

GREECO

Territorial Potentials for a Greener Economy

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Main Report

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

1.1. “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” (United Nations (UN), 2012). Moreover, the final document emphasises “that fundamental changes in the way societies consume and produce are indispensable for achieving global sustainable development” (United Nations (UN), 2012).

Other international organisations have contributed with similar definitions of the green economy. They all stress that a green economy is able to deliver progress in the social, ecological and economic dimensions simultaneously (Division for Sustainable Development (UNDESA), 2012). Social progress cannot be measured by GDP growth alone. Progress in the ecological and social dimensions are as important.

These definitions depict a shared vision of a 21st century green economy. Unlike the typical industrial economy of the 20th century, the green economy is inclusive and able to prosper without over-consuming the sink, resource and space budgets provided by nature. This is only possible if its system of fixed capital and supply chains (the econosphere) is designed for minimising the consumption of the resources, sinks and spaces of nature.

This does not in any important respect differ from the principles of sustainable development agreed upon in the documents of the Rio Summit in 1992. On the contrary, the concept of the *green economy* reflects the *operationalization* of the sustainability principles. These principles include balances between the present and the future generations, between social, ecological and economic concerns and between global interests and national self-interest.

As argued within the Interim Report of GREECO project (ESPON & Tecnalía, 2013), the traditional three spheres mentioned above (environment, economy and society) can be enlarged to include yet one additional sphere where the intrinsic sustainability of the socio-economic system may be tested against the spatial dimension. This additional sphere of sustainability is the territory. This perspective rests on the idea that not only environmental sustainability but also territorial equilibrium and cohesion are a requisite for a *genuine* socio-economic development to take place. Accordingly, the green economy, as the operationalization of sustainability, should contribute to strengthen the territorial balance too.

The 2014-2020 legislative proposals for the new EU Cohesion Policy 2014-2020 adopted by the European Commission (EC) on 6 October 2011 also seem to share this multi-dimensional goal. According to the new Regulation 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).

Against this background, regional and local government bodies are increasingly taking responsibility for the progress towards a green economy on their territory. The Covenant of Mayors, for instance, initiated by the EU, has now more than 4000 signatories – cities, towns and municipalities taking responsibility for the transformation to a low carbon economy on their territory. Many of them set a green economy as their vision for the future of their economy or even the backbone of their economic development strategy.

The formulation of operational programmes for progressing towards a green economy a framework of indicators can be very helpful. It allows the formulation of ends and means in specific targets and instruments.

The implications of these prospects for a green economy for the regional economies are at the center of the research interests of the GREECO project.

In the GREECO project, the focus has been on the nexus between the territorial, ecological, and economic dimensions with only peripheral reference to the social dimension. This is not because the social dimension is unimportant, but to avoid spreading the resources in too thin layers.

The project has explored what the green economy and the transformations to it looks like from the perspective of 10 different case study regions and from the perspective of 9 economic sectors. The green economy has also been studied from the birds eye perspective using the available statistical information with acceptable coverage to identify regional disparities and geographical patterns.

Whereas it is not the aim of the project to deliver a blueprint for a green economy, the studies have led to the formation of ideas on policies that could enhance the role of local government in the green transformation of the economies.

1.2. Academic and political debates on the green economy

Academic and policy debates on the green economy have mainly developed along four related conceptual strands, as discussed below:

1.2.1. Economic progress without ecological decline?

The main dilemma in relation to transitioning towards a green economy concerns the feasibility of achieving progress in all the relevant dimensions at the same time (environment, economy, society and territorial cohesion and the overlaps between them). In particular is it really possible to achieve economic growth without ecological decline?

A very illustrative example is decarbonisation of the economy: in the economies typical for Europe in the 20th century, fossil energy use would be expected to grow when the economy grew. This is because the fixed capital stock was (and to some extent is) designed to use fossil flows to produce its services such as transport. This carbonised system of fixed capital and supply chains (the econosphere) effectively links economic growth to growing flows of fossil fuels. In contrast, a green economy is characterised by a different design of the internal flows and mechanisms within the econosphere. As the fixed capital stock of oil-, gas, and coal boilers, combustion engines, heat wasting buildings etc. are replaced by wind turbines, photovoltaics, heat pumps, electro-motors, near-zero-energy buildings etc., the econosphere decarbonises. In other words, economic growth becomes delinked from growing CO₂-emissions. The EU has agreed on policies in this direction, but the pace of the transformation is debated.

1.2.2. Ecological progress without economic decline?

A related question is whether it is possible to achieve progress in the ecological dimension without decline in the economic dimension.

The level of production and employment of an economy depends on the demand at relevant markets and its market share of this demand. The aggregate demand relevant to an economy consists of consumption and investment expenditure (private and public) and exports. Each of these aggregate demand components can be decomposed in sub-groups of products. In a period with idle production capacity, higher investments in green fixed capital means higher demand and thus higher production and employment. The market shares eventually depend on the competitiveness, that is, the cost level of inputs, the efficiency with which they are used and the performance of the product relative to the competitors.

From this perspective, resource efficiency will be an increasingly important parameter shaping EU's competitiveness in the near future. In particular, energy bill will be a relevant parameter to be considered, as the North American competitors face much lower energy costs and countries like Russia and Ukraine continue to subsidise energy use. Without dramatic progress in energy efficiency it will be more economic for Europe to import energy intensive goods from such economies.

The learning costs associated with driving renewable energy technologies forward by using them have to be shared by all energy users. Industries that carry a disproportionally large share of these costs risk their competitiveness. The cause of this is, however, not the progress in the ecological dimension, but the distribution of costs on industries.

A green new deal was suggested as a response to the cascading crises after 2008. Advancing green investments that would otherwise take place later on would be an effective instrument to restore the investment demand in the economy (Edward B. Barbier, 2009; United Nations Environmental Programme (UNEP), 2009). The EU Commission shared some of these views in its recovery plan from 2008 (EC, 2008), but did and does not control the government budgets required for realising the green new deal. The fiscal consolidation strategy from 2011 pulled in the opposite direction, but was relaxed in 2013.

The OECD also presented the transformation to a green economy as a more long-term growth strategy in "Towards Green Growth". The strategy addresses the "twin

challenges: expanding economic opportunities for a growing global population, and addressing environmental pressures that, if left unaddressed, could undermine our ability to seize these opportunities” (OECD, 2011).

Against this backdrop there is no reason to expect economic decline to follow from progress in the ecological dimension (although it might occur if the wrong policies and strategies are implemented). On the contrary, the green transformation can lift employment in times of unemployment and provide a long-term growth paradigm.

1.2.3. Green growth without green economy?

It is, however, possible that the production of green investment goods such as wind-turbines and e-cars in an economy can increase without bringing the economy closer to being a green economy.

All technological innovation is product innovation as well as process innovation at the same time. In a closed economy without foreign trade any product innovation would also be a process innovation in the same economy. However, the European economies interact in globalised markets. The investment products of one economy are invested in another economy – even more so when it comes to regional economies. Successful innovation of green solutions leads to green production in one region and substitution, efficiency or recycling in some region, but not necessarily the producing region. Thus, a region aspiring to become a green economy cannot concentrate on developing green products, but needs also to support the transformation of the ecosphere at its territory to comply with the regional ecological budgets. Of course good policies can make this transformation lead to a local market supporting the product innovation of the regional economy.

1.2.4. Green innovation without green economy?

The “rebound effect” or “Jevons’ paradox” controversy points to the fact that resource efficient technologies reduce costs of the production based on the resources in question. E.g., more efficient injection technology increase fuel-efficiency, but the savings on the fuel bill can be spent directly on more fuel if the low fuel costs per kilometre increases demand for car transport or induce consumers to purchase more powerful engines in larger and heavier cars. Indirectly they can be spent on other goods with high content of energy. Thus, the progress in resource efficiency must be accompanied by resource taxes, quotas, technical standards etc. guiding the use of efficiency gain away from self-defeating resource consumption.

Against all these research background and policy development, this project is expected to meet the demand for analytical methods approaches and supporting local and regional practitioners and policy makers looking for ways to detect territorial potential involving a European perspective and to turn challenges into potential.

1.3. Defining the balances

The international economic and scientific organisations have contributed to defining indicators and goals at the global level for a number of green economy features.

The IPCC has defined a carbon-budget available to developing economies such as the EU (Intergovernmental Panel on Climate Change (IPCC), 2007). According to it, GHG-emissions must decline gradually towards 2050 where they must be less than 5-20% of the 1990 emission level. This vision has been endorsed by the EU.

The World Bank has defined the “adjusted net national income” as the upper limit for how much an economy can spend on consumption and still sustain that level of consumption in the future (The World Bank, 2011). However, it follows naturally that it contains no information on ecological balances. These are matters of natural science.

The UN has operationalized the poverty eradication goal by defining the millennium goals (MDGs) as the minimum resources that should be available for the poor to have a chance for working themselves out of poverty (United Nations (UN), 2013).

The EU and the OECD have addressed the question of how social progress should be measured if not by GDP (EC, 2009). One of the ideas is to develop a similar one-dimensional measure as a weighted average of sub-indices representing all the balances.

The weights used to compute these indexes, however, are in effect prices of how much of progress in one sub-index is needed to offset decline in another. These weights reflect the importance of progress in each sub-index versus the other sub-indices. Estimates of such weights can be retrieved from surveys of citizens or their political representatives, but they cannot be expected to be stable. Rather they are likely to vary by time, country and region. This makes it difficult to compare over time and between countries or regions. Moreover, the implicit rates of substitution between the sub-indices of the three dimensions imply that e.g. a rising poverty rate can be offset by less overconsumption of the carbon budget. This is, however, not in line with the sustainability principles of balance.

Against this backdrop, the GREECO project has chosen to use a multidimensional approach to indicators of challenges, potentials and performance. 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. The GREECO datasets include indicators of very different types such as:

- ecological pressure vs budgets, e.g. of emissions
- the catch-up potentials of the regional economy with respect to resource efficiency
- the delinking of fossil energy use from economic growth
- the natural resource potential for substituting fossil (and in some regions nuclear) energy by renewable energy
- the use of the innovative potential to develop green solutions
- the use of the productive potential to produce green solutions
- the territorial dimension of green research and innovation
- the role played by local stakeholders within international initiatives oriented towards the establishment of more ambitious environmental targets

1.4. Regional carbon-budgets and actual emissions

The transition of the brown economy towards an economy in ecological balance involves particularly three types of changes of the econosphere:

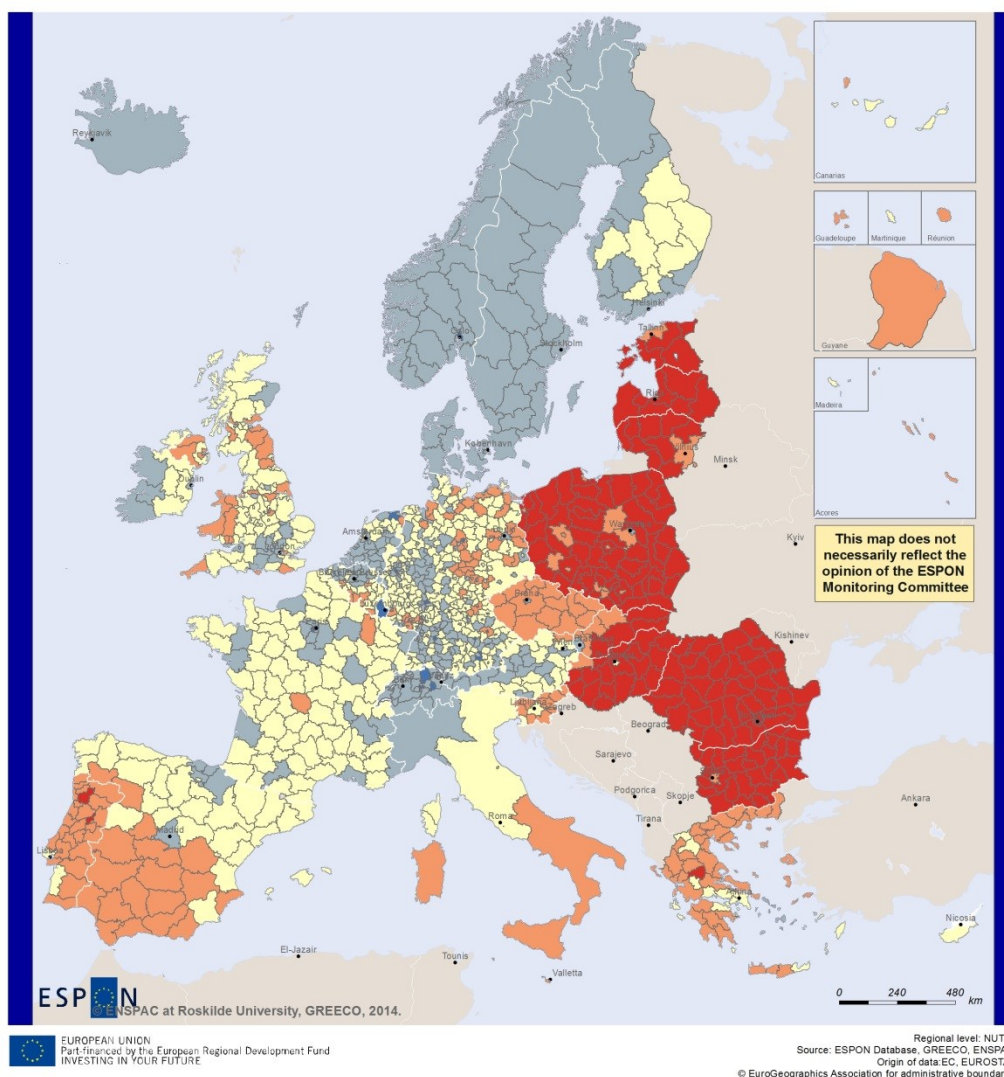
- substitution of unsustainable with sustainable flows
- more efficient use of materials and energy
- development of circular supply chains

Among them, decarbonisation of the economy is probably the most important transformation towards a green economy.

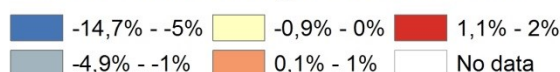
The EU has developed an operational policy framework for decarbonisation consisting of policy-instruments aimed at reducing the fossil fuel use to limited carbon-budgets. The progress of decarbonising the economy is monitored by comparing the actual emissions to the carbon-budgets. A similarly operational framework can be developed for the regional economies if primary data on energy use are collected with an EU-harmonised approach. The budget component of the framework could be developed by taking the existing carbon-budget framework one step further to the regional level.

The carbon-budgets are 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 to 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 is then 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.



Regional annual growth rates of GHG emissions 2013-2020 following similar income level adjustments as in the effort sharing decision. Per cent.



Map 1 Annual carbon-budget change for regional indicative carbon-budgets following national effort-sharing patterns. Per cent per year, 2013-20

Map 1 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.

The patterns of carbon-budget change showed on Map 1 are differentiated between regions within the same member-state according to the regional income disparities within the countries. 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.

However, 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 where 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. Thus, budgets should rather be adjusted according to the *actual* growth of population, employment and production. Regions in decline do not need increasing carbon-budgets as some growth regions do.

2. 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.

The five sectors under analysis in GREECO are: Bio-economy (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 and waste management, building/construction and green research activities including the implementation of clean technologies such as carbon capture technologies.

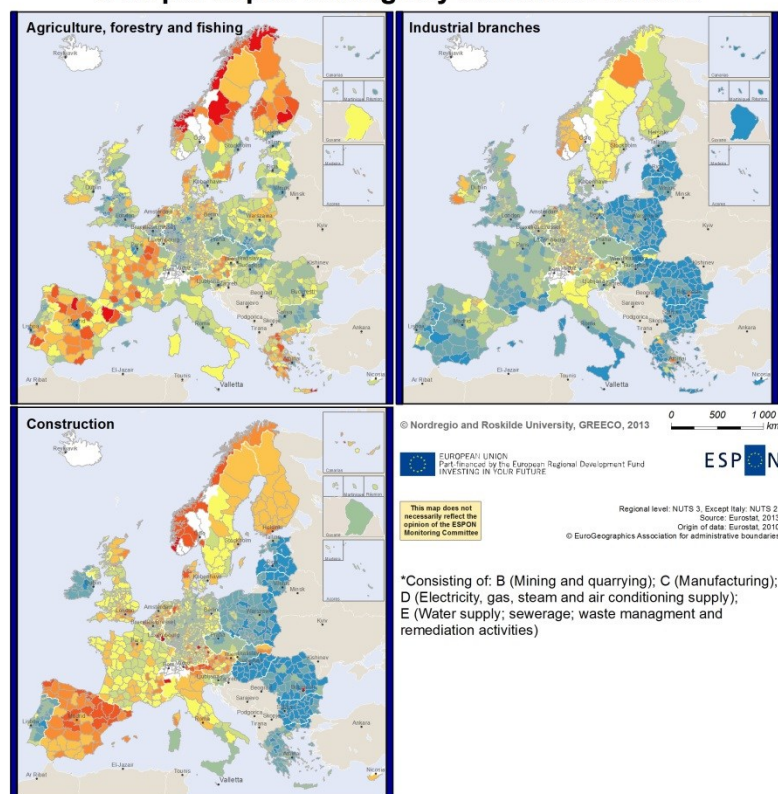
2.1. Spatial distribution of sectors in Europe

A first overview of the spatial distribution of the sectors is shown on the miniature maps 1-3 and 4-6 on figures 1 and 2, 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 on the miniature map 1 are agriculture, forestry and fishing and the miniature map 3 includes construction. The miniature map 2 consists of selected NACE sectors: B (mining and quarrying), C (manufacturing), D (electricity, gas, steam and air conditioning supply) and E (water supply, sewerage, waste management and remediation activities), which are referred to as industrial branches. The miniature map 4 combines all GREECO branches included in both figure 1 and 2. Under the professional services on the miniature map 5 the following NACE sectors are included: K (financial and insurance activities), L (real estate activities), M (professional, scientific and technical activities) and N (administrative and support service activities). Finally, the miniature map 6 includes G (wholesale and retail trade), H (transporting and storage), I (accommodation and food service activities) and J (information and communication) activities.

Looking at Figure 1 that shows the territorial distribution of the bioeconomy, industry and building and construction sectors across the EU, it can be noticed that the development of these sectors has a diversified and quite heterogeneous territorial pattern. On the one hand, there are substantially more industrialised countries/regions in the western and northern Europe with high rates of construction and building activities. 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 the highest in the Nordic countries (especially Norway), Spain and some regions in the central Europe. In addition, the bioeconomy sector plays an important role in the economies of the Nordic countries, primarily due to large forest reserves and fisheries, but also in the Southern Europe. On the other hand, there are Eastern and South-Eastern countries with a significantly lower GVA of the industrial and construction sectors, but at the same time a fairly well represented bioeconomy sector.

Regional economic specialisation 2010 GVA per capita among key economic sectors



Agriculture, forestry and fishing

3 - 87
88 - 200
201 - 345
346 - 522
523 - 750
751 - 1 048
1 049 - 1 469
1 470 - 2 221
2 222 - 4 535

Industrial branches*

172 - 1 799
1 800 - 3 097
3 098 - 4 531
4 532 - 6 351
6 352 - 8 586
8 587 - 12 345
12 346 - 19 658
19 659 - 31 806
31 807 - 58 164

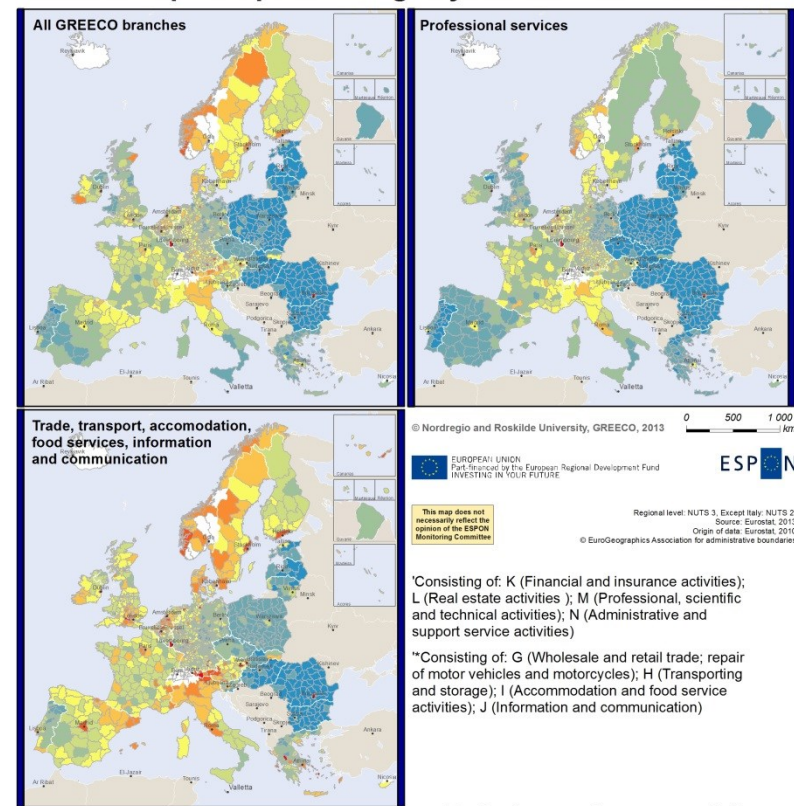
Construction

22 - 440
441 - 753
754 - 1 059
1 060 - 1 344
1 345 - 1 645
1 646 - 2 064
2 065 - 2 563
2 564 - 3 473
3 474 - 9 002

No Data

Figure 1 (miniature maps 1 to 3) Regional economic specialisation. GVA per capita among the bioeconomy, industrial and construction sectors.

Regional economic specialisation 2010 GVA per capita among key economic sectors



All GREECO branches

1 318 - 6 442
6 443 - 10 861
10 862 - 14 336
14 337 - 17 939
17 940 - 22 320
22 321 - 27 975
27 976 - 36 597
36 598 - 50 919
50 920 - 75 533

Professional Services*

274 - 1 854
1 855 - 3 614
3 615 - 4 993
4 994 - 6 267
6 268 - 8 062
8 063 - 10 839
10 840 - 15 397
15 398 - 21 349
21 350 - 35 837

Trade; transport; accommodation and food services; information and communication**

273 - 1 229
1 230 - 2 319
2 320 - 3 284
3 285 - 4 295
4 296 - 5 546
5 547 - 7 091
7 092 - 9 388
9 389 - 13 296
13 297 - 20 306

No Data

Figure 2 (miniature maps 4 to 6) Regional economic specialisation. GVA per capita among all GREECO branches; professional services; trade, transport, accommodation and food services, information and communication

Besides the East-West divide, there is a clear pattern of the sectors' distribution depending on the urban development and population dynamics. The lowest contribution of the bioeconomy sector to the GVA is in the capital regions across all countries due to the expansion of urban land use as a consequence of urban sprawl, for instance. Moreover, in many capital regions across the EU the GVA of the building and construction sector is quite high, which indicates that the urbanisation process is taking place and creates a high demand for new buildings. In some cases the GVA of the construction sector tends to be higher outside the capital cities, which shows that the urban areas are growing beyond the city borders (e.g. Paris, London).

The Figure 2 shows that 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 (e.g. along the Mediterranean coast). The importance of these activities is lower in largely uninhabited and sparsely populated regions in the North.

Looking at the map combining the five maps together (GREECO branches) it can be seen that the Nordic countries are more innovative and prosperous in comparison to developing eastern and southern parts of the BSR.

2.2. Main findings from sector analysis: Highlights of 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 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. Food waste is still a major problem in developed countries.

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) had 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.

Most of Europe's commercial fish stocks are over-exploited due to increased quantity and the 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 could be mentioned an 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.

Many countries have managed to improve energy and resource performance of the **buildings** 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.

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.

Eco-innovation sector in Europe is growing relatively rapidly, especially when it comes to eco-industry sector (mainly environmental technology). 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. However, only little evidence of correlation between high eco-innovation performance and higher environmental performance in the regions was found.

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.

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. Biofuels are currently only about 6 percent of all energy.

The development of a more sustainable **tourism** has been increasingly prioritised in the EU. Some segments of tourists are becoming more environmentally aware and engaging in ecotourism and other niche-products, and an increasing demand for more sustainable tourism has been reported. 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.

The share of **waste** being recycled and reused, composted and incinerated has been increasing 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.

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, which is an indication of more efficient water consumption during

the industrial processes. Over the past 25 years a significant progress has also been achieved in improving the ecological status of the water bodies due to reducing the pollution, improving waste water treatment, reducing industrial discharges, and reduction in the use of fertilisers.

2.3. 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. GREECO views the sectors in a 'hierarchy' of territorial-bound 'building blocks'. In the sector hierarchy triangle (Figure 3) the sectors with the strongest territorial bounds are at the bottom.

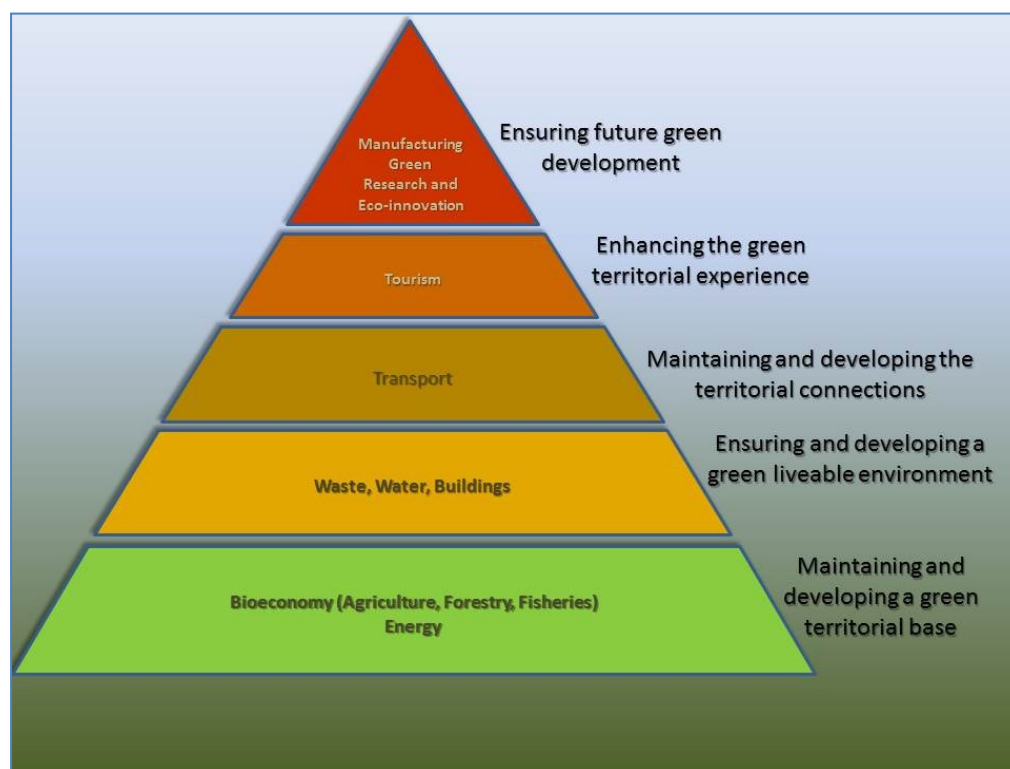


Figure 3 Territorially relevant sectors in the green economy and the main focus of the sectors

As shown on Figure 3, the bioeconomy 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. For the sectors at the bottom of the triangle (primary sectors of the economy) the main aspects of the greening relate to maintaining and developing of a green territorial base. These sectors are the largest users of land, which often results in land use competition.

Therefore for a greener development of these sectors addressing the **land use multifunctionality**, taking into account interconnections between economic and

ecological values and incorporating multifunctionality in producing food, renewable energy and recreation is essential. Furthermore, greening of the sectors also addresses management inputs that have a relation to the land and resource base but may be alien to the environment. For instance the question of reducing input of pesticides and fertiliser that have a negative impact in the long run on the quality of the land base, but also generates impact on vital resources such as water and biodiversity that are a part of the quality of the base.

In the center of the sector hierarchy triangle are waste, water and building sectors. These sectors are crucial for ensuring and developing a **green livable environment**. These sectors are also bound to a territory and require a significant amount of land but they are less dependent on the landscape features (e.g. soil fertility and availability of natural resources) in comparison to the bioeconomy and renewable energy development. The key aspects with regard to greening of these sectors are prevention and minimisation (waste) through improving **resource efficiency** (water, energy) and the re-use of resources. An important issue in this context 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**. 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.

Overall, the conceptual elements of the green economy which are relevant for the sectors studied can be grouped around 6 key topics as shows in the text box below:

Box 1 Key topics of the green economy that are relevant for sectors

1. *Key environmental relation* and the way we consume key natural resources (e.g. supporting biodiversity, re-use of waste, improving water quality, minimising environmental impact).
2. *Responsiveness to changes* (e.g. climate change adaptation and mitigation, developing green transport modes, sustainable waste and water management, changes in product design).
3. *Energy relations* (e.g., improving energy efficiency, renewable energy use, innovative technologies).
4. *Management and planning* (e.g. certification, land use planning, community involvement, demand management).
5. *'Green footprint'* or visible impacts and outcomes of changes (e.g. organic agriculture, carbon sequestration, improving water quality, improved productivity).
6. *User behaviour* (e.g. food habits and waste, use of wood as construction material, improved health security at a workplace).

2.3.1. Key environmental relation

The first association people have hearing the word 'green' is usually related to the environment and its protection. In case of a green economy it is also true, as sustaining the environment is an important part of the concept and one of the reasons behind 'greening' of the sectors. Since all sectors are directly dependent on the environmental services and are often responsible for a negative environmental impact, greening process implies breaking this negative pattern. In case of the bioeconomy sector as a whole, a significant attention is paid to biodiversity protection. For example, less intensive use of fertilisers and pesticides could have a positive impact on biodiversity, as well as sustainable fisheries. Also, the implementation of Natura 2000 represents a significant contribution to the preservation of the biodiversity on farmland. Other practices that contribute to improving the environmental qualities relate to enhancing soil fertility, improving the efficiency of water use, etc.

Development of greener buildings aims to reduce a negative impact of the sector on the environment through increased resource- and energy efficiency during the whole life cycle of buildings. Green research and eco-innovation and green manufacture also refer to solutions and innovations that are developed to reduce the environmental impact. More efficient and compact land use is among the measures aimed at reducing the environmental pressure of the transport sector. Tourism sector is also responsible for the environmental degradation and depletion of resources. In a greener economy the environmental management and eco-labelling schemes are used to improve the environmental performance of the sector. The most important processes in greening of the waste sector are waste prevention, minimisation and re-use (recycling or recovery) during the whole life-cycle of the product. On the one hand, these processes help to reduce the use of natural resources. On the other hand, they help to prevent waste disposal to the highest possible degree, which is a damaging activity for the environment. Greener water sector relates to activities that, among other things, improve water quality, which is a prerequisite for the development of water ecosystems and thereby sustaining the life of fish and maintaining fisheries as a sustainable resource.

2.3.2. Responsiveness to changes

Greening of the sectors implies improving the capacity to respond and adapt to emerging challenges and risks posed by climate change, for instance. In general, a greener economy is more resilient to changes and risks, as it relies to a smaller extent on the fossil fuels and is therefore less vulnerable to oil price fluctuations, for instance. Higher adaptive capacity is especially important when it comes to issues of food and energy security, risk management, planning and livelihood security.

Developing of both mitigation measures and improving adaptation capacity to climate change are equally important objectives with regard to greening of the sectors, especially in the bioeconomy sector. When it comes to global climate change mitigation efforts, agriculture and forestry perform as carbon sinks by sequestering carbon dioxide from the atmosphere and transforming it into biomass, as well as by storing carbon in soils and through supplying renewable energy from biomass. However, agriculture and forestry are vulnerable to climate change too and they need to be adapted to become more resilient. Greener agriculture and forestry are increasingly promoted for their high mitigation – adaptation potential, whereas responsible methods of fishing are among the most

effective responses to the challenges caused by climate change and other factors.

In a greener economy other sectors' responses to climate change include improving energy and resource efficiency, substitution of fossil fuel based energy sources and products with renewable sources or those with a lower carbon content, use of greener transport modes, etc.

2.3.3. Energy relations

Energy is a central topic in development of the sectors. How to produce more using less energy, minimise energy losses and the substitution of fossil fuel based sources with renewables are among the key questions relevant to all sectors. The sectors studied are either directly contributing to a greener energy production (e.g. energy from crops, forest biomass, waste and other renewables) or addressing the energy topic indirectly through consuming greener energy in daily operations (e.g. green vehicles running on alternative fuels, biogas use on farm, wind energy use in operation of buildings) and achieving energy saving through increased productivity and innovation (e.g. production processes in manufacturing industries, more energy-efficient construction).

Delinking the sectors' growth from energy consumption is among the important principles of a greener development of many sectors, which would support the shift to a low carbon economy, promote renewables, modernise transport and increase energy efficiency. An absolute delinking means that final energy consumption grows less than the GVA of the sector. Delinking progress connected to energy use, GHG emissions and waste generation is measured in the manufacture sector.

2.3.4. Management and planning

Most of the processes related to greening of the sectors require proper management and planning. Therefore these elements play a significant role in promoting greening incentives in many sectors.

Environmental management systems (EMS), eco-labelling and certification schemes are among the tools that help to integrate sustainability criteria in daily operations of the companies in a comprehensive, systematic and planned manner. Thereby they also help to improve the environmental awareness and 'green skills' of the personnel and external stakeholders. Moreover, responsible management also contributes to social equity and economic well-being of workers and local community.

In greening of the forestry sector the role of certification schemes is utterly important. Through forest certification it is possible to inspect and track timber and other forest products to ensure that they have been harvested according to a strict set of guidelines. In the agricultural sector, responsible management contributes to improved water quality and availability, improved soil productivity etc. Promoting improved management of water resources that takes into account many different uses of water (agriculture, ecosystems, people and livelihoods) and addresses both supply and demand side measures is highly important for a more sustainable development of the water sector.

Effective planning is essential for avoiding unbalanced development of the sectors, which could result in, for instance, uncoordinated and low functional road infrastructure development, industrial and real estate development in areas with unique natural values etc. Therefore spatial planning is an important instrument for promoting sustainable development of the sectors, particularly building, transport and tourism sectors.

Overall, closer cooperation with the local community is crucial for any effective management and planning outcome, as it a prerequisite for avoiding conflicts and reaching consensus. The importance of community involvement has been especially emphasised for achieving effective governance of the fisheries activities. Consulting and negotiating with local interest groups are also necessary when it comes to planning of waste treatment plants and the development of renewable energy projects, for instance.

2.3.5. 'Green footprint'

For the last decades the concept of Ecological Footprint has been a measure aiming at reminding us how much nature and environment our lifestyle requires. The Ecological Footprint estimates the amount of land and ocean area required to sustain a specific consumption pattern as well as how much land and resources would be needed in order to absorb the amount of waste generated by individuals. The ecological footprint is thereby a measure of human demand on the Earth's ecosystems, and thereby a message of why it would be necessary to change the practices. In recognition of the need to include sustainable principles into our daily interactions, the concept of a Green Footprint is stressing the practice of an increased environmental awareness and stewardship.

By green footprint a visible impact and outcome of the changes in the sectors are considered. It refers to the development of greener processes, practices and concrete actions which help to reduce the ecological footprint in the sectors. Among the good examples in the agricultural sector is development of organic farming, which is increasingly gaining popularity in Europe. It relates to common practices designed to minimise the human impact on the environment, while ensuring the agricultural system operates as naturally as possible. In reducing an environmental footprint in the forestry sector increased carbon sequestration of the forests plays an important role. A green footprint of the energy sector can be reduced, for example, through improved recycling of energy which is based on recovering and reduction of the process energy and utilising residual materials as a source of energy. In the waste sector, several aspects can be highlighted, such as waste reduction, waste reuse, waste recycling and incineration with energy recovery. The ecological footprint of the transport sector in a greener economy can be reduced through promotion of access instead of mobility (e.g. avoiding or reducing trips through the integration of land use and transport planning and more compact city development) and switch to less carbon intensive and polluting vehicles. In reducing the tourism sector's ecological footprint a combination of a number of measures across various sectors is important – from reducing water consumption, better waste management, promoting greener buildings to more sustainable transportation and conservation of biodiversity. And by focussing on multifunctional use of the landscapes the increase in activities takes place within already exploited land areas and therefore limits the need of further inclusion of land.

2.3.6. User behaviour

User behaviour is another common topic in greening of all sectors studied, as users are important actors in accepting, implementing and driving the greening processes. For example, in greening of the agricultural sector the consumers play an important role through changing their food habits (e.g. organic and less meat/dairy products) and reducing food waste. This would increase the demand for organic production and vegetarian alternatives which are less energy and resource intensive and have a lower impact on the environment. The consumers' role in greening of the forestry sector is less important in comparison to agriculture. However, the consumers could steer the demand for sustainable wood products through increased use of certified timber in green infrastructure and buildings. In fisheries sector the consumers are becoming concerned and more demanding about the quality (freshness) and the origin of fish, as well as management methods of fisheries.

Households and individuals have a high contribution to energy and water conservation. Changing households' consumption patterns is also central in achieving waste minimisation. Behavioural changes are also important in achieving greener transport objectives (e.g. enabling the shift towards less harmful modes of transport). Today's challenge is that lower prices on conventional agricultural production, uncertified timber and irresponsible production of fish etc. may determine the consumer choices and therefore override the goals of ensuring sustainable development. This also concerns transport, building and manufacturing sectors, where changes require conscious investment choices that trade-off higher upfront costs with an expected future savings and other benefits.

2.4. Linkages and interdependencies between the sectors

The sectors are highly dependent on the presence of the functions found in the levels below and above of the sector hierarchy pyramid, which shows that there are strong cross-sectoral linkages and 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. so it does not deteriorate over time. Tourism also depends on an attractive liveable environment (level 2 in the Figure 3) with attractive cultural environments with buildings for tourists, energy supplies and manufactured products to supply the tourism sector. Furthermore, tourism is highly dependent on mobility and the transport connections linked to the territorial connections (level 3 in Figure 3) but tourism is also a high contributor to emissions – in particular through aviation.

3. Understanding Green Growth: A territorial approach

3.1. Understanding ‘territory’ in the context of the green economy

From GREECO perspective, 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 conceptualising territory in the perspective of the green economy.

Against this backdrop, we define the space/spatial reflects 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. While territory/territorial also reflects on the distribution of people, objects (including man-made and natural resources) and activities (including flows and processes) in space, the key difference is that the reflection is structured through a pattern of boundaries imposed by individuals or groups. This mainly relates to the political sphere in terms of institutional 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.

Thus, in 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 emphasised.

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. On one hand it 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 this territorial definition report 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.

3.2. 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 mobilises place-based possibilities for development. In our current political and economic development paradigm – stretching since the period of industrialisation, 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 minimised in favour of government derived boundaries.

However, by focusing specifically 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 even speak of a paradigm shift in terms of how we view the relationship between administrative regions, territory and space; where political structures are not necessarily the de facto boundaries that define and shape development potentials.

Therefore, the GREECO’s territorial concept 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).

In these terms, the GREECO exchanges what has perhaps become a regional-based perspective to territorial, place-based development with a space-based perspective that emphasises the physical distribution of ingredients of a green economy in Europe. This also acknowledges 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.

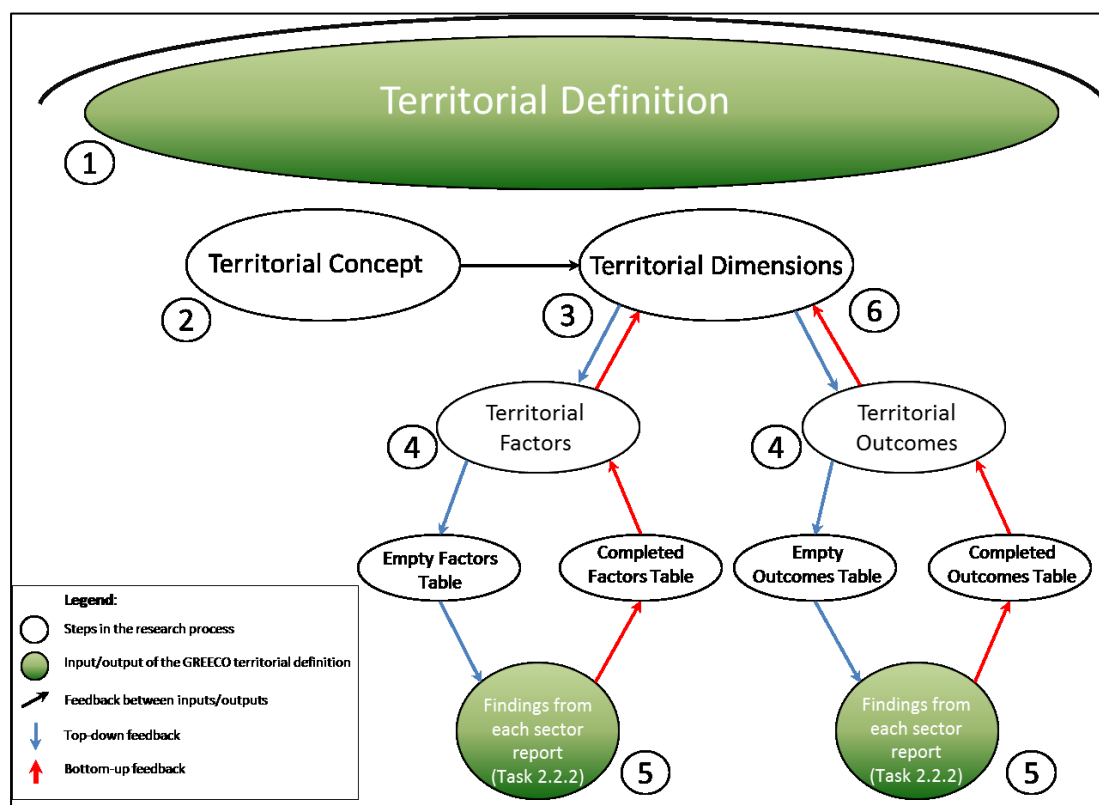


Figure 4: Schematic of the research flow for developing the territorial dimension within the GREECO project

3.3. The territorial dimensions of the green economy

As argued above, 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 or conditions that either influence or result from the pursuit of a greener economy. It makes it possible to synthesise the findings into a discussion on how the GREECO project interprets the relationship between territory and the green economy.

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 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 sector, 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.

3.3.1. Territorial Factors

Territorial factors can be founded and interact between the physical / material / technological / spatial side of green production and consumption (physical infrastructure; land-based resources); but also socially (consumer and producer cultures; tacit versus coded and formalised knowledge); in terms of information (communication and information services); economically (as consumer-driven versus producer-driven), or politically (through the goals of territorial cohesion; through the interplay between different levels of multi-level governance for policy making/implementation). But, not least, these 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

This acknowledges that 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. In terms of resources, it is well understood that settlement structure has a formidable impact on resource 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. Especially the latter emphasises that territorial diversities are actually a boon in the green economy as places with different characteristics have unique roles to play in achieving a green economy.

In the bio-economy sector the development is confronted by a request for being even more productive based on research and innovation, and produce more, with less inputs, and as little labour as today; But at the same time also with the challenge of maintaining smaller settlements in rural areas and the coastal zone otherwise challenged by losing jobs and other economic activities. Settlement structures may not be directly affected by changes related to green models in energy production or distribution. It may instead be the energy sector that becomes better adapted to prevailing spatial, structural and social characteristics of settlements.

Cities are the biggest waste generators and in a way hold the key to developing new paradigms for waste management. Water efficiency is another key word in any type of settlement in a green economy. Introducing e.g. water efficient buildings and distribution systems and water saving household appliances will have a significant effect on greening the sector as urban areas are a main water consumer. And while growing urban population leading to increase in water use the densification of population in urban areas can reduce the cost of water and sewage infrastructure construction, per capita, compared to dispersed areas.

Higher building densities are a prerequisite for a plausible future of green building and the compact city perspective is viewed as a standard practice of urban development in Europe. This is not only due to the potential increased resource efficiency of multi-family dwellings (compared to larger, detached homes), but especially due to the cross sector implications of higher densities of scale and mixed land uses of more compact urban development. In particular, denser built environments improve the efficiency and feasibility of non-car transport schemes, innovative solutions for waste and sewage disposal/recycling/reuse, as well as innovative energy systems operating at the community or district level. Current green economy trends suggest that those industries creating synergies will show a natural tendency to clustering and that those industries treating industrial waste and residuals will tend to locate nearby larger polluting plants.

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, 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 the major impact (outcome) of a greening of agriculture. All environmental and land based aspect of the green concept should be emphasised here as this is the major benefit of sustainable production processes and less damaging inputs and outputs. Furthermore a focus on access to products with issues of quality (freshness), place of origin

(=territoriality) and production methods (=responsibility) are keywords and identifiers of a greening of the bio-economy sector which has become cornerstones in marked changes in relation to both sector characteristics and in relation to activities in other sectors.

Due to increasing importance of renewable energy sources, 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.

Landfilling is the waste treatment option which is the most land consuming. With decreasing of landfilling the demand for land will diminish. Also focus on preserving rich water resources of good quality to maintain ecosystem services which improve water quality and reduce costs of water treatment. Water management policies must be based on the recognition that water of adequate quantities and quality is indispensable for the functioning of ecosystems.

Land take in connection with building activities will be monitored and limited as much as possible. Mandated investigations seeking for opportunities for brownfield rather than greenfield development are now preconditions to obtaining EU funds in support of development projects. Furthermore, coordinated EU policy on land use and landscape has been developed to create conditions that Member States' shall adhere to when developing their built environment and it especially focusses on restricting development to already developed areas. In this context transport systems might lead to a net reduction of land consumption for transport infrastructure, however new green transport infrastructure (e.g. for new rail links) will consume land resources.

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. 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 emphasising 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. The construction sector has gone through a certain level of industrialisation in order to reduce resource waste during the construction process (embodied emissions) construction process are now more coordinated because larger construction firms (operating on the national and international scales) are now commonplace. The demand for green building products has been conditioned by policy support at a range of scales, especially in terms of financial support from national and regional administrations, coupled with knowledge and awareness support from local levels of government.

As the internal energy market integrates thanks to increasing interconnection between

nations by power grids and the construction of new roads and railways, competition will increase and the availability of energy resources will diversify. This development may be accompanied by the diversification of global energy markets. Thanks to increasing competition energy prices may stabilise while consumers may gain more power.

Inter- and intra-territorial relations

This theme emphasise how no development happens in a vacuum but 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, characteristics of interaction, networks, social relations, and local cultures represent a network of organisations within an economic system that are directly involved in the creation, diffusion and use of scientific and technological knowledge, as well as the organisations 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. Relations 'between' territories include consideration of that economic produces and activities are a composition of a number of inputs -each coming from its own place and via its own development process; all of which have to be organised and managed accordingly. Relations 'across' territories is a crucial dimension to consider because a greener economy, based on an increased consideration of the connection between the economy and the material world, can also become a more specific or specialised economy.

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.

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 realise 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 Multifunctionality – Especially important for all "space and resource-consuming" sectors, i.e., bioeconomy, 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.

Two aspects are important in this context. Tacit/experiential knowledge accounts for any knowledge that cannot be transferred through direct means (such as informing someone

through writing or speaking). In a territorial context, this dimension acknowledges that many of the intangible assets of the region are indispensable to advancing the green economy, and, because of this, they are embedded as experience- and historically-based knowledge structures within the local society.

Furthermore the question of Proximity based on an understanding that economic activities are not only located in space, but they are positioned in a specific locational context vis-à-vis all other economic activities, resources, inputs, actors, markets, etc. within a given area. Therefore, connected to other dimensions such as multi-functionality, market relations and territorial relations seeks to explore how proximity is an important for achieving a greener economy.

By exploring the connection between each sector and its target market, this dimension 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.

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 for consumer products, as well as access to labour. 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 characterised 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. Considering that it continues to be such an important priority for investment via regional policy funds (in particular for newer Member States where Cohesion Funds are directed) it is therefore important to reflect on the implications it has for achieving a greener economy. This is distinguished among the following sub-dimensions:

- **Transport connections** (transport of materials; transport of labour, etc.) encompassing physical infrastructure of all forms that allows connecting people, materials, goods and services across space. As such, it is about how mobility across space affects the development of the green economy within and among the GREECO sectors;
- **Regional Accessibility** (access to markets; access to supply of materials; access to public services) While the previous sub-dimension discusses the idea of accessibility concretely through the notion of transport and mobility, this one reflects the importance of access to markets, input materials, goods and services that are generally fixed in space. Therefore, the intention of this dimension has been to identify the impact that physical and information connections have on how we arrange and conduct our various socio-economic activities in space.

Policy and governance by territorial level

This section lies very much at the heart of what is being investigated by the GREECO project. It understands 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 comprehensive 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 organised at the most local level possible in order to cater to territorial specificity. At the same time, territory is explicitly emphasised by also considering the relevance of EU territorial policy across the GREECO sectors. For a given sector this likely means that multiple administrative scales are responsible for devising and/or implementing policy, which reflects the reality that many territorial dimensions are operating at the same time in all sectors.

Other EU policies with territorial dimension highlight the role of regional funding in supporting resource efficient growth. In particular, it is important to analyse the manner in which key EU funding schemes (ERDF and the Cohesion Fund) are used to support place-based, regionally-oriented development initiatives among the GREECO sectors.

Yet one additional perspective of GREECO territorial assessment has been focused on private versus public sector – led development. This sub-dimension seeks to know what types of producer, consumer, citizen, non-profit or other types of consumer organisations are important for developing the green economy in a given sector, and what administrative scale these are located at. Due to the fact that the sector reports are designed to have a European relevance, this may include the identification of specific association or, more likely, those that are often found within Member States or their regions and cities.

3.4. Synthesis of the territorial dimensions

The table shown in Figure 5 and the diagrams below provide a general overview of how the territorial dimensions were elaborated by the sector reports. This keeps in mind that the task of the reports was to identify territorial factors and outcomes using the dimensions listed above as inspiration; thereby determining which of the dimensions are relevant for each sector.

3.4.1. 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 urbanisation reduces the growth potential in certain sectors). This territorial perspective should help to reiterate 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'. For the latter, this reflects that the energy sector, while being an economic activity in its own right is emphasised 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 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 reflects the emphasis that sectors place on, for example, providing 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 interesting to analyse further. The eco-innovation sector has not provided any territorial outcome, which is due to the fact that it is de facto already a green sector and a key tool for promoting the greening of other sectors. In turn, indirect territorial outcomes of promoting eco-innovation are rather 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 a wide number of sectors. It must be recognised that the method of asking the authors of each sector report 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, coupled with the many sectors under consideration, means that there is no possible way to systematically 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.

		Sectors											
		Agriculture	Forestry	Fisheries	Energy	Waste	Water	Buildings	Transport	Tourism	Manufacturing	Eco-innovations	TOTAL
Territorial Factors													
1	Settlement types												
i	Urban Areas	1		1	1	1	1	1	1	1	1		9
ii	Rural areas	1	1	1	1	1	1		1	1	1		9
iii	Urban-rural interactions	1	1	1	1	1	1	1	1	1	1		10
2	Land and land based resources												
i	Land consumption or dependence (or water)	1	1	1	1	1		1	1	1			8
ii	Material consumption or dependence	1	1	1	1	1	1	1	1	1	1		10
iii	Energy consumption or dependence on specific energy types or systems	1	1	1	1	1	1	1	1	1	1		10
iv	Management of ecosystem services	1	1	1	1	1	1	1	1	1	1		10
3	Market relations (Production, consumption, export, import) and innovation												
i	Local/regional markets	1	1	1	1	1	1	1	1	1	1		10
ii	National markets	1	1	1	1	1	1		1	1	1		9
	EU markets	1	1	1	1				1	1	1		7
iv	Global markets	1	1	1	1				1	1	1		7
4	Inter- and intra-territorial relations												
i	Within territories (place based, local cultures, territorial policies)			1	1	1	1	1	1	1	1		8
ii	Between territories (networks, competition)			1	1	1	1	1	1	1	1		8
iii	Across territories (cross-border supply and demand)			1	1	1	1	1	1	1	1		8
5	Place-based factors												
i	Competitiveness through strong local economies	1	1	1	1	1		1	1	1	1		9
ii	Multi-functionality	1	1	1	1	1		1	1	1			8
iii	Tacit/experimental knowledge	1	1	1	1			1	1	1	1		8
iv	Proximity	1	1	1	1	1	1		1	1	1		9
6	Consumer relations												
i	Are development and innovation consumer-demand driven?	1	1	1	1			1	1	1	1		8
ii	Are development and innovation producer driven?	1	1	1	1			1	1	1	1		8
iii	Development and innovation based on territorial constraints		1	1	1				1	1			5
7	Accessibility and mobility												
i	Transport connections (transport of materials, transport of labour)	1	1		1	1	1		1	1	1		8
ii	Regional accessibility (access to markets, access to supply of materials, access to public services)	1	1	1	1	1			1	1	1		8
iii	Information connections (use of communication and information services, need of interaction, questions of consumer and producer cultures)	1	1	1	1	1	1		1	1			8
8	Policy and governance by territorial level												
i	Scale of sector-based policy support												
	>From the EU level	1	1	1	1	1	1	1	1	1	1		10
	>From the national level		1	1	1	1	1	1	1	1	1		9
	>From the regional level		1		1	1	1		1	1			6
	>From the local/municipal level		1		1		1	1	1	1			6
ii	Role of other EU policies with territorial dimension		1		1		1	1	1	1	1		7
iii	Private versus public sector-led development.		1		1		1	1	1	1	1		7
	Total number of factors identified:	21	26	25	30	21	20	20	30	30	24	0	247
	Territorial outcomes												
1	Settlement types	1	1	1	1	1	1	1	1	1	1		10
2	Land and land-based resources	1	1	1	1	1	1	1	1	1	1		10
3	Market relations (Production, consumption, export, import) and innovation	1	1	1	1	1	1	1	1	1	1		10
4	Inter- and intra-territorial relations	1	1	1	1	1	1	1	1	1	1		10
5	Place-based factors	1	1	1	1			1	1	1	1		8
6	Consumer relations	1	1	1	1			1	1	1	1		8
7	Accessibility and mobility	1	1	1	1			1	1	1	1		8
8	Policy and governance by territorial level	1	1	1	1	1	1	1	1	1	1		10

Figure 5: Overview of incorporated territorial factors and outcomes

3.4.2. The role of the identified factors and outcomes

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

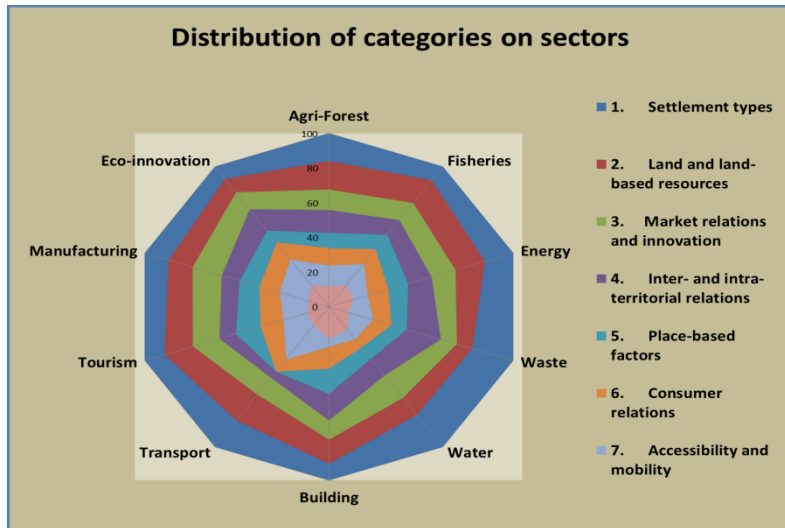


Figure 6: Distribution of references to territorial factors throughout the sector reports

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 main report.

The first graph to the left is an account of how often the different territorial factors have been emphasised in each sector report, 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

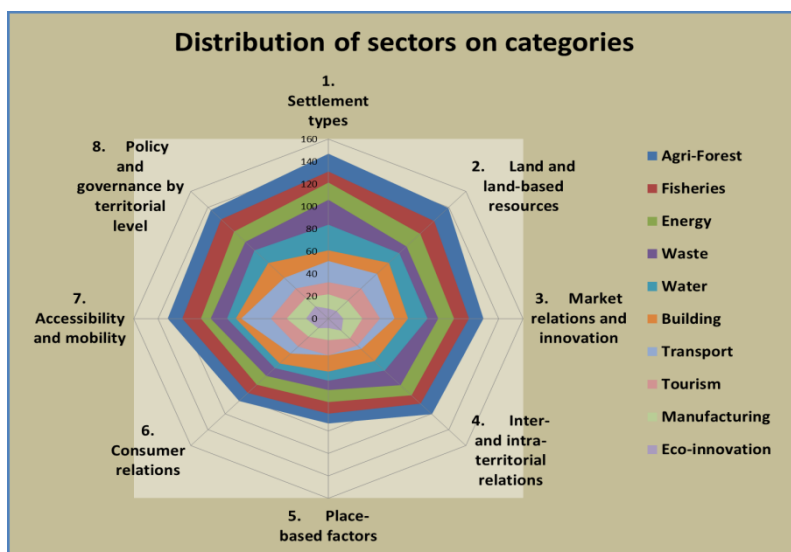


Figure 7: Distribution of sectors on the different green aspects.

approaches.

The next spider diagram show 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

4. The green economy in place: evidence from case studies

4.1. Regions' potential to develop green economy as seen in the case studies and main transversal drivers

The development of case studies within the GREECO project was meant to give a real life dimension to the theoretical concepts and hypothesis developed within the other tasks. The main objectives of the case studies are to identify the role of the regions in driving a green economy development; analyse the regional key drivers and enabling conditions of the transition to the green economy (policies, financial instruments and investments, etc.); and to identify good practices of regional transition to green economy.

GREECO's main goal during the selection of the case studies was to have a mixture of regions which are balanced from a geographic, economic, policy, size, and typology point of view. The case studies have been selected according to criteria such as types of territories (ESPON); geographical and historical contexts; sectors and size of the region.

GREECO selected four decentralised and developed regions: Navarra (Spain), Ruhr (Germany), Jämtland (Sweden) and Burgenland (Austria). Four of them have different economic context with Ruhr being highly industrialised previously and facing the challenge of transition to a modern economy. Navarra and Burgenland have benefited from strong regional leadership and have exploited their natural assets to the maximum especially in the field of renewable energy. Jämtland has predominantly been a leader in greening the agricultural and forestry sector. Two other regions – Cornwall (UK) and Puglia (Italy) - are less developed than the first group of regions but share their strong drive towards the green economy especially in the energy sector. The GDP per capita of Zealand (Denmark) is lower than the EU-27 average except for the northeastern part which is closely linked to the Capital Region. Green economy is seen as a possibility to catch up with the rest of the country. South Transdanubia (Hungary) is an example of a less developed region that has some ambition in green economy development but still has a long way to travel. Malta is an interesting case of a small island territory with abundant natural assets (wind and sun) and a big shortage of water and raw materials.

4.2. 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). Thus the green economic potentials of the region might be in export of renewable energies and in know-how transfer on developing and implementing renewable energies to other regions.

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

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.

Estonia - Lõuna-Eesti, NUTS-2 (EE008)

Southern Estonia is one out of five NUTS 3 regions in Estonia consisting of six counties. The administration in the country is centralised 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 utilisation of wood residues, raising awareness of environmental issues and popularisation 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

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.

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

Hungary is a traditionally centralised 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.

Italy - Puglia, NUTS-2 (ITF4)

Puglia is a NUTS-2 region comprising five provinces. Puglia is considered as the most dynamic region in Southern Italy. Puglia has a very rich and diversified agriculture and it has a great potential for renewable energy, in particular solar Photo-Voltaic. The region has important cultural assets, complemented by high-standards beach and country 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. Puglian pioneering experience in renewable energy (photo voltaic in particular) is often mentioned as a best practice and according to ARTI (2013) could be easily transferable to other regions with similar characteristics. To conclude, Puglia already ranks high in Italian classifications of green entrepreneurship.

Malta, NUTS-0 (MT)

Malta is a densely populated city-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 renewables, building sector, water management, waste recycling and organic farming. Although Malta has the most abundant solar and wind resources in Europe it is a late starter in renewables development, 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.

Spain - Navarra, NUTS-2 (ES22)

Spain is a highly decentralised country and Navarra is one of the regions in the country with the highest degree of self-government. In terms of territorial capital, Navarra's climatic conditions hold a great renewable energy potential, whereas its landscapes and natural areas are a great touristic asset. Navarra holds one of the most developed environmental legislative frameworks in Spain. In addition, in 2010 Navarra adopted MODERNA, a strategic plan to define a new model of economic development for in the medium and long term based on the green economy as one of the main regional growth drivers in the years to come. In practice, the strategy foresees further 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 evolution. Its regional R&D expenditure as a percentage of GDP has increased from 0.9% in year 2002 to 2.13% in year 2009. Moreover, the region's innovation network is highly clustered, which facilitates knowledge spill overs. This can also be attributed to a steady and well managed regional innovation support policy. In turn, the combination of all these factors make Navarra hold a number of sectors prone to become green(er).

Sweden – Jämtland, NUTS-3 (SE322)

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 is also endowed with less tangible assets such as 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 region. 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.

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

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.

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 operationalisation 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 as explained elsewhere in the report.

5.1. Basic approach

The analysis of green economy regional performance is based on two different but interrelated strands of research within GREECO, 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 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 core features in the second.

Different approaches have been explored to aggregate from individual indicators to more abstract levels of analysis. A multicriteria evaluation based technique has turned out to be most suitable for the aggregation of individual indicators. The output from this step is a tentative assessment of regional green economic performance across Europe. 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.

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. GREECO tries to go as deep as feasible in spatial terms. In any case, in GREECO 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 6.3 below for additional information on potentials), data were transferred to a common territorial reference framework, i.e. NUTS-2. Regrettably, for some 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 core features 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 in which an explicit indicator system for measuring the green economy were reviewed. Based on this a set of headline indicators by which GREECO addresses the question of regional green economic performance.

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 core features 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 core features. The economic sectors are each represented by one headline indicator. The green economy core features 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 1 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 sectoral studies.

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 1 Headline indicators for regional green economic performance of economic sectors

The indicators for the regional green economic performance based on the core features of the green economy are organised along the five core features defined in GREECO project. Table 2 below lists the core features, their components and headline indicators.

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 technology	Green patents
	Green labour	Green jobs (EGGS)
Ecosphere	Energy productivity	GDP per energy unit

Table 2 Headline indicators for regional green economic performance of core features of green economy

However, data scarcity prevented this analysis to be fully implemented for some spheres. As a feasible alternative, a flexible approach towards the characterisation of green economy performance was carried out. This 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 what the current performance of the environment is in terms of availability of open space, biodiversity etc. 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 (Böhme, Doucet, Komornicki, Zaucha, & Świątek, 2011) are used. 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".
- For the *economic sphere*, GREECO's intention was to address the "greenness of economic activities" as far as possible. 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. How far economic activities can be considered as being green is reflected in the EGGS share of employment.
- The *econosphere* is covered by environmental and resource productivity indicators. The proposed headline indicator is energy productivity.

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 core features of green economy as defined in the GREECO concept. This is a value as such as it 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 multicriteria analysis techniques. This aggregation has first been done to the five core features 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.

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 2). 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

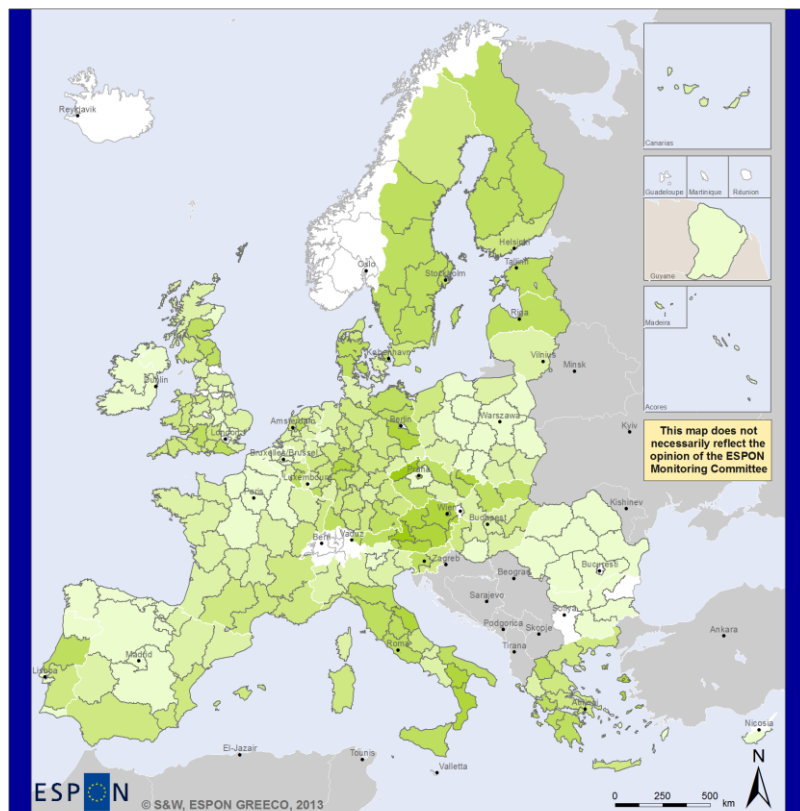
one million ha since the beginning of the 2000s. However it is out performed by Spain in 2008 which reached an impressive 1.1 million ha. Some of the "pioneers" in the sector such as Denmark, Finland, Sweden and Italy seem to have reached a plateau or display only slow growth. Among Southern EU, Greece, 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%.

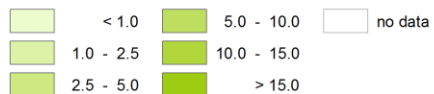
5.2.2. Econosphere: sample headline indicator for a core feature of the green economy

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 3 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.

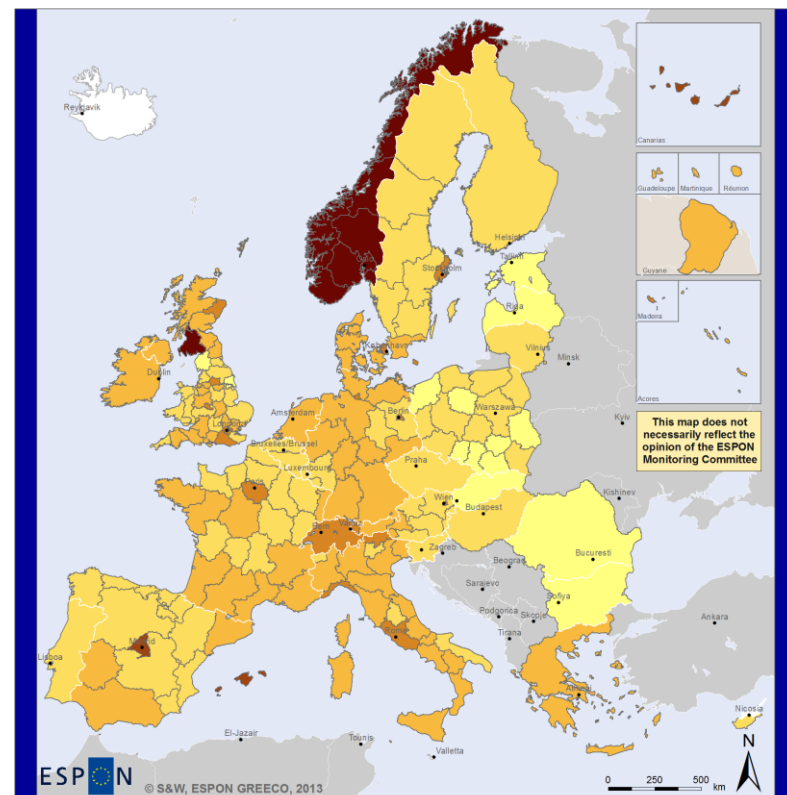
Apart from Norway for which the high energy productivity is based on the oil resources, the most productive areas are the high-density service oriented agglomerations (or countries in the case of Switzerland); Madrid, London, Paris, Rome or Stockholm have highest energy productivity. Less urbanised areas 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.



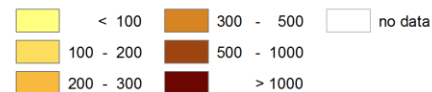
Share of organic farming in the utilised agricultural area (%), 2007



Map 2 Share of organic farming in total utilised agricultural area in 2007
(Source: DG AGRI, 2011)



Final energy productivity (€ GVA/kJ)



Map 3 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 techniques of multicriteria analysis. 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 core features and for the overall regional green economic performance.

The result of the regional green economic performance for the five core features are presented in Figure 3.

- 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. Similar good is the situation 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 worst, but there are also some more rural regions in Spain and Germany in those lower classes.
- In the *social sphere*, most regions 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, 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 only based on the number of green patents per billion GDP sees the largest 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. 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 a high economic output per energy unit used. Most regions in Eastern Europe, Finland and Sweden, Spain and good parts of the UK, France and Belgium are at the other end of the spectrum.

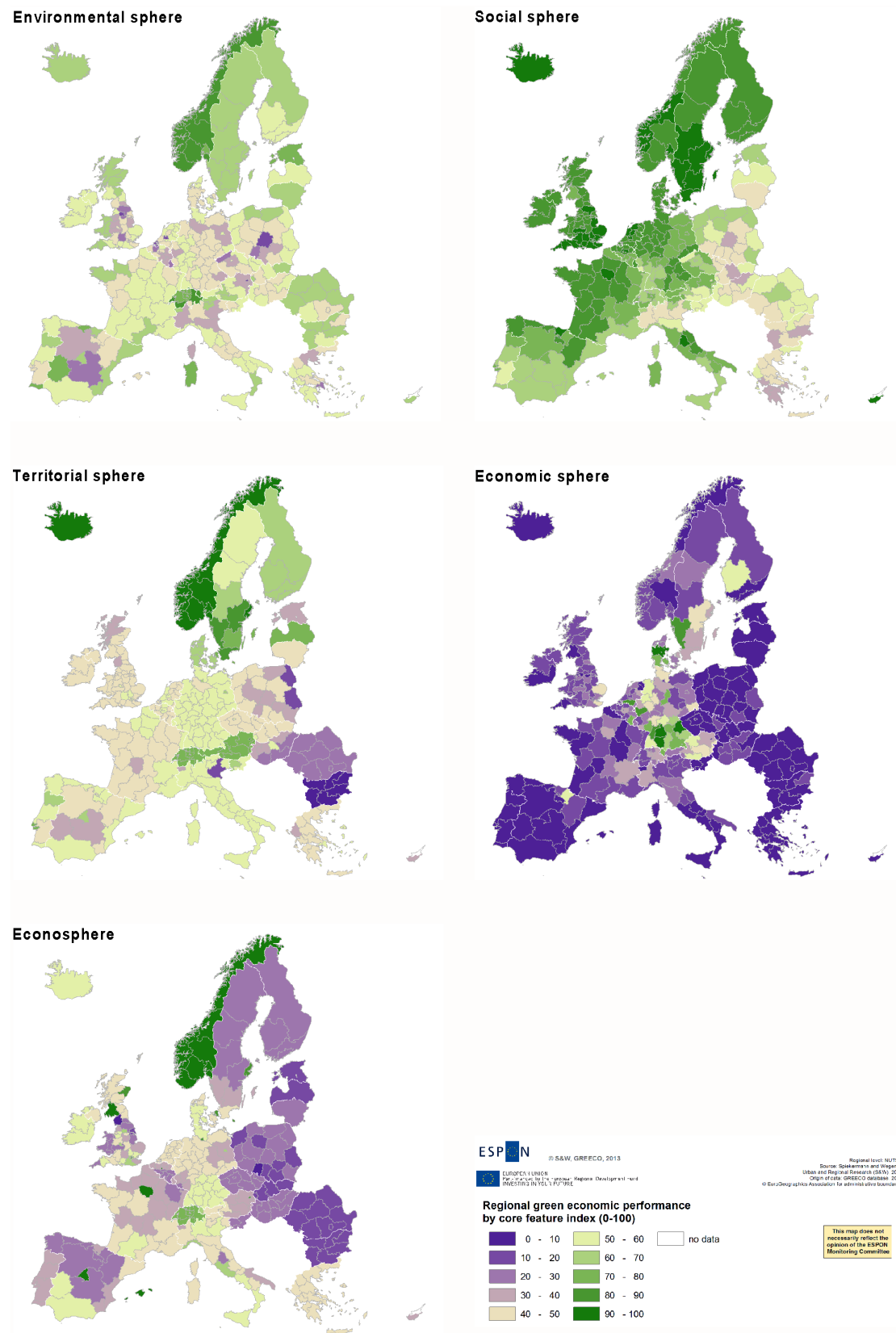
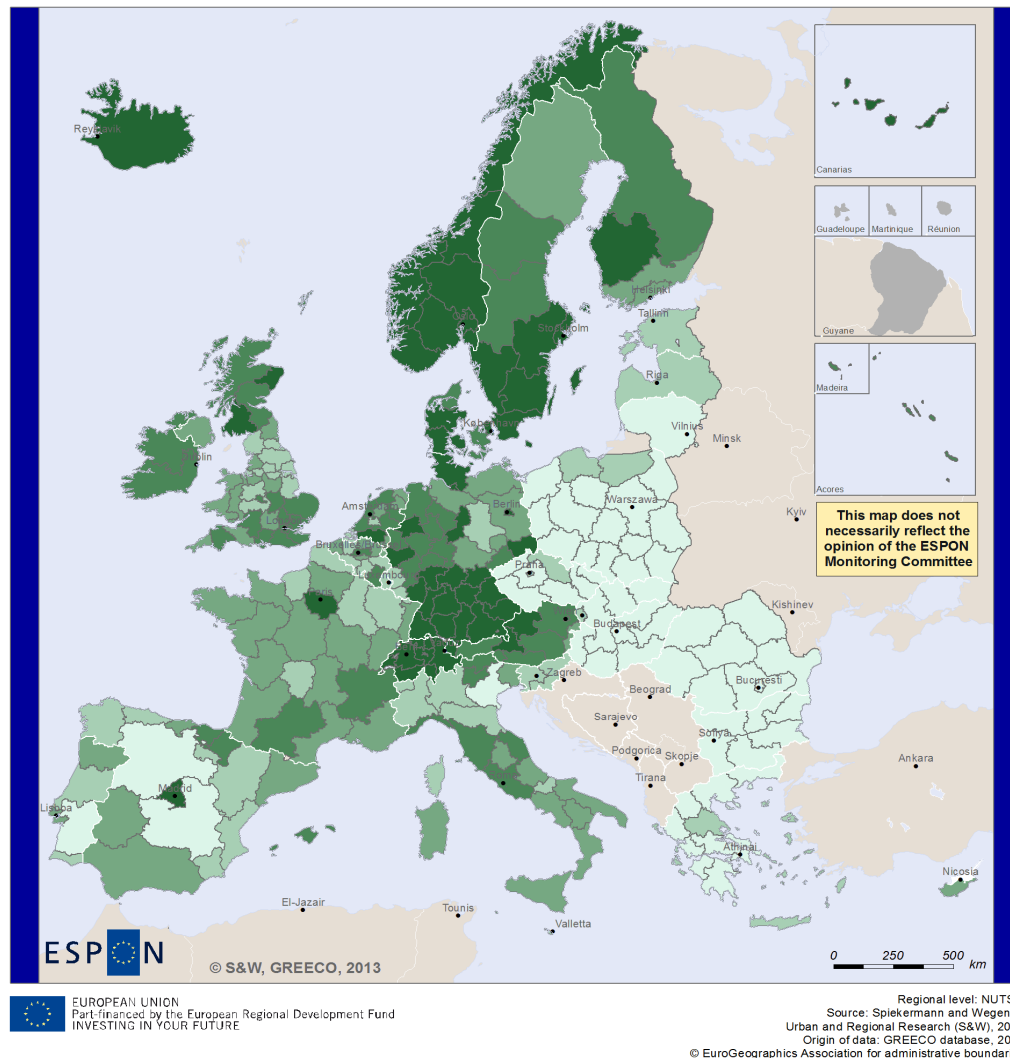


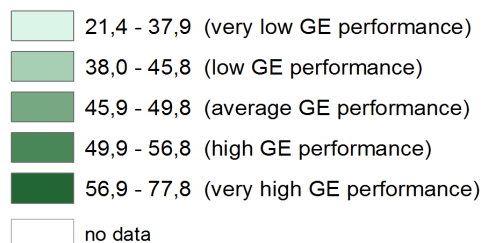
Figure 8 Standardised regional green economic performance for core features of green economy

The aggregation of the performance of the five core features to one single regional green economic performance index is presented on Map 4. 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, Germany, Austria and Switzerland and Italy, and also Paris and Madrid. 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.



Regional green economic performance Aggregate typology (quantils)



Map 4 Typology of regional green economic performance

5.4. Regional green economic performance vs. regional economic performance

Does it pay for a region to have a good green economic performance? Is there a correspondence between this and overall regional economic performance. At the level of the five core features, the relationship is rather weak for the environmental sphere ($R^2 = 0.08$), moderate for the social sphere ($R^2 = 0.47$) and the economic sphere ($R^2 = 0.32$), but fairly good for the territorial sphere ($R^2 = 0.62$) and the econosphere ($R^2 = 0.65$).

However, the aggregation of the performance of the five core features of the green economy to the single comprehensive typology of regional green economic performance shows an even higher degree of relationship with the economic output of regions in Europe (Figure 9).

The distribution of the regions in the diagram gives a clear message supported by the correlation coefficient ($R^2 = 0.69$): Lagging regions are also low performing in green economic aspects, prosperous regions do display a high degree of green economic performance. This relationship 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 those regions.

Regional green economic performance (index)

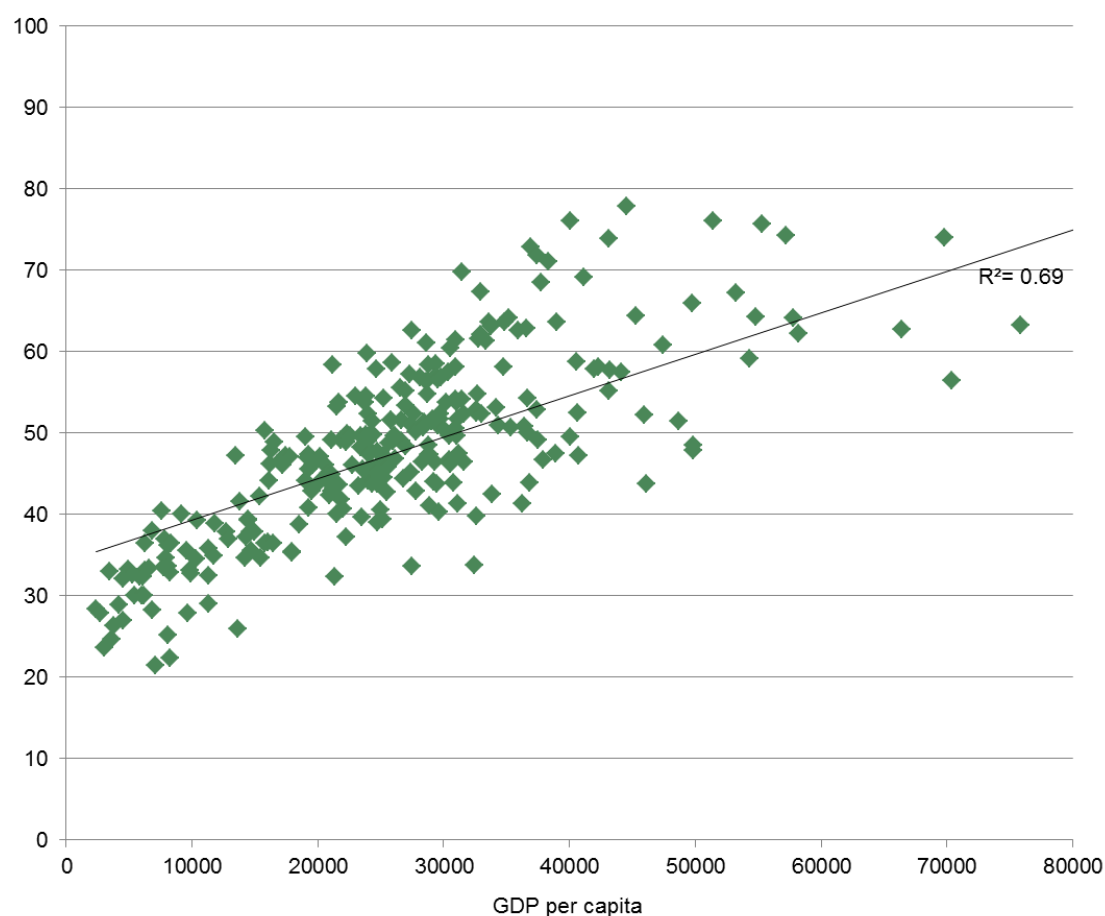


Figure 9: Typology of regional green economic performance vs. regional economic performance

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*]¹.

The definition above includes 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 conceptual perspective, the two strands are highly correlated, as the presence of the “latent qualities” may also be understood as a prerequisite for “something happening”.

Indeed, it is the combination of both strands the one that creates a conceptual foundation for a working concept of territorial potentials within GREECO project. However, these two components should be complemented with a third additional *external* element:

From a territorial perspective, 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. But these *internal* factors, being a condition for “something happening”, are not necessarily enough to unleash change. On the contrary, territorial potentials in relation to specific transitions or transformations depend also on *external* forces, or, more precisely, on the *manifestation* of such external forces in a given territory, and on how external forces interface 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.

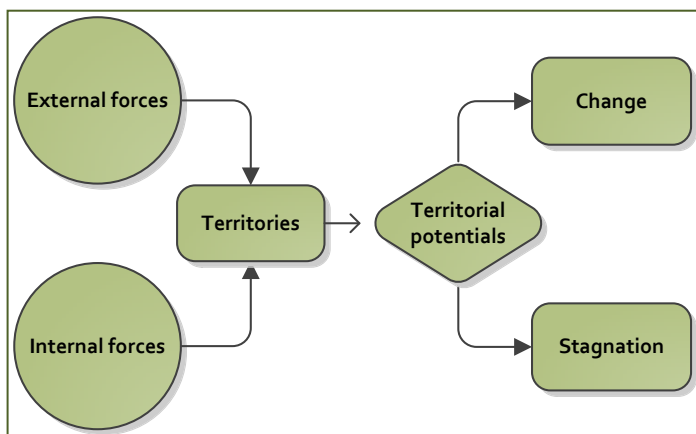


Figure 10 A visual representation of the role of territorial potentials in territorial development

As far as the green economy is concerned, such external forces might be global challenges like climate change

or globalisation forces, rocketing energy prices, scarcity of raw materials, new green

¹ <http://oxforddictionaries.com/definition/english/potential>

technologies developed elsewhere, etc. All these grand challenges may have different local territorial implications depending on other array of local conditions, imposing burdens to some places, but also offering opportunities to others. Thus, it is the overlap of internal assets and the manifestation of external forces on different spatial contexts the one that eventually determines “the possibility of something happening” on specific territories, and accordingly their *territorial potentials*.

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 green economy.

In other words, the main goal of GREECO project in terms of assessing territorial potentials for a greener economy has been to unveil, analyse and interpret the most relevant weaknesses and strengths (mainly internal factors), as well as opportunities and threats (mainly external factors) that characterise different groups of ESPON regions with regard to a green economy.

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

Following to previous discussion, GREECO understands the territorial potential for a greener economy as the *combination* of all those *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 thought to activate the concepts and improve current and future greening performance across Europe. Identifying and characterising such territorial factors is thus instrumental in assessing territorial potentials at the regional level.



Figure 11: A combination of main drivers and enablers in the green economy

In a nutshell, 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.

Such key factors shaping the evolution of green economy are described in the following pages:

6.2.1. Good governance: institutions, policies and regulations

Quality of government has been mentioned as a significant factor contributing to environmental sustainability by some studies (Morse, 2006). The territorial evidence produced in GREECO proves that it certainly is instrumental for the transition to the green economy from many perspectives.

All governance levels are important and it is difficult to single out one as more important than the other. GREECO case studies 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 **policies** help to create favourable framework conditions, reduce the cost of investments and increase knowledge development. From a sectorial perspective, **EU policies** are highly important for some sectors, such as agriculture (CAP) and fisheries (CFP). For other sectors there are no common policies, but a combination of different EU Roadmaps, Thematic strategies and Directives that steers greener development.

National legislation and regulations are highly important, in turn, in steering the green development of the forestry and building sectors. In case of the building sector, national policy schemes in the form of local building regulations have played a crucial role. Similar regulations have been found to be key greening drivers for most sectors.

From the **regional perspective**, one possible strategy for regions is to align themselves with national, EU targets and ensure compliance. Among GREECO case studies, this is the case with less ambitious regions or late starters such as Malta and its RES targets. However, these targets might not be sufficient for ambitious regions such as Navarra, Zealand or Puglia which have already reached far in their RES development and therefore need more ambitious goals.

The significance of regions is bigger in larger, more decentralised countries such as Spain, Germany and Italy. Other countries like Sweden and Denmark have weaker regions with limited jurisdiction but are instead having strong municipalities and the primary driving forces of the transformation towards the green economy are thus the national government and the municipal administrations. Regional 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 in importance especially as far as planning is concerned. Nonetheless, 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.

Another lesson emerged from GREECO case studies is that stability is also one of the characteristics of good governance. 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. This is very much a challenge at the end of a political cycle. Navarra (Spain) is a positive example in this regard where a persistent commitment to green the regional economy has been translated into a widely consulted and agreed Regional Innovation Strategy – MODERNA.

Along these lines, all case studies 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 the strategic vision 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, permitting and enforcement of legislation** which is the case for Zealand. For example, integrated urban and transport planning making it easier to use bicycle-public transport combinations and park-and-ride commuting are examples of local planning efforts that are key to the transformation.

In parallel, case studies show that the **diversity of regional institutions**, the synergies between them and the quality of human resources are a strong factor for enabling the transition to the green economy. Puglia is a positive example in this respect with a remarkable landscape of institutions operating in the field of advanced technologies within energy, agriculture and nanotechnology, which have enabled the leading role of the region in this field. These institutions are not restricted to public organisation, but range from industry to research.

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

Increased availability of finance for governments and businesses in green sectors is crucial for achieving a green growth. Access to the economic capital is essential for R&D and application of new technologies, RES, development of infrastructure for cycling etc., as these developments require high initial capital investments, which normally have a long pay-back period.

In order for green businesses to emerge and expand, adequate levels of private investment need to be available. It may also be necessary to increase the availability of public finance so that a range of policy tools can be used to leverage local assets. In particular, **access to funding** via the EU and national policies and funding schemes is an irreplaceable prerequisite for fostering greener development.

From the opposite angle, 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 within case studies stressed the importance of financial mechanisms and emphasise the need for increased public support.

Financial support can take the forms of a feed-in tariff (e.g. renewables in Malta, Puglia, Navarra, etc.); enhanced financing of R&D and technological cooperation in the region; grant support for innovative companies and projects, etc.

Funding could either come from national sources or from Structural and Cohesion policy. The latter is a strong driver for greening the energy sector especially in less developed regions (through RES targets and concentration of funding), through support to energy efficiency renovation of building and through its sustainable transport priorities. There are ongoing comprehensive efforts on mainstreaming the environment and climate change into the planned investments.

Green public procurement is another efficient economic instrument which can be implemented on local and regional levels. E.g. in Jämtland, green public procurement in the transport sector has been one main reason for the success of greening the transport sector. Moreover, since the prices hardly reflect the real value of natural resources, the policy support is essential for **adjusting the economic and fiscal framework** through, *inter alia*, comprehensive tax reforms, to provide incentives to become more resource

efficient.

At the local level, economic instruments such as landfill **taxes and fees and penalties** to municipalities for not meeting the targets are significant drivers for stimulating the certain waste treatment options. In turn, water pricing is an effective instrument used by the Member States to signal water scarcity and promote water efficiency across the sectors.

6.2.3. Territorial assets and physical conditions

As shown by GREECO sector assessments included in Vol. 3 of this report, territorial characteristics and land use issues, 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.

Take for example the transition to a greener energy sector through a growth in renewable energy. 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 the best possible conditions in this respect has not been able to develop the sector. Broadly speaking, the reasons for the weak development of Malta's RES sector lay on lack of political drive, appropriate legislation and financing but also on a lack of space and resistance of the populations towards the construction of wind turbines.

On the other hand, other areas like Burgenland and Navarra have fully profited from the abundance of wind and through a strong leadership, and thanks to the excellent legislation and institutional framework 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. An interesting case of how lack of natural assets puts a pressure for greening a sector is Malta's water sector. Here 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.

For the abovementioned reasons, rich natural assets can only be considered enabling conditions for green economy development if are coupled with other essential factors. Moreover, 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. Taken in isolation, physical assets cannot be considered key enablers or barriers for green growth. Empirical evidence collected within the project shows that it is the combination with other factors the one that eventually leverages such territorial potentials at the regional and local levels.

6.2.4. Access to technology

Development and increased uptake of **new technologies and eco-innovation** play an

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important role in fostering the transition to the green economy across all sectors analysed in GREECO.

By investing in new 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.

6.2.5. Expected market demand

Market is the ultimate driving force for increasing the demand within all green economy sectors. For example, higher energy prices favour the proliferation of green buildings, as the benefits associated with retrofitting and new building standards outperform the 'business as usual' situation. This is also true in case of developing the renewable energy and eco-innovation, as with increasing prices on conventional energy the RES and eco-innovation targeting resource efficiency in energy use become more competitive.

6.2.6. Human resources, knowledge and skills

Human resources development is a greener economy driver recursively found within GREECO sector assessments. In particular, the development of **human capital** is essential for fostering the technology transition and increasing innovation capacity.

In some case study areas, **scarcity of human resources** has been related to demographic challenges. These challenges can influence green economy development for instance through the lack of competent labour force following negative population trends. This is for instance the case in Jämtland region in Sweden. Lack of working force is expected in many parts of the county, both in terms of low and high qualified labour force in all sectors.

In Estonia, there are significant disparities between urban and rural areas and it is difficult to attract and keep the **qualified labour force** in the peripheral areas. There is simply a lack of committed and knowledgeable people, who would take an initiative and drive the change.

In turn, South Transdanubian institutions are suffering from the low availability of quality human resources in the region. In South Transdanubia in Hungary, two universities provide various courses in the region, which could potentially satisfy the local needs of professional labour force. However, a remarkable part of the graduates 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.

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. With an overall increase of awareness level the demand for more sustainable products and services also increases. Thus, awareness may trigger market change, technology penetration, adoption of new policies etc. 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. In GREECO case studies there are a number of examples illustrating such mechanisms (see Vol 4).

With growing awareness levels of the population, expectations from the manufacturers and any other businesses when it comes to social, ethical and environmental responsibilities are growing. 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 forestry, 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.

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. From the territorial perspective, awareness is achieved through long and persistent efforts on behalf of the regional and municipal administration which control a number of communication tools. Awareness is also strengthened through consistent **involvement of stakeholders into creating a future vision**. Additionally, awareness could also act as a pull factor for environmentally-friendly goods and services.

6.3. From green economy factors to indicators on territorial potentials

As far as the construction of a regional typology based on territorial green economic potentials is concerned, the approach followed in GREECO relies on the list of drivers and indicators identified within the project.

Along these lines, coherently with the theoretical approach presented in previous Section, the most comprehensive collection of indicators that could be obtained at the regional level (NUTS-2) with European coverage, was made available for further analysis and interpretation from a top-down perspective.

In a context of severe data scarcity, the chosen indicators enable as far as possible the provision of a regionally differentiated picture (i.e. they are spatially mutable). This has implied selecting indicators that take account of the regional differentiation by means of their intrinsic spatial variability. For instance, powerful market-related factors such as the current and anticipated high prices of energy and raw materials, which is one amongst the most relevant factors of greening of the energy sector, does not typically show a strong regional variability across Europe, and accordingly loose much relevance from a territorial perspective.

In brief, the indicators listed below, which are strongly related to the factors discussed in

Section 6.2, are the building blocks used to produce the regional typology of green economic potentials.

Green economy factors	Indicator	Source
Good governance: institutions, policies and regulations	European Quality of Government Index (2009)	Quality of Government Institute at The University of Gothenburg (Charron, Dijkstra, & Lapuente, 2013).
Key economic instruments: access to funding and financial support	Environmental protection expenditure in euro per capita (2010)	Eurostat Regional Database (env_ac_exp4r2).
Territorial assets and physical conditions	Onshore wind, photo voltaic and biomass energy potentials (TOE per capita 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	Number of greentech clusters per million inhabitants (2013)	New indicator developed in GREECO project.
	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.
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.
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_ifse_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 3 Indicators for territorial potentials of the green economy

6.3.1. Good governance: institutions, policies and regulations

From the governance perspective, it seems 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 and sustainability, if any, from those that are rather unspecific and do not only apply to a greener growth model. Regrettably, accessing to comparable territorial information on 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 of good governance at the regional level available in Europe is the “European Quality of Government Index” (EQI) produced by the Quality of Government Institute² at The University of Gothenburg (Charron et al., 2013). This indicator, which was first constructed for a report sponsored by the EU Commission for Regional Policy, provides a comparative overview of the quality of regional governance for 172 NUTS 1 and NUTS 2 regions within 18 of the 27 countries of the EU. The indicator itself has been inspired by the World Bank Government Indicator (Kaufmann, Kraay, & Mastruzzi, 2008).

The EQI was produced relying on a large survey of roughly 34,000 respondents in Europe which was distributed 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 good governance: (1) public education, (2) public health care and (3) law enforcement, and criteria: (1) quality, (2) impartiality and (3) corruption. Given its methodological soundness and relevance, even if not directly related to environmental policies and the green economy as such, the EQI is a good indicator of government quality.

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

Among the very limited range of available regional indicators on financial support systems and funding mechanisms, there are two good proxy indicators to compare financial support tools. Such indicators are Environmental Public Expenditure and Green Public Procurement Expenditure.

Environmental Protection Expenditure refers to activities that are directly aimed at environmental protection through “the prevention, reduction and elimination of pollution or any other degradation of the environment”. These activities are defined according to the Classification of Environmental Protection Activities (CEPA 2000), which distinguishes nine environmental domains. This indicator covers two economic sectors (public sector and industry), plus the so-called specialised producers of environmental services³ (public and private enterprises specialised in environmental services such as waste collection). The indicator may render the idea of the actual willingness, financial capacity and objective need to invest on environmental restoration by the economic agents involved in

² <http://www.qog.pol.gu.se/data/datadownloads/qogeuregionaldata/>

³ http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/EN/env_ac_exp4r2_esms.htm

productive activities within a given region.

Besides, both indicators, in particular public expenditure on green procurement, inform on public demand for green products and services within the public sector, and can arguably shed light on the emphasis that regional authorities place on greening supply chains by pouring money on green products and services, which are thought to create the conditions for the establishment of long-term private-public partnerships (OECD, 2013).

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Nonetheless, whereas green public procurement data is only available from the Eco-Innovation Observatory for a small subset of EU countries, and thus it could be used with the purpose of producing regional typologies, Environmental Protection Expenditure is delivered by the Eurostat at non-comparable NUTS levels. This made necessary to fill data gaps using the closest territorial level available as the best estimate.

6.3.3. Territorial assets and physical conditions

According to GREECO case studies and sectoral insights, the most relevant territorial assets that shape green economic potentials can be said to be biodiversity and renewable energy potentials.

Biodiversity is probably the most fragile and valuable environmental asset that any territory can hold. It is also broadly accepted that habitat loss and degradation are the most serious threats to the conservation of biodiversity. The Habitats Directive (92/43/EEC) builds on this idea and is concerned with the creation of a network of special areas of conservation at the EU level. This network together with the network of special protection areas under the Birds Directive (79/409/EEC) makes up the Natura 2000 network.

Additionally, it has to be considered that ecosystem deterioration usually does not have an immediately perceived economic impact. For this reason, biodiversity loss and environmental depletion are not usually included in traditional economic accounting systems, which include the depreciation of capital assets, but not for environmental assets. This failure is one of the most relevant leaks that undermine traditional accounting systems based on monetary flows. The omission has, in turn, become an underlying cause for the observed degradation of ecosystems and the loss of biodiversity worldwide.

For the abovementioned reasons, the Share of Natura 2000 area by NUTS 2 region has been chosen as an indirect way of assessing the overall quality and amount of valuable and healthy ecosystems at the regional level. This indicator, showed on Map 5, has been obtained from INBALUD project (Geoville, 2012) basing on 2009 data provided by the EEA. Figures have been checked for accuracy within a number of EU regions. Results show that the accuracy INBALUD data is considerably higher than similar indicators made available by other data providers.

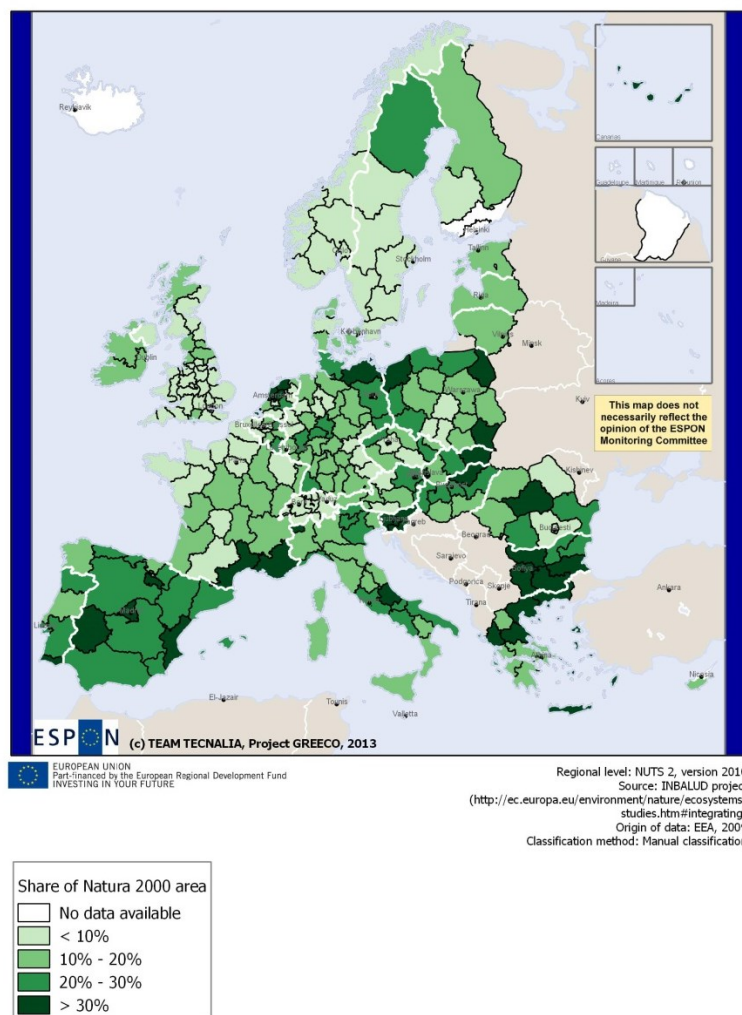
Contrary to biodiversity, which is usually perceived as non-economic asset whose main role is to maintain the resilience of ecosystems, other services provided by nature have a direct and well recognised economic impact. Among those it could be mentioned such ecosystem services supporting agriculture, fisheries and forestry. Similarly, other services provided by nature hold strong links with the economy.

Energy production from renewable sources has a very relevant, obvious and direct link to territorial assets. We still know very little about the green economy, but one thing we know about it is that it will certainly be powered by renewable energy sources. Accordingly, renewable potentials have been chosen as the best possible indicator of the direct economic benefit connected to the most paradigmatic sector within the green economy concept.

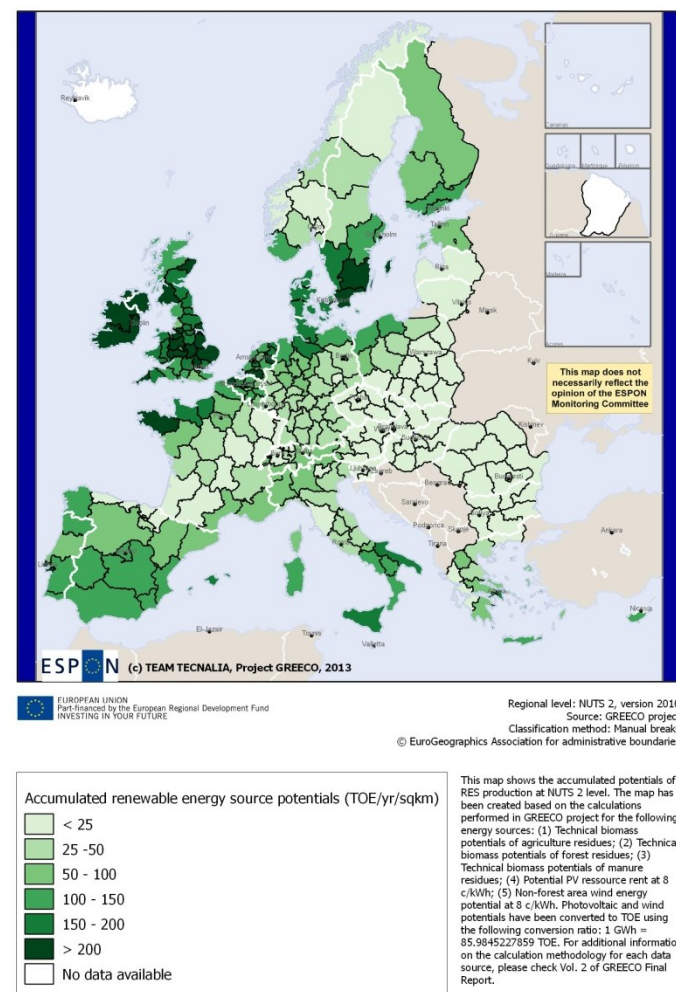
Map 6 has been produced relying on a number of estimates on technical and economic energy potentials for biomass production from forest, agriculture and manure residues, alongside wind and photovoltaic potentials. The methodology used to generate these figures can be found within the Scientific Report of GREECO project.

Whereas biomass potentials have been delivered taking mainly into account technical considerations, wind and photovoltaic potentials have also included economic considerations related to generalised installation and operation costs. However, it is important to note that these economic constraints do not take the location-specific costs of installation, grid connection and transport into account and that this is particular important for remote and sparsely populated regions where such costs can be higher. It is also important to acknowledge that the map does not take into account the extent to which existing potentials might have been already exploited within the regions.

Potentials are expressed as Tonnes of Oil Equivalent (TOE). Given the order of magnitude of wind potentials, several times larger than other energy sources, these condition the spatial distribution of the combined renewable energy potentials more than any other energy source.



Map 5 Share of Natura 2000 area by NUTS 2 region (2009)



Map 6 Onshore wind, photo voltaic and biomass energy potentials (TOE per km² per year) at NUTS 2 level

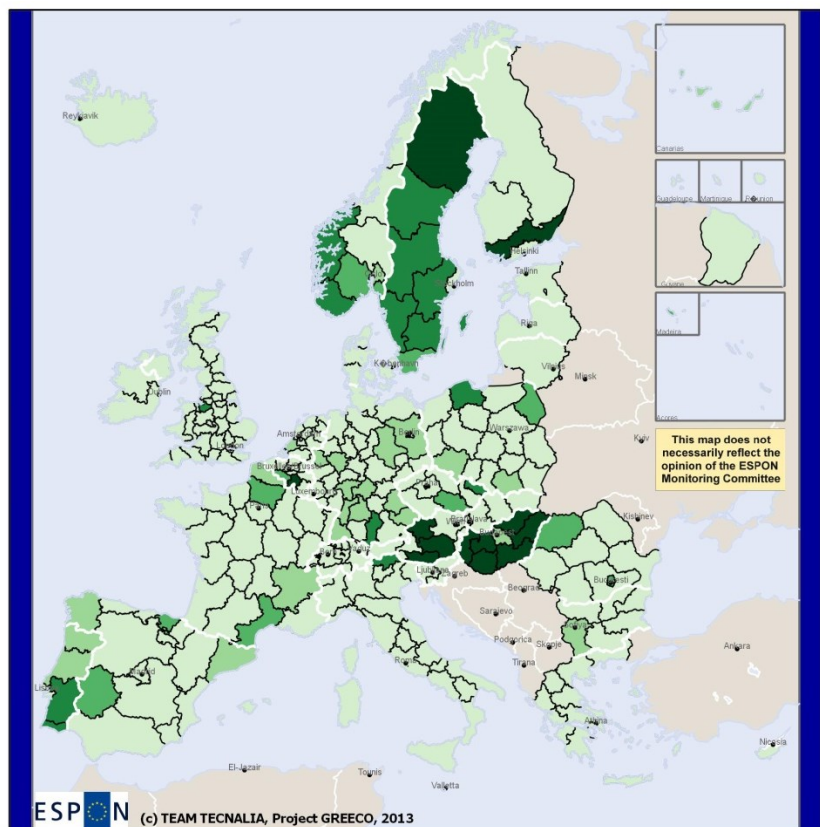
6.3.4. Access to technology

One of the green economy dimensions found to have a greater impact on future green growth potentials is access to technology. This dimension is covered in GREECO by two strands of indicators. The first strand is based on green patent data made available by the OECD, either from the Regions and Cities Database⁴, or from the Science, Technology and Patents database⁵, both including regional information on green patents, although with minor differences on contents and geographical levels. However, this indicator does not reflect some dimensions of innovation that are crucial for territorial development. In particular, business networking and public-private partnership activities linked to green activities are not fully unveiled by the OCDE figures.

This issue was addressed in GREECO through a new indicator on greentech clustering. The indicator was derived from data provided by the European Cluster Observatory. The database included a list 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. Clusters were linked to the specific NUTS-2 region of operation and weighted according to their specialisation on green technologies and total population of each region. The final indicator is presented on Map 7 as the number of greentech clusters per million inhabitants.

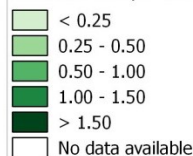
⁴ <http://www.oecd.org/gov/regional-policy/regionalstatisticsandindicators.htm>

⁵ <http://www.oecd.org/sti/inno/oecdpatentdatabases.htm>



Regional level: NUTS 2, version 2010
Source: Eco-Innovation Observatory, 2013
(<http://www.clusterobservatory.eu>, accessed 2 July 2013)
Classification method: Manual breaks
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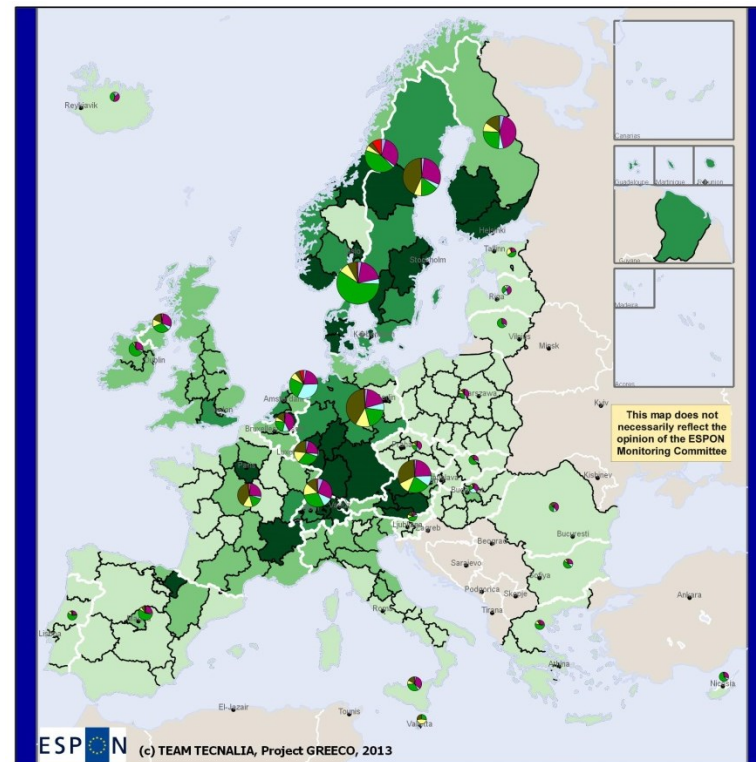
Green clusters per million inhabitants (2013)



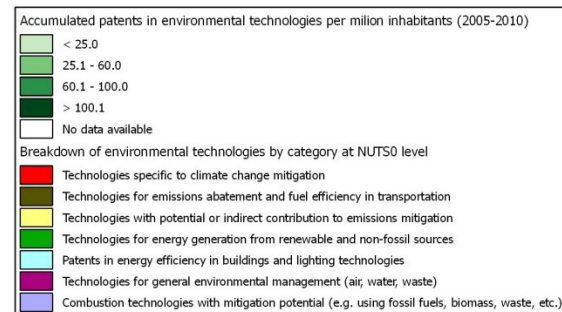
This map shows the number of clusters specialised in green technologies per million inhabitants at NUTS-2 level, according to the Cluster Observatory Database (<http://www.clusterobservatory.eu>). The green technologies considered in the analysis are: (1) Bioenergy, (2) Eco-construction; (3) Environmental Technology; (4) Hydrogen and Fuel Cells; (5) Recycling; (6) Renewable energy; (7) Solar Energy; (8) Sustainability; (9) Water, and; (10) Wind Energy. In those cases where both green and non-green activities are carried out, clusters have been weighted according to the sectoral specialization on green technologies.

Map 7 Number of greentech clusters per million inhabitants (2013)

ESPON 2013



Regional level: NUTS X, version 2010
Source: OECD Regions and Cities Database
Classification method: Manual breaks
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Map 8 Accumulated patents in selected environmental technologies per million inhabitants at various territorial levels (2005-2010)

6.3.5. Expected market demand

A key green economy driver is the potential market demand for green products and services. Still, available market surveys on green products and services are much focused on concrete products and services and are also rather unspecific from the geographical perspective. At the same time, as discussed on Section 3, in an open and unified market such as the EU it cannot be argued that a direct cause-effect relationship between a growing demand for concrete products and services within a given territory and a greener profile of local production systems holds. Similarly, it cannot be forecasted either future demand for such products and services at the local and regional levels.

Nonetheless, some sectors will necessarily have to initiate a transition to different development pathways as a result of the implementation of strong EU, national, regional and local regulations, strategies and targets. Some of these sectors, such as the building sector, are strongly linked to territorially-bound assets. Additionally, this particular sector shows a much localised market from the geographical perspective. Most of the supply related to building and construction indeed is located very close to where demand for these types of services is actually generated.

For these reasons, an estimate on the annual CO₂ emissions savings potential for the building sector in 2050 has been proposed in GREECO as proxy indicator for the market dimension of green economic development. 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.

The indicator, which is specific for the green subset of the economy, has the capacity to include in one single figure more than one relevant dimensions of the process of green economic transformation, namely territorially-bound assets, such as housing stock, the spatial patterns of current development model –though residential patterns- and the expected market size –though population projections-, as well as the policy perspective – though carbon-budgets linked to mitigation policies at the EU level-.

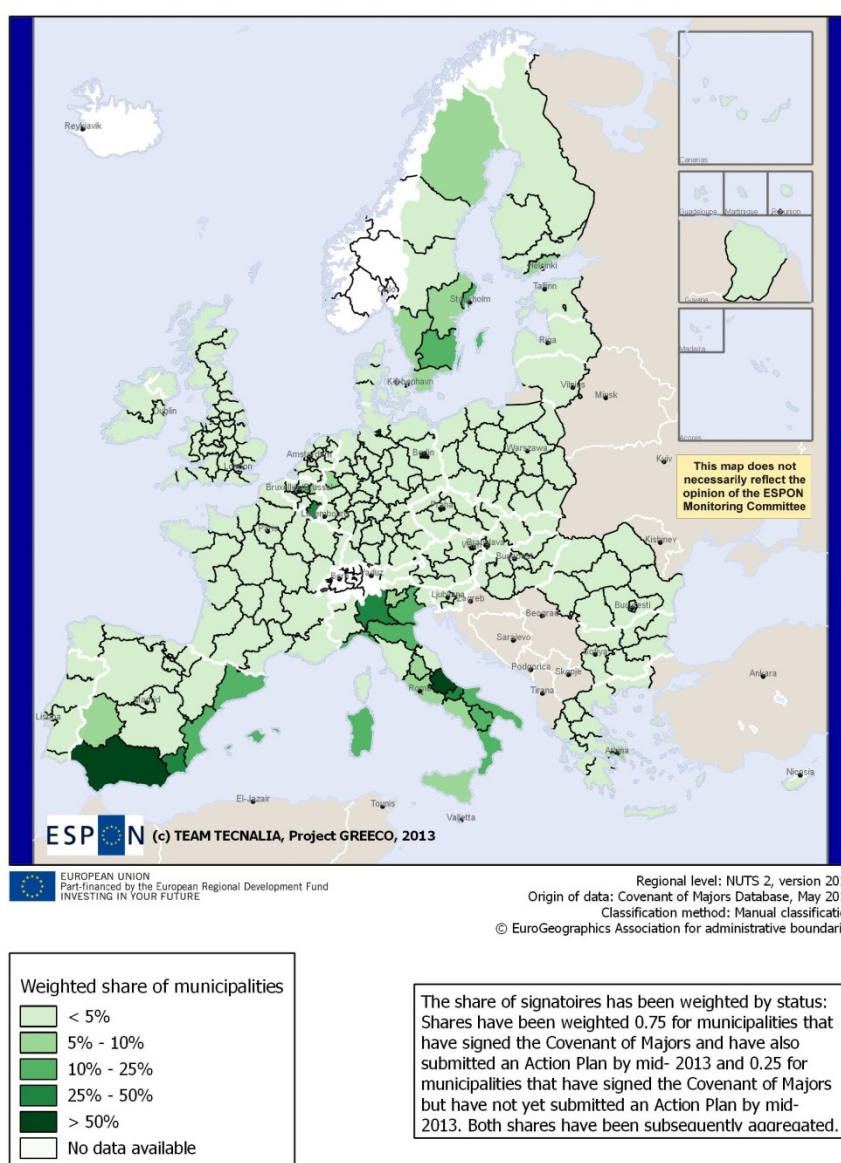
6.3.6. Human resources, knowledge and skills

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 the environmental goods and services sectors, but also those transversal skills needed to support transitions in terms of increased energy and material efficiency, adaptation to climate change, etc. (Martinez-Fernandez, Hinojosa, & Miranda, 2010). Accordingly, 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). Thus, the indicator chosen in GREECO to reflect this dimension on the regional typology is the Percentage of persons aged 25-64 and 20-24 with upper secondary or tertiary education attainment, by NUTS 2 regions.

6.3.7. Environmental awareness and voluntary actions

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.

One of the most 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. 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 seeks to create “skilled and stable jobs, not subject to delocalisation; healthier environment and quality of life; enhanced economic competitiveness and greater energy independence”⁶.



⁶ http://www.eumayors.eu/about/covenant-of-majors_en.html. Last accessed 17 November 2013.

developing a set of strategies towards the achievement of the specific objectives of the initiative –Share of local administrations that have already submitted an Action Plan –.

One interesting feature connected to this initiative launched by the European Commission in 2008, is that according to the Covenant of Majors webpage⁷ so far no local administration has reached Step 3 in the implementation sequence. 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 local and regional authorities have not yet reported the extent to which the actions foreseen in their Action Plans are actually being implemented.

The most involved regions are those concentrated around the Mediterranean and Baltic seas, alongside the Benelux, both with a large share of municipalities that have joined to the Covenant of Majors. This holds for all kinds of signatories, but particularly for those that have already submitted their Action Plans. Those regions that have signed but have not yet submitted their plans are mainly located in the Mediterranean region, particularly in Southern Italy and Spain. This may well suggest a lack of capacity to actually design and implement action plans.

6.3.8. Integration of factors and indicators: a tentative typology of territorial potentials for a greener economy

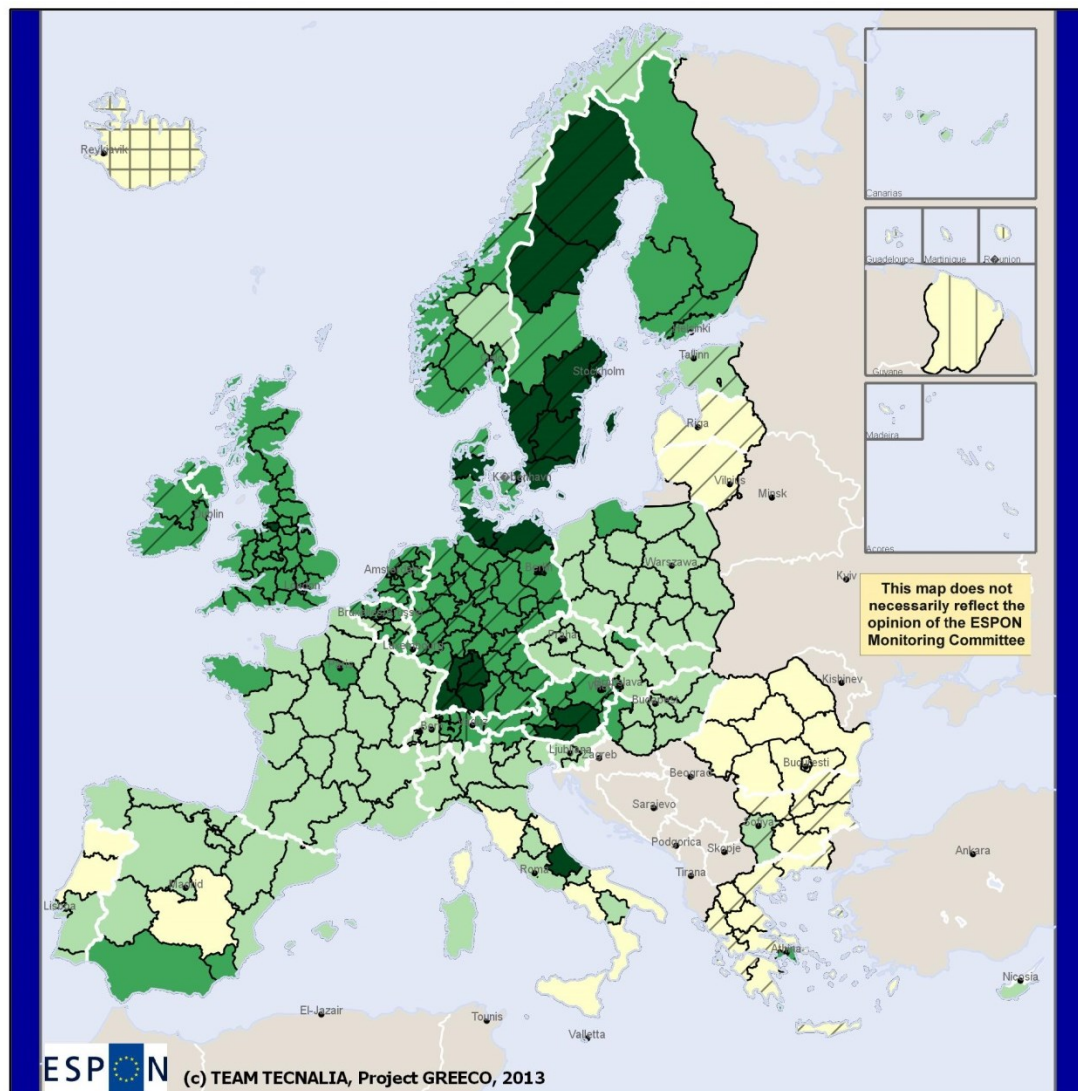
All the empirical evidence introduced on previous paragraphs was combined to generate the Green Economy Theoretical Potentials Index (GEPI). The GEPI was generated as an arithmetic sum of the weighted averages of all the 7 factors considered in the analysis. As it has been discussed above, some of these factors relied on one single indicator, whereas others included two (Territorial assets and physical conditions) or three (Access to technology) indexes combined. The resulting sum of all factors was subsequently normalised from 0.5 to 1.5 for representation purposes. All factors have been assigned identical weights. However, this option could be discussed, taking also into account the possible trade-offs and links among different drivers as well as the asymmetric implications that such elements might have on the different green economy spheres (i.e. environment, economy, society and territory).

The final decision on how to assign weights not only relates to objective factors derived from territorial evidence, but also to the way such evidence is interpreted from the field and regional and local practice. On-going strategies and political priorities, cultural beliefs and even personal choices may condition the way the influence of different issues on the green economy is perceived. For this reason, it is a good practice to gather as much perspectives as possible in order to assure the maximum overall relevance of pondering outputs.

With that goal in mind, the typology presented on Map 10 below will be disseminated among the ESPON community, including MC members, in order to achieve the maximum

⁷ 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.

possible consensus on the weights given to each specific factor. Following, all inputs will be combined to deliver a final, harmonised pondering. Such weights will be further used to build the regional typology of regional potentials for the green economy to be included in the Final Report of GRECO project.



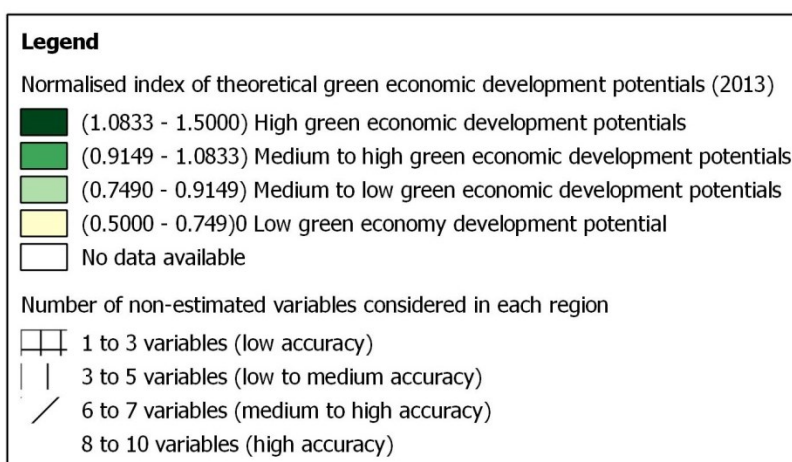
EUROPEAN UNION
Part-financed by the European Regional Development Fund
INVESTING IN YOUR FUTURE

Regional level: NUTS 2, version 2010

Source: Tecnalia, 2013

Classification method: Jenks

© EuroGeographics Association for administrative boundaries



Map 10 A tentative regional typology of territorial potentials for a greener economy at NUTS 2 level, including the number of non-estimated variables used in the classification (2013)

Map 10 shows a quite uneven territorial distribution of theoretical green economy development potentials across Europe. Such potentials seem to be higher in the Pentagon, Nordic countries, British Isles, and some specific NUTS-2 regions located in Mediterranean countries and New Member States. However, most regions located within the latter two macro-regions show medium to low and low theoretical green economy development potentials. Map 10 also informs on the number of non-estimated variables used in each region. It goes without saying that less accuracy of the GEPI should be expected in those regions where a smaller number of indicators were used. Here, results should be interpreted with much care.

The spatial variation of the GEPI is of course tightly related to the spatial variability of the different components combined in the index. Small variations in the number of variables included and the weights used might lead to totally different outputs. This raises two methodological concerns: first, it implies that this specific typology probably relies on a too narrow number of indicators to qualify as something more than a preliminary research output, and; second, linking to a recurrent critique to synthetic indicators it can also be argued that the GEPI hides factor-specific information relevant for descriptive and normative purposes. This is particularly important, as basing decisions on synthetic indexes might lead to undesired outputs.

In order to avoid these drawbacks, the typology should be analysed jointly with the different components included in it. All such indicators have been mapped and are available in Vol 2 of this report (and some of them also within this same Volume).

The use of benchmarks of indicators is arguably preferable to synthetic indexes that combine several intrinsically diverse dimensions. Panels of indicators enable a better policy interpretation of research outputs and allow for a more accurate design of policies compared to synthetic indexes. The interpretation of results based on panels of indicators allows benchmarking of regions that are comparable in the dimensions benchmarking is done. Along these lines, the formulation of a framework of indicators capable of assessing progress towards a green economy, such as the one provided in GRECO project, might be very helpful. It would allow the formulation of ends and means in specific targets and instruments.

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

The policy analysis has been a cornerstone in the GREECO project and as a result a range of policy messages have emerged, originating both from the specific economic sectors analyses as well as from the regional case studies. Derived from the experience and knowledge generated within the project, the following general key lessons learnt and policy messages should be considered in the future process of developing green economy policy in European regions. Most of these conclusions have already been reflected through different instruments of the Structural and Cohesion policy.

It is worth noticing that a single region cannot achieve the needed changes, but Europe as a whole, with its experience, track-record and economic power has a realistic chance to lead this transition towards a greener, more resource-efficient economy and future, tackling current sustainability challenges.

7.1. Key findings of GREECO project of particular relevance for policy action

Cities and regions are key actors in a green economy transition. Regions and local authorities have the potential and the necessary leverage to make a significant contribution to the achievement of the green economy through the definition of territorial actions under their competence. Although a number of factors (e.g. taxes, legislation) fall out of the scope of regional stakeholders, regional authorities play a leading role in fostering regional economies through purchasing policies, promoting regional R&D, awareness raising, etc. In such a context, eco-innovation strategies, capitalising on the local strengths may strengthen regional economies and reduce regions' dependency on non-renewable resources and thus increases resilience. This is demonstrated by many of the regions studied within GREECO which are formulating strong policies for green economy development aligned with their respective level of jurisdiction. Many of the regions are in fact setting more ambitious goals than the national ones, such as in case of Jämtland (SE) and Cornwall (UK) to further accelerate a green economy transition.

Cities and regions hold significant assets that are key building blocks in green economy development. The assets (or territorial capital) vary across territories and there is a fundamental qualitative difference in their nature (geographical location, natural resources, social capital and institutions, etc.), their economic role in the local communities and regions, and how much they can be leveraged to foster transition to a green economy. The realisation of the potential of the territorial capital depends on a number of policy, institutional, political and financial factors. The region of Zealand has managed to profit on the rich wind potential of the region and has made wind energy one of the most expansive sectors in the economy of the region since the early 1990s. This is a result of the focused regional and municipal policies on development of renewable energy, bioeconomy and green experience economy. Close to all municipalities are signatories to the Covenant of Mayors and they pursue their own climate and energy programmes.

Local networks and local initiatives can support a transition of both the supply and demand side of the green economy by supplying information, education support to

SME's and concrete practical tools for engaging in greening initiatives. One of the key factors behind Puglia's (IT) success in developing an 'ecosystem' of green innovation and research organizations is its institutional framework that is driven by regional clusters and networks. Enhancing collaboration among firms, universities and the public sector increases knowledge transfer and boosts the potential for innovation, research, and development which acts as a powerful accelerator for green transformation.

The regulatory framework is a key driver for green growth. The differences and potentials of territories should be reflected by policy-makers across Europe and across territorial levels in the implementation of policies contributing to green economy. It is important to ensure that different policies and EU Cohesion Policy in particular, take on board the territorial dimension, build on the diversity of regional potentials and challenges. An example of a strong regional policy that is driving a regional shift towards green economy is the MODERNA plan of the autonomous region of Navarra (ES). Coupled with economic instruments, the strategy seeks an economic paradigm change, from a resource intensive economy to a resource efficient one built on RES and innovation.

The lack of data at the regional and local levels is a real challenge. One of the critical observations of GREECO was the overwhelming lack of good regional data. Given the high regional variations, coupled with the fact that greening potential of regions is directly related to existing performance, the lack of data is a major limitation creating comparable information for holding regions accountable to greening their build stock. Even at the national level the data availability is limited. The standard statistical framework for economic analysis in Europe is developed for satisfying the 20th century needs for statistical information. In the 21st century with its transformations towards a green economy different statistics are required. Further development of green economy and resource efficiency indicators would enable to set a measurement framework to monitor progress towards green economy and would benefit the policy-making process at the EU level.

A clear political orientation and guidance through policy is needed, and the EU and its member states and regions could lead the way and set a positive example through e.g. thoroughly applying Green Public Procurement and strengthening the market-based instruments, creating a demand for green products and services.

7.2. Key policy messages emerged from GREECO research

Countries and regions need sound and clear-cut but ambitious and transformative policies based on wide stakeholder involvement and accompanied by sufficient financial resources.

Increase policy ambition would speed up transition to a green economy

More transformative policies. 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. The current EU framework is not truly transformative but rather builds on marginal

improvements of the business as usual scenario through introduction of best-of-class technologies and processes.

Increasing the targets. Policy targets and objectives are a major driver of green growth. Cities and regions have the potential to lead the green economy transition by setting more ambitious goals than the EU. For example, London has set targets for 45% municipal recycling/composting by 2015; 70% commercial recycling/composting by 2020 and 95% of C&D waste by 2020. Lagging regions need to consolidate their policy, institutional and financial systems in order to reach compliance and decrease the gap with the leaders.

Bigger stakeholder involvement and awareness are key for the success of policies

Strategic policy development at all levels must engage local actors: Important strategic shifts in the regional economy need to be consulted with relevant local actors in order to ensure their buy-in. Additionally, complex strategic documents need to reflect the available expertise in the region which is held by stakeholders from the public, private, academic and non-governmental sectors.

Raise public awareness to stimulate behavioural change. An often repeated obstacle to green economic development is the lack of access to information and knowledge. Measures improving the access to knowledge and facilitating knowledge spill-over should therefore be promoted such as creation and support of knowledge networks, clusters, associations, strengthening linkages between actors and across sectors, dissemination of good practices, etc.

Involve consumers and promote demand for greener consumption. The labelling of products according to environmental, economic, and social standards is an important tool in ensuring the consumer partnership in the process towards greening economic sectors. There is numerous awareness raising programs, EU labelling and certification schemes, web-portals as well as national and regional initiatives. Labelling of products with visible and clear messages to consumers on the energy consumption and future environmental and economic impacts of their choices should be promoted. In addition, it is important to harmonise the plethora of labelling schemes in certain sectors as it can cause confusion among consumers.

Further investments in public infrastructure provide the basis for greening sectors such as water, waste, biodiversity, transport, etc.

Improve public infrastructure to enable the development of green economies. The infrastructures needed range from modernised transport systems, to energy networks that unleash tacit RES potentials. The availability of state-of-the-art infrastructure such as tertiary wastewater treatment plants, waste handling and recycling systems, public transport, efficient energy grids etc. is needed to increase the environmental performance of regions (as well as the impacts from the overall community). The process of designing and constructing this infrastructure is an integral part of greening of the economic sectors.

Further support resource efficiency and invest into ecosystems in order to maintain a profound environmental foundation to green economy development. Ecosystems provide life-supporting services to Europe's economy and society which have an economic value counted in billions of Euro, through provisioning and regulating services.

Decoupling resource use from economic activity should become a key factor in policy making at all levels and across sectors.

Avoid the 'silver-bullet approach': Emblematic large-scale projects are not a strategy for change in itself, unless they are integrated into a larger, more holistic approach to build the region's or city's future. Large-scale projects cannot be the drivers for green economy transitions. These should be based on multiple, incremental activities to create a positive climate in which change can flourish.

Better pricing of resources is a powerful driver of change

More realistic pricing of natural resources: The price of natural resources does not reflect the true value. Therefore, policy support is needed to adjust the economic and fiscal framework to provide incentives to become more resource efficient (i.e. greener).

Charge for external costs to create a higher share of consumption on organic and resource efficient products. Products that have high negative external costs should be considered for taxes or charges or other cost efficient measures. E.g. the OECD suggests the further implementation of trading schemes for e.g. water rights or carbon emissions. These are cost efficient and dynamic (in the sense that they stimulate the development of new technologies) ways for correcting for market failures.

Strengthen financial support for regional actors in implementing green economy

Make better use of available investment support schemes. The development and spreading of green investment support schemes would support green economy development in many sectors; e.g. tourism, agriculture, construction. Investment support for modernisation of e.g. agricultural or public buildings and equipment holds great potential in reducing emissions of GHG, improving energy efficiency, etc.

Incorporate environmental, eco-innovation and resource-efficiency elements in available EU, national and regional funds and improve regions' access to finance and funding by increase absorption capacity of regional institutions. There is significant EU and national financial resources that are playing and could play an even bigger role for greening the economy. For this purpose, environment, eco-innovation and resource-efficiency need to be incorporated both on planning and project level. It is also essential to develop networks and establish cooperation supporting SMEs and municipalities in providing support for application procedures.

Strengthen market based instruments, such as environmental taxes and tradable rights, which create incentives for environmental efficiency. Implementing tax reforms through further development of the environmental tax system is seen as an effective driver which steers the economic development towards more sustainable scenarios. In addition, a stronger legislative provision and stricter regulations need to be introduced. Moreover, an adequate fiscal policy and a full-fledged environmental fiscal reform could also generate incentives to stimulate innovation and create revenue for further investments into sustainable resource use.

Progress towards the adoption of an integrated territorial approach

Towards a resilient urban and regional planning: Promoting densities of scale that

reduce energy demand in buildings, and non-car forms of mobility through cities and peri-urban regions of functional distances are very effective tools to induce green responses in the economy.

Further promote the mutually profitable synergies between business and municipalities where underutilised and undervalued resources from one (materials, energy, waste, water and waste water) are recovered and reused elsewhere in the industrial and municipal networks creating Circular Economy. The promoting of opportunities of business linkages and connection to residential/municipal activities may help companies cut disposal, storage and transport costs, generating sales by adding value to previously under-used or discarded resources, and thereby ensuring a general reduction in energy consumption. It increases profitability through reduced costs and additional sales, promotes more value for by-products, share innovations through knowledge transfer and access to solution providers, and ensures corporate social responsibility commitments through measurable actions.

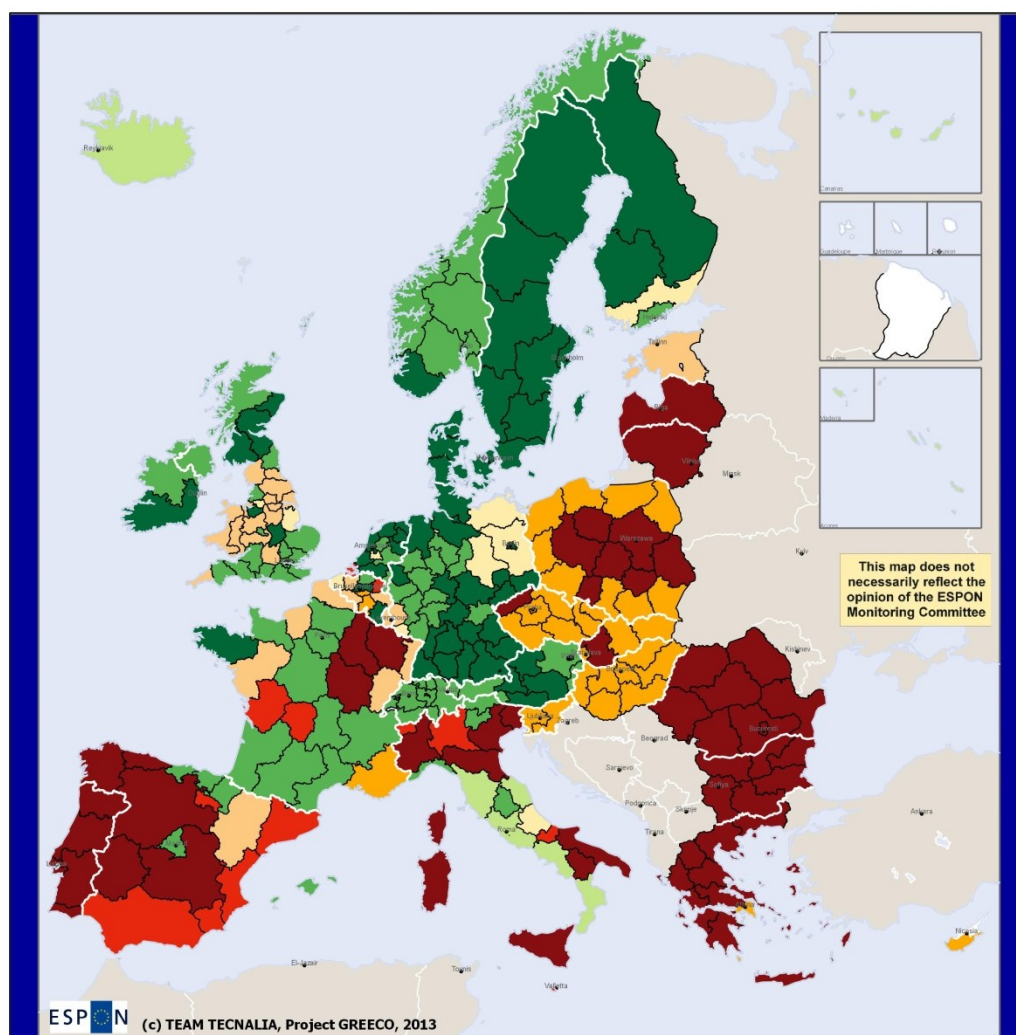
Consider links and trade-offs of green economy sectors: For instance, benefits of water and waste management systems are actually greater when planned and developed in an integrated manner than the summed technical potentials of the individual components alone.

Implement a multi-level and collaborative territorial governance approach, particularly in some sectors. For example, from a water and waste management perspective, cities hold the keys to awareness raising and separate waste collection, whereas regions are better placed to organise functioning regional waste management systems. Regions are also the right governance level for supporting circular economies based on industrial ecology systems. Regional/local partnerships are key players to incorporate renewable energy in energy systems.

Better monitoring and enforcement increase the credibility of policies and contribute to their constant improvement

Improve regional monitoring: The formulation of operational programmes including a framework of indicators capable of assessing progress towards a green economy can be very helpful, as it allows the formulation of ends and means in specific targets and instruments.

Improve regional indicators: It is strongly recommended to develop a statistical framework with collection of primary data that allows for monitoring the green transformation of the fixed capital stock and the related consumption of resources, sinks and space. In particular, a harmonised regional energy statistics would be an invaluable tool to local government as well as national and Regional Fund assessments of the regional decarbonisation processes. Thus, it is strongly advised that a database of energy statistics at the regional (at least NUTS2) level is developed.



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INVESTING IN YOUR FUTURE

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Types of green economy performance and potentials

- Pre-transition regions with low green economy development potentials
- Pre-transition regions with medium green economy potentials based on low- to medium territorial assets and excellent level of policy and finance-related factors
- Pre-transition regions with medium green economy potentials based on excellent territorial assets and low- to medium level of policy and finance-related factors
- Other types of pre-transition regions with medium green economy development potentials
- Pre-transition regions with high green economy development potentials
- Transition regions with low green economy development potentials
- Transition regions with medium green economy development potentials
- Transition regions with high green economy development potentials
- Data not available

The map above presents a typology of regions based on the overlap between regional green economy performance and potentials. The thresholds used to build the typology are introduced below:

1. "Pre-transition regions with low green economy development potentials" are those regions with combined regional green economy performance under the ESPON average and combined green economy development potentials below Quartile 1 (0.25)

"Pre-transition regions with medium green economy development potentials" are those regions with combined regional green economy performance under the ESPON average and combined green economy development potentials ranging between Quartiles 1 and 3 (0.25 to 0.75)

The latter have been divided into three sub categories:

2. "Pre-transition regions with medium green economy potentials based on excellent territorial assets and low- to medium level of policy and finance-related factors" are those regions where combined territorial assets (share of Natura 2000 area, RES potentials, expected market demand and human resources) are above ESPON average, whereas combined governance and finance factors (quality of government, voluntary actions and funding) are under ESPON average.
3. "Pre-transition regions with medium green economy potentials based on low- to medium territorial assets and excellent level of policy and finance-related factors" are those regions where combined governance and finance factors (quality of government, voluntary actions and funding) are above ESPON average, whereas combined territorial assets (share of Natura 2000 area, RES potentials, expected market demand and human resources) are under ESPON average.
4. "Other types of pre-transition regions with medium green economy development potentials" are all the remaining regions with low green economy performance and medium green development potentials
5. "Pre-transition regions with high green economy development potentials" are those regions with combined regional green economy performance under the ESPON average and combined green economy development potentials over Quartile 3 (0.75)
6. "Transition regions with low green economy development potentials" are those regions with combined regional green economy performance over the ESPON average and combined green economy development potentials under Quartile 1 (0.25)
7. "Transition regions with medium green economy development potentials" are those regions with combined regional green economy performance over the ESPON average and combined green economy development potentials ranging between Quartiles 1 and 3 (0.25 to 0.75)
8. "Transition regions with high green economy development potentials" are those regions with combined regional green economy performance over the ESPON average and combined green economy development potentials over Quartile 3 (0.75)

Map 11 Regional typology based on green economy performance and potentials

7.3. Key policy messages for specific types of regions

Map 11 above shows a typology of regions based on the overlap between the typology of green economic performance showed on Map 4 and the typology on regional green economy potentials showed on Map 10. When developing the typologies we need to provide a disclaimer whereas it is extremely difficult to qualify the whole economy as one or another. Throughout the whole GREECO research it has been demonstrated that the performance of the green economy has very strong sectoral dimensions and therefore greening of the economy is in fact greening of the individual sectors. Therefore, the classification of the regions and assigning of policy messages remains on a general level.

Regions with pre-transition economies and high green economic development potentials

These are regions with rich environmental resources, a good mix of drivers and enabling conditions and a certain political willingness to remove existing barriers. These are regions where some factors are particularly favourable but where the rest of the drivers and enabling conditions have been established relatively recently (e.g. New Member States which have recently adopted EU targets). These are the regions where marginal growth (δ) of green economy value added over relatively short periods of time will be high as they have to catch up with average and good performers in a number of areas such as waste, water, manufacturing, eco-innovation, construction, etc..

Regions with pre-transition economies and medium green economic development potentials

These will typically be regions which have not yet benefited from green economy development and which do not have an outstanding mix of drivers and enabling conditions to take them on a new growth path in the near future. This will mean that they either have excellent territorial assets but deficiencies in policy and its implementation or they have average to low territorial strengths but are able to utilise them fully through smart policy drafting and robust institutions. For the sake of future policy relevance these regions can be split in two typologies which stem from the nature of their medium potentials:

- Regions with pre-transition economies, excellent territorial assets and low- to medium- level of policy and finance-related drivers and enablers. These are regions where the environmental resources are particularly favourable but where the rest of the drivers and enabling conditions have been established relatively recently (e.g. New Member States which have recently adopted EU targets). A number of these regions will be Cohesion Regions and will be in the position to benefit from significant financial resources. However, it may be expected that regional political and hence financial and institutional support will be average too little. This situation might lead to impossibility of fully utilising EU funds in the current and future Programming Period 2014-2020 or utilising them for common, carbon intensive investments.
- Regions with pre-transition economies, low- to medium territorial drivers and enablers and excellent level of policy and finance-related drivers and

enablers. This will be a relatively rare group of regions which have not yet benefited from green economic development, which do not dispose of strong natural assets but which are ambitious and have recently developed a solid mixture of policy and finance-related drivers and enabling conditions which may take them on a green development path despite the lack of outstanding natural assets.

Regions with pre-transition economies and low green economic development potentials

These would be those regions which have not been a part of serious green economy development efforts and which have a number of obstacles to create the right conditions for such development. Having in mind that all EU regions benefit from the stimulating EU policies, being in this group may mean existence of significant institutional and financial barriers or lack of capacity for implementation of EU policies. Such regions will also have low capacities for benefiting from EU Structural and Cohesion policies and will choose to spend them (if at all) for one off carbon intensive investments (in terms of large infrastructure projects?). These might also be regions where lack of the above drivers and enabling conditions and/or existence of serious obstacles is coupled with very low environmental assets, low human resource capacities and weak institutions.

Box 2 Policy messages to pre-transition regions

General policy messages to all types of pre-transition regions

The policy messages to such regions would be to capitalise on a full, high-quality transposition of EU legislation and integrate it in regional strategic frameworks and legal systems where relevant. Policy ambitions need to be matched with sufficient finances be it from national, regional or EU sources. Main regional actors should be mobilised in defining a vision for greening of the regional economy and the level of regional ambition. Similar regions would often have environmental legislation enforcement issues and corresponding responsibilities. Strengthening enforcement is primordial.

Similar regions will also have a relatively low level of awareness compared to Western and Northern European regions with longer tradition of environmental protection and sustainability actions. It is a common characteristic for poorer, pre-transition regions that they would have lower levels of utilities such as water and waste and lower non-compliance penalties. Getting the right level of prices is of extreme importance for defining individual and business behaviour. Removing Environmental Harmful Subsidies is even more important in such regions as this would free up precious financial resources.

Pre-transition regions would have environmental institutions which do not have long traditions and would therefore need significant consolidation and capacity development. The quality of the institutions is key for setting intelligent strategic vision, competent guidance and framing a new mindset through appropriate communication actions.

Policy messages to regions without large territorial assets

All of the above policy messages are valid to these regions as well. Additionally, such regions should concentrate on these green economy sectors that are not directly dependent on natural endowments and other drivers and enabling conditions that cannot be acted upon. Water and waste management, construction, manufacturing and eco-innovation are such sectors. The importance of strong institutions and human resource

capacity is even higher.

It is also possible to turn a disadvantageous position into a commercial advantage. A severe shortage of one resource (e.g. water) can spur research and innovation and lead to development of new technologies which subsequently creates business opportunities.

Regions with transition economies and high green economic development potentials

These are regions where both natural assets and policy and institutional drivers and enabling conditions are present. These will typically be the most successful regions which have already embarked on a path of green economic development years ago and which are at the forefront of institutional and policy innovation. These may be regions which have already realised a big part of the lower-hanging fruits of green economic development (including the ones related with traditional EU policy) as a consequence of robust institutional and policy mixture as well as significant funding. However, these regions might be good candidates for forerunners in setting up innovative behavioural and new economic patterns. These will typically be regions which realise and which have internalised the competitive advantage of a green economy environment and which will exert certain pressure on national and EU policy makers for higher targets. Of course, the marginal growth might not be that big because of the fact that it already took place in the past.

Regions with transition economies and medium green economic development potentials

These will be regions which have already benefited from a certain level of green economy development because of traditionally good mix of drivers and enabling conditions. However, these might be regions which do not have outstanding natural capital and whose geographical location and economic realities do not allow them to be at the forefront and do not promise outstanding green economy development in more than a limited number of sectors. We may assume that if the region has already transitioned to green economic development the existing policy, institutional and finance-related drivers and enabling conditions are in place and the limited possibilities for development come from natural and other realities that cannot be modified, at least in the short-term.

Regions with transition economies and low green economic development potentials

If these regions have already walked a significant part of the green economy road this means that probably their drivers and enabling conditions set-up is relatively favourable with the exception of environmental assets. This might also mean that after significant green economy investments have been made there has been a change of political leadership leading to a change of economic priorities. These regions might be about to lose their status of relative leaders and embark on a flattening curve of development. These might also mean that the regions and states have made the initial investments related to green economy pressured by compliance considerations but where economy structures and big companies and SMEs have low innovation performance and

potentials.

Box 3 Policy messages to transition regions

General policy messages to all types of transition regions

The policy messages to such regions would be to keep up the policy and performance ambitions that have made them green economy or sectoral leaders. Without any doubt this position is due to targeted, quality policies both at national and regional backed up with sufficient financial resource. Both need to be maintained. Additionally, such regions would have the potential to introduce even more innovative policies and in this way inform overall EU policy and processes.

Target-setting for transition regions should be more ambitious and should not be constrained by easily achievable EU targets. Most probably, very high targets will have to be associated with adoption of a bigger number of transformative policies calling for different individual and company behaviours but also different system-wide innovations such as industrial ecology.

Successful regions have undoubtedly reached this level thanks to the involvement of regional stakeholders which needs to be further developed. There is a possibility for even newer cooperation and synergies between sectors – public, private, non-governmental, academia – which capitalise on different expertise, knowledge and energies. Strengthening the links between research and business is a factor for higher commercialisation of eco-innovations.

Institutional quality has been a factor of success for transition regions and it should not be compromised. Especially in times of crisis there is a temptation to reduce number of employees, suspend non-essential services, reduce budget for programmes, etc. Similar approach would pose a risk for keeping the leading role of the region. Enforcement of environmental legislation is closely related to the quality of institutions and rule of law.

The relatively high level of awareness in such regions should be consolidated and utilised for behavioural break-throughs – both on individual and business levels. This might lead to radically different ways of physical planning and new perceptions of production and consumption leading to a much better resource use but also a smarter consumption. Green Public Procurement (GPP) has a huge potential leverage effect and its full-fledged introduction is a key to market transformation and development of new products and services.

Successful regions need to secure political continuity for green, low-carbon development which is translated in stable strategic framework, stable financial support and prices and maintaining or strengthening of relevant institutions.

EU Structural funds are usually not significant in size in similar successful regions. However, their role remains crucial because of their innovative character. EU funds could be used for funding demonstration projects with high potential for replication.

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