasted population development for 2050, then applying a linear 89.5% reduction in order to achieve the EU's policy target for the sector.

Thus, this indicator illustrates more than one relevant dimensions of green economic transformations, namely territorially-bound assets such as housing stock, the spatial patterns of current development model – though residential patterns – and the expected market size – through population projections –, as well as one type of policy stimuli for a greener growth – through carbon-budgets linked to mitigation policies at the EU level –. A detailed description of this indicator can be found in the Green Building and Construction Report (Vol. 3.4). A graphical representation is presented within the Executive Summary (Vol. 1.1).

6.2.5. Human resources, knowledge and skills

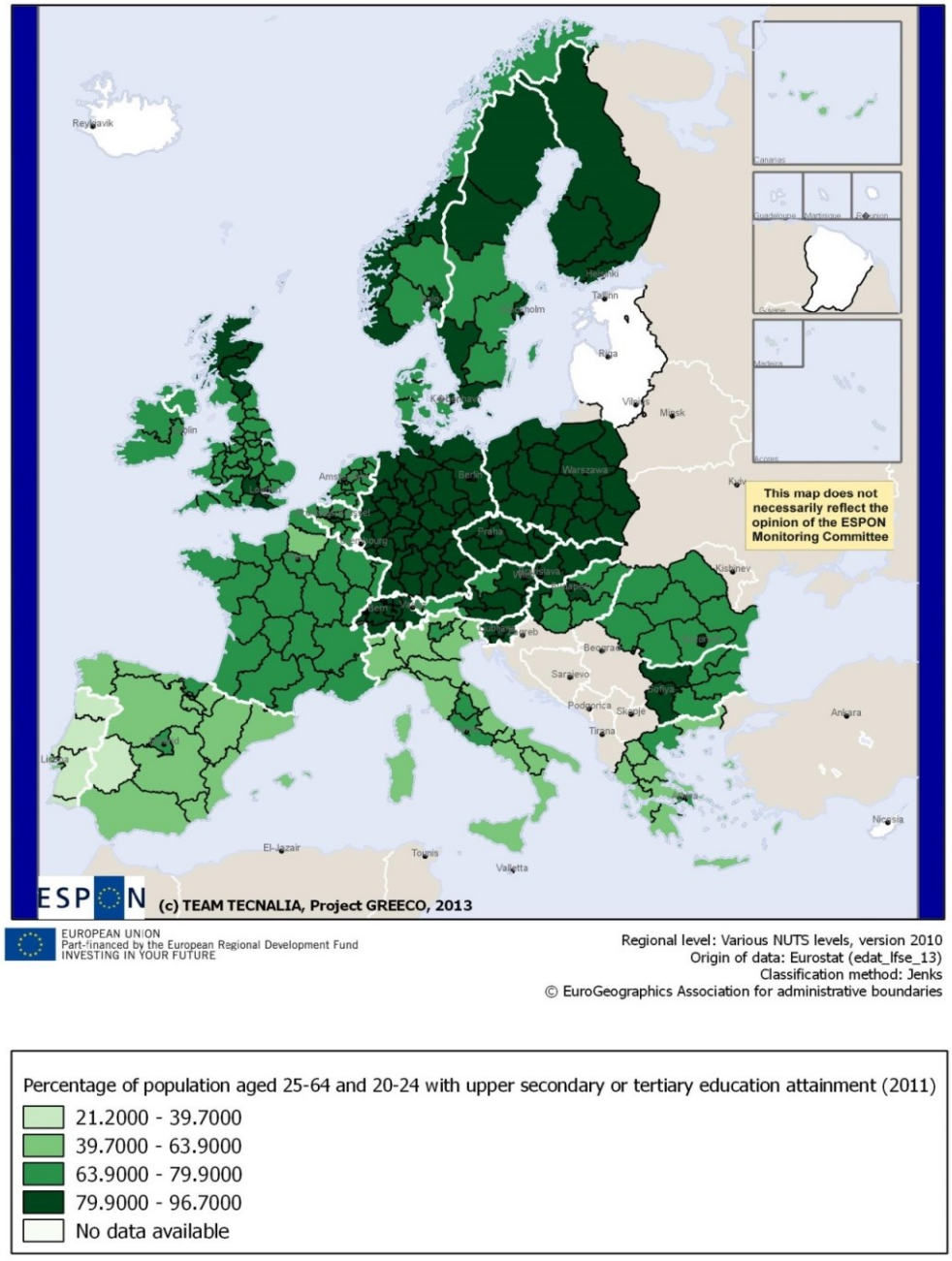
A skilled workforce is a crucial resource for all economic activities. Those included in the green economy are no exception. Needed skills comprise those that are specific for producing and selling green products and services, but also those transversal skills needed to support transitions in terms of increased energy and material efficiency, adaptation to climate change, etc. (ILO, 2011; Martinez-Fernandez, Hinojosa, & Miranda, 2010). Along these lines, several studies claim that **from the labour perspective transitioning to the green economy will be much more about changing the way work is performed rather than replacing existing jobs** (CEDEFOP & ILO, 2010).

In line with such studies, the availability of enough quantity and well trained workforce is recursively mentioned within GREECO case studies sector assessments as a key factor for a

[5] So far, the Eurostat has only made available figures on the EGSS for a limited number of countries: http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Environmental_goods_and_services_sector

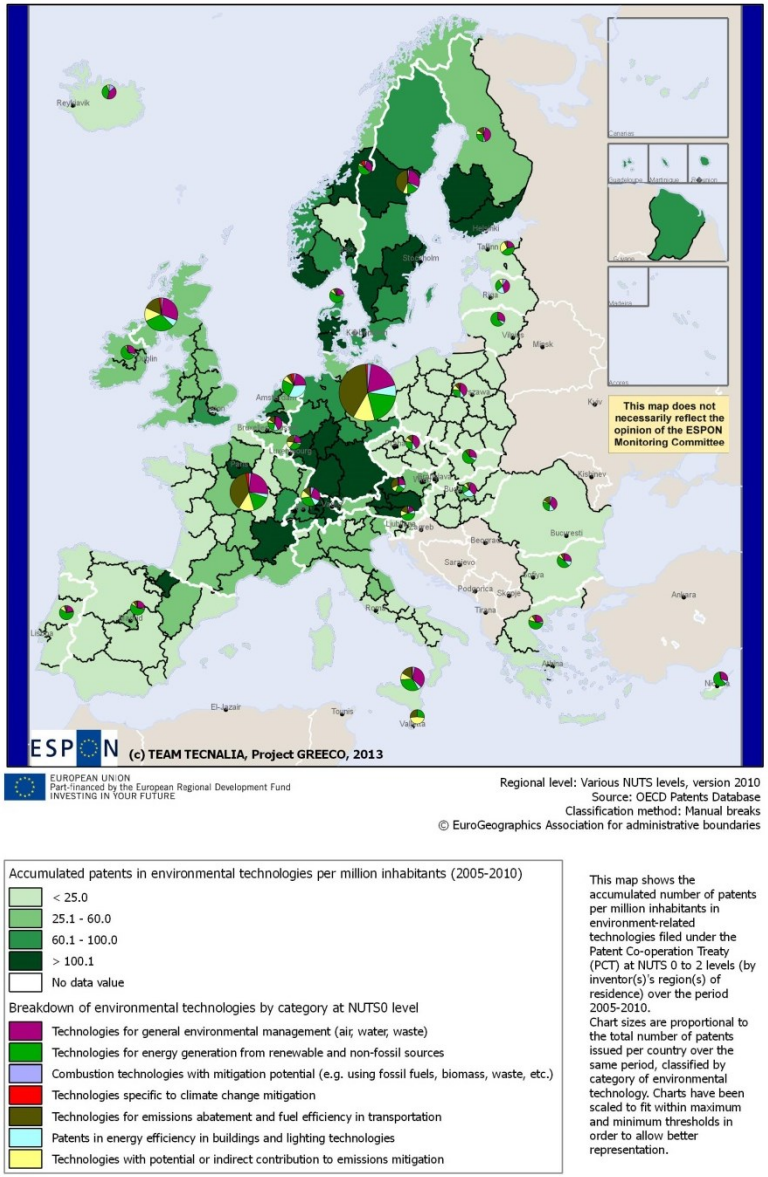
greener growth. The development of **human capital** is crucial for fostering the technology transition and increasing innovation capacity within many sectors, in particular for the eco-innovation sector.

In some cases, the availability of human resources is linked to other challenges. For instance, in some of the case study areas analysed in GREECO project the **scarcity of human resources** is linked to demographic trends. Such challenges might hinder green economy development in different ways. In some areas the lack of competent labour force follows negative population trends. This is for instance the case in **Jämtland** region in Sweden. Other areas, like **Estonia**, face difficulties to attract and keep the **qualified labour force** mostly in the peripheral and more rural areas. **South Transdanubian** institutions in Hungary are suffering from the low availability of quality human resources in the region. A remarkable part of the graduates trained locally apply for jobs outside of the region after finishing their studies – mostly in the capital Budapest. This situation is leading to drainage of qualified labour force in the region, creating obstacles for finding highly skilled workers necessary in a – knowledge based – green economy transition.

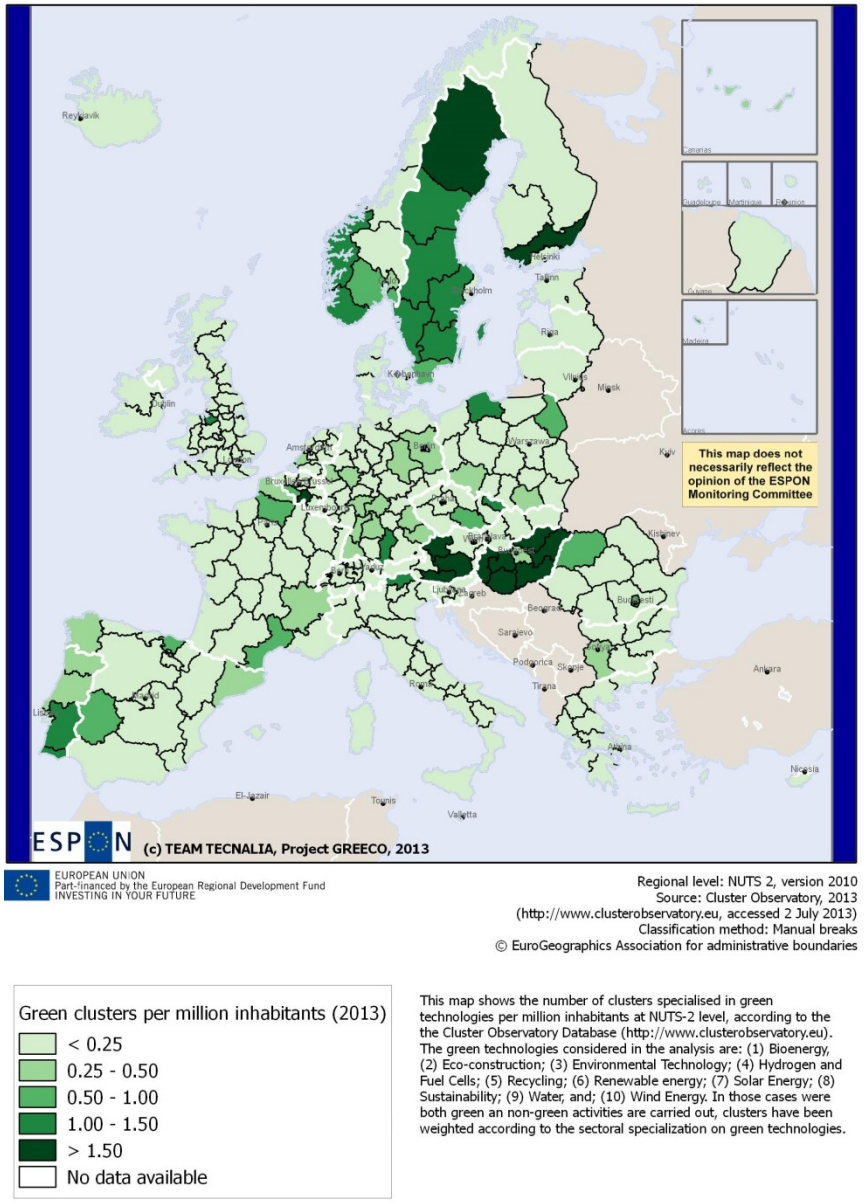


Map 12: Percentage of population aged 25-64 and 20-24 with upper secondary or tertiary education attainment, by NUTS-2 regions (2011)

Against this background, the indicator used in GREECO to reflect the availability of human resources within regions in GREECO is the percentage of persons aged 25-64 and 20-24 with upper secondary or tertiary education attainment, by NUTS 2 regions, shown on Map 12.



Map 13: Accumulated patents in selected environmental technologies per million inhabitants at various territorial levels (2005-2010)



Map 14: Number of greentech clusters per million inhabitants (2013)

6.2.6. Access to technology

As reported by a vast array of previous academic and non-academic research initiatives (see for instance EEA, 2011, 2014b; EREP, 2014; Rene Kemp, 1994; René Kemp, 2011; UNEP, 2011), the development and uptake of **eco-innovation technologies play a key role in fostering the transition to the green economy**, including all the sectors analysed in the GREECO project. **By investing in state-of-the-art technologies firms achieve emission reductions and are becoming more environmentally friendly, but at the same time reduce their costs, attract new customers, reduce risk and vulnerability, and gain first mover advantages compared to their competitors.** Eventually, all these elements increase expand potentials for a greener economy (Bleischwitz & Bahn-Walkowiak, 2009; Dangelico & Pujari, 2010; Esty & Winston, 2009; OECD, 2009, 2010, 2011a).

This dimension is covered in GREECO by two strands of indicators:

- The first strand focuses on the **production of new technologies** – i.e. green technology development –, relying on green patent data made available by the OECD Regions and Cities Database and the Science, Technology and Patents Database[6]. The spatial distribution of this indicator is shown on Map 13 above.
- The second strand focuses on **green clusters**, the spatial dimension of technological development and access to new technology. A new indicator on regional greentech clustering has been produced for this purpose. The indicator presented in Map 14 above relies on data provided by the European Cluster Observatory[7]. It has been produced by characterising the spatial distribution (at NUTS 2 level) of more than 170 cluster organisations, consulting organisations, national agencies, professional organisations, regional agencies, science parks and universities that are involved in green research and development within any of the following sectors: Environmental Technology, Bioenergy, Hydrogen and Fuel Cells, Recycling, Solar Energy, Wind Energy, Eco-Construction, Renewable Energy, Sustainability, Water and Green Technology. More information on the methodology and scope of this indicator can be found in Vol. 2.6 of GREECO Final Report.

6.2.7. Environmental awareness and voluntary actions

Higher awareness level contributes to fostering sustainable practices and choices of the companies and individuals. Awareness is important for greening the economic sectors through consumption choices. It may enable market change, technology penetration, and even the adoption of new policies (Amel, Manning, & Scott, 2009; Brécard, Hlaimi, & Lucas, 2009; Nash, 2009). In transport, this would be the preference for public transport or alternative transportation; in energy, the decision to renovate the building and improve insulation; in agriculture, the preference to purchase organic products, etc.

With growing awareness of the population, expectations from the manufacturers and any other businesses increase. For this reason, **voluntary certification, agreements and such tools as Corporate Social Responsibility (CSR) and eco-labelling play increasingly important role in greening of the sectors** associated with production and provision of services, particularly

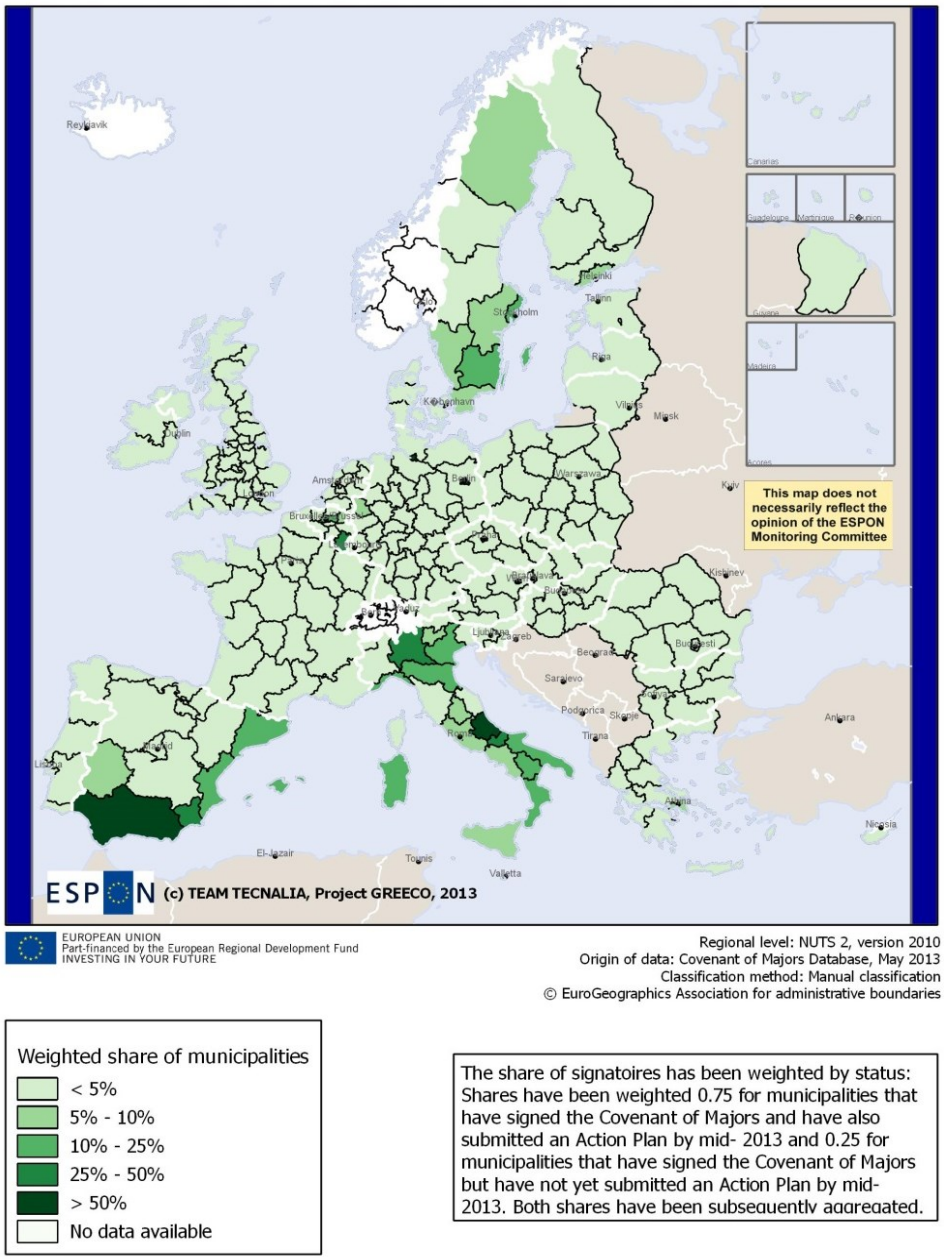
[6] The Regions and Cities Database is available at http://www.oecd.org/gov/regional-policy/regionalstatisticsandindicators.htm. The Science, Technology and Patents database is available at http://www.oecd.org/sti/inno/oecdpatentdatabases.htm

[7] http://www.clusterobservatory.eu

forestry, fishing, building, manufacturing and tourism sectors. Additionally, **voluntary environmental schemes have been among the most efficient tools for fostering eco-innovation**. These instruments help the enterprises to unleash innovations, improve competitiveness and reputation, and deliver better financial returns (Banerjee & Solomon, 2003; Gulbrandsen, 2006).

Similarly, GREECO case studies show that relatively high level of environmental awareness has been translated into political expectations and eventually into strategies, policies, financing and actions at the local and regional levels. At such levels, **general public awareness may be increased through long and persistent efforts on behalf of the regional and municipal administrations, both of which control a number of communication tools**. Awareness can also be strengthened through consistent involvement of stakeholders into creating a future vision.

A good sign of regional and local commitment to move towards greener scenarios is the role played by public stakeholders within international initiatives oriented towards the establishment of more ambitious environmental targets. Such European and global networks are crucial for promoting local green governance through information sharing, communication of best practices and logistical and technical support.



Map 15: Weighted share of municipalities that have signed the Covenant of Majors and have also submitted an Action Plan by mid- 2013

As it has been claimed before, one of the relevant initiatives at the European and international levels in terms of articulating the participation of regional and local authorities to tackle global environmental challenges is the **Covenant of Majors** initiative launched by the European Commission in 2008. This initiative is voluntarily joined by local and regional authorities committing to increasing energy efficiency and use of renewable energy sources on their territories, with the specific aim to meet and exceed the European Union 20% CO2 reduction objective by 2020.

Beyond energy savings, the initiative also seeks to create "skilled and stable jobs, not subject to delocalisation; healthier environment and quality of life; enhanced economic competitiveness and greater energy independence"[8].

However, according to the Covenant of Majors webpage[9] so far no local administration has reached Step 3 in the implementation sequence of the Covenant of Majors. Reaching this step implies the submission of implementation reports by signatories in order to check the compliance of the interim results with the objectives set in the Action Plans in terms of measures implemented and CO2 emission reductions. This means that most local and regional authorities have not yet reported the extent to which the actions foreseen in their Action Plans are actually being implemented.

6.3. Developing a tentative typology of territorial potentials for a greener economy

All the empirical evidence presented in previous section was combined to generate the Index of Green Economy Theoretical Potentials (IGETP) by means of a multi-criteria analysis. The IGETP was generated as an arithmetic sum of the weighted averages of all the 7 factors shown on Table 5 below.

Green economy factors	Indicator	Data provider
Good governance: institutions, policies and regulations	European Quality of Government Index (2009)	Quality of Government Institute at The University of Gothenburg (Charron et al., 2014).
Key economic instruments: access to funding and financial support	Public/private support to SMEs for increased resource efficiency and/or the production of green products and services (2013)	Flash Eurobarometer 381 SMEs, resource efficiency and green markets (EC, 2013c).
Territorial assets and physical conditions	Combined onshore wind, photo voltaic and biomass energy potentials (TOE per square kilometre per year) at NUTS 2 level	**New indicator developed in GREECO project**
	Percentage of Natura 2000 area by NUTS 2 region (2009)	INBALUD project based on EEA data (Geoville, 2012)
Access to technology	Accumulated patents in selected environmental technologies per million inhabitants at NUTS 2 level (2005-2010).	OECD Regions and cities database.
	Share of patents in selected environmental technologies over total number of patents (2005-2010).	OECD Regions and cities database.
	Number of greentech clusters per million inhabitants (2013)	**New indicator developed in GREECO project.**
Expected market demand	Estimated annual CO2 emissions savings potential for the building sector in 2050 (Mt per square km per thousand inhabitants)	**New indicator developed in GREECO project.**

[8] http://www.eumayors.eu/about/covenant-of-mayors_en.html. Last accessed 17 November 2013.

[9] http://www.eumayors.eu/about/signatories_en.html?q=Search+for+a+Signatory...&country_search=&population=&date_of_adhesion=&status=3. Last accessed 17 November 2013.

Human resources, knowledge and skills	Percentage of persons aged 25-64 and 20-24 with upper secondary or tertiary education attainment, by NUTS 2 regions (2011).	Eurostat Regional Database (edat_lfse_13)
Environmental awareness and voluntary actions	Weighted share of municipalities that have signed the Covenant of Majors and have also submitted an Action Plan by mid- 2013.	**New indicator developed in GREECO project.**

Table 5: Indicators for territorial potentials of the green economy

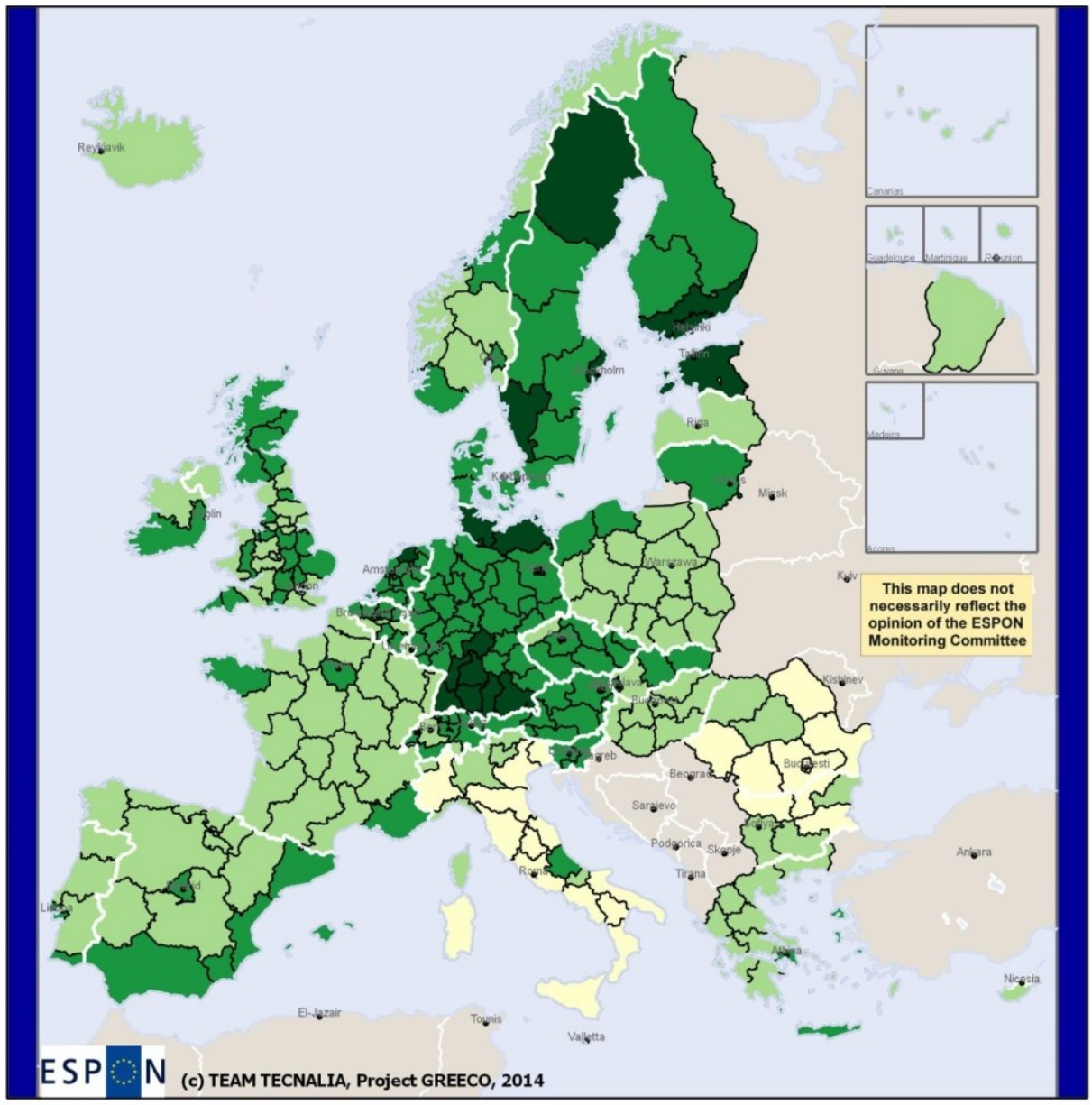
As shown on Table 5, some of the green economy factors considered in the IGETP were illustrated through one single indicator, whereas others combined two (territorial assets and physical conditions) or even three (access to technology) sub-indexes. Regardless of the number of contributing dimensions, identical weights were applied to all factors. The arithmetic sum of all green economy factor scores was eventually normalised for representation purposes. Vol. 2.6 provides more details on this methodology.

The spatial distribution of the IGETP is shown on Map 16 below. This map shows a quite uneven territorial distribution of green economy potentials across Europe. Territorial potentials seem to be higher in the Pentagon, particularly Germany's Southernmost and North-eastern regions, Nordic countries (in particular within the most urbanised Swedish and Finish regions), plus the remote and sparsely populated Upper Norrland (Övre Norrland) region in Sweden, and the Baltic countries, particularly Estonia. Apart from these areas, medium to high IGETP scores can also be found in some specific NUTS-2 regions located in the British Isles, New Member States and around the Mediterranean Basin. However, most regions located within the latter two macro-regions show medium to low and low theoretical green economy development potentials. In particular, IGETP scores are particularly low in most Italian and Romanian regions. The remaining areas show medium to low values.

It should be considered that the spatial variation of the IGETP is of course tightly related to the spatial variability of the different components merged in such index. Given that the IGETP has been estimated as a weighted average of the indicators chosen to cover the seven green economy factors included in the analysis, the numerous possible combinations of such scores could depict a highly variable output. In fact, the sensitivity analysis performed on IGETP scores showed that small variations in the number of variables included and the weights used could lead to quite different results. This implies that the IGETP relies on a too narrow number of variables to qualify as something more than a highly exploratory and preliminary research output.

Moreover, regardless of the level of sensitivity of the IGETP and the accuracy of the proxy indicators available to characterise the green economy factors, the multi-dimensional nature of the analysis makes the interpretation of results based on a composite indicator like the IGETP is an extremely difficult task. Interpretation is particularly difficult for those regions with medium IGETP scores, being those areas where different combinations of green economy factors may yield similar IGETP scores. It has to be acknowledged that the IGETP may hide factor-specific information that could be relevant for descriptive and normative purposes. Thus, in order to avoid the various potential pitfalls linked to composite indicators in general and to the IGETP in particular, the typology presented on Map 16 should be used along with the individual factors combined in the IGETP (introduced on Section 6.2 above).

Besides, complementary analyses should also be implemented to assess specific territorial trends relevant for understanding green economy potentials. One of such analyses would be observing of how the different factors included in the IGETP distribute according to other regional typologies and classifications, such as the development level of regions.



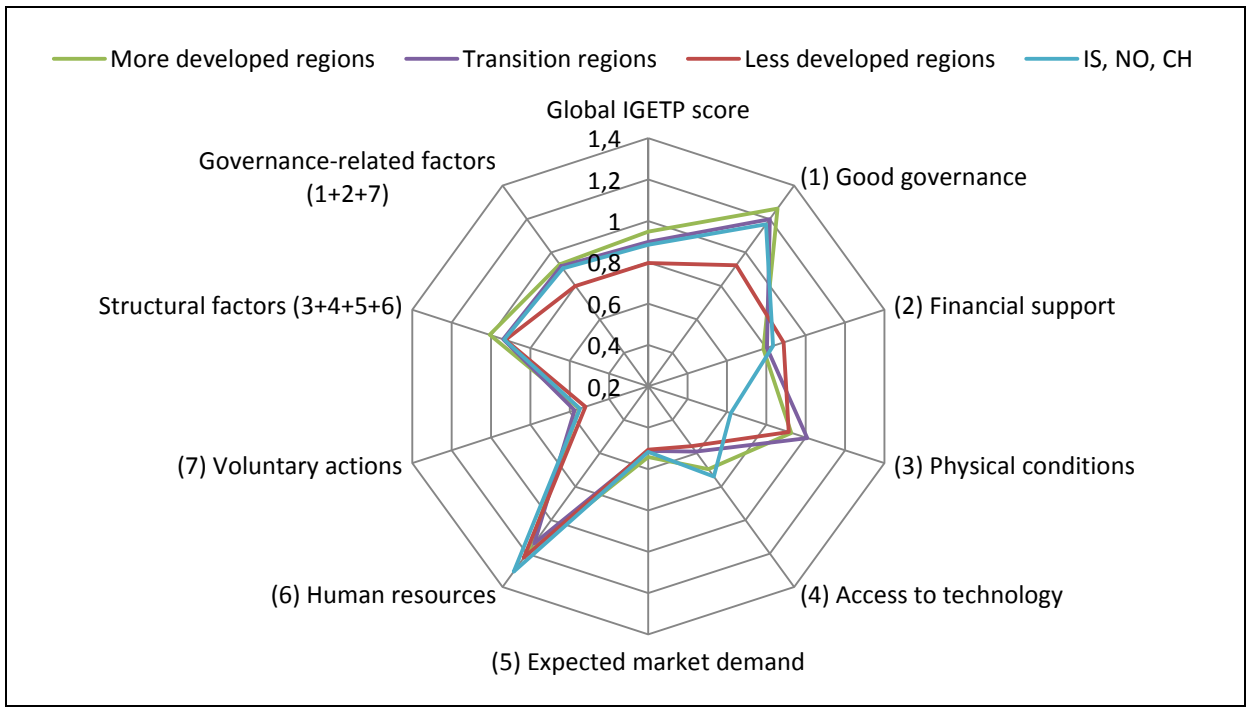
Map 16: A tentative regional typology of territorial potentials for a greener economy at NUTS 2 level (2013)

As shown on Figure 18 presented below, in most cases variability of green economy factors

according to the 'level of regional development'[10] (above diagram) and regional classification (below diagram) is rather low. This implies that internal variability within specific categories of regions is, in general terms, higher than in-between groups. All groups of regions seem to follow similar distribution patters, with the exception of non-EU regions (Island, Norway and Switzerland) and less developed regions. Still, even for these specific categories relative differences with other groups of regions appear to be small for most factors. Differences are higher for the governance-related factors (including (1) good governance and institutions, (2) key economic instruments and financial support, and (7) environmental awareness and voluntary actions), than for the so-called structural factors (including (3) territorial assets and physical conditions, (4) access to technology, (5) expected market demand, (6) human resources, knowledge and skills).

According to the bottom diagram shown on Figure 18, regions from New Member States (EU12 countries) perform slightly worse than Old Member States (EU15 countries) for most of the green economy factors, with two remarkable exceptions: The first one is financial support, where New Member States rank better than the Old Member States on average, probably due to the availability of public funding schemes supporting businesses in such countries. The second exception is quality of government. In this case New Member States tend to perform consistently below UE-15 countries mainly due to historical reasons.

All the above implies that, from a green economy perspective, green economy drivers are not concentrated within any specific category of regions. **Regions appear to be, if not equally, at least similarly endowed to start or consolidate transitions to a greener economy**, regardless of their present level of development.



[10] As in DG Regio's classification of regions for Structural Funds within the framework of the Reformed Cohesion Policy for the period 2014-2020: http://ec.europa.eu/regional_policy/what/future/index_en.cfm

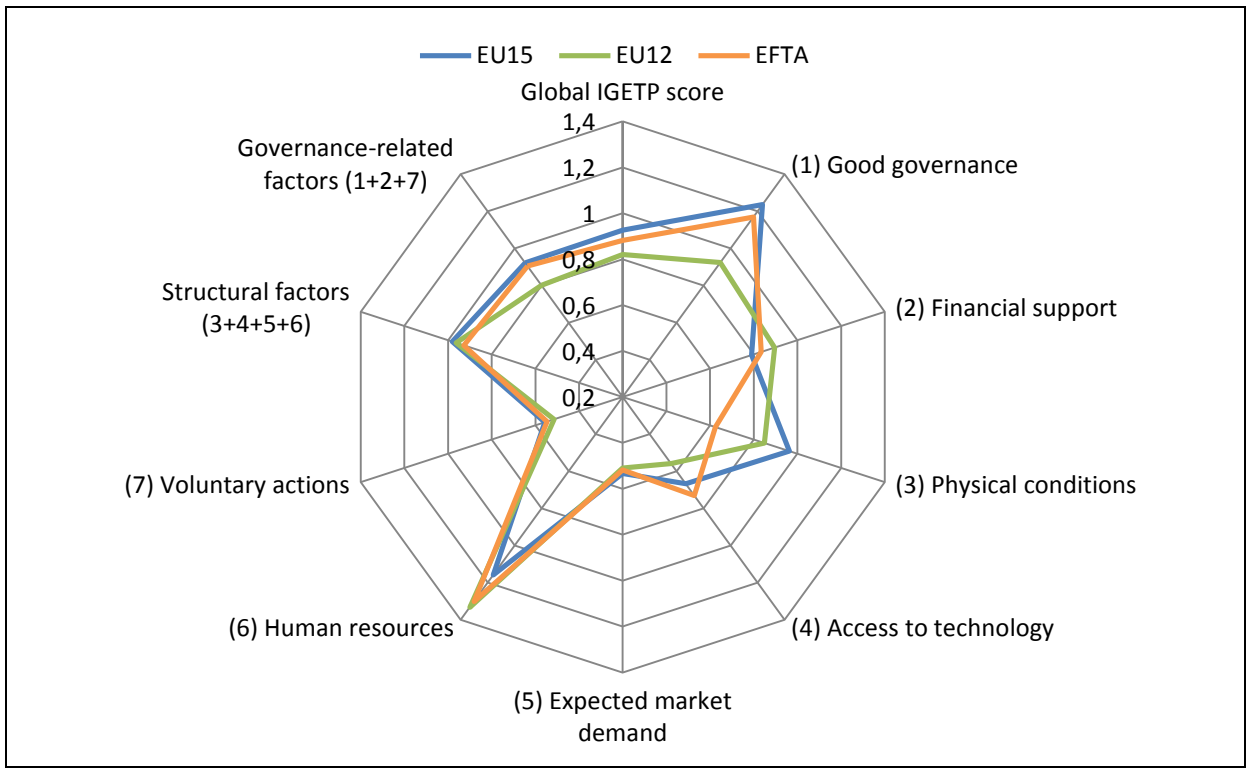


Figure 18: Contribution of green economy factors to the global IGETP score by level of regional development (top diagram) and type of region (bottom diagram)

6.4. Relating green economy potentials to key socio-economic variables

As previously mentioned, relating IGETP scores and their components to contextual socio-economic variables and different types of regions can be useful in order to identify territorial patterns related to green economy potentials. Although from a purely statistical point of view none of the socio-economic variables analysed in GREECO shows a strong linear relation to IGETP (Adjusted R-squares values remain below 0.15 in all cases), a linear model offers the possibility to explore differential behaviours of dependent and explanatory variables across the distribution:

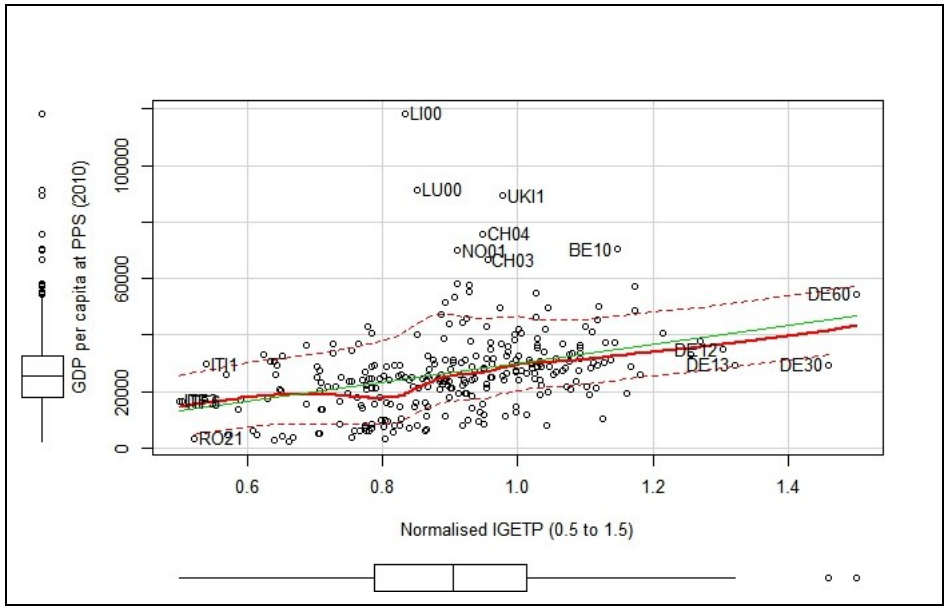


Figure 19: Scatterplot showing the relation between IGETP and GDP per capita at NUTS-2 level (2010)

In general terms, the relation between IGETP and deflated **GDP per capita** (expressed in terms of Purchasing Power Standard – PPS – *deflated* by the GDP deflator with respect to the price level of 2005) seems to be positive (see the scatterplot on Figure 19). Simply put, this relationship

implies that an increase in one point in IGETP score, which is the maximum total variability of the index, *is worth* € 33 553 measured in GDP per capita. By income level, all types of regions seem to correlate positively with the IGETP, with the only exception of transition regions, where there does not seem to be a clear relationship in either direction.

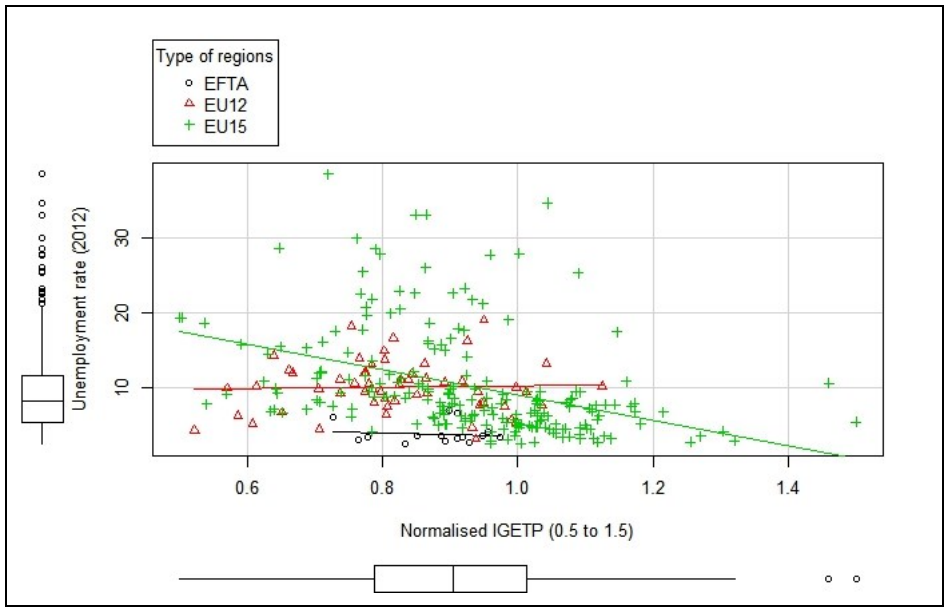


Figure 20: Scatterplot showing the relation between IGETP and unemployment rates (2012) for different types of regions

Contrary to previous example, the global correlation between regional **unemployment rates** and IGETP scores is negative. This seems obvious, as the IGETP combines several variables – albeit not all of them – that have a strong negative correlation with unemployment rates, in particular the availability of well-trained human resources and access to technology.

Quite interestingly, the New Member States (EU-12) have a clearly differentiated behaviour in comparison to the remaining regions (see Figure 20). If taken in isolation, unemployment rates and normalised IGETP scores of regions located within EU-12 countries do not show any correlation pattern at all, whereas the remaining regions have a pretty strong negative one. Even if its statistical relevance is limited, this differentiated behaviour is symptomatic of a higher level of complexity of the mechanisms activated by green economy factors within the New Member States in comparison to other areas, which calls for a more detailed assessment in those regions.

A similar situation can be observed within Figure 21 that relates regional IGETP scores with poverty rates in the ESPON space regions. In this case, whereas the global correlation between the IGETP and poverty rates is negative, variability among different groups of regions is very high, with the less developed regions showing stronger negative correlation rates than the remaining areas. This suggests that the returns of investments aimed at improving the green economy factors considered in GREECO could be higher within poorer

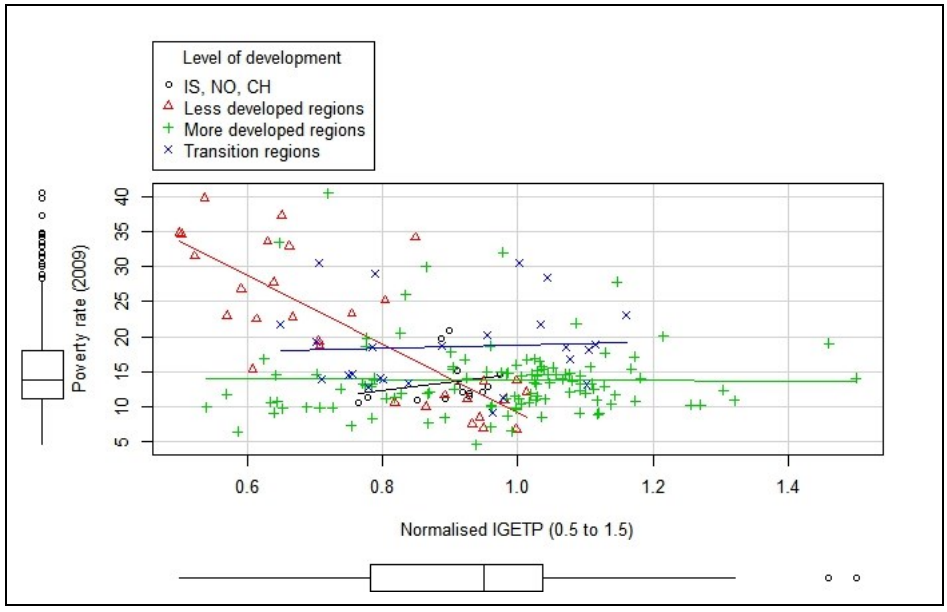


Figure 21: Scatterplot showing the relation between IGETP and poverty rates (2009) for different types of regions

regions than within the more developed and transition regions. It could also be claimed that **concentrating resources in improving those factors linked to green economy potentials could also help the most vulnerable regions to reduce their poverty rates**.

Several pieces of territorial evidence collected in this project suggest that investing in greening the economy can create favourable conditions for the implementation of a number of win-win policy strategies that in the worst case could contribute to improve environmental conditions alone and, in the best and most probable case, could improve collective quality of life, economic welfare and wellbeing in many, not only mutually compatible, but also synergic respects.

6.5. Relating green economy performance and potentials: a regional analysis

In order to analyse the relation between green economy performance and green economy factors, a multiple linear regression model is proposed. Albeit the overall explanatory capacity of the model is rather low (the R^2 is 0.53), the test statistic performed on it suggests that at least one of the seven green economy factors considered in the GREECO project is associated with increased the regional green economy performance shown on Map 6 above.

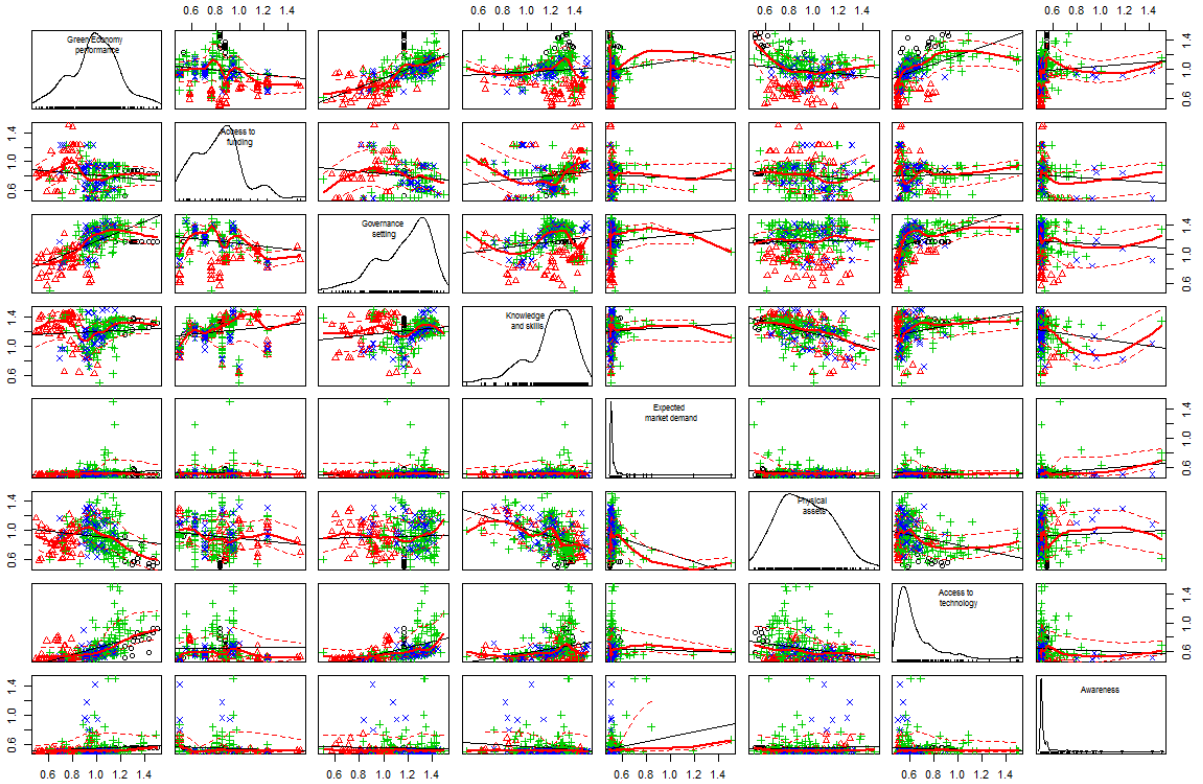


Figure 22: Matrix of scatterplots showing the relationship between green economic performance (as characterised on Section 5 above) and the most relevant green economy drivers[11].

As shown in the matrix of scatterplots presented in Figure 22, the correlation between the regional green economic performance index and the different green economy factors is, in general terms, quite weak. Analysing the different predictors of the model, it turns out that correlation is statistically significant for four out of seven green economy factors, namely 'governance setting', 'knowledge and skills', 'physical assets', and 'access to technology'.

[11] The scatterplots are represented by type of regions according to the level of development: More developed regions (green pluses), Transition regions (blue crosses), Less developed regions (red triangles), and IS, NO, CH (black circles).

	Green economy performance	Access to funding	Governance setting	Knowledge and skills	Expected market demand	Physical assets	Access to technology	Awareness
Green economy performance	1,000	-0,144	**0,612**	0,096	0,120	-0,165	**0,581**	0,109
Access to funding		1,000	-0,173	0,151	-0,024	-0,143	0,017	-0,076
Governance setting			1,000	0,189	0,071	0,034	**0,439**	-0,053
Knowledge and skills				1,000	0,047	-0,443	0,288	-0,162
Expected market demand					1,000	-0,202	-0,024	0,211
Physical assets						1,000	-0,281	0,051
Access to technology							1,000	-0,050
Awareness								1,000

Table 6: Least squares coefficient estimates of the proposed multiple linear regression model

Such results are also confirmed by the correlation matrix shown in Table 6 above. This table proves that at NUTS-2 level **the presence of high values of the good governance indicator tend to be concurrent with higher green technological and innovation capacity**. On the contrary, regions with better access to green technology and eco-innovation capacity tend to be ill-endowed from a physical perspective. This is no surprise if one considers that the latter indicator includes the share of regional extension included in the Natura 2000 network, which tends to be larger in most remote, peripheral and less urbanised regions, which are also those with weaker research infrastructures.

Surprisingly, one of the factors that have been more recurrently mentioned by GREECO case studies, sector assessments and international surveys as being a precondition for the green transformation of businesses, namely 'access to funding and financial support', does not show statistically relevant correlation with the index of green economic performance. This could be related both (i) to the multi-dimensional nature of the green economic performance concept used in GREECO, which makes difficult to assess particular dimensions, such as the – probably differential and specific – impact of financial support schemes on specific features of the green economy, or (ii) to the nature of the indicator used to characterise financial support to green transformations, namely the *combined public/private support to SMEs for increased resource efficiency and/or the production of green products and services* reported by Flash Eurobarometer 381 (EC, 2013c), which to our present knowledge is the only indicator of its kind available at the EU level.

In order to test the first possibility mentioned above, it was built another multiple linear regression model relating those performance indicators characterising exclusively the econosphere (i.e. regional energy and CO2 productivity) and the seven green economy factors considered in the GREECO project. Results illustrate that no correlation trend between the combined public/private support to SMEs and the energy and CO2 productivity seems to be present at the regional level. Apparently, this questions the role that public/private support to SMEs for increased resource efficiency and the production of green products and services may have on the green economy, even from a narrower energy and CO2 productivity perspective. Not so surprisingly, it turns out that at the NUTS-2 level both the multi-dimensional green economy performance and its energy productivity sphere seem to be more related to the regional 'capacity for eco-innovation' and even to the 'non-green' dimensions of the territorial potential, such as the 'quality of government', rather than to the existing financial support and funding mechanisms. This may be an important message to be delivered to EU regional authorities in the face of the New EU Cohesion Policy

2014-2020.

Once again, **the territorial evidence collected in the GREECO project seems to point in the direction of more transformative and comprehensive policy approaches as the most effective stimuli to consolidate green economic transformations**. Basing on GREECO results, ambitious cross-cutting policy approaches could be more efficient than narrower alternatives targeting specific sectors or green economic features, both from a broader as well as from a narrower interpretation of what green transformations entail from the economic perspective.

Although the empirical evidence collected in the project is not enough in itself to deliver a cost / efficiency analysis of the different policy alternatives, it may well be stated that policy support for the different green economy factors that can be modified by policy intervention (i.e. all of them with the exception of the physical endowment), particularly quality of government and regional technologic and eco-innovation capacity, appear to be **no-regret alternatives** that may well contribute to spark or consolidate green economy transitions.

7. The road ahead: setting the agenda for a greener economy in Europe at the regional and local levels

The markets that serve as institutional frameworks for our economic activities are incapable of incorporating the ecological and social concerns of society if they are not regulated appropriately. For this purpose, governments have technical and economic regulatory instruments at their disposal as well as information and innovation programmes.

The *greening* of these policy instruments is primarily the responsibility of EU, national and state government levels, but **regional and local governments are also to varying degrees delegated powers that can enable and drive green transformation**. They include tasks such as physical planning, regional energy provision, housing standard programmes, solid waste and waste water treatment, etc.

Within this framework, the GREECO project has mainly focused on policies with a direct impact on green activities in general and on the economic sectors under analysis in particular. Priority has been given to policies with the 'biggest green economy implications on a territorial level'. Types of policies which have been considered include: EU Roadmaps; Thematic strategies; communications; green papers; white papers; EU directives; EU regulations; voluntary instruments with EU coverage; national legislation transposing the directives; national strategies; regional strategies; regional development programmes; structural and cohesion policy; taxes, levies, fees, charges; Subsidies, like tax credits or subsidised prices, including Environmentally Harmful Subsidies (EHS).

What follows is a synthesis of all policy-related work within GREECO and on the territorial dimension of the green economy in relation to policy development in Europe on European, national and regional level. The detailed policy recommendations can be found in Vol. 5 of the Final Report.

7.1. Potential contribution of the Territorial and Cohesion policies to the green economy

The EU has the ambition to mainstream green economy objectives into all policy areas including

the Common Agricultural Policy, the Common Fisheries Policy, energy infrastructure and trans-European networks, measures addressing the world markets for commodities and raw materials, water policies, climate change adaptation policies, etc. In this context, it goes without saying that contributing to achieve the green economy goals implicit in the Europe 2020 Strategy has also become a major objective of the Territorial and Cohesion policies:

7.1.1. The EU Territorial Agenda 2020

The Territorial Agenda of the European Union builds upon the European Spatial Development Perspective (ESDP) adopted in 1999, which aimed at developing common objectives for the future development of the European territory. The ESDP was followed up by the Territorial Agenda of the European Union (2007), which for the first time declared territorial cohesion as the most important aspect of territorial policies. Territorial cohesion is already an integral part of the New EU Cohesion Policy 2014-2020.

The most obvious green economy implication found in the Territorial Agenda 2020 stems from the strong links with the Europe 2020 strategy and its sustainable growth priority. Indeed, the Territorial Agenda of the European Union has already been reviewed against Europe 2020 Strategy, providing strategic orientations to ensure implementation of the Strategy from a broad territorial perspective (EU, 2011).

But the Territorial Agenda also includes more direct and specific links to green economy. First and foremost, it identifies in the economic and financial crisis “an opportunity for a transition towards a more sustainable and resource efficient economic structures” (EU, 2011, par. 15). Besides, the Territorial Agenda 2020 stresses the relevance of climate change as one of the major challenges faced by regions that might nonetheless create new economic opportunities in sectors such as agriculture, renewable energy production, water management, housing, tourism and transport (op. cit., par. 20). Along these lines, it explicitly identifies energy dependency as one element threatening economic competitiveness in some regions that “are heavily dependent of fossil fuel imports or specialized in energy intensive activities”. Thereby, it stresses the need to shift the focus towards “greener, low carbon economic activities” basing on “renewable energy solutions such as realising the potential of renewable energy resources” (op. cit., par. 22). Similarly, the Priority no. 5 of the Territorial Agenda 2020 supports “decentralized, efficient, secure and environmentally-friendly production and use of renewable and low carbon energy” (op. cit., par. 35).

Interestingly, Priority no. 4 of the Territorial Agenda 2020, which supports global competitiveness of regions based on strong local economies, does not make any specific statement on the green economy dimension. However, several other priorities of the Territorial Agenda emphasise the need to adopt greener and low carbon ways of delivering products and services. For instance, Priority no. 6 advocates the best use of natural and cultural assets through the promotion of “environmentally-friendly jobs” and the strengthening of their “recreational functions” as a complement of conservation policies (op. cit., par. 38).

The Territorial Agenda 2020 thus identifies several challenges and puts forward a number of territorial priorities that specifically emphasise the need for stronger, more resilient and sustainable production systems. These priorities mainly rest on (i) placed-based and integrated governance and planning approaches in cities, rural and specific types of regions for the design of territorial strategies capable of unleashing regional potentials; (ii) improved territorial connectivity for a decentralized, efficient and secure renewable production of renewable energy, and; (iii) wise management of cultural and natural heritage for the creation of new job opportunities based on the recreational functions of ecosystems.

It can thus be concluded that according to the Territorial Agenda 2020 the contribution expected from regions and cities to the green economy transformation requires a placed-based and integrated policy approach, as well as a strong commitment and coordinated actions from policy

makers operating at different geographical levels. These would allow for the exploitation of the multiple opportunities that stem from current and future challenges faced by EU territories, like the availability of affordable and sustainable energy, the mitigation and adaptation to climate change, and environmental risk management.

7.1.2. Structural and Cohesion Policy

The Cohesion Policy supports regional development with a clear investment strategy that aims to increase competitiveness, expand employment, improve well-being, and protect and enhance the environment, providing a close link to the Europe 2020 objectives of smart, inclusive and sustainable growth. The Cohesion Policy focuses on some thematic objectives, or key components. Such thematic objectives are very much in line with the dimensions that are relevant for the green economy.

Along these lines, the new **EU Cohesion Policy 2014-2020** gives priority to investments in low-carbon economy in all sectors, climate change adaptation and risk prevention and management, environmental protection, resource efficiency, sustainable transport and adequate network infrastructures. In particular, the EU Cohesion Policy 2014-2020 will concentrate resources on some key growth sectors with strong green implications:

- Investments under the European Regional Development Fund (ERDF) will be concentrated on innovation and research, the digital agenda, support for SMEs and **the low-carbon economy**, depending on the category of each region (Less Developed: 50%, Transition: 60%, and More Developed: 80%).
- Remarkably, on **low-carbon economy** (energy efficiency and renewables) there will be separate obligations to dedicate ERDF resources (Less Developed regions: 12%, Transition and More developed regions: 20%).
- Similarly, at least 23.1% of the Cohesion Policy budget (i.e. around € 70 billion) will be allocated to investments under the European Social Fund (ESF) to finance training and life-long learning, fight poverty and promote social inclusion.
- Around € 66 billion will be focused on priority Trans-European transport links and key **environmental infrastructure projects** through the Cohesion Fund, which can also boost the development of environmental management activities.
- Last but not least, the urban dimension of the policy will be enhanced by earmarking a minimum amount of resources under the ERDF to be spent for **integrated projects in cities**.

The sustainable character of EU Cohesion Policy 2014-2020 investments is underlined in the Article 8 on sustainable development of the Regulation No 1303/2013 laying down common provisions on the Structural and Cohesion Funds (EC, 2013a). This Article guarantees that the mainstreaming of environment, resource efficiency, climate change mitigation and adaptation, disaster resilience and risk prevention and management are promoted in the preparation and implementation of Partnership Agreements and programmes. Additionally, the Regulation estates that co-financing rate from the Structural and Cohesion Funds to a priority axis may be modulated to take account of protection and improvement of the environment, mainly through the application of the precautionary principle, the principle of preventive action and the polluter pays principle (EC, 2013a, Article 111).

The Regulation also establishes that Member States are requested to “give particular attention to prioritising growth-friendly expenditure, including spending on education, research, innovation and energy efficiency and expenditure to facilitate the access of SMEs to finance and to ensure environmental sustainability, the management of natural resources and climate action, and to ensuring the effectiveness of such spending” (EC, 2013a, Annex 1). The initiatives to attract the largest share of Structural and Cohesion Funds are those with climate change mitigation potential, those preserving and managing biodiversity, and those related to innovative water and

waste management. Managing Authorities are further requested to:

a) direct investments towards the most resource-efficient and sustainable options;

b) avoid investments that may have a significant negative environmental or climate impact, and supporting actions to mitigate any remaining impacts;

c) take a long-term perspective when 'life-cycle' costs of alternative options for investment are compared, and;

d) increase the use of green public procurement.

Last but not least, ex ante conditionalities linked to environmental targets and strategies are also placed to receive Structural and Cohesion Funds. These include a vast array of instruments potentially relevant for green growth, such as ordinary environmental assessment for major projects and Strategic Environmental Assessment for regulations, taking into account climate change adaptation and mitigation needs, and risk disaster resilience (EC, 2013a).

Box 2: *Key policy messages for supporting the green transformation through the Cohesion Policy*

Member States should secure a robust mainstreaming of energy, environment and climate change into the Partnership Agreements with the Operational Programmes for 2014-2020 Programming period. They should guarantee the same level of mainstreaming when it comes to concrete financing of projects including the most energy intensive ones. Countries should use the tool has been developed to measure the carbon impact of investments.

Selected themes from the EU cohesion policy which are important from a green growth perspective include: Territorial assets/territorial capital (e.g. cultural landscapes, natural and cultural heritage, trust etc.); Critical green mass: i.e. green networks, ecological corridors and preservation of areas of high ecological value; Balanced territorial development encompassing different types of territories; Quality of urban nodes, dynamism and competitiveness of cities, sustainability of their structures under a changing climate, their integrated development; Functional areas including urban rural co-operation, integration of border areas, coastal zones; Access to knowledge and diffusion of innovation. Regional clusters of competition and innovation; Greening of transport; Developing energy resources; Sustainability of tourism development.

Countries, regions and cities should find the right balance between security of implementation and innovativeness of projects. [*Relevant for businesses as well*]

Integrated territorial investments and sustainable urban investments are a great opportunity for addressing and greening more than one sector of the economy in an integrated manner.

Areas of intervention where Cohesion Policy will have the greatest effect include: those traditionally handled by local and regional institutions (existing competency or familiarity); where important territorial assets/capacities dictate potential; where regions make investments in public procurement; where new forms of local and regional collaboration between regions and municipalities can have the most impact; where new forms of local and regional collaboration between public authorities and private actors can have the biggest impact.

7.2. Delivering key messages to sector-specific stakeholders

Besides the policies for territorial cohesion there are many different strands of policy at local, regional, national and EU level that can have an impact on both green growth and territories. Within the sector analyses performed under GREECO, the specific policy measures within some of these economic strands was further analysed and the implications from a territorial perspective was made more explicit. A big part of the resulting recommendations presented below are based on the sector assessments and case studies, but unfortunately not all of them can be backed with concrete examples in the Main Report. This is done as much as possible in the Policy Report (see Vol. 5 of the Final Report).

7.3. Multi-level governance for green economy development

Green economy policy efforts are implemented through multi-level governance. While the EU sets the overall directions and targets (through roadmaps, directives and regulations), the Member States translate those to the national context. The regional role in policy definition and implementation is twofold – firstly regions are able to respond to national legislation/targets; secondly, it is through self-driven, proactive regional policies and vision. Strong territorial implication of policies means strong regional governance aspects and regional governments and municipalities often bear the responsibility for the implementation. Such policies also take into account the need to consider specific local characteristics for a successful implementation. This comes as recognition that regional diversity and the need for place-based approaches to increase Europe's competitiveness are central also from the green economy perspective.

7.3.1. The role of the national level governance

Member States need to transpose the EU directives into their national policy framework. The strategic vision and development directions of a country are formulated on a national level and the key strategic priorities are included in national level programmes which guide regional and local strategies. National level is responsible for coordinating the developing of strategic vision for the future of a specific sector of the economy. In the case studies GREECO identified a number of strong national policies steering the transition towards green economy.

Box 3: *Key policy messages to national authorities*

National governments could embark on very transformative policy paths similar to the German Energy Concept 2050 and to the Danish Energy Economy. In order to speed up the green economy transition, more policies need to have a transformative character to support a complete shift in the paradigm on which current patterns of production, consumption, working and living are based. All mechanisms and systems of the national government from research to funding and governance should be geared towards this transformative goal.

Well-thought national feed-in tariffs are one of the best policy approaches to stimulating development of the RES. The level of the feed-in tariffs should be sufficient to serve as a business driver and incentive but not too big. Germany's Renewable Energy Act (EEG) has been a major driver for RES development through a well-designed feed-in tariff.

The central national level has a **strong responsibility for stimulating technological development** across the sectors such as RES and energy efficiency but also water technologies.

The initial momentum of **efforts related to access to knowledge and public awareness** should also be given by the national level then taken up by lower governance levels.

Adopting **Market-based Instruments (MBIs) in different sectors** is within the remit of the national governments.

Defining of a **smart approach towards R&D&I** is mainly driven by national governance especially in relation to programming the Structural and Cohesion Funds.

7.3.2. Regions as driving forces in the green economy

Regional governments are important in the green economy as they have a significant role in 'translating' EU policy objectives into concrete measure on the ground. Regions also have a great oversight of both local assets (e.g. RES potentials, clusters, know-how, etc.) and environmental challenges. They also provide a suitable governance level by reaching economies of scale.

GREECO identified a number of ways in which the role of the regions is manifested in the

transition towards the green economy such as: governance overlaps with geography in waste and water management; cooperation between municipalities as a key to success; Puglia (Italy) - Regional planning for RES and innovation: opportunity for an integrated approach and network contracts for innovation and development; Jämtland (Sweden) - coordination for higher efficiency and monitoring and data management essential for efficiency; South Transdanubia (Hungary) – Regional Energy Strategy: the region as a bridge between the state and local authorities.

Box 4: *Key policy messages to regional policy-makers*

Regions have a particularly important role when the administrative governance overlaps with the geographical boundaries. Regional cooperation and coordination is an important factor for greening a number of sectors including enforcement of legislation.

Regions should make use of the EU LEADER Community Initiative to promote green growth and in such a way promote the participation of local actors. This is particularly suitable for agriculture and tourism.

Regional authorities are critical for the successful implementation of green building and in particular of the Directive on the Energy Performance of Buildings. Municipal authorities are key actors because they are generally responsible for land use planning and development.

Regions in countries with strong regional autonomy are key to **formulating higher regional ambitions** by setting up higher targets and by providing additional incentives. Such is the case in Green Cornwall (UK) Strategy with high ambition, measurable results and a green infrastructure. Navarra (Spain) is another excellent example developing strong and ambitious regional policies through wide consultation.

Regions have an important leverage in the field of innovation through the Regional Research and Innovation Strategies for Smart Specialisation (RIS3) and are in the position to promote partnerships, networking and establish regional technology and innovation institutions.

Regions can easily rely on cultural and natural identity and strengthen it additionally. This is very relevant for the tourism sector where certain regions can specialise in eco-tourism. In Southern Estonia the Regional Strategy for Sustainable Tourism is relying on regional assets for green growth.

The regional councils have a strong responsibility in coordinating work and improving general efficiency of operation. They are also in the position to develop a monitoring system concerning the green economy and improve data management in general. Such is the case in Zealand (Denmark) where regions act as coordinators and catalysts.

Regions have an important role in development of RES through physical planning and permitting. Zealand Region has a very important role in this respect. In the case of Puglia (Italy), regional authorities develop policy initiatives with the support of the recently created Regional Agency for Technology and Innovation (ARTI).

Regions are extremely important when it comes to networking and coordination. They could facilitate the coordination between universities, public and private research centres and other institutions in different areas such as technology development and transfer and innovation. One of the key factors behind Puglia's (Italy) success in green innovation and research sector is its institutional framework that is driven by regional clusters and networks.

The Public Private Partnerships are important instrument in the hands of regions. Companies could participate in international innovation projects and raise the level of awareness on new opportunities for innovation. In Zealand (Denmark) an important instrument in implementing the regional development strategy is the public-private partnership 'Growth Forum', which has adopted the Industrial Development Plan.

7.3.3. Cities as major actors in the transition to green economy

Urban areas are growing in importance and most of Europe's GDP is produced in cities. People live, work, commute and consume in cities. Re-construction and construction of buildings are most intense in urban centres and a big part of tourism takes place in cities. Cities are also home to most environmental problems and their causes such as air pollution, waste generation, water consumption and sewerage dismissal, noise disturbances, etc. Thus, in order to transition to green economy there is a need to capitalize on the role of cities and urban centres and to realize the opportunities that cities have in realizing this process.

The local governments are important for setting the conditions for the transition to the green economy, including the: **legal system** (in favour of environmental protection and social justice); **institutional mandate** (all sectoral and decentralized institutions tackle environment as a cross-cutting issue); **public concern** (public demands to address environmental degradation and to care for local environmental assets are significant); **public and media advocacy** (mass media and NGOs are able to raise difficult policy issues in relation to the green economy); **leadership** (local leaders are prepared to listen, to change policy and to be accountable); **communication and transparency** (there are different ways to access and share information about environment-economy links), and; **cooperation** (there are shared initiatives and processes allowing actors to collaborate).

GREECO identified a number of possibilities for cities playing an important role in the transition towards a green economy, such as: the **Covenant of Mayors and other voluntary agreements** as instruments for increasing the ambition, municipalities as enablers of **industrial ecology networks** of companies for transformative waste management, crucial role of cities in **green transport**; greening the city administration; innovative local funding tools; **green public procurement**, etc.

Box 5: *Key policy messages to policy makers at the local level*

Communication: Local government can use communication to stimulate community buy-in into the green economy transformation of societies.

Active involvement: More and more often community groups can take up the initiative to deliver green economy actions.

Financial support: Local government can help to set the context for new inclusive green businesses. Jämtland (Sweden) has been providing complementary funding to EU projects. The municipality of Östersund is in the process of developing a new local funding form for green ideas. It would be funded by a municipal CO2 fund where it would be possible to set money to climate compensate for the CO2 emissions caused by travelling.

Cities have a number of instruments for influencing the greening of the economy through spatial planning and permitting. Physical planning could make an impact on RES development, buildings and transport. In Cornwall (UK), with their physical planning powers, the local authorities can enforce energy efficiency standards in new buildings, plan for urban structures that minimise car transport needs, help reconciling conflicts of interest in local planning of RES and plan for low-carbon district heating, green infrastructure and sustainable transport.

Cities have a big leverage for change of paradigm in waste management and set much more ambitious targets. For example, London has set targets for 45% municipal recycling/composting by 2015; 70% commercial recycling/composting by 2020 and 95% of construction and demolition waste by 2020**.**

Local services to facilitate access SMEs to innovation knowledge. SMEs will also depend even more on knowledge flows and institutional support available within their region.

Behavioural changes. The transition to green economy will also depend on how fast firms and people learn to appreciate their added value. These changes and learning processes mainly

happen at the local level.

Cities can become a part of international networks such as the Covenant of Mayors and national green economy commitment arrangements. Almost all municipalities in the Danish region of Zealand are signatories to the Covenant of Mayors and national green economy commitment arrangements. These commitments include not only commitments to reduce energy waste and emissions in the service institutions of the municipalities, but also to help the private sector in the territory of the municipality to become more resource efficient.

Cities have a crucial role in greening the transport sector. Östersund has been very active in developing 'green traffic' (including e.g. promoting the use of green cars and especially biogas, developing cycle traffic and informing about transport sustainability). The municipality has a permanent department for green traffic with two permanent employees and it has successfully worked towards decreasing the climate impact of travels and transport in the municipality.

7.3.4. Particularities of rural territories in the transition to green economy

According to Eurostat, around 23% of the EU population lives in rural areas and 35% lives in intermediate regions (2012 data). Agriculture, tourism and fisheries are the key sectors in rural areas which remain of extreme importance to the European Union. Therefore, the greening of these sectors *has to take place* in rural areas.

GREECO has identified a number of ways the transition towards green economy in rural areas can take place such as: Southern Estonia: LEADER – bottom-up initiative for sustainable tourism; Community involvement and information; Vision for tourism in Gozo, Malta; Waste management in sparsely populated, rural regions; Treated sewage effluent as a cheaper source of water in Malta, Waste water recycling Moriso project; Potential for biomass production in Southern Transdanubia (Hungary) and role of food industry; role of economic instruments; Jämtland (Sweden) - greening the transport sector as a key to greening the economy of a rural region; Lack of qualified labour as a major stumbling block to greening the bioeconomy sector.

Box 6: *Key policy messages to rural territories (most of the recommendations are valid for remote regions as well)*

Rural regions should benefit fully from the European Agricultural Fund for Rural Development (EAFRD) by **streamlining environment and climate change into as many thematic objectives as possible**. This is to be done through the Partnership Agreements and the Operational Programmes. [*Valid for remote regions as well*]

Rural territories will benefit significantly if the territorial approach of Cohesion policy is taken up through the Community-led Local Development, designated as **LEADER**. Regional networks should be shifted more towards greening of agriculture from a supply/demand perspective at the same time strengthening rural and regional development agendas. For example, the eight LEADER groups in Southern Estonia region have played a significant role in promoting sustainable tourism development, more environmentally-friendly agricultural practices and alternative construction techniques. [*Valid for remote regions as well*]

The Water Framework Directive objective of efficient use of water resources is particularly relevant for agriculture which is one of the biggest water users in the economy. **Rural regions should take advantage of waste water as a resource** and reuse of waste water and grey water is important for stimulating growth in water scarce regions.

Regions should reduce agricultural production with intensive use of fertilisers and pesticides as well as an excess agricultural production. These measures should be integrated in the **reformed CAP** but also within all relevant national and regional policies.

There is a big potential in modernising agricultural buildings and diversifying use of energy. Support for this could come from the Cohesion Policy but also through other funds.

Develop the labour force and skills in the agricultural sector and improve the capacity for restructuring the agricultural sector. [*Valid for remote regions as well*]

Further research is needed on the spatial implications of green energy production in order to ensure that policy development across different sectors, and for different strategic planning goals, are mutually reinforcing.

There is a need to make tourists more sensitive towards the eco-labels for greener agricultural tourism. A good example is the Tourism Development Plan in Southern Estonia 2014-2020 that promotes an increased application of Green Key eco-labels by the accommodation establishments, integrating the principles of sustainable waste management in Soomaa and development of local eco-marks for Southern Estonian products. [*Valid for remote regions as well*]

The **food industry** is a major opportunity for rural areas to create additional jobs outside of agriculture and forestry. Local and regional policies should stimulate processing of 'bio' and 'eco' agricultural products within the region.

Greening the economy in a sparsely populated and peripheral county is highly dependent on greening the transport sector. Jämtland (Sweden) us a good example. Here, the transport sector is responsible for 57% of GHG emissions. The county has actively been promoting 'green traffic' (including e.g. use of biogas). An example of this is the Green Highway project that resulted in a fossil fuel free transport corridor from cost to cost between Sweden and Norway.

8. Dissemination activities

8.1. Presentations delivered by TPG members

Hansen, Anders Ch. (2012). Ecological Economics and Rio+20: Contributions and Challenges for a Green Economy. Poster session presented at ISEE 2012 conference; 2012 June 16-19; Rio de Janeiro, Brazil.

Hansen, Anders Ch. (2014). Delinking, recession and recovery in the transition to the low carbon economy. Presentation to be delivered at ESPON 2013 Programme Workshop: 'Green Economy in European Regions?'; 29 September 2014; Brussels, Belgium.

Berlina, A. (2014). Green growth in different economic sectors – how does it work in practice?. Presentation to be delivered at ESPON 2013 Programme Workshop: 'Green Economy in European Regions?'; 29 September 2014; Brussels, Belgium.

Feliu, E. (2011). GREECO. Presentation delivered at the ESPON 2013 Programme Internal Seminar 2011: 'Sustainable Territories'; 29-30 November 2011; Kraków, Poland

Feliu, E. (2013). GREECO contribution to Workshop 6: Developing an integrated territorial approach to recovery & resilience - Environmental Resources, Climate Change and Risk Prevention. Presentation delivered at the ESPON 2013 Programme Open Seminar 2013: 'Territorial co-operation for growth and jobs'. 13-14 June 2013; Dublin, Ireland.

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Rasmussen, R.O. (2014). Conference on Change and adaptation in socio-ecological systems, Department of Arctic and Marine Biology, University in Tromsø 28-30 April 2014. Presentation by Rasmus Ole Rasmussen on Green Growth and Change and adaptation in socio-ecological systems.

Rasmussen, R.O. (2014). Conference of Peripheral Maritime Regions – Baltic Sea Commission and the County Council of Norrbotten. Thursday 8 May 2014, Luleå. Presenter and Discussant on "The World is too round to sit in a corner and grump" – Aspects of Green Development in the Baltic and Arctic Regions.: Rasmus Ole Rasmussen

Rasmussen, R.O. (2014). Arctic Connections – Regional Cooperation Networks in the North of Europe. EPRC-European Policies Research Centre, The Scottish Government, Glasgow, Scotland 10-11 June 2014. Contribution to workshop: Diversifying Regional Resource Based Economies. Presenter and discussant: Rasmus Ole Rasmussen

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Tapia, C. Feliu, E., Peña, I. (2012). Territorial Potentials for a Greener Economy: The European Perspective. Poster session presented at Klimagune Workshop 2012; 2012 June 8; Bilbao, Spain.

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Zhechkov, R. (2014) Training for young NGO leaders in Moldova (12 May 2014) on 'Introduction

to the green economy'. The training was part of a Master Class within a SIDA-funded project. GREECO examples and findings were used.

Zhechkov, R. (2014) Training for young NGO leaders in Belarus (29 May 2014) on 'Introduction to the green economy'. The training was part of a Master Class within a SIDA-funded project. GREECO examples and findings were used.

Zhechkov, R. (2014) Workshop on Streamlining Investments in the Waste Sector in Ukraine (28 May 2014) organised by REC. Certain insights and examples from GREECO sectoral report on waste were used.

Zhechkov, R. (2014) Workshop on Financing Eco-innovation and Green Investments in CEE (9 July 2014) organised by REC. Certain insights and examples from GREECO have been used.

8.2. Publications of TPG members

Hansen, A. Ch. Paper on 'The wind energy potential and potential resource rent in European regions' currently under preparation. To be submitted to Energy and Environment Journal.

Hansen, A. Ch. Paper on 'The PV energy potential and potential resource rent in European regions' currently under preparation. To be submitted to Energy and Environment Journal.

Hansen, A. Ch. Paper on 'Delinking CO2-emissions from economic growth in European regions' currently under preparation. To be submitted to Energy and Environment Journal.

Tapia, C. Paper on 'Regional potentials for a greener economy' currently under preparation. To be submitted to European Planning Studies Journal.

Zhechkov, R. (2014) GREECO examples and findings have been included in a report on social aspects (drivers and enabling conditions) for transition to green economy - within the ENEL Foundation with Venice International University.

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