INTERACT Sharing Expertise

"Expert assignment to deliver a Scoping Study on European Territorial Cooperation"

Scoping Study:

A thematic analysis of territorial developments and Interreg / ETC Investments in the period 1990-2013

(Volume 1b)

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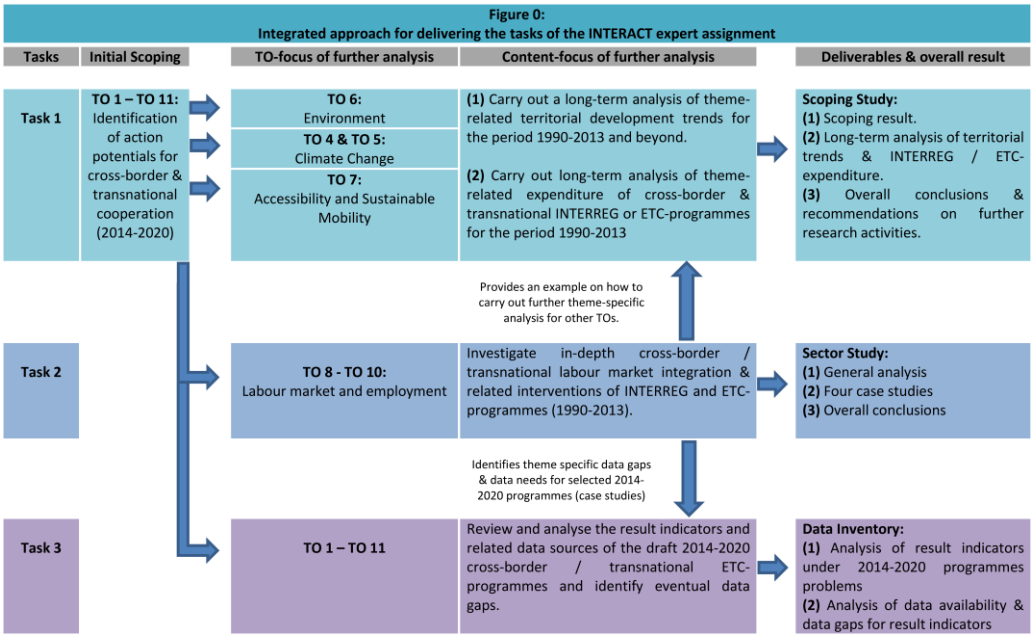
1. Introduction

This study is one of the key deliverables of an INTERACT expert assignment that was carried out by an international consortium composed of "EureConsult" (Luxembourg, Lead Partner), "t33" (Italy) and "Spatial Foresight" (Luxembourg).

The INTERACT assignment is meant to be a first step in a more systemic effort, which aims to conduct studies with certain regularity on issues of strategic relevance for European Territorial Cooperation (ETC). This shall allow to capitalise on past experiences and achievements of ETC and to further improve ETC-programmes in the period 2014-2020 through learning from the capitalisation results. Due to this, the INTERACT assignment expected that cross-border and transnational cooperation is analysed in a long-term perspective (1990-2020). This approach was deliberately chosen and differs from traditional evaluation work. By looking back into the period 1990-2013, the evolution of ETC since its beginnings and achievements that take a longer time to evolve and manifest should be captured. By looking forward into the medium-term future, theme-specific trends and cooperation potentials as well as other aspects of relevance for ETC in the period 2014-2020 should be explored. For this to be achieved, the assignment defined three operational tasks which were delivered by the experts through an integrated approach **(see: Figure 0)**.

Figure 0:
Integrated approach for delivering the tasks of the INTERACT expert assignment



To determine more precisely the specific focus of further analysis to be carried out under the three tasks, an initial scoping exercise was carried out in August 2014. This scoping identified cooperation potentials under all eleven Thematic Objectives (TO) of the European Structural and Investment Funds (ESIF) in the period 2014-2020 and prepared discussions at the joint kick-off meeting of September 2014. At this meeting it was agreed to address all eleven TOs of the ESIF, however with a different scope of coverage across the tasks and alongside the specific analytical focus of each task.

- The "Scoping Study" (Task 1) covers TOs 4-7, by looking at long-term territorial trends and corresponding INTERREG / ETC investments in the fields of environment, climate change, accessibility and sustainable transport.
- The "Sector Study" (Task 2) covers TOs 8-10, by realising a long-term and in-depth investigation on cross-border and transnational labour market integration.
- The "Data Inventory" (Task 3) covers TOs 1-11, by reviewing and analysing result indicators and related data sources of the 2014-2020 draft cross-border and transnational ETC-programmes and by identifying eventual data gaps.

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For the "Scoping Study", the specifications of the INTERACT assignment suggested that the analysis should be carried out as a gradual process.

- In a **first step**, the experts were supposed to **identify, prioritise and further analyse topics of cross-border and transnational relevance in relation to the eleven TOs of the ESIF for the period 2014-2020.** This initial scope-analysis was carried out at the level of the individual Investment Priorities IPs (where existing) and by applying a differentiated set of criteria for appraising and prioritising the various IP-topics under the TOs. The outcome of this initial scoping was an analysis paper and two lists with a prioritisation of topics with cooperation relevance under the eleven TOs, i.e. one list for cross-border cooperation and one list for transnational cooperation. This outcome **is presented as volume 1a of the scoping study.**
- In **steps 2 and 3**, on ground of the findings of the initial scope-analysis and further discussions with INTERACT, the experts were supposed to **analyse long-term territorial developments** for certain themes of particular cooperation relevance since 1990 **and** also **investments that cross-border and transnational INTERREG and ETC-programmes** have allocated to these thematic fields between 1990 and 2013. It was decided to focus the long-term analysis on the themes environment, climate change, accessibility and sustainable mobility. The outcome of this long-term analysis **is presented as volume 1b of the scoping study.**

The present long-term analysis of territorial developments and INTERREG / ETC-investments for the themes environment, climate change, regional accessibility and sustainable mobility **was very challenging.** This was partly because of the rather limited time frame dedicated to the entire assignment (August 2014 - November 2014), but especially **due to reasons of data availability and data quality.**

The analysis of territorial developments faced the problem that data on many themes and sub-themes was often only available at EU-wide or Member State level for the entire time period to be covered (1990-2014), but not for the regional level. This was the case for most of the analysis on the themes "environment" and "climate change", for which existing comprehensive studies and additional topical data analyses from Eurostat and the European Environment Agency (EEA) were used. These indeed important sources helped us to identify general developments and trends, for which complementary sources were used to add a territorial dimension. These complementary sources were mainly specific applied research projects carried out under the ESPON 2006 and ESPON 2013 programmes. They allowed looking at a number of sub-themes and issues from a regional-level perspective, but very often only for a partial time sequence and not for the entire period 1990-2014. For the theme "accessibility", our analysis could use the

rich results of several ESPON 2006 and ESPON 2013 projects on this matter. They had the advantage of applying the same analytical approaches on certain issues, which eased comparison over time. However, data and in-depth analysis was more abundant for the period 2000-2014 than for the previous decade. For the last theme on "sustainable mobility", comprehensive territorial ESPON analyses are missing. Most of the related issues could only be addressed at EU-wide or Member State level by using analyses and data from Eurostat, the EEA or other sources.

The long-term analysis of INTERREG- and ETC-investments[1] also had to cope with considerable problems regarding the availability, completeness and comparability of financial data for the different funding periods to be covered (i.e. 1990-1993, 1994-1999, 2000-2006 and 2007-2013). There was very little information on thematically differentiated financial data for the early period (i.e. 1990-1993) and financial data had to be "re-constructed" from a few existing sources in order to make them correspond to the specific themes in focus of our analysis (i.e. 1994-1999). For the following two funding periods more thematic financial data was available, because Structural Funds expenditure was recorded at EU-level for the so-called "fields of intervention". But we still had to cope with the problem that the classification system of these fields of intervention changed from one period to another and that the available raw data sets were of a different nature (i.e. a thematic one at country level, a thematic one at programme level). All this obviously made a very detailed analysis at sub-theme level and also an inter-period comparison very difficult.

The study starts with **a short historical review (Chapter 2)** which aims to situate the evolution of cross-border and transnational cooperation between 1990 and 2013 in the wider context of major EU-wide challenges prevailing during this period. This is important because these challenges strongly influenced on the main development objectives and types of interventions that were assigned to both types of cooperation during the respective funding periods.

The next chapters carry out **the long-term analysis of territorial developments** and trends for the themes **"environment and resource efficiency" (Chapter 3), "climate change mitigation and adaptation" (Chapter 4)** and **"regional accessibility and sustainable mobility" (Chapter 5).** The analysis under each chapter explores the territorial dimension of the relevant theme and analyses, both in a retrospective and forward-looking perspective, sub-themes that are of relevance for cross-border and transnational cooperation.

The long-term analysis of **cross-border and transnational INTERREG and ETC-programme investments since 1990 (Chapter 6)** explores to what extent both types of cooperation have addressed the four themes "environment", "climate change", "accessibility" and "sustainable mobility". Of particular interest in the analysis was if shifts in the thematic funding allocation have taken place in the long term. This would suggest that the types of cooperation or specific programmes had reacted to changing or newly emerging territorial developments in the respective time periods.

Finally, **overall conclusions (Chapter 7)** are then drawn from the thematic long-term analysis of both dimensions (i.e. developments & investments) which also include suggestions for future and more detailed investigations to be carried out by INTERACT in relation to the four themes addressed.

[1] The notion "investments" covers in our study not only investments in physical infrastructure or equipment, but also expenditure for all types of soft cooperation measures such as networking, capacity building or studies etc.

The scoping study on long-term territorial developments and INTERREG / ETC-investments was elaborated by Dr. Thomas Stumm (EureConsult) and Pietro Celotti (t33), with support and help from other t33 colleagues as regards the financial analysis. EureConsult mainly dealt with the historical review and long-term territorial analysis as well as with the financial analysis 1990-1999, whereas t33 carried out the entire raw data processing for the periods 2000-2006 and 2007-2013 and also supported the long-term developments analysis by a targeted analysis of specific documentary sources.

1. The evolution of cross-border and transnational cooperation between 1990 and 2013 seen in a wider policy context

European Territorial Cooperation (ETC) was launched in the late 1980s and operated during the period 1990–2013 in the wider context of three major EU-wide challenges: the completion of the Single Market and the introduction of the Economic and Monetary Union (EMU), the preparation and full achievement of the EU's most significant enlargement process since 1958 and a tackling of the consequences of the EU's strongest economic recession since World War II while also ensuring territorial cohesion.

These major challenges, although not always clearly separable in terms of timing, have also influenced the overall development objectives and actions that cross-border and transnational cooperation programmes were supposed to address in the four different funding periods (i.e. 1990-1993, 1994-1999, 2000-2006 and 2007-2013).

Cooperation context in the period 1990-1999: Completing the Single Market, introducing the Economic and Monetary Union and preparing for the EU's most important enlargement

During the second half of the 1980s, a number of important decisions had been taken at the Community level which paved the way for starting ETC in 1990.

At the European Council of Brussels (March 1985), the Heads of State and Government made the completion of a large internal market an objective to be achieved by 1992 and asked the Commission to draw up a detailed action programme with a precise timetable. This plan was presented in the Commission's "White Paper on completing the Internal Market"[2], which was adopted by the European Council of Milan (June 1985). In order to cope with the ambitious Internal Market programme and its 1992 deadline, the Member States started in 1985 to negotiate a first substantial change to the Treaty of Rome. This led to the signature of the Single European Act (SEA) on 17 February 1986, which entered into force on 1 July 1987. The SEA provided an appropriate legal framework for the completion of the Internal Market (i.e. reform of the Community institutions and policies).[3]

The SEA also introduced a new Treaty chapter on "economic and social cohesion" (former Articles 130A-130E). This chapter made economic and social cohesion a competence of the European Community, envisaged modifications of the rules of functioning of some already existing Community-level policy instruments (i.e. the ERDF, ESF, EAGGF-Guidance Section) and also provided for a stronger coordination among these instruments in order better achieve the new Treaty objectives.[4] The new provisions were a necessary corrective element to further market integration, as regional disparities in the EEC 12 had widened significantly after the accession of Greece (in 1981), Portugal and Spain (in 1986). Moreover, also the Commission's reports on the Internal Market programme pointed to "*serious risks of aggravated imbalances in the course of market liberalisation*" (Padoa-Schioppa report)[5] and highlighted that a fair social

[2] COM(85) 310
[3] De Ruyt, J. (1987): pp.47-91 ; European Parliament, Directorate General for Research (1991)
[4] De Ruyt, J. (1987): pp.198-202 ; European Parliament, Directorate General for Research (1991)
[5] European Commission, Directorate General for Regional Policy (2008), p.9

and regional steering of the benefits of market integration would be a prerequisite for the success of the Single Market (Cecchini-Report)[6].

Against this wider background, the European Council of Brussels (March 1988) decided to allocate ECU 64 billion to the Structural Funds: this represented a doubling of annual resources over the period 1989-93 and made the Structural Funds - next to the Common Agricultural Policy – to one of the most quantitatively significant Community policies. In the following, the Council adopted on 24 June 1988 the Coordination Regulation EEC No 4253/88 which integrated the Structural Funds under the umbrella of a now more genuine "European" Cohesion Policy. *This landmark reform introduced key principles such as focusing on the poorest and most backward regions, multi-annual programming, strategic orientation of investments and the involvement of regional and local partners.*[7]

An important innovation of the 1988 Structural Funds reform was the introduction of Community Initiatives by virtue of Article 11 of the Coordination Regulation EEC No 4253/88[8], which transformed and replaced the already existing "ERDF Community Programmes".[9] The Community Initiatives under the ERDF were more closely defined by Article 3 (2) of the ERDF-Regulation EEC No 4254/88: they were directed towards problems associated with the implementation of other Community policies, the application of Community policies at regional level and problems common to certain categories of regions. On ground of these provisions, a total of 14 Community Initiatives were subsequently launched for the programming period 1989 to 1993,[10] one of which was the INTERREG Community Initiative that was implemented during the sub-period 1990-1993.

Another important provision with relevance for future ETC **was Article 10 of the ERDF-Regulation EEC No 4254/88.** It allowed under (a) the financing of studies at the Commission's initiative and under (b) the support of specific pilot schemes which (…) *constitute incentives to the creation of infrastructure, investment in firms and other specific measures having a marked Community interest, in particular in the border regions within and outside the Community* (…) or (…) *encourage the pooling of experience and development cooperation between different Community regions, and innovative measures.*

On grounds of Article 10(b) of the ERDF-Regulation and a specific budgetary line established by the European Parliament, the Commission had launched a **specific pilot programme for border regions which was implemented between 1988 and 1989.** Already before the actual start of the first generation of INTERREG programmes, this scheme supported 14 groups of

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[6] Cecchini (1988), p.138

[7] European Commission, Directorate General for Regional Policy (2008), p.8

[8] *Article 11 - Community initiatives: In accordance with Article 5 (5) of Regulation (EEC) 2052/88, the Commission may, on its own initiative and in accordance with the procedures provided for in Title VIII, decide to propose to the Member States that they submit applications for assistance in respect of measures of significant interest to the Community not covered by the plans referred to in Title II. Any assistance approved pursuant to this provision shall be reflected in the establishment or revision of the relevant Community support framework.*

[9] The concept of "Community Programmes" was introduced on 1st January 1985 with the entry into force of a new Regulation governing the Community's regional policy and the European Regional Development Fund (ERDF). This new form of ERDF assistance was intended to deal more effectively with the many different problems that the Community's regional policy faced at that time. The Community nature of these programmes resided in the fact that their main features (including specific objectives, territorial scope, nature and terms of assistance, and the level of Community participation) were determined on a proposal from the Commission. At the same time, the purpose of these programmes was to provide a better link between the Community's regional development objectives and the objectives of other Community policies. Community Programmes were focused on enhancing in the less-favoured regions the benefits that may result from implementation of those policies. See: http://europa.eu/rapid/press-release_IP-86-15_en.htm

[10] i.e. ENVIREG, INTERREG, RECHAR, REGIS, STRIDE, REGEN, TELEMATIQUE, PRISMA, EUROFORM, NOW, HORIZON, LEADER, RETEX, KONVER.

cross-border pilot projects at various internal and external borders of the Community[11] with a total funding of approximately ECU 21 million.[12]

After this early pilot phase, **in July 1990,** the European Commission decided **to launch the Community Initiative INTERREG for border regions** and at the end of August a Commission notice was issued to the Member States which laid down guidelines for establishing operational programmes on INTERREG.[13] In line with the strategic main challenges and needs prevailing at that time, INTERREG I was devised to help border regions to prepare for the large Single Market mainly through greater cooperation between regions along the Community's internal borders, but also through assistance to stimulate the economies of areas on the Community's external borders.[14]

According to section I and point (3) of the Commission's Guidelines[15], the **overall development aims of INTERREG** were:

- to assist both internal and external border areas of the Community in overcoming the special development problems arising from their relative isolation within national economies and within the Community as a whole, in the interests of the local population and in a manner compatible with the protection of the environment,
- to promote the creation and development of networks of cooperation across internal borders and, where relevant, the linking of these networks to wider Community networks, in the context of the completion of the internal market of 1992,
- to assist the adjustment of external border areas to their new role as border areas of a single integrated market,
- to respond to new opportunities for cooperation with third countries in external border areas of the Community.

The range of measures that could be supported under INTERREG was actually very wide. What distinguished them from other regional policy interventions was that they should contribute to establishing lasting cooperative frameworks for action in areas where development efforts were previously fragmented by the existence of a national border.[16] The 31 INTERREG I programmes at internal and external EU-borders implemented over 2,500 projects and the start of the Community Initiative was generally considered a success.[17] Due to this, there was consensus among the Community Institutions that INTERREG and the other Community Initiatives should be continued during the following programming period 1994-1999.[18]

Already at the European Council of Maastricht (December 1991), the decision to form an **Economic and Monetary Union (EMU)** was taken and also enshrined in the Treaty on the European Union (the Maastricht Treaty). This decision represented a major step further in the integration of the EU's economies and involved the coordination of economic and fiscal policies, a common monetary policy and a single currency. Whilst all EU Member States form part of the

[11] The projects were: Ems Dollard Regio, EUREGIO, Rhein Waal, Rhein-Maas-Nord, Euregio Maas-Rhein, Benelux Middengebied, Schleswig-Sonderjylland, PED, Nord-Pas de Calais/Wallonie, SaarLorLux, PaMiNA Palatinat du Sud - Mittlerer Oberrhein - Nord-Alsace, France-Spain, Greek external borders. The 14th project group could not be identified. INTERACT (2010), p.6
[12] European Commission, DG XVI (1995); INTERACT (2010), p.6
[13] European Commission, DG XVI (1995), p.2
[14] European Commission (1993a), p.28
[15] INTERREG I Guidelines (1990)
[16] European Commission (1993a), pp.4, 29
[17] INTERACT (2010), p.6
[18] European Commission (1993a), p.4

economic union,[19] some countries have taken integration further and adopted the euro as single currency thus creating the "euro area".

At the end of 1992, the overall financial framework for the new **Structural Funds period 1994-1999** was established as part of the wider agreement that was reached on the future financing of the Community at the European Council of Edinburgh (December 1992). Furthermore, the European Council conclusions also set out guidance for the future policy on Community initiatives: *The allocation for Community initiatives should be between 5 and 10% of total resources committed under the Structural Funds. They should mainly promote cross-border transnational and interregional cooperation and assistance for the outermost regions, in accordance with the principle of subsidiarity.*[20]

In 1993, the European Commission had issued a "Green Paper on the future of Community Initiatives under the Structural Funds" which intended to encourage a wide debate about the potential options and funding priorities that needed to be tackled in the coming programming period while taking into account the lessons drawn from the past experience. The Green Paper highlighted that the overall circumstances were (…) *evidently very different from 1989* (…) because (…) *the internal market is now in place* (…). However, further efforts are needed (…) *to ensure industry benefits fully from this* (…) internal market in the light of the (…) *serious economic downturn with 17 million unemployed, and a crisis in public finances which restricts public investment in particular* (…), to address of the increasingly felt (…) *pressure of competition and economic and social change* (…) affecting (…) *the stronger regions and the heartland of Community industry* (…) and to react to the fundamentally changed political landscape of Europe (…) *with the developments in central and eastern Europe and with the Community preparing to admit new Members.*[21]

As a follow up to the 1993 Green Paper debate, the European Commission issued in 1994 the document "Future of Community Initiatives under the Structural Funds". This document also set out the guidelines for INTERREG II which followed closely those of the first INTERREG initiative, but have been modified in the context of the completion of the Single Market.[22]

For the future, it was originally proposed that **INTERREG II (1994-1999)**[23] should have two strands, cross-border co-operation (Strand-A) and the completion of energy networks (Stand-B), for which a single budget of ECU 2,900 million was proposed.

- **Strand-A of INTERREG II on cross-border co-operation** continued the action started under INTERREG I and was endowed with ECU 2,400 million in 1994 prices, of which ECU 1,800 million were allocated to the Objective 1 and 6 regions. Cooperation aimed to assist both internal and external border areas of the EU in overcoming the special development problems arising from their relative isolation within national economies and within the Union as a whole, to promote the creation and development of networks of cooperation across internal borders, to assist the adjustment of external border areas to their new role as border areas of a Single Market and to respond to new opportunities for cooperation with Third Countries at the external EU borders. As under the previous

[19] Economic integration was expected to bring the benefits of greater size, internal efficiency and robustness to the EU economy as a whole and also to the economies of the individual Member States (i.e. though offering opportunities for economic stability, higher growth and more employment).
[20] European Commission (1993a), p.11
[21] European Commission (1993a), pp.4-5
[22] European Commission (1994)
[23] INTERREG II Guidelines (1994); http://ec.europa.eu/regional_policy/archive/interreg3/inte2/inte2a.htm

programming periods, eligible measures for cooperation covered again a wide range of issues which made it possible to address nearby all aspects of daily life in cross-border areas.

- **Strand-B of INTERREG II on the completion of energy networks** aimed to conclude the action started under the previous Community Initiative REGEN. It focussed on accelerating the creation of infrastructures for the reception and transmission of natural gas in peripheral regions (where these do not exist at present) and the completion of Community-wide networks for the transmission and distribution of gas and exceptionally electricity, so as to ensure appropriate interconnections between peripheral regions of the Community and the rest of the Community. To this strand, a budget of ECU 500 million was dedicated.

In 1997, **the C-Strand of INTERREG II on transnational co-operation**[24] was launched with a total budget ECU 412.84 million. It recognised the need of the Member States to get involved in a more operational way into co-operation on regional and spatial planning, as a consequence of the increasing economic integration and interdependence between Member States and regions (with the Internal Market) and of new common challenges resulting namely from major economic trends such as the globalisation of the economy. Co-operation on spatial planning mainly developed in two parallel and complementary ways:

- Though a joint reflection carried out with the development of an integrated long term strategy for the development of the territory of the Community, the "European Spatial Development Perspective" (ESDP). It was prepared in partnership between the Member States and the Commission and set the framework for action to be taken under INTERREG IIC.
- Though a more operational approach, with transnational co-operation programmes aiming to develop concrete projects in the field of regional and spatial planning, being the “raison d'être” of the new C-Strand.

INTERREG IIC clearly differed from the cross-border strand because it concerned co-operation over broader areas. In terms of its overall objective, it focussed more specifically on questions of regional and spatial planning. The main development aims of INTERREG IIC were to:

- promote a harmonious and balanced development of the territory of the European Union;
- foster transnational co-operation within a common framework in the field of spatial planning by the Member States, regions and other authorities and actors;
- contribute improving the impact of Community policies on spatial development and help Member States and their regions to cooperate on a pro-active approach to common problems, including those linked to water resource management caused by floods and drought.

Accordingly, the three types of INTERREG IIC programmes focussed on general transnational co-operation in the field of spatial planning (Total budget ECU 120.69 million), on cooperation for flood mitigation (ECU 148.15 million) and on cooperation for drought prevention (ECU 114 million).

[24] http://ec.europa.eu/regional_policy/archive/interreg3/inte2/inte2c.htm

In parallel, also four **Pilot Action Programmes** were adopted under **ERDF Article 10** which following the same objectives and type of co-operation as INTERREG IIC (i.e. Northern Periphery, Eastern Alps, the Central and Eastern Mediterranean space "Archimed" and Mediterranean Gateway).

At the end of the 1990s, the negotiations on the new Cohesion Policy funding period 2000-2006 started which were strongly influenced by the preparation of the forthcoming EU's Eastern enlargement. This also involved a clarification of the role of the new generation of Community Initiatives, for which the Commission suggested that they should have a distinct Community dimension. It was proposed that actions and themes should be more complementary to each other and to "mainstream programmes", but also that they are implemented in a way to promote the Community interest more prominently.

Cooperation context in the period 2000-2013: Achieving and completing the EU's eastern enlargement, coping with the EU's most serious economic downturn and striving for territorial cohesion

The launching of the **INTERREG III Community Initiative for the period 2000-2006** intervened at the crossroads of two important development trends which, seen from a today's perspective, placed cross-border and transnational co-operation within a kind of "transitional phase".[25]

- Territorial co-operation in general was expected to address and tackle a number of issues that were still closely related to strategic EU-level policy decisions of the 1990s (i.e. establishing the EMU), but it also had become clear that territorial co-operation practices launched during the previous decade needed to be further consolidated and upgraded.
- The forthcoming EU-enlargement meant that major changes would take place in the EU's overall territorial context (i.e. increased socio-economic disparities; emergence of an "Eastern periphery", adding to the already existing western, northern and southern EU peripheries), which also considerably affected cross-border and transnational co-operation (i.e. substantial growth in the number of internal and external EU borders; more diverse institutional context of territorial co-operation resulting from the territorial governance systems in the former candidate countries; strong differences in cooperation experience and maturity).

Against this wider background, INTERREG III was closely linked to the "traditional" socio-economic cohesion objective of the Treaty which was complemented in the INTERREG III Guidelines by references to an improved "territorial integration" (i.e. *the overall aim of the Interreg initiatives has been, and remains, that national borders should not be a barrier to the balanced development and integration of the European territory*). The total ERDF-contribution to INTERREG III was fixed at € 4,875 million (at 1999 prices), of which Member States should allocate at least 50% to cross-border cooperation under Strand-A and at least 14% to transnational cooperation under Strand-B and 6% to interregional cooperation under Strand-C.

[25] Panteia (2010b), pp.27-28; Panteia (2009), pp.9-20; INTERREG III Guidelines (2000)

Strand-A of INTERREG III on cross-border cooperation between neighbouring territories aimed to develop cross-border economic and social networks and joint approaches to territorial development. Priority was given to the following actions:

- promotion of cross-border urban, rural and coastal development;
- development of entrepreneurial spirit and small and medium-sized enterprises (SMEs), tourism, local development and employment initiatives (LDEI);
- creating an integrated labour market and promoting social inclusion;
- cooperation on research, technological development, education, culture, communications, health and civil protection;
- environmental protection, energy efficiency and renewable energies;
- basic infrastructure of cross-border importance;
- cooperation in the legal and administrative fields;
- cooperation between citizens and institutions.

Similar to the previous funding periods, cross-border cooperation programmes could take action on a wide range of issues which covered nearly all aspects of daily life in border and cross-border regions.

Strand-B of INTERREG III on transnational cooperation between national, regional and local authorities aimed **to promote a higher degree of territorial integration,** with a view to achieving sustainable, harmonious and balanced development in the Community and better territorial integration with candidate and other neighbouring countries. The wider policy framework for INTERREG IIIB was provided by the European Spatial Development Perspective (ESDP). This was the first spatial strategy for the EU which was adopted by the Informal Council of Ministers responsible for Spatial Planning in Potsdam on 10 and 11 May 1999. The ESDP provided national spatial development policies and EU sectoral policies with a clear territorial vision and objectives which were to be pursued simultaneously in all regions of the EU and whose interactions were to be taken into account. The ESDP policy options strongly influenced the content of future transnational cooperation programmes, namely a polycentric balanced development and a new urban-rural relationship or the parity of access to infrastructure and knowledge and the wise management of natural and cultural heritage.

Beyond encouraging transnational cooperation among the EU15 Member States, also cooperation on the EU's external borders and between regions with common handicaps (island and maritime regions) was particularly encouraged. In the case of the outermost regions, the aim was to improve economic integration among themselves, with the Member States and with their neighbouring non-Community countries. In operational terms, the following areas of cooperation were supported:

- territorial development strategies;
- development of efficient and sustainable transport systems and improved access to the information society;
- promotion of the environment and sound management of cultural heritage and natural resources, in particular water resources.

Already during the implementation period of INTERREG III, the EU-level policy debate moved on and also major changes in the territorial context of the EU had taken place. The Lisbon and Gothenburg Strategies, agreed at the European Councils in 2000 and 2001 respectively, have set out important EU-wide policy goals for economic and sustainable development which also

provided an important framework for EU's Cohesion Policy in the period 2007-2013. The accession of 10 new EU-Member States took place already in 2004 and the forthcoming accession of Romania and Bulgaria in 2007 would again involve a considerable change in the EU's territorial situation. Finally, since a first tentative interpretation given to EU-wide territorial cohesion in the Third Cohesion Report of 2004, also a broad debate emerged around this new concept which continued during a major part of the 2007-2013 funding period. Partly as a reaction to this, EU Member States also started in 2004 to prepare a "Territorial Agenda for the European Union" (TAEU) which was adopted by the EU27 in 2007.

All these aspects strongly conditioned the overall content and procedural set-up of the **EU's Cohesion Policy in the period 2007-2013,** which now featured a full inclusion of all EU27 Member States. Cross-border, transnational and interregional cooperation were not any longer pursued under a separate Community Initiative, but integrated into the Cohesion Policy mainstream in form of a new objective on "European Territorial Cooperation" which preserved the distinction between the three basic cooperation strands. Another important novelty was the EU-Regulation on "European Groupings for Territorial Cooperation (EGTC)",[26] which enabled regional and local authorities from different EU-countries for the first time to set up cooperation groupings as EU law-based legal entities for all types of cooperation. Although the entire budget for the ETC-objective increased to € 8.7 billion (about 2.5% of the total Structural Funds budget), it now covered 27 Member States. Cooperation programmes for the three strands were also clearly directed towards achieving thematic priorities such as innovation, environment, accessibility and sustainable urban development, which all were key themes promoted by the now revised EU Lisbon and Gothenburg Strategies.[27]

Cross-border cooperation under the ETC-objective was, according to Article 6 of the ERDF-Regulation,[28] **expected to focus on the development of cross-border economic, social and environmental activities through joint strategies for sustainable territorial development,** primarily

(a) by encouraging entrepreneurship, in particular the development of SMEs, tourism, culture, and cross-border trade;
(b) by encouraging and improving the joint protection and management of natural and cultural resources, as well as the prevention of natural and technological risks;
(c) by supporting links between urban and rural areas;
(d) by reducing isolation through improved access to transport, information and communication networks and services, and cross-border water, waste and energy systems and facilities;
(e) by developing collaboration, capacity and joint use of infrastructures, in particular in sectors such as health, culture, tourism and education.

In addition, the ERDF could also contribute to promoting legal and administrative cooperation, the integration of cross-border labour markets, local employment initiatives, gender equality and equal opportunities, training and social inclusion, and sharing of human resources and facilities for R&TD.[29]

[26] Regulation (EC) No 1082/2006
[27] Panteia (2009), pp.31-33
[28] Regulation (EC) No 1080/2006
[29] The PEACE cross-border programme between Northern Ireland and the border counties of Ireland should - in addition to the Strand-A actions - also contribute to promote social and economic stability in the regions concerned, notably by actions to promote social and economic stability in the regions concerned as well as by actions to promote cohesion between communities.

Transnational cooperation under the ETC-objective, which partly also included bilateral cooperation between maritime regions, **was expected to support** the financing of networks and **actions conducive to integrated territorial development.** For this to achieve, cooperation should concentrate primarily on four priority areas: (1) innovation, (2) environment, (3) accessibility and (4) sustainable urban development. The topics which could be addressed under each of these priority areas were relatively wide-ranging and thus allowed transnational cooperation areas to adequately respond to their territorial specificities. However, there was no longer a specific expectation for transnational cooperation programmes to underpin their measures by an overall coordinative approach which could, for example, result from the preparation of a new transnational spatial vision or a further up-dating of already existing vision documents. Moreover, the TAEU adopted in 2007 appeared to play a rather limited role in influencing the policy content of the "INTERREG IVB" programmes, which represented a clear shift away from the close linkage that still existed between the ESDP and the INTERREG IIIB programmes in the period 2000-2006.[30]

Right at the start of the implementation of ETC-programmes for the period 2007-2013, however, **the European Union faced its most significant economic downturn since the Second World War.** The economic crisis in the years immediately after the 2007/2008 financial crisis had highly asymmetric impacts on the EU-territory which unveiled structural weaknesses in the economies of the EU-Member States and their regions. Furthermore, the crisis also led to a rapidly increasing public indebtedness in a number of EU Member States[31] which was and still is a major issue of concern, mainly because it restricts their capacity to respond to territorial development problems and also because it induced further negative macro-economic effects (i.e. Euro-crisis). As a response to all this, short-term crisis support measures and programmes for substantial structural reforms with a medium- to longer-term perspective were introduced to achieve sustainable public finances and enhance potential growth.[32] Also a new and comprehensive EU-wide exit strategy was adopted in 2010 for the medium-term up to 2020, the "Europe 2020 Strategy".[33] This strategy promotes smart, sustainable and inclusive growth and was expected to have the same important "directing effect" for the thematic focus of the EU's Cohesion Policy in the period 2014-2020 as had previously the revised Lisbon Strategy for the Structural Funds programming period 2007-2013.

However, achieving a new medium-term growth perspective for the EU as promoted by the "Europe 2020 Strategy" must have to consider the **EU's new territorial cohesion objective** which **was introduced by the Treaty of Lisbon** signed in December 2007.[34] Territorial cohesion also entered the list of competences that are shared between the EU and the Member States, while a new paragraph written into Article 158 indicates to which areas this concept will apply more specifically.[35] Yet, the academic and country-level discussions on this concept during the years 2005-2009[36] and especially the intense EU-wide debate launched with the publication

[30] Panteia (2009), pp.31-33
[31] European Commission (2009)
[32] e.g. by budgetary consolidation or reforms of pension, health care, social protection and education systems
[33] COM 2010(2020) final
[34] After the entry into force of the Treaty of Lisbon in 2009, Article 3, third indent, of the Treaty on European Union (TEU) now reads: "[the Union] shall promote economic, social and territorial cohesion, and solidarity among Member States". Article 2 (c) of the Treaty on the Functioning of the European Union (TFEU) provides that "shared competence between the Union and the Member States applies in (…) economic, social and territorial cohesion".
[35] "Among the regions concerned, particular attention shall be paid to rural areas, areas affected by industrial transition, and regions which suffer from severe and permanent natural or demographic handicaps such as the northernmost regions with very low population density and island, cross-border and mountain regions."
[36] see for example: Mirwaldt/McMaster/Bachtler (2009); Battis/Kersten (2008), Schout/Jordan (2007), David (2007), Davoudi (2007), Schön (2005)

of the European Commission's "Green Paper on Territorial Cohesion" of 2008 showed that quite considerable variations in the basic understanding of this concept and also of its policy-level translation continue to persist. Moreover, it also appeared that territorial cohesion together with economic and social cohesion were mentioned only incidentally by the Europe 20020 Strategy, although it claimed that these objectives (…) *remain at the heart of the Europe 2020 Strategy to ensure that all energies and capacities are mobilised and focused on the pursuit of the strategy's priorities.*

The economic crisis and the EU's new response strategy as well as the introduction of the territorial cohesion objective considerably influenced on the implementation of cross-border and transnational cooperation programmes towards the end of the 2007-2013 funding period, but the challenges associated to both of them were to be solved in the new Cohesion Policy programming period 2014-2020.

3. Long-term territorial developments in the field of environment and resource efficiency

The wider theme environment and resource efficiency is extremely complex and trends are analysed for a limited number of sub-themes which have a significant territorial dimension that is also relevant for cross-border and transnational cooperation. These sub-themes are (1) water resources and water quality, (2) air pollution and air quality, (3) land cover and land use, (4) ecosystems and biodiversity and finally (5) material resource use and waste.

For some issues belonging to these five sub-themes, long-term developments indicate that there has been an improvement of the EU-wide situation:[37]

- Water abstraction is close to sustainable levels and total water abstraction has decreased over the past decade in most regions of Europe, with the exception of South-Western Europe where it has been constant.
- Across the EU, waste treatment practices have improved considerably since 2000 and landfilling, being the least environment-friendly method of disposal, has been gradually replaced by incineration and, to a greater extent, by recycling and composting.
- Between 2000 and 2011, one can notice a significant fall in emissions of three major air pollutants (NOX, NMVOC and NH3). Since 1990, also atmospheric emissions of acidifying substances and ozone precursors steadily declined and allowed the EU27 to meet its emission targets for sulphur oxides (SOX) and non-methane volatile organic compounds (NMVOC) by 2011.
- There are also signs that indicate more environment-friendly production patterns in the EU, as the number of organisations implementing a certified environmental management system according to the Eco-Management and Audit Scheme has grown since 2003.

For other issues, however, long-term developments do not indicate a clear trend towards a more positive situation in the EU:[38]

- Rising demands for housing and economic activities in urban areas and the increasing expansion of transport networks in coastal zones are mainly responsible for a continuous shrinkage of semi-natural and arable land in the EU, where 4.6 % of the total land area was covered by artificial areas in 2012.
- Although Europe has become more efficient in managing material resources, there is not yet a clear trend towards a more sustainable use of resources: the EU's consumption of materials continues to increase in absolute terms in the long term and growth in the productivity of materials in the EU has been significantly slower than growth in the productivity of labour. Furthermore, the overall trend in waste generation, including hazardous waste, is upwards, although recent figures show a decline that is probably connected to the economic downturn in Europe.
- Some aspects also indicate a further loss of natural capital in the EU. Land-take for urban areas and infrastructures continues to fragment ecosystems and threatens biodiversity, while changes in agricultural methods, intensification and specialisation especially in Northern and Western Europe is largely responsible for a drop in the populations of

[37] European Commission, Eurostat (2013a), pp.10, 15
[38] European Commission, Eurostat (2013a), pp.10, 15, 16

common farmland and forest birds. Also total fish stocks remain threatened by overfishing, especially in the North East Atlantic. [39]

3.1. Protecting water resources and improving water quality

The abundance of Europe's freshwater resources is affected by high water abstraction and water scarcity due to droughts, while the quality of freshwater essentially depends upon whether wastewaters and other pollutants are collected and directed to a treatment facility and, if so, upon the way how they are treated. Also the quality of transitional, coastal and marine waters is negatively affected by numerous pollutants and there are many sources for this pollution. Cross-border and transnational cooperation can make important contributions to a more sustainable use of freshwater and also to an improvement of the quality of freshwater resource and marine or coastal waters.

Freshwater abstraction and water scarcity

Freshwater is abstracted in Europe for many purposes[40], but there are significant geographical and sector-specific differences in the consumptive use of water. **Since the early 1990s one can observe a general reduction in water abstraction across the EU** which was strongest in Eastern Europe and also clear in Western Europe, but relatively small in Southern Europe (**see: Figure 3.1**).

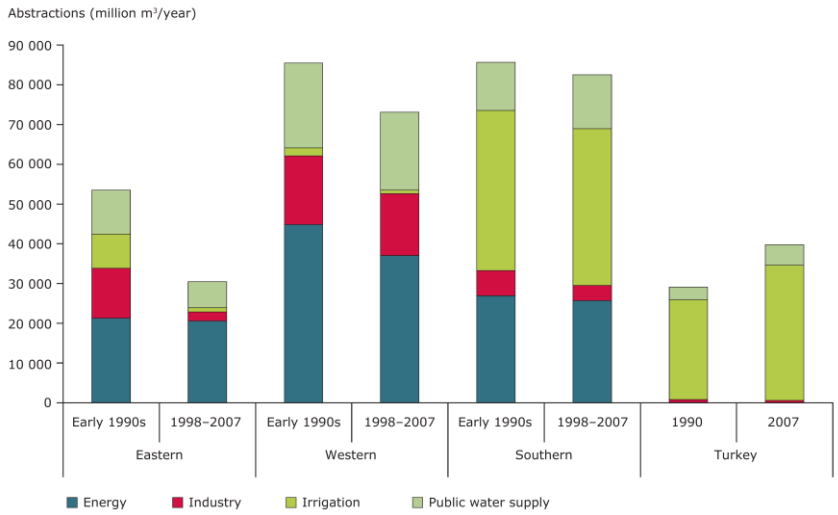
The strong decrease in overall water abstraction in Eastern Europe was driven by a drastic decrease of water used for industry and irrigation, with the latter being mainly a consequence of the decline of agriculture in Bulgaria and Romania during the period of economic transition. In the remaining eastern EU countries, the total irrigable area has declined by about 20%. The reduction of water abstraction in Western Europe since 1990 was mainly driven by less water used for cooling in energy production, but this sector still accounts for more than half of the total water abstracted. Water abstraction for irrigation in Western Europe is very low compared with southern countries but rises in years with dry summers. In Southern Europe, agriculture accounts for more than half of total national water abstraction, rising to more than 80% in some countries. Due to a tendency to use irrigation water more efficiently with a higher proportion of the area using drip irrigation, water abstraction for irrigation decreased in Southern Europe by about 2% from the 1990 level.[41]

Today, water abstraction from ground and surface water seems to be sustainable in most EU Member States. Between 2000 and 2011 eleven countries appear to have stabilised abstraction pressure on water resources and a major step towards more sustainable abstraction was made in Lithuania, Romania and Belgium. Only Cyprus, Estonia and — to a limited extent Bulgaria and the Czech Republic — increased surface water abstraction, reaching 36% of renewable resources in 2011.[42] Still, it appears that especially in Southern Europe freshwater resources are

[39] European Commission, Eurostat (2013a), p.15
[40] Overall, 44 % of the total abstracted water is for energy production, 24 % for agriculture, 21 % for public water supply and 11 % for industry. While almost all water used as cooling water in energy production is returned, water used in agriculture for crop growth is only returned to around 30% as a consequence of evaporation.
[41] EEA (2010c), pp.9-10
[42] European Commission, Eurostat (2013a), pp.229-230

under stress or even under severe stress, which clearly points to an unsustainable use of the resource. An important driver of this water stress is tourism, because the Mediterranean as a whole is one of the world's leading tourist destinations (**see: Box 3.1**).

Figure 3.1: Water abstraction for irrigation, manufacturing industry, energy cooling and public water supply (million m3/year) in the early 1990s and 1998–2007



Source: EEA (2010c), p.10

Box 3.1: Water stress in the Mediterranean

The Mediterranean is the world's top tourist destination. Tourism peaks in summer, when natural water availability is at its lowest. Tourism generally overuses water resources for hotels, swimming pools, golf courses and personal use. This can result in water shortages and saltwater intrusion in aquifers, as well as producing large volumes of wastewater. The Mediterranean islands including Cyprus, Malta, Crete, the Balearic Islands and Sicily are generally heavily water-stressed due to quite low net-precipitation with large annual and inter-annual variations, their geographical isolation and their inability to draw on more distant water sources. In addition, near-shore aquifers are threatened by seawater intrusion. The situation is worse in summer when average precipitation is very low and water demand for agriculture and tourism high. This makes water resource management on these islands particularly challenging.

Source: EEA (2010c), pp.8, 9

Scarcity of freshwater can be caused by many factors such as changed water flow regimes or over-abstraction of water and droughts, which frequently result in reduced river flows or lower lake and groundwater levels and the drying of wetlands. If the water resource of any one of these water bodies has diminished, then also detrimental impacts on one or more of the other freshwater bodies and the related ecosystems may emerge. Reduced water availability has also serious consequences for all types of human activities that strongly depend on high water abstraction and use such as irrigated agriculture, tourism, the use of cooling water by energy production or the provision of drinking water.[43]

[43] EEA (2010c), pp.12-13

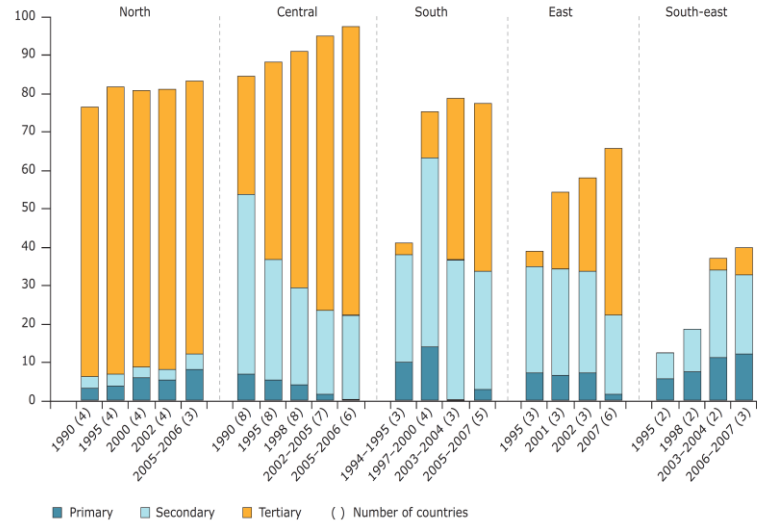
Pollution of freshwater and wastewater treatment

A poor quality of freshwater results from various sources (i.e. presence of nutrients, disease-causing micro-organisms, agricultural pollutants or pesticides and chemicals with endocrine-disrupting properties) and it can adversely affect human health in many ways, for example through lack of access to safe drinking water and the consumption of contaminated freshwater or food and via freshwater recreational activities.[44]

Therefore, significant and continuous investments are made in infrastructures for the collection and treatment of wastewater as a consequence of the ongoing implementation of the EU's urban wastewater treatment directive (UWWTD).[45] This has led to an increasing proportion of the EU population being connected to a municipal treatment plant via a sewer network **(see Figure 3.2).** Most recent available information shows that connection rates are high in central Europe (>95%) and northern Europe (>80%), while elsewhere in Europe connection rates are lower. For the new EU Member States, however, this is explained by the later compliance dates agreed in the accession treaties. Differences also exist in the levels of treatment, as in northern and central Europe the majority of wastewater plants now apply tertiary treatment although elsewhere in the EU the proportion of primary and secondary treatment is higher. Already in the 1990s but especially since the implementation of secondary biological wastewater treatment under the UWWTD, a clear downward trend in organic pollution of most of Europe's rivers is observed which contributed to improvements in water and biological quality **(see Figure 3.3).**[46]

As many political borders in Europe are running along rivers, it becomes clear the especially cross-border cooperation has a high potential to act in this field. A number of the past INTERREG and ETC programmes have supported the establishment of joint treatment plants and thus contributed to enhanced wastewater treatment along river borders. But further action is still required, given the longer compliance timelines for the new EU Member States and also the geographically different levels of progress achieved.

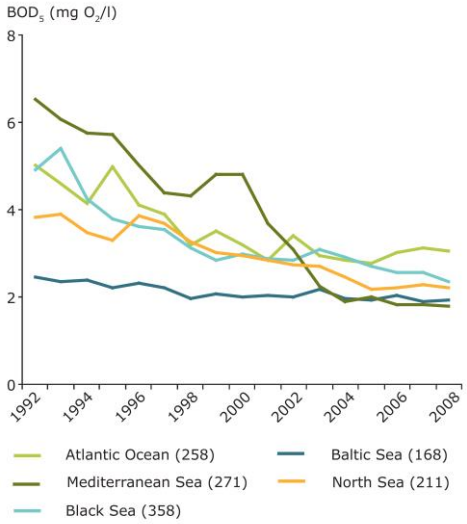
Figure 3.2: Regional variation in wastewater treatment between 1990 and 2007 (in % of national population connected to urban waste water treatment plants)[47]



North: Norway, Sweden, Finland and Iceland;
Central: Austria, Denmark, England and Wales, Scotland, the Netherlands, Germany, Switzerland, Luxembourg and Ireland. For Denmark no data has been reported to the joint questionnaire since 1998. However, according to the European Commission, Denmark has achieved 100 % compliance with secondary treatment and 88 % compliance with more stringent treatment requirements (with respect to load generated) under the UWWTD (EC, 2009). This is not accounted for in the figure.
South: Cyprus, Greece, France, Malta, Spain and Portugal (Greece only up to 1997 and then since 2007);
East: Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovenia, and Slovakia;
South-east: Bulgaria, Romania and Turkey.

[44] EEA (2010g), pp.20-21
[45] The UWWTD requires the collection and treatment of wastewater from all agglomerations of more than 2 000 people. The UWWTD requires secondary biological wastewater treatment and, therefore, the substantial removal of both biodegradable and nutrient pollution. In addition, in catchments with waters designated as sensitive to eutrophication, the legislation demands more stringent tertiary treatment to remove much of the nutrient load from wastewater.
[46] EEA (2010g), pp.10-11
[47] Regional percentages have been weighted by country population.

Figure 3.3: Trends in annual average biological oxygen demand (BOD_5)[48] concentrations in rivers, aggregated to the sea region to which each river drains



Source (Figures 3.2 & 3.3): EEA (2010g), pp.11, 18

Pollution of transitional, coastal and marine waters

There are numerous pollutants impacting on transitional, coastal and marine waters and also many sources for this pollution. The latter can be atmospheric deposition of certain pollutants to marine waters, land-based human activities such as agriculture, industry and wastewater treatment (i.e. emitting or discharging pollutants to freshwater and ultimately to coastal waters) or illegal oil discharges and accidental oil spills from ships as well as marine litter (e.g. large-scale accumulations of floating waste, particularly microscopic pieces of plastic). There is also concern about increasing noise pollution, which is suspected of impacting communication among marine mammals. The effects of this pollution are very complex, ranging from direct impacts on the lower levels of the marine food-web over adverse effects for all kinds of higher level animals (e.g. fish and other animals living on the sea floor; marine mammals, seabirds etc.) and a fundamental altering of the ecosystems functioning to adverse consequences for human health (e.g. high concentrations of toxic chemicals in fish).[49]

Nutrient pollution can change the composition and abundance of marine organisms and ultimately lead to oxygen depletion in bottom waters, killing bottom dwelling organisms. The problems caused are serious and manifest by algal blooms, anoxic water, destruction of habitats, reduced size and fecundity of marine organisms, and loss of biodiversity. All these can contribute to a decline of assets such as fish and other sea food and the recreational opportunities provided by the coast and seas. In spite of measures to reduce nutrient concentrations in European seas, 85% of measurement stations show no change in nitrogen concentrations and 80% show no change in phosphorous concentrations. Oxygen depletion is particularly serious in the Baltic and Black seas[50] and algal blooms have increasingly become a problem in many parts of the European seas **(see: Box 3.2).**

Transnational cooperation is particularly well-placed to address these complex matters, because most of the problems require large-scale solutions in order to be tackled effectively.

[48] BOD_5 is defined as the amount of dissolved oxygen consumed in five days by biological processes breaking down organic matter.
[49] EEA (2010b), pp.4, 20, 30
[50] EEA (2010b), pp.4, 15, 24

Box 3.2: Increase of algae blooms posing a health risk to humans

In the Baltic Sea, for example, blooms of toxic cyanobacteria pose a health risk to humans and domestic animals swimming in the sea. The intensity of the summer blooms has increased since the early 1990s with wide spread events in 1997, 1999, 2003, 2005, and partially in 2006. These blooms are clearly promoted by the anthropogenic inputs and internal load of phosphorous and nutrient reduction to date has been insufficient to break this cycle. Harmful algal blooms are also a problem in other parts of Europe, e.g. in the North-East Atlantic, from Portugal to northern Norway and around the British Isles.

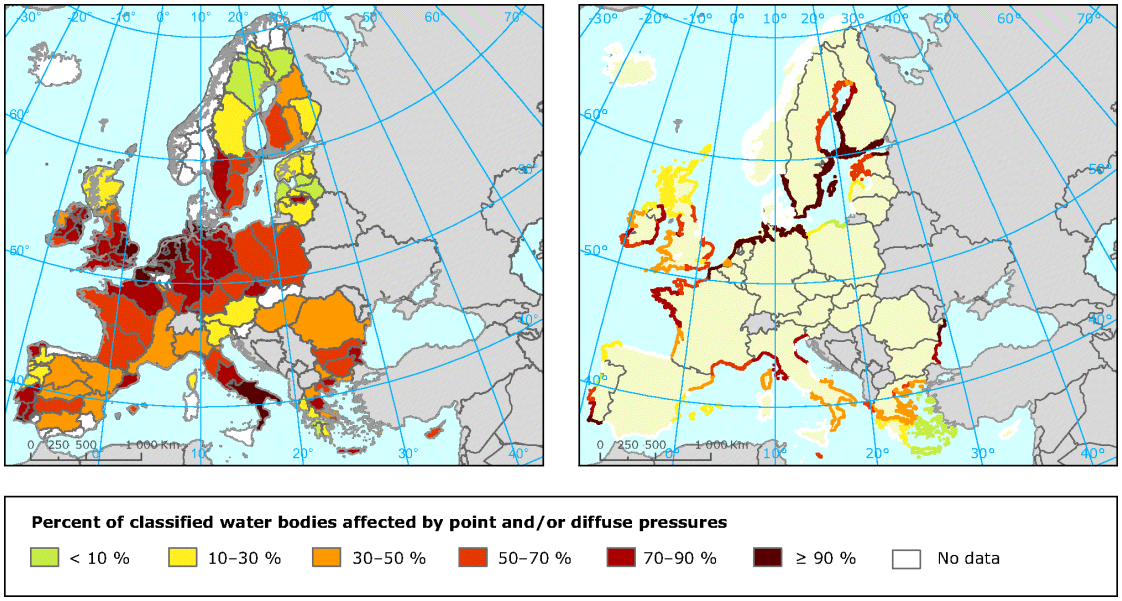
Source: EEA (2010b), pp.15, 24

Quality status of freshwater water bodies and coastal waters

Although improvements in the collection and treatment of wastewater in some regions of Europe have led to a reduction in the discharge of some pollutants to fresh and coastal waters, multiple challenges remain in both dimensions.

As regards **the quality of Europe's freshwater bodies,** the current reporting under the EU Water Framework Directive (WFD) shows that a substantial proportion are at risk of not achieving the aim of "good status" by 2015.[51] A recent EEA-report of 2012 assessing pressures on different water bodies shows for rivers and lakes (**see: Figure 3.4, left panel**) that high or very levels (>70%) are mainly found in river basin districts (RBM) located in the centre-north of the EU, but also in central and southern Italy.

Figure 3.4: Proportion of classified water bodies in different RBDs affected by pollution pressures, for rivers and lakes (left panel) and for coastal and transitional waters (right panel) (*)



(*) The percentage is based on total number of classified water bodies.. A water body is considered to be affected by pollution pressures if it is reported with the aggregated pressure type 'Point sources' and/or 'Diffuse sources' and/or any of the corresponding disaggregated pressure types (e.g. urban wastewater, industry emissions or agriculture diffuse pollution). Swedish surface water bodies are defined as not affected by diffuse pollution pressures if the only reported diffuse pollution pressure is airborne mercury contamination.

Source: http://www.eea.europa.eu/data-and-maps/

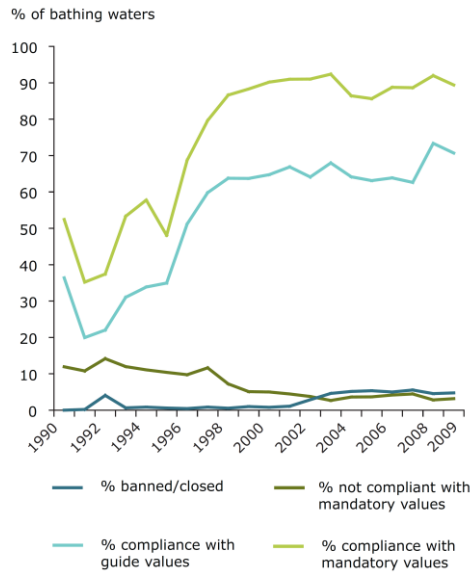
[51] EEA (2010g), p.4

However, the quality of inland bathing waters (i.e. rivers and lakes) in the EU has improved significantly since 1990 (**see: Figure 3.5**) and this improvement was strongly driven by the implementation of the EU's Bathing water directive (BWD): in 2009, 89% of inland bathing areas complied with mandatory values, whilst 71% complied with the more stringent guide values. Nevertheless, inadequate treatment of sewage and urban stormwater, together with emissions of pathogenic micro-organisms from livestock, continue to prevent full compliance across Europe.[52] Bathing waters with poor quality in 2012 and 2013 **(see: Map 3.1)** are most often found in Spain, France and the Benelux countries.

For coastal and transitional waters, high or very levels of pressure (>70%) are mainly found along the coasts of northern Europe (i.e. Ireland, France, Belgium, Netherlands, Sweden, Finland and partly Estonia), but also at the coasts of southern Portugal, northern Italy, Romania and Bulgaria (**see: Figure 3.4, right panel**).

Hotspots of poor coastal bathing water quality in 2012 and 2013 **(see: Map 3.1)** are most often found in Spain, Italy, northern Germany and Denmark, but punctually also in Finland and France (Corsica, western France).

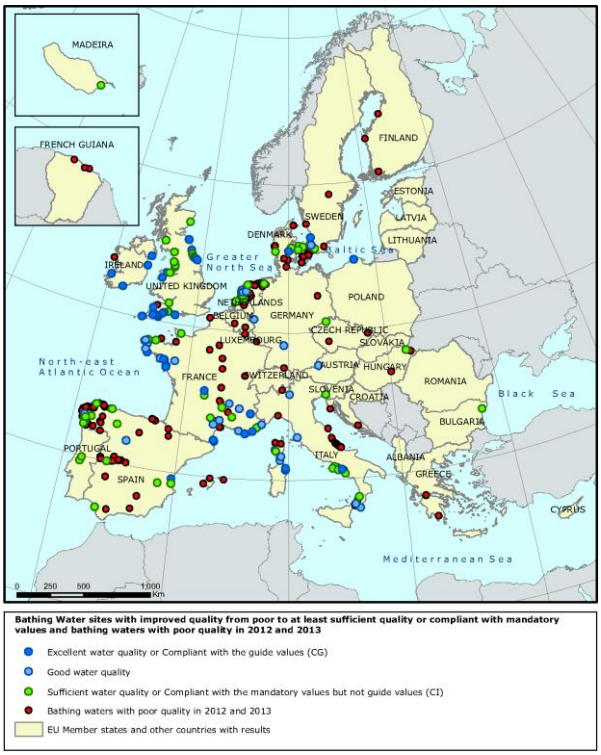
Figure 3.5: Evolution of inland bathing water quality in the European Union (*)



(*) EEA/ETC-Water (CSI 022) based on data reported to the European Commission under the Bathing Water Directive

Source: EEA (2010g), p.17

Map 3.1: Bathing water sites that were poor or non-compliant in 2012 and their status in 2013



Source: http://www.eea.europa.eu/data-and-maps/

[52] EEA (2010g), p.17

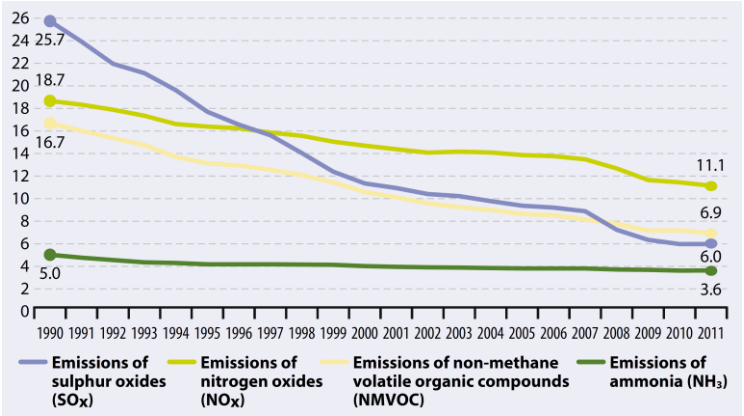
3.2. Reducing air pollution and improving air quality

Poor air quality has multiple negative effects for human health and the environment. Air pollution damages health in the short and long term (from minor respiratory irritation to cardiovascular diseases and premature death), leads to corrosion and soiling of materials, including those used in objects of cultural heritage, and adversely affects ecosystems.[53]

Air pollution still affects larger parts of the European population living in highly urbanised areas and larger cities, despite falling emissions of the main air pollutants over the past decades. Improving air quality is therefore a relevant issue to be addressed by ETC, especially in cross-border metropolitan areas with high levels of border-crossing traffic and also in densely populated transnational areas.

Since 1990 and in particular between 2000 and 2011, a significant fall in man-made emissions of ammonia (NH3), sulphur oxides (SOx), nitrogen oxides (NOx) and non-methane volatile organic compounds (NMVOC) is observed (**see: Figure 3.6**). Key factors which contributed to this significant decline are major structural changes in Eastern European countries over the past decade and a use of cleaner sources of energy production (SOx), technological improvement of fuel combustion especially in the fields of transport and energy production (NOx), EU-level regulatory actions (NOx, NMVOC) and a modernisation of the agricultural sector (NH3).[54] However, many EU Member States still do not comply with legally binding air quality limits protecting human health. In 2010, only 14 European countries were expected to comply with all four pollutant-specific emission ceilings set under EU and international legislation. Especially the upper limit for nitrogen oxides (NOx) was exceeded in 12 countries, some by as much as 50%.[55]

Figure 3.6: Atmospheric emissions EU27 (million tonnes)



Source: European Commission, Eurostat (2013a), p.84

At present, airborne particulate matter (PM), tropospheric (ground-level) ozone (O3) and nitrogen dioxide (NO2) are Europe's most problematic pollutants in terms of causing harm to health, especially for the population living Europe's urban areas. Whereas an exposure of the urban population to NO2 shows a decreasing trend between 2001 and 2011 and was with 5% of the EU's urban population rather low in 2011,[56] one can see that PM and O3 continue to affect larger proportions of the urban population (**see: Figure 3.7**).

[53] EEA (2010d), p.4
[54] European Commission, Eurostat (2013a), pp.84-86
[55] EEA (2010d), p.6
[56] European Commission, Eurostat (2013a), p.70

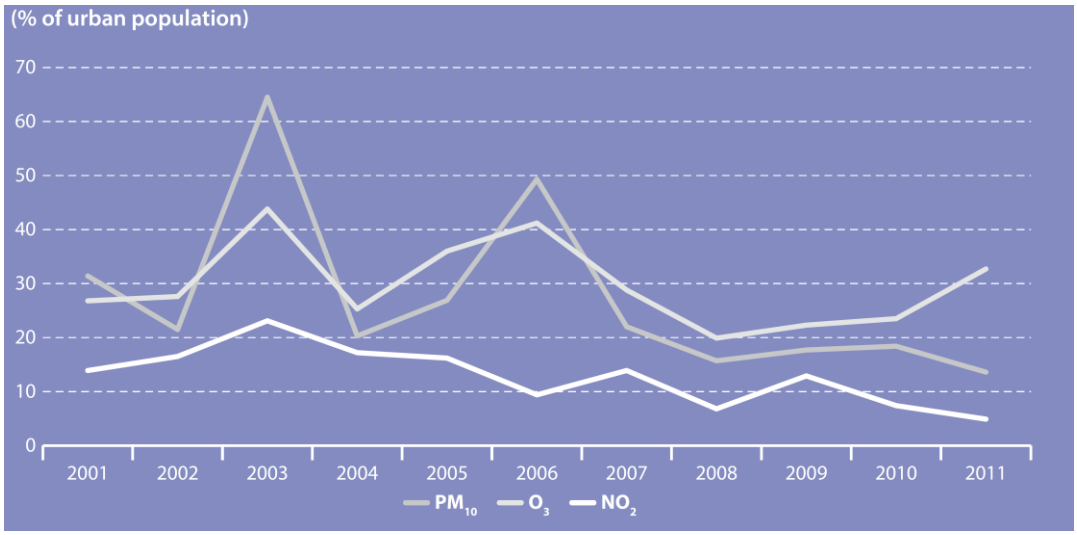
Exposure of urban and rural population to above-limit PM and O3 levels

Overall air pollution by **particulate matter**[57] decreased by 1 microgram per cubic metre between 2000 and 2011, but substantial year-on-year variations with marked peaks in 2003 and 2006[58] make it difficult to discern a clear trend.

In 2011 about 33% of the urban population in the EU was exposed to PM10[59] above the daily limit value. Between 2001 and 2011 the extent of exposure above the limit value varied between 20% and 44% without any apparent trend over this period (**see: Figure 3.7**). Main reasons for unchanged PM10 concentrations in many European urban agglomerations are minor decreases in emissions from urban road traffic, an increasing use of vehicles, a stronger dieselisation of the vehicle fleet and in several places also emissions from the industry and domestic sectors (e.g. wood burning).

But also in some rural areas, largely constant NH3 emissions from agriculture have contributed to the formation of secondary particulate matter and prevented significant reductions of PM in, for example, the Netherlands and north-western Germany.

Figure 3.7: Urban population residents living in areas where pollutant concentrations are higher than selected limit/target values, EU-27



Source: European Commission, Eurostat (2013a), p.70

Overall exposure to air pollution by ozone[60] increased in the EU between 2000 and 2011 at an annual average rate of 1.7%, but changing weather patterns contribute to yearly and also regional differences in ozone concentrations. Particularly high exposure occurred in the years 2003 and 2006, mainly due to a heat wave in summer 2003 and a period of warm, sunny weather in 2006.[61]

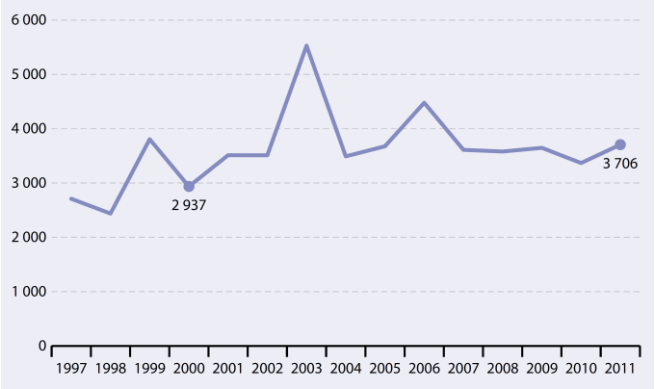
This volatile development is also reflected in the exposure of the urban population to above-limit O3 levels (**see: Figure 3.8**). During the peak years 2003 and 2006, the shares of the

[57] EEA (2010d), p.9; European Commission, Eurostat (2013a), pp.70,172
[58] The peaks in 2003 and 2006 were partially due to severe heat waves during those summers. The hot, dry conditions led to stagnant air in which pollutants accumulated. Furthermore the 'El Nino' phenomenon might have had an impact on particulate matter concentration and contributed to the peaks in 2003 and 2006.
[59] PM10 is particulate matter with an aerodynamic diameter of 10 µm or less, suspended in the air.
[60] EEA (2010d), pp.12-14 ; European Commission, Eurostat (2013a), pp.70,174
[61] Photochemical O3 formation depends mainly on meteorological factors and on the concentrations of NOX and volatile organic compounds (VOCs).

affected urban population reached almost 65% (2003) and 50% (2006), but stood at only 14% in 2011. Urban exposure to ozone also varies widely between countries, as southern countries with higher summer temperatures generally show higher exposure levels than the cooler northern countries. During the peak years 2003 and 2006, however, the increase was most pronounced in the northern countries which showed higher relative increases compared to the southern countries (**see: Figure 3.9**).

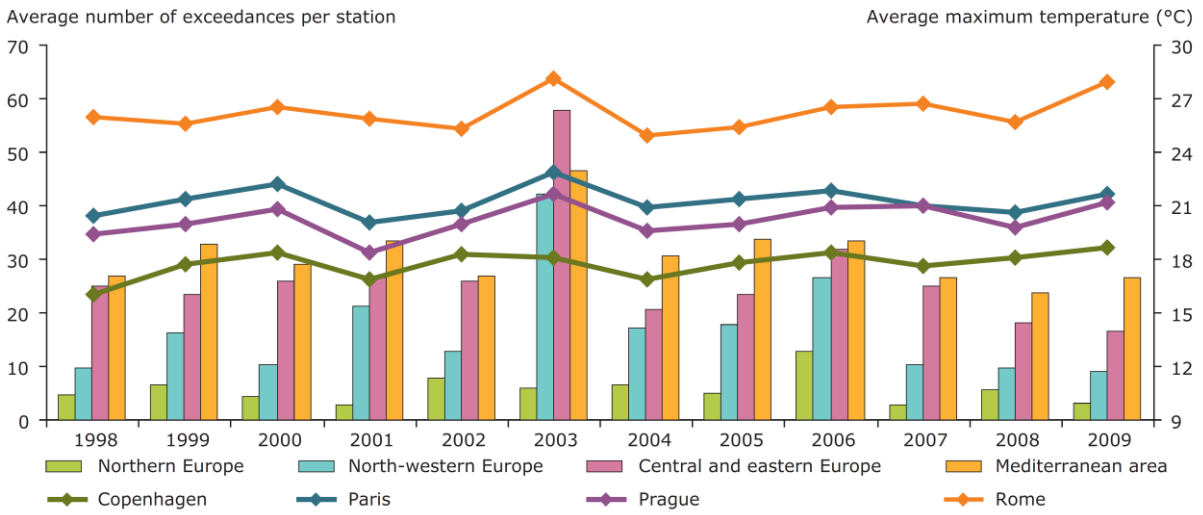
In rural areas ozone levels are generally higher than in urban areas with high NOX emissions, although fewer people are exposed to ozone on the countryside. This can be explained by the depletion of O3 through a reaction with nitrogen monoxide (NO) especially emitted by traffic (i.e. the titration effect), which is in general lower in rural areas (i.e. leading to lower NO concentrations).

Figure 3.8: Urban population exposure to air pollution by ozone, EU-27 (micrograms per cubic metre day)



Source: European Commission, Eurostat (2013a), p.174

Figure 3.9: Regional average number of exceedances of the EU long-term objective for ozone (120 µg/m3) per station during the summer for stations that reported at least one exceedance (columns)



Notes: The respective lines show average maximum daily temperatures in selected cities.

Northern Europe: Denmark, Estonia, Finland, Iceland, Latvia, Lithuania, Norway, Sweden. **North-western Europe:** Belgium, France (north of 45 ° latitude), Ireland, Luxembourg, the Netherlands, the United Kingdom. **Central and eastern Europe:** Austria, Bulgaria, Czech Republic, Germany, Hungary, Liechtenstein, Poland, Romania, Slovakia, Switzerland. **Mediterranean area:** Albania, Andorra, Bosnia and Herzegovina, Croatia, Cyprus, France south of 45 °N latitude, Greece, Italy, Malta, Monaco, Montenegro, Portugal, San Marino, Serbia, Slovenia, Spain, and the former Yugoslav Republic of Macedonia.

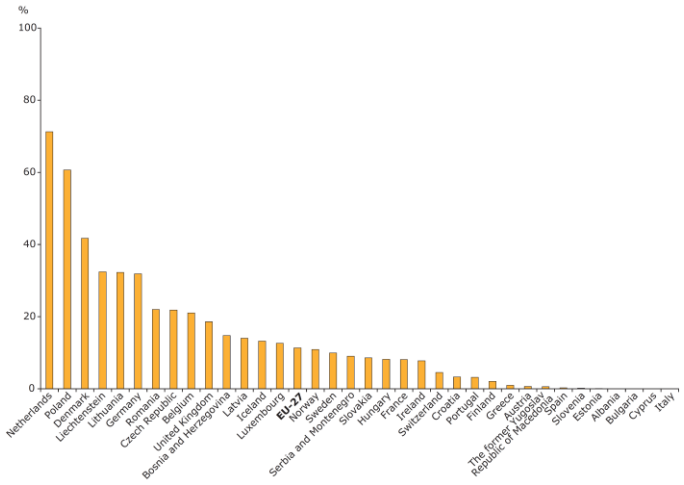
Source: EEA (2010d), p.15

Impact of air pollution on ecosystems

Reducing the impact of air pollution on ecosystems is also an important issue of relevance for cross-border and transnational cooperation, as sensitive ecosystems exist all over Europe and because especially cross-border areas are favoured in terms of biodiversity due to their often peripheral location and their specific land-cover features (**see: Section 3.3 below**). While the reduction of sulphate (SO42-) deposition on European ecosystems is a success story, reducing the deposition of nitrogen (N) has not been tackled as effectively. This has harmful environmental effects as it leads to increasing loads of acidity and nutrient nitrogen in ecosystems and also to freshwater acidification and acid rain.

(1) Critical loads of acidity: To protect sensitive ecosystems in Europe, the EU has set a long-term objective of not exceeding critical loads of acidity and in addition also an interim environmental objective for 2010 (i.e. reducing areas where critical loads are exceeded by at least 50 % in each grid cell for which critical load exceedances are computed, compared with the 1990 situation). Although the interim environmental objective for acidity has strictly speaking not been met in 2010, improvements are nevertheless considerable. However, exceedance hot spots were still in Denmark, Germany, the Netherlands and Poland (**see: Figure 3.10**). Exceedance here was due mainly to a high local contribution of acidifying ammonium (NH4+), emitted as NH3 from agricultural activities.[62]

Figure 3.10: Percentage of ecosystem area (e.g. freshwaters and forests) at risk of acidification for EEA's member countries and cooperating (Western Balkan) countries in 2010 assuming that the current legislation has been implemented.[63]



Source: EEA (2010d), pp.12-14

(2) Critical loads of nutrient nitrogen: Excessive inputs of nutrient nitrogen to sensitive ecosystems can cause eutrophication and nutrient imbalances. Although the EU has a long-term objective of not exceeding critical loads for nutrient N, the magnitude of the risk of ecosystem eutrophication and its geographical coverage has diminished only slightly over the last decades. The modelled results for 2010 indicate that the risk of exceedance remains high even assuming that current legislation for reducing national emissions is fully implemented, as in 13 EEA

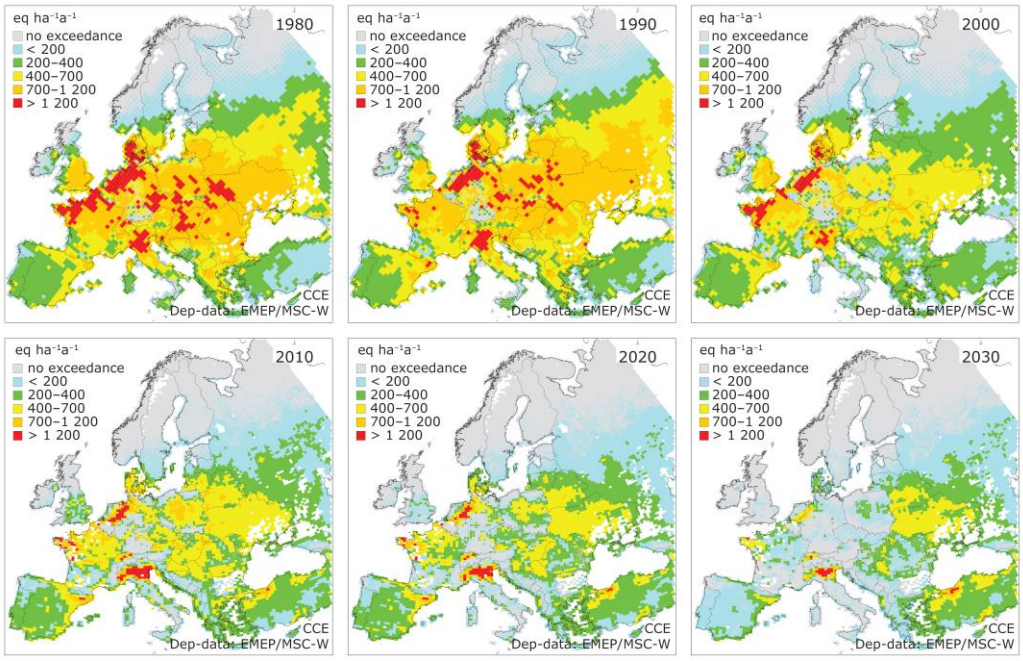
[62] EEA (2010d), p.17

[63] Data not available for Malta. Turkey has not been included in the analysis due to insufficient data being available for calculating critical loads. In most southern European countries soil and water acidification is not a serious problem because the bedrock is mainly calcareous — the soils have high buffering capacities and rates.

member countries, the percentage of sensitive ecosystem area at risk in 2010 is still close to 100%.[64]

However, a recent long-term retrospective and forward-looking analysis for eutrophication in all ecosystem-types and Natura 2000 areas (1980-2030) shows that the overall magnitude of the problem reduced over time (1980-2010) and that this trend is also expected to continue up to 2030. Most central European areas of very high exceedances of critical loads in 1980 are on track to be markedly reduced in 2020. The projection results for 2020 predict that there will still be a few hot spots with very high exceedances in western France and the border areas between Belgium, the Netherlands and Germany as well as in Northern Italy. However, in 2020 more than 50% of the classified ecosystems are still expected to be at risk of excessive nutrient nitrogen deposit (**see: Figure 3.11**).[65]

Figure 3.11: Areas where critical loads for eutrophication are exceeded by nitrogen depositions caused by emissions between 1980 and 2030



Note: The maps show the average accumulated exceedance (AAE) of critical loads for eutrophication in 1980 (top left), 1990 (top centre), 2000 (top right), 2010 (bottom left), 2020 under the revised Gothenburg Protocol (GP-CLE scenario) emission reduction agreements (bottom centre), and in 2030 assuming maximum technically feasible reduction (GP-CLE scenario) (bottom right).

(3) Freshwater acidification and acid rain: Excess deposition of acidifying air pollutants in the past has led to a loss of key species in many sensitive freshwater ecosystems in Europe as a result of changes in the chemical balance of ecosystems. Today, as a result of reduced acidifying deposition following successful mitigation measures particularly for sulphur emissions, sensitive European lakes and rivers are showing significant signs of recovery. However, according to observations in 2007 at forest monitoring sites all over Europe, one fifth of assessed trees were still rated as damaged, still showing critical crown defoliation.[66]

[64] EEA (2010d), p.17
[65] EEA (2014), pp.20-21
[66] EEA (2010d), pp.17-18

3.3. Towards more sustainable practices in land use

Promoting more sustainable land use through wise land use management is not only an important matter for regional and local policies alone, but also a key issue where cross-border and transnational cooperation allow addressing shared needs and can add value to purely domestic actions.

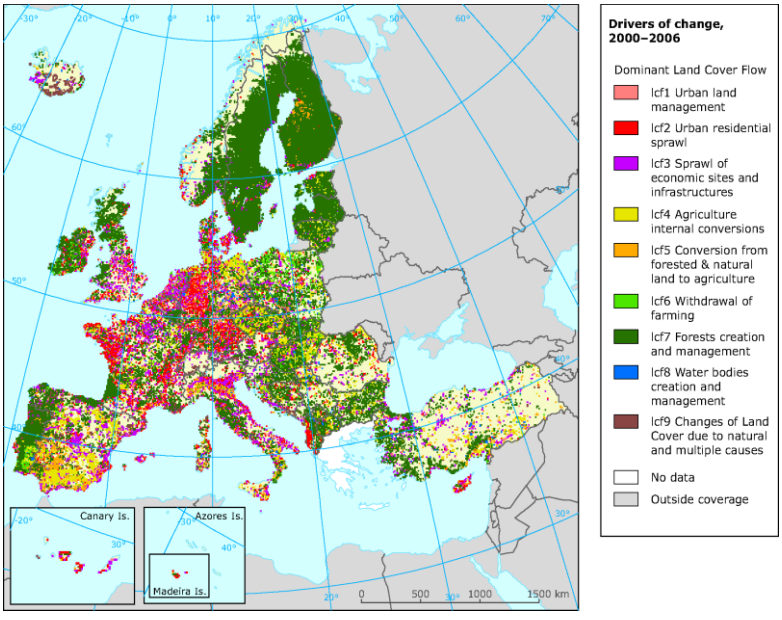
Long-term trends and main drivers of change

The main European-wide source of information for long-term land-cover change is the Corine land cover inventory (CLC), which performed land-monitoring in 1990, 2000 and most recently in 2006. Overall, one can observe the following **long-term trends in land cover change during the period 1990-2006:**[67]

- Total land cover change was less in 2000–2006 than in the previous assessment period 1990–2000 (23 countries were assessed) and annual land-cover change slowed from 0.2% in 1990–2000 to 0.1% in 2000–2006.
- Artificial surfaces increased the most in terms of net area and percentage change in 2000-2006 (i.e. by 3.4%), with yearly 1,000 km2 of land covered by artificial surfaces.
- Forest creation and management was the largest land-cover change in absolute terms, as the total forest area increased by 0.1% due mainly to internal conversions within the boundaries of forest areas (i.e. forest felling and regeneration).
- Arable land and permanent crops decreased by 0.2% and pastures and mosaics by 0.3%.
- Land with semi-natural vegetation, open spaces and wetlands continued the downward trend of 1990–2000 while the total area covered by water increased because new artificial lakes and reservoirs exceeded the loss of water bodies as a result of infrastructure development and mineral extraction activities.

If one looks from a geographical perspective at the **main drivers of land cover change between 2000 and 2006 (see: Map 3.2),** then a pronounced core-periphery pattern appears in the EU. Urban land management, urban residential sprawl and sprawl of economic sites and infrastructures were strong drivers in the central part of the EU (e.g. UK/England, Benelux, Denmark, larger parts of France, western Germany, Austria, northern Italy), but also along many parts of the Mediterranean coast (ES, IT).

Map 3.2: Main drivers of land cover change between 2000 and 2006



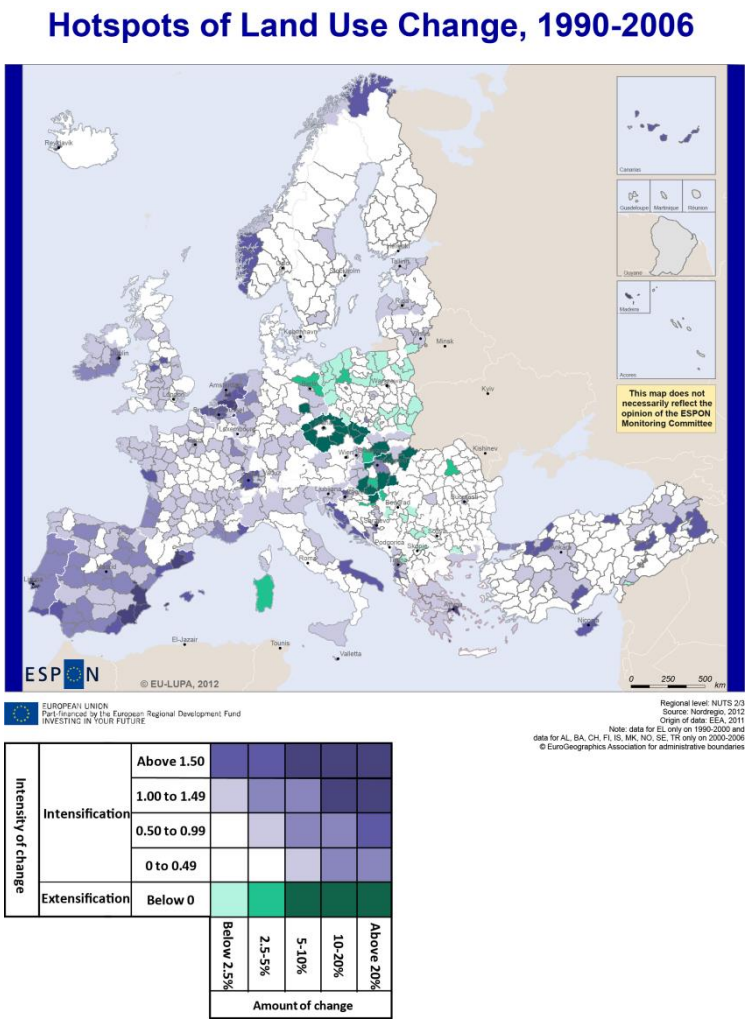
Source: EEA (http://www.eea.europa.eu/data-and-maps/)

[67] EEA (2010i), p.11

Forest creation and withdrawal of farming were important drivers in some Nordic countries (SE, FI) and the three Baltic States as well as in Portugal, but also in Ireland and the UK (Scotland, Wales) or in some other new EU Member States (PL, HU, BG). Agriculture-internal conversion was strong driver in Spain, but also in the Czech Republic and in eastern Germany.

A map drawn from the ESPON project "EU-LUPA - European Land Use Patterns" (**see: Map 3.3**) illustrates well which regions in Europe have experienced an **intensification of land use** (e.g. when natural grassland is turned into an airport or agricultural land is used for urbanisation) or an **extensification of land use** (i.e. e.g. when a crop area is turned into land for pasture or when pastures are turned into natural grassland).

Map 3.3: European Land Use Patterns – hotspots of land use change



Source: ESPON (http://www.espon.eu/main/Menu_Publications/Menu_MapsOfTheMonth/map1401.html)

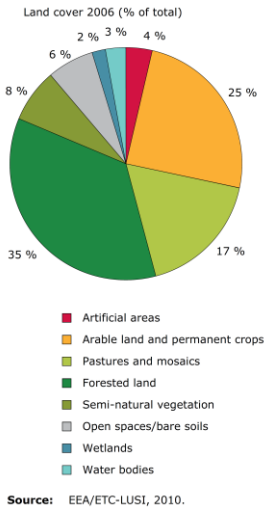
The **dominant trend** shows an **intensified use of land** due to densification in existing urban areas through redevelopment and infilling of urban areas. Many countries have regions with high volumes of land use intensification (NL, BE, ES, PT, IE, HR, NO) and the main drivers here were a growth of urban areas, economic sites and transport infrastructures (e.g. urban sprawl), but also ownership reforms which induced changes in the agricultural structure (ES, PT). The overall changes in European cities indicate that areas under redevelopment have significantly increased in both the core city and large urban zone during the period 2000-2006. However, while the development of new residential areas has been reduced, industrial and commercial areas were still increasing and became the main source of urban expansion. But there are also some exceptions on this general trend. For example, in the Mediterranean coast, and specifically in Spain, second homes and speculation have been driving factors for urban sprawl still in the period 2000-2006. In addition, in many cities in the Eastern part of Europe the development of new residential areas is dominant over new industrial and commercial ones. **Extensification of land use shows a clear East-West dimension.** Large volumes of land use extensification are almost exclusively found in Eastern European member states, particularly in Poland, Czech Republic and Hungary. This pattern appears to be very

dominant until 2000 but continues as well from 2000 to 2006. In the Czech Republic the more rural areas show high degree of extensification, which is due to the conversion of different crop areas into land for pasture.[68]

Corine data for 2006 shows that 77% of Europe's land was covered by three main land cover types (**see: Figure 3.12**): forests (35%), arable land and permanent crops (25%) and pastures and mixed mosaics (17%). About 4 % is covered by artificial surfaces, mostly urban areas which accommodate the majority of Europe's population and host the vast majority of economic activity.[69]

For the EU27 only, most recent data from Eurostat indicates that 4.6% of the EU land area was covered by artificial areas in 2012. Around one third of these artificial areas are built-up (e.g. mainly buildings and greenhouses), while the other two thirds is non built-up land (e.g. mainly road and railway transport infrastructure or parking areas). *The highest shares of artificial areas in total land area were recorded in Malta (32.9 %), Belgium (13.4 %), the Netherlands (12.2 %) and Luxembourg (11.9 %). The 'Benelux' countries host the most densely populated regions and thus are the most densely built-up and non-built up areas (41). Two Nordic and two Baltic countries rank lowest: Finland and Latvia (1.6 % each) and Sweden and Estonia (1.8 % each). These countries are among the least densely populated and therefore, artificial area coverage is low.*[70]

Figure 3.12: Share of land-cover types in Europe (total area)



Source: EEA/ETC-LUSI, 2010.

The 2006 Corine data set covers the 38 EEA member and collaborating countries, plus Kosovo, but excludes Greece, Switzerland and the United Kingdom.

Source: EEA (2010i), p.10

Focus on urban land use

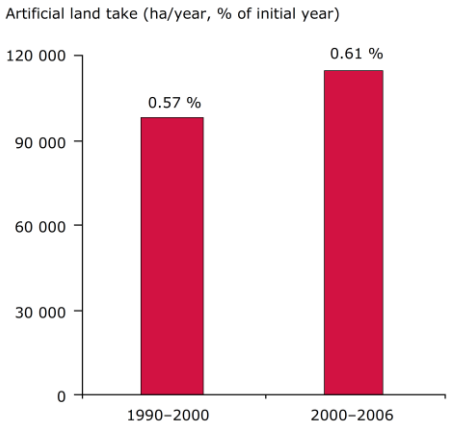
The above shown trend of a continuous increase of artificial areas which are encroaching on farmland, forests and semi-natural land clearly indicates that also territorial cooperation should pay special attention to adverse environmental effects resulting from this development (e.g. soil sealing, change of landscapes etc.).

Land take for urban areas and infrastructures increased between 1990 and 2000 by 5.7% across Europe and this trend accelerated during 2000–2006 (annual increase by 0.61%). Furthermore, the intensity of urban land use has changed in relation to population because built-up areas - in particular commercial and industrial areas - increased more than Europe's population (**see: Figures 3.13 & 3.14**). Although residential urban land take in the EU15 Member States has slowed in recent years and was moving closer to the population trend, economic sites have further sprawled which creates a mixed signal on sustainable land use. The increasing urbanisation also leads to higher soil sealing which varies in European capitals between 23%

[68] http://www.espon.eu/main/Menu_Publications/Menu_MapsOfTheMonth/map1401.html
[69] EEA (2010i), p.10
[70] European Commission, Eurostat (2013a), pp.131-132

and 78%, with cities in eastern and southern Europe showing a tendency of having more soil sealed than cities in northern Europe.[71]

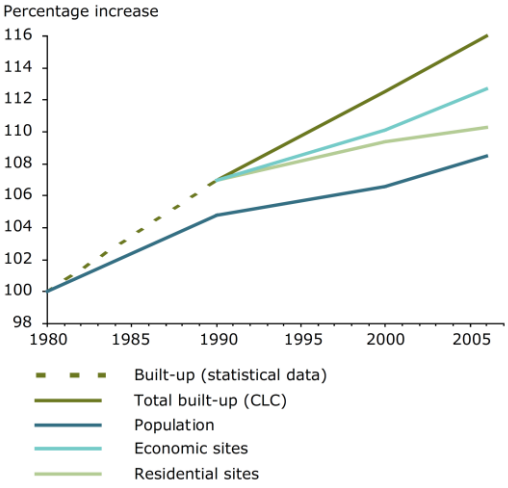
Figure 3.13: Annual land take by artificial surfaces in the 36 European countries in the Corine land cover 2006 data set (*)



(*) Land-take indicator — increase in the amount of agricultural, forest and other semi-natural and natural land taken by urban and other artificial land development. It includes areas sealed by construction and urban infrastructure as well as urban green areas and sport and leisure facilities. The main activities that result in land take are the extension of housing, services and recreation, industrial and commercial sites, transport networks and infrastructures, mines, quarries and waste dumpsites.

Source: EEA (2010i), p.16

Figure 3.14: Built-up area and population increase in selected countries



Source for built-up area for the period 1980–1990 is OECD (statistical data). Built-up area for 1990–2006 calculated from Corine land cover. Population data from Eurostat. Graph includes 25 EEA member and collaborating countries.

Source: EEA (2010i), p.20

Focus on cross-border areas

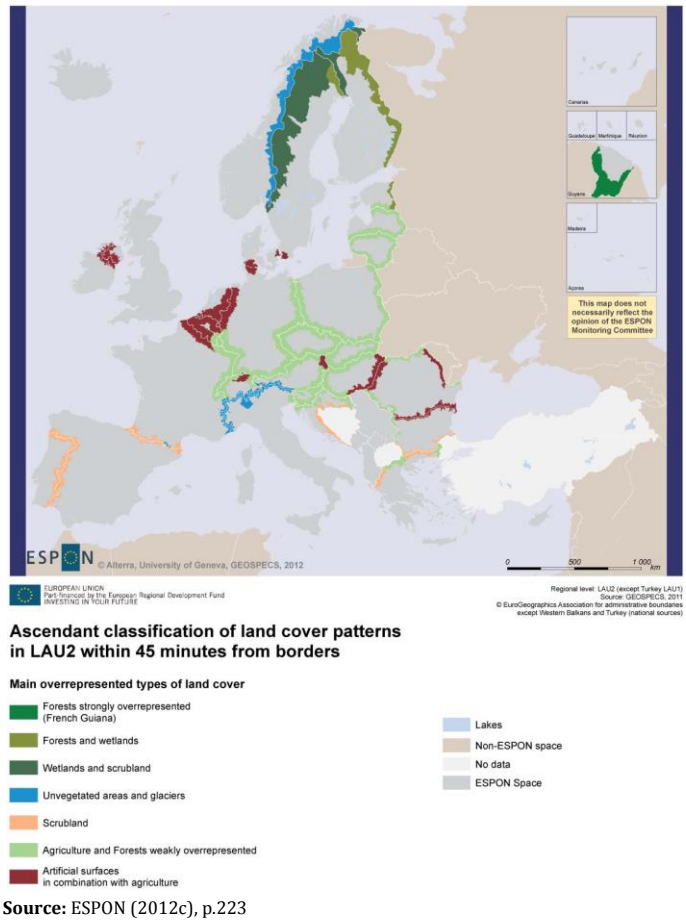
The ESPON project GEOSPECS has realised and aggregated mapping of the predominant **land cover types that are prevailing at the borders of the EU27/EEA and Switzerland (see: Map 3.4).** On ground of this map, one can distinguish two larger groups of border areas:[72]

(1) The majority of "core borders areas" (i.e. areas within 45 minutes from the border) **are predominantly rural and sometimes even consist of important proportions of undeveloped open spaces.**[73] These areas are located at various internal and external EU land borders, and land cover categories are either similar on both sides of the border or different on each side.[74] In border areas with a predominance of agriculture and forests, human interventions are already significant and have led to a visible alteration of the natural environment (i.e. existence of cultural self-maintained systems and/or cultural-assisted systems). In the less densely populated border areas of Scandinavia and the high mountain border areas (i.e. South-West and Centre or the East of the EU) as well as in the ultra-peripheral border area of French Guyana, however, human interventions are nearby absent or reduced and one can find a high proportion of different types of natural environments (i.e. "natural systems", "sub-natural systems", "quasi-natural systems" or "semi-natural systems").

[71] EEA (2010i), pp.16, 18-20
[72] ESPON (2012c), pp.222-224
[73] i.e. the land cover categories "agriculture", "forests", "wetlands", "scrubland/no vegetation" and "unvegetated land/glaciers" are over-represented here.
[74] e.g. FI-NO, SE-NO, SE-FI.

(2) A smaller but still important group of core border areas **shows a particularly strong presence of man-made land cover types**, as artificial surfaces (i.e. mainly built environment) in combination with agricultural surfaces (i.e. very high proportions of fields and pastures) are clearly over-represented here. These areas are most often located in the West and North of the EU (e.g. UK-IE, BE-FR, BE-NL, DE-BE-NL, DE-NL, DE-DK, DK-SE), but sometimes also in the Central-South and Eastern part of the EU (e.g. DE-CH, AT-SK, HU-RO, RO-BG). This land cover category appears most often on both sides of a border and is only in a few cases different on either side (i.e. DE-CH, AT-SK). In these border areas all sorts of human interventions are very intense (or extreme) which has led to a significant alteration (or complete loss) of biotic elements and also to an intense (or extreme and complete) fragmentation of natural habitats.

Map 3.4: Predominant land cover types prevailing at the borders of the EU27/EEA and Switzerland



Source: ESPON (2012c), p.223

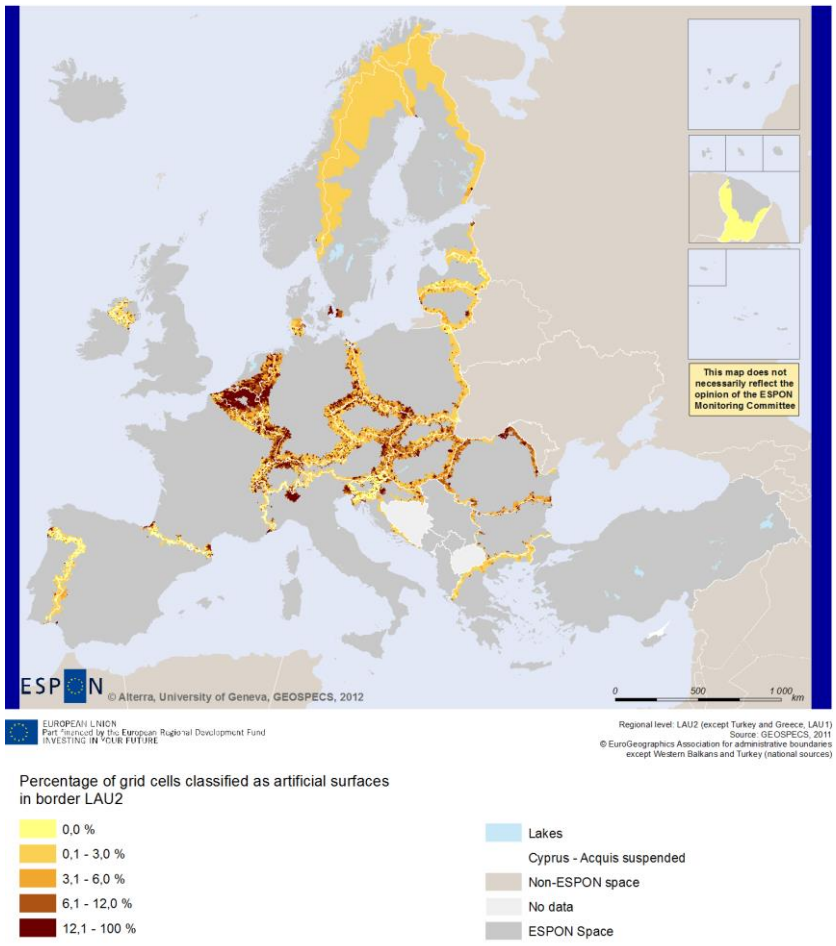
Because map 3.4 could easily suggest that land take by artificial surfaces tends to be an issue only in some EU-border areas, we included another GEOSPECS map with data at LAU 2 level showing that joint territorial challenges also exist in a number of other cross-border areas **(see: Map 3.5).** These areas are mainly found at the borders of Luxembourg with France and Germany, at the German-French border (Saarland-Lorraine) and in the Upper Rhine Area (DE-FR-CH), but also to some extent at the Swiss-Italian border and at several eastern borders (DE-CZ, HU-SK).

Land use practices and GHG emissions

Promoting policies involving wise land use management can also be rewarding from a climate change point of view, because land use and land use change and forestry (LULUCF) practices can lead to additional greenhouse gas emissions (e.g. conversion of forests into farmland). In the EU, however, the net effect of LULUCF has been positive between 1990 and 2011 **(see: Figure 3.15)**. This means that newly planted forests and improved management of existing forests helped to remove GHG emissions from the atmosphere.[75]

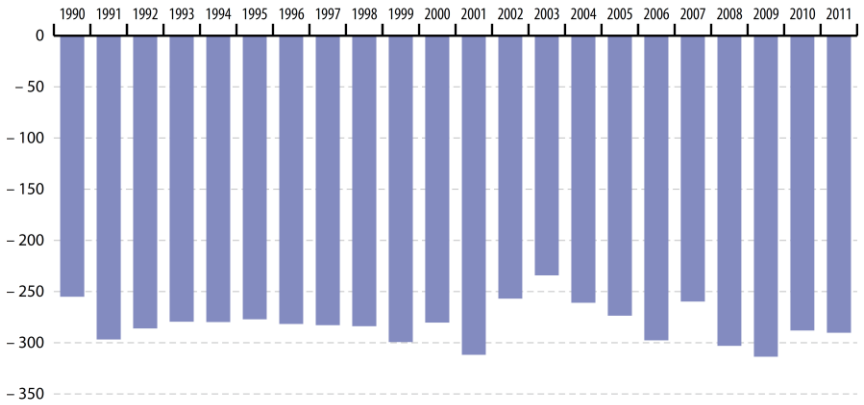
[75] European Commission, Eurostat (2013a), p.186

Map 3.5: Detailed mapping of artificial surfaces at the borders of the EU27/EEA and Switzerland



Source: ESPON (2012c), p.1070

Figure 3.15: Emissions from land use, land use change and forestry (LULUCF), EU-27 (million tonnes of CO2 equivalent)



Source: European Commission, Eurostat (2013a), p.186

3.4. Preserving terrestrial and marine ecosystems and biodiversity

Human well-being relies on natural capital, including the ability of ecosystems to provide food, water and fuel as well as to regulate the environment through services such as carbon storage, flood control and water purification. Given that natural systems can only tolerate disruption up to a certain point, the sustainable use of natural resources and maintenance of well-functioning ecosystems is crucial to meeting the demands of current and future generations. However, human activities continue to threaten vast areas of natural and semi-natural habitats and the life contained within. These modifications not only threaten biodiversity, but also reduce the resilience of ecosystems to foreseen climate change effects such as an increase in the frequency of natural disasters (**see: Box 3.3**).[76]

Recent assessments present a distressing picture about the status of ecosystems and biodiversity and highlight the lack of progress achieved in Europe in these fields. Cross-border and transnational cooperation can significantly contribute to protect terrestrial and marine ecosystems and to maintain a good conservation status, mainly by lowering threats and pressures that result from manifold human activities (e.g. land-use change, pollution, overexploitation).

Box 3.3: About ecosystems and biodiversity

An ecosystem is a community of living organisms (e.g. plants, animals, microbes) in conjunction with the non-living components of their environment (e.g. air, water, mineral soil), interacting as a system. These biotic and abiotic components are regarded as linked together through nutrient cycles and energy flows. Because ecosystems are defined by complex interactions among organisms, and between organisms and their environment, they can be of any size but usually encompass specific limited spaces. Due to the different physical characteristics of air and water and also the salt content of water, one can distinguish between ecosystem found only on landforms or in freshwater (terrestrial ecosystems) and ecosystems found in marine waters (marine ecosystem), with the stretching from mangroves, salt marshes and intertidal areas, estuaries and lagoons, coral reefs to the deep sea and the sea floor.

Biodiversity, understood as the degree of variation of life forms within a given species, ecosystem, biome or the entire planet, is a measure of the health of ecosystems. Biodiversity is in part a function of the climate (e.g. tropical regions are typically rich whereas polar regions support fewer species), but it also significantly influenced by all kinds of human activity. Biodiversity is essential to human wellbeing, delivering services that sustain our economies and societies. Biodiversity loss can emerge from rapid environmental changes which typically cause mass extinctions of species and most important changes in land use and land cover due to growing human demands for food, renewable energy and infrastructure which typically cause fragmentation of habitats and their degradation through pollution or a complete loss of natural habitats.

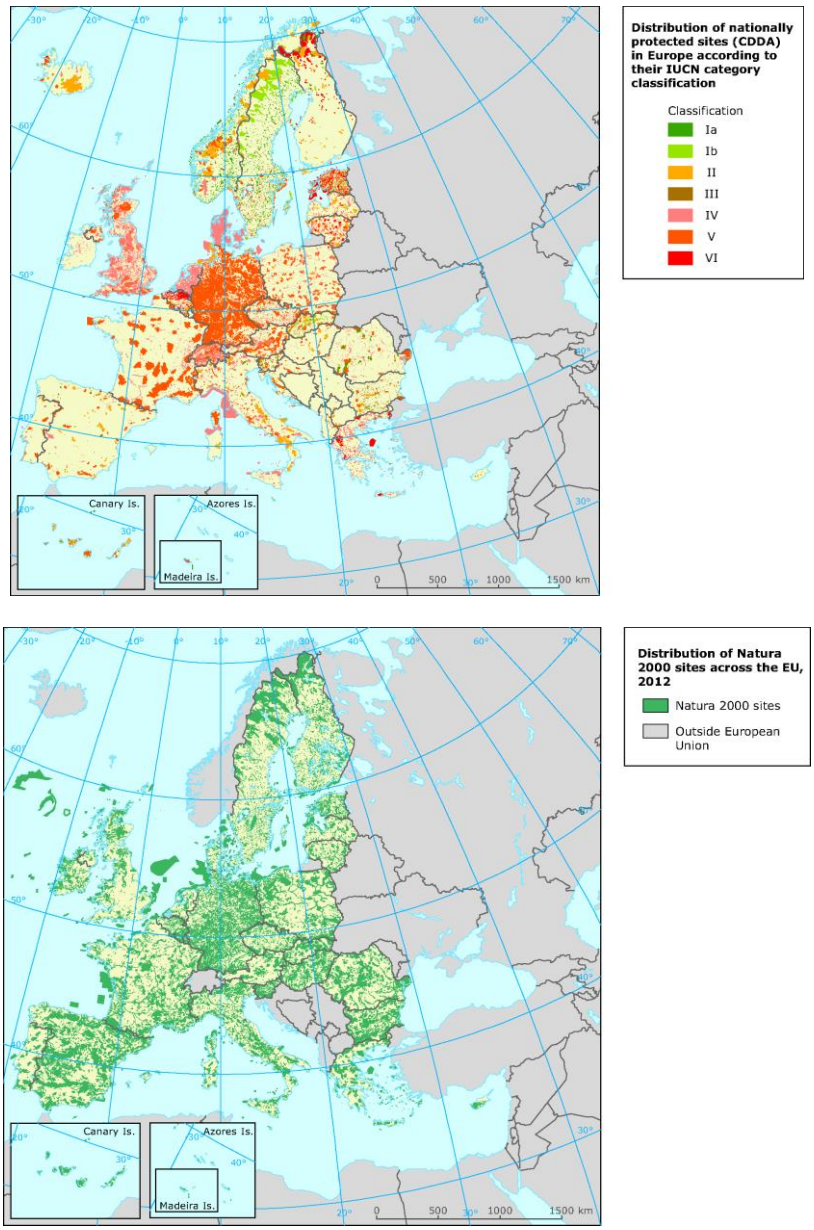
Terrestrial ecosystems

Protected areas have long been the only way of preserving remarkable natural assets from adverse land use wherefore **the number and coverage of protected areas designated under national legislation has increased in Europe,** reaching now more than 100,000 sites across 54 countries. The size of protected areas varies greatly, with 90% of them covering less than 1,000 ha. Also among EEA member countries, the percentages of national territories designated for conservation, including national designations and the EU Natura 2000 sites, vary greatly. If spatial overlaps are removed and only sites with a clearer conservation objective (i.e. sites

[76] European Commission, Eurostat (2013a), p.219 ; EEA (2010j), p.4

corresponding to IUCN categories Ia, Ib, II, III, IV[77]) are considered, then the total area under protection in EEA countries is at 90,922,576 ha or 16 % of the total area of these countries **(see: Map 3.6)**.[78] **Also protected areas designated under EU legislation have further increased.** The long-term survival of Europe's most valuable and threatened species and habitats is promoted by the **Natura 2000 site network,** which was established by the EU Birds and Habitats Directives. The network has steadily developed over the last 15 years and is **now reaching 18% of the terrestrial area of EU Member States (see: Map 3.7).**[79]

Maps 3.6 & 3.7: Distribution of nationally protected sites (CDDA) and of "Natura 2000" sites in Europe



Source: EEA (http://www.eea.europa.eu/data-and-maps/)

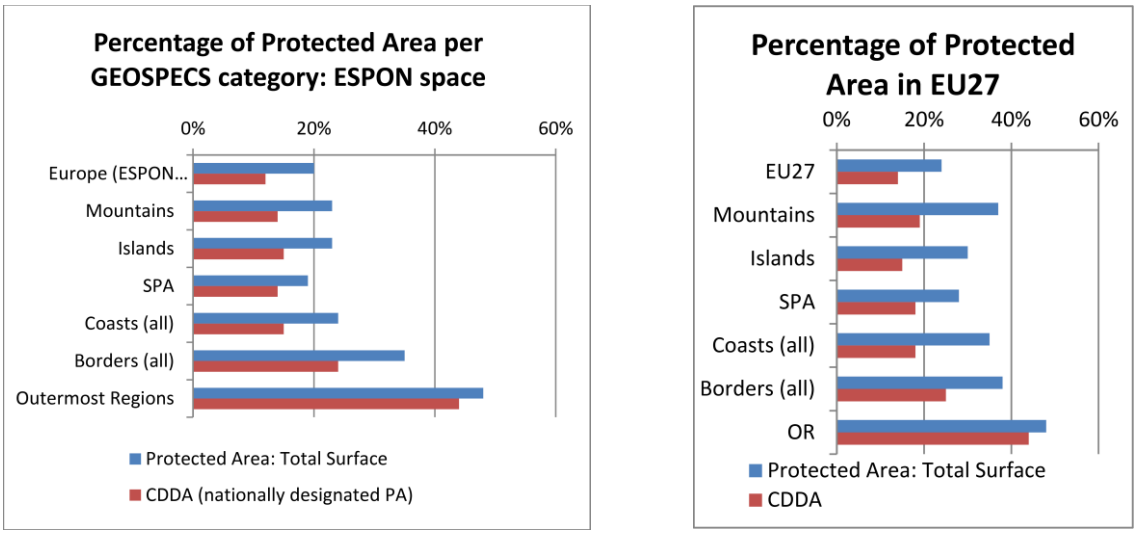
[77] As variety of national designations exists, the management categories of the International Union for Conservation of Nature (IUCN) are used to allow comparisons and data aggregations across countries. These are the following categories: Strict Nature Reserve (Ia), Wilderness Area (Ib), National Park (II), Natural Monument or Feature (III), Habitat/Species Management Area (IV), Protected Landscape/ Seascape (V), Protected area with sustainable use of natural resources (VI).

[78] EEA (2010j), pp.14-16

[79] All types of ecosystems are represented within the network, with 38 % of it approximately covered by agro-ecosystems including 11 % that are grasslands, 34 % covered by forests, 16 % by heath and scrub, and 11 % by wetlands. The main land uses in Natura 2000 sites and the degree of their similarity to their surrounding areas vary significantly EEA (2010j), p.15

Our previous analysis of land-cover patterns showed that **border areas were often suitable places for the evolution of comparatively untouched areas and the preservation of natural or semi-natural habitats** with a high degree of biodiversity. This is partly a result of their peripheral location and specific geographical features (i.e. borders often running along rivers, mountain and maritime ranges), but also due to political factors of the past which avoided a further development of these areas (e.g. borders as forbidden areas for tourism, travel and economic activity for several decades).[80] This obviously makes many border areas a favourable place for designating protected areas and for the launching joint action, for example, in the context of cross-border nature parks. This is also confirmed by quantitative evidence from the ESPON project GEOSPECS, which shows that border regions have the second highest share in the total surface of protected areas designated under both national and European legislation (**see: Figure 3.16**).[81]

Figure 3.16: Protected areas in specific types of territories



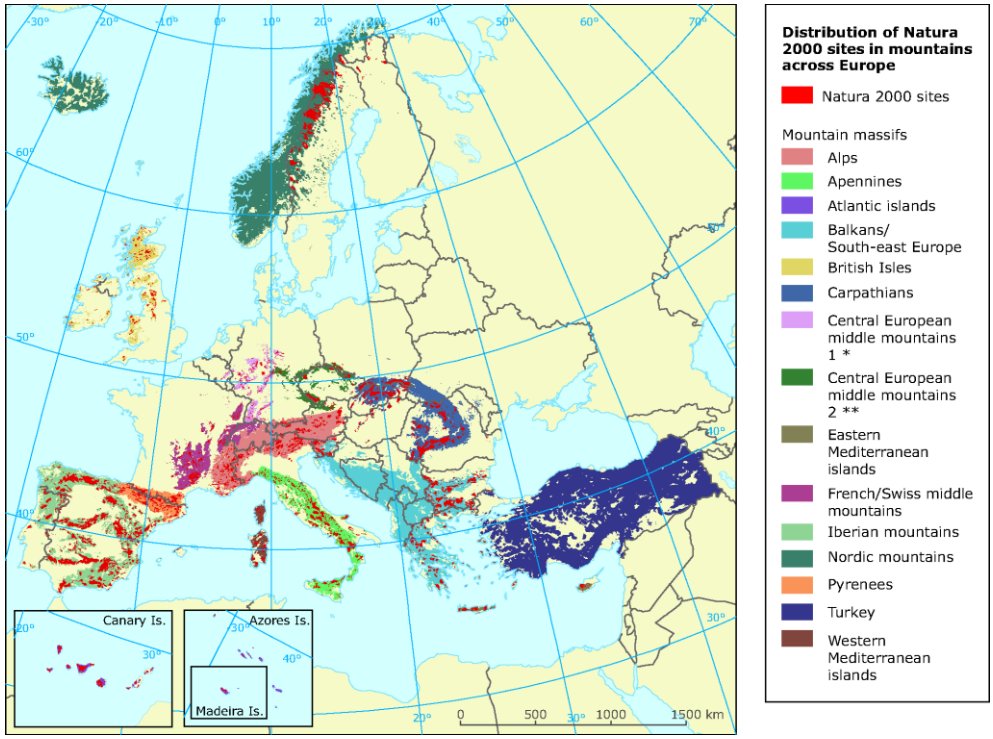
Source: ESPON (2012c), p.414

Other **hotspots of biodiversity** in Europe **are mountain areas.** Here a number of factors interact to cause high levels of biodiversity which include the compression of thermal and climatic zones over relatively short distances, steep slopes, variations in geology and soils, and the fragmentation of mountain terrain. In addition, many mountain areas are isolated from one another so that species have evolved separately - a major reason for the high levels of endemism in many mountains, including those on islands. Millennia or centuries of human intervention have also been important for maintaining populations of many species and particular habitats in spatially diverse cultural landscapes.[82] Mountains also host a particularly high proportion of protected areas. Of the total area designated as Natura 2000 sites in the EU, 43% is found in mountain areas and these sites cover 14% of the mountain area of the EU **(see: Map 3.8)**.

Islands are also **important hotspots of biodiversity**, probably more than any other type of territory because they were much more isolated. Over time, this isolation has led to unique evolutionary processes that resulted in the development of a distinct genetic reservoir and the emergence of highly specialized species. As a legacy of this history many island species are unique, but also particularly vulnerable and threatened by extinction (**see: Box 3.4**).

[80] ESPON (2012c), p.407
[81] ESPON (2012c), p.414 (NB: The share of all border areas also covers sites in mountain border areas)
[82] ESPON (2012c), p.405

Map 3.8: Distribution Natura2000 sites across European mountain massifs



Source: EEA (http://www.eea.europa.eu/data-and-maps/)

Box 3.4: Islands and biodiversity – findings from the GEOSPECS project

Islands harbour higher concentrations of endemic species than continents, and the number and proportion of endemics rise with increasing isolation, island size and topographic variety. However, island species are therefore also particularly vulnerable: of the 724 recorded animal extinctions in the last 400 years, about half were of island species. In the same period, at least 90% of the bird species that became extinct were island-dwellers. Within Europe, islands (which are often mountainous) have particularly high levels of endemic species. Some islands are too small for human habitation and therefore host a number of species which have been able, and continue, to evolve undisturbed; often, such islands have been designated as protected areas. In contrast, species and habitats on some touristic islands (particularly in the Mediterranean and other popular tourist destinations) face high pressure from the expansion of infrastructure.

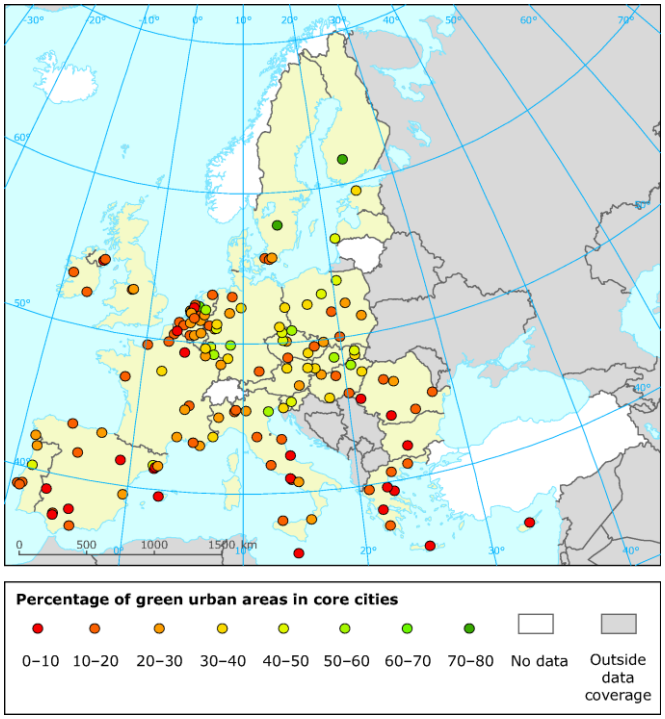
Source: ESPON (2012c), pp.405-406

Biodiversity is also an issue within and around urban areas, because biodiversity is generally decreasing along an urban gradient from city centres to rural areas. As cities grow, the range of plant and animal species supported is restricted and the species present may be those most adaptable to the urban environment, rather than more typical native species. Both of these factors contribute to the homogenisation of biodiversity in urban areas.[83] Urban ecosystems are highly artificial and provide specific habitats, but they can only survive and deliver good quality of life by using the basic ecosystem services provided by nature and biodiversity, both of which originate from green areas within and outside cities.

[83] EEA (2010j), p.18

Urban green infrastructure within cities and around them is therefore important for both biodiversity and the quality of life of people. From a mapping of the situation in the EU **(see: Map 3.9)** it appears that cities with more than 40% of green urban areas in the core area are mostly found central and eastern Europe, but at some extent also in Scandinavia and western Germany. Conversely, cities with a very low or low percentage of green areas (i.e. 0-40%) are mainly found in the densely populated areas of North-West Europe (i.e. northern France, BE, NL) and the southern Member States of the European Union. as well as on the Mediterranean islands.

Map 3.9: Percentage of green urban areas in core cities



Source: EEA (http://www.eea.europa.eu/data-and-maps/)

There is a great variety of aspects that represent **threats and pressures for terrestrial ecosystems and they also affect the conservation status of both protected areas designated under national and European legislation.** The most important ones are (1) land-use changes leading to habitat loss and fragmentation, (2) pollution, (3) natural resources exploitation, (4) invasive alien species and (5) climate change.[84]

(1) A long-term analysis of **land use changes and changes in ecosystems** between 1990 and 2006 shows that **the EU's semi-natural habitats have been in decline since 1990 (see: Figure 3.17).** Agro-ecosystems continue to decrease in coverage, and between 2000 and 2006, semi-natural agricultural areas were lost to forest afforestation programmes and conversion to arable land or to mixed agriculture with pastures. Grasslands in particular declined between 1990 and 2006 (by more than 4,300 km2), mainly because of intensive agriculture and urban residential sprawl or the development of economic sites and natural afforestation due to farmland abandonment.[85]

Increasing **urban sprawl and land-take for infrastructures have also augmented the fragmentation of landscapes and semi-natural habitats,** leading to diverse pressures on biodiversity. Currently, fragmentation is moderately high to very high on nearly 30% of the EU27 territory (**see: Figure 3.18**) and it is highest in the lowlands of Western Europe. High fragmentation has increased the vulnerability of ecosystems to diffuse external pressures such as drainage, eutrophication and acidification. In addition, isolated populations of animals and plants have become more vulnerable to local extinction due to disrupted migration and dispersal opportunities. Connectivity between areas with remaining semi-natural features is very important for safeguarding biodiversity and increasing disconnection is a challenge that needs

[84] EEA (2010j), pp.16-24
[85] EEA (2010j), p.17

to be addressed through developing green infrastructures.[86] Improving connectivity through such measures is also an important issue along several European borders, despite their most often rather favourable natural context. The most urgent needs to ensure a higher degree of functional connectivity of Natura 2000 sites seem to exist along the borders between the three Baltic States, the northern and western borders of the Czech Republic and also at the German-Danish border. But also along the borders of France, Belgium, the Netherlands and Germany or Austria, scope for further improvements does exist (**see: Map 3.10**).

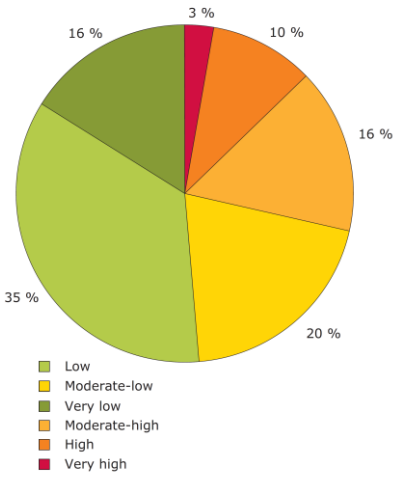
Figure 3.17: Changes in EU ecosystems between 1990 and 2006

Ecosystem	Surface change (km²)	Change (%)
Agro-ecosystems (intensive and heterogeneous, agro-forest)	– 12 611	– 2.0
Agro-ecosystems (extensive)	– 4 476	– 2.6
Grasslands (pastures)	– 2 553	– 0.9
Grasslands (natural)	– 1 795	– 2.4
Heath and scrubs	+ 13 245	+ 5.9
Forests	+ 5 378	+ 0.6
Wetlands (marshes/bogs)	– 1 266	– 5.0

Note: The term 'agro-ecosystems' is based on the following Corine land cover categories:
Regularly cultivated land: non-irrigated arable land (211), permanently irrigated land (212), rice fields (213). vineyards (221), fruit trees and berry plantations (222), olive groves (223), pastures (231), and annual crops associated with permanent crops (241).
Mixed cultivated land: complex cultivation patterns (242), agricultural area with significant areas of natural vegetation (243), and agro-forestry areas (244).
Semi-natural areas with possible extensive agriculture practices: natural grasslands (321), moors and heathland (322), and sclerophyllous vegetation (323).

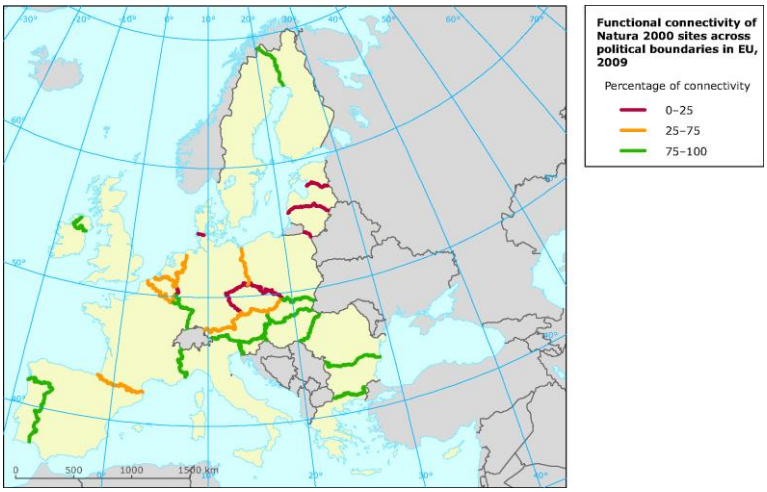
Source: EEA (2010j), p.18

Figure 3.18: Landscape fragmentation in the EU27 (% of total terrestrial area)



Source: EEA (2010j), p.18

Map 3.10: Functional connectivity of Natura 2000 sites across political boundaries in EU, 2009 (*)



Note: The map reflects the likely degree of spatial connectivity of Natura 2000 sites across 34 terrestrial political borders of the EU, measured as a quantified proportion of Natura 2000 sites on both sides of a boundary against total border length.

Source: EEA (http://www.eea.europa.eu/data-and-maps/)

[86] EEA (2010j), p.18

(2) Pollution continues to negatively impact both threatened and non-threatened species, habitats and ecosystems. There is a wide range of pollutants including excess nutrients, pesticides, microbes, industrial chemicals, metals and pharmaceutical products which end up in the soil or in ground- and surface-water, to which also atmospheric deposition of eutrophying and acidifying substances have to be added (**see also Section 3.2.**)[87] Some geographically-specific habitats are particularly affected (Alpine and sub-alpine area; Arctic area), but also the many other Natura 2000 sites across the EU (**see: Box 3.5**).

Box 3.5: Effects of excess nitrogen deposition on habitats and biodiversity

Alpine and sub-alpine grasslands and Arctic, alpine and sub-alpine scrub habitats are particularly endangered by excess atmospheric N inputs. Negative effects of high N fertilisation from the atmosphere include species loss, changes in inter-species competition and increased susceptibility to plant diseases, insect pests and frost, drought and wind stress. Also Natura 2000 habitats are particularly vulnerable to atmospheric N inputs, which represent a major anthropogenic threat to habitat structure and function within this network as well as to the conservation status of habitats and species listed under the Habitats Directive. The contrast between the high degree of protection afforded to Natura 2000 sites, and the actual high degree of critical load exceedances and current impacts in them is cause for concern.

Source: EEA (2010d), pp.19-20

(3) Natural resources exploitation takes place everywhere in Europe, but it becomes problematic if wildlife and plant species are excessively harvested by people for food, clothing, pets, medicine, sport and many other purposes. Such over-exploitation affects the loss of genetic diversity and the loss in the relative species abundance of both individual and/or groups of interacting species.[88] Tensions between a preservation of natural resources and an exploitation of natural resources often emerge in sparsely populated areas of the EU. Here, natural resources exploitation still is an important aspect of the regional economies in terms of wealth generated (i.e. less though in terms of employment due to modernisation and rationalisation processes in those industries) and also essential for maintaining the regional social capital **(see: Box 3.6).**

Box 3.6: Exploitation and preservation of natural resources in sparsely populated areas

The ESPON project GEOSPECS distinguished two main types of resource-based activities that can be found in the EU's sparsely populated areas. Activities such as fishing, intensive livestock production and aquaculture are important at the Norwegian coast (esp. aquaculture) and in the Scottish Highlands (esp. livestock production), while activities in the mineral and chemical industries and the processing of metals or forest exploitation mainly take place in the sparsely populated areas of Sweden and Finland. These resource-based activities often have environmental impacts with regard to both the methods employed for extraction or production and the residues and waste produced by these activities that need to be stored or treated. Due to this, there is a tension in sparsely populated areas between resource-based development for wealth generation and the preservation of the environment. This also challenges the capacity of local and regional economies based on natural resource exploitation to develop activities that are based on high environmental quality, such as forestry or tourism, which is often linked to the relatively 'pristine' or 'wild' ecosystems and landscapes. Thus, a decision to follow an amenity-led development path might jeopardize the long-term potential for other types of activities. There is therefore a complex and, to some extent, paradoxical relationship between the need to develop human (and industrial) activities in sparsely populated areas and to protect the environment.

Source: ESPON (2012c), p.199-203

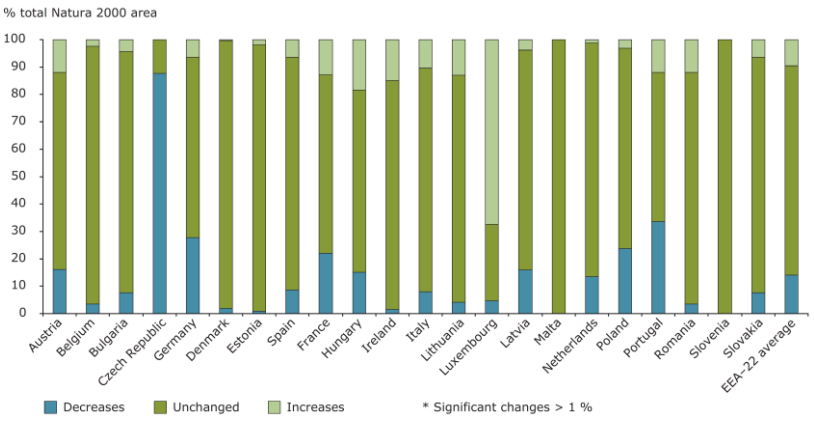
[87] EEA (2010j), p.21
[88] EEA (2010j), p.21

(4) Invasive alien species (IAS) are non-native species whose introduction and/or spread outside their natural past or present ranges pose a threat to biodiversity. More than 10,000 non-native species are now present in Europe, 10–15% of which are considered to have negative economic or ecological effects. In order to gain a better understanding of invasive alien species and their impact on European biodiversity, a list of the worst invasive alien species threatening biodiversity in Europe has been established.[89] As the expansion of IAS does not stop at national borders, cooperation is therefore well-placed to take joint action on this particular challenge.

(5) Climate change impacts on biodiversity and ecosystems are now considered likely to be greater than initially forecast and it impacts biodiversity through a complex interaction of species and their habitats (**see also Chapter 4**). Most notable are changes in species composition in the Alpine region, which represents 20% of all native vascular plants in Europe. Rapid climate change in Europe in the past 20 years has strongly affected the common bird population. Three quarters of the common bird species were declining as a result of climate change, while only one-quarter were benefitting from it. Climate change also led to changes in butterfly communities during the period 1990–2005, today showing a significant trend towards a higher proportion of warm species relative to cool species.[90]

All the above-mentioned threats and pressures also strongly affect the conservation status of terrestrial Natura 2000 sites. This can be shown, for example, by the long-term influence of an intensification and withdrawal of agriculture and of urbanisation on Natura 2000 sites, which appears from the latest EU-wide analysis of land cover changes between 1990 and 2006. The long-term review indicates that, while the vast majority of sites remained with no significant changes to their 1990 pressures from intensive agriculture and urbanisation,[91] **clear changes have taken place in a number of countries and sites** (**see: Figures 3.19 and 3.20**). The strongest increase of diffuse pressure from intensive agriculture is observed in Luxembourg, but also some other countries show increasing pressure albeit at much lower levels (HU, IE, FR, AT, LT, PT, RO). As regards diffuse pressure from urbanisation, a strong increase is observed in Luxembourg and in the Netherlands, but at lower levels also in a number of other countries (BE, AT, PT)

Figure 3.19: Changes in diffuse pressure from intensive agriculture in Natura 2000 sites, 1990–2006

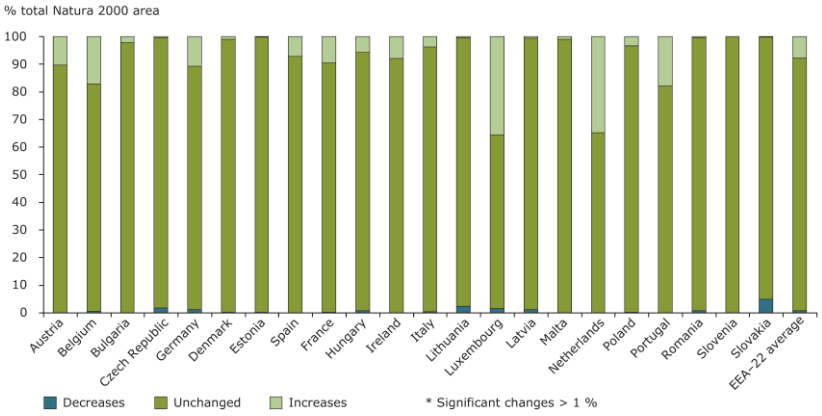


Note:
Corine land cover classes used for intensive agriculture include: Arable land: non-irrigated arable land (211), permanently irrigated land (212), rice fields (213). Permanent crops: vineyards (221), Fruit Trees and Berry Plantations (222), olive groves (223). Heterogeneous agricultural areas: annual crops associated with permanent crops (241).

Source: EEA (2010j), p.15

[89] EEA (2010j), p.23
[90] EEA (2010j), pp.23-24
[91] EEA (2010j), p.16

Figure 3.20: Changes in diffuse pressure from urbanisation in Natura 2000 sites, 1990–2006



Note:
Corine land cover classes used for urban diffuse pressure include: Urban fabric: continuous urban fabric (111), discontinuous urban fabric (112). Industrial, commercial and transport units: industrial or commercial units (121), Road and rail networks and associated land (122), port areas (123), airports (124). Mines, dump and construction sites: mineral extraction sites (131), dump sites (132), construction sites (133). Artificial non-agricultural vegetated areas: green urban areas (141), sports and leisure facilities (142).

Source: EEA (2010j), p.16

All ecosystems provide services[92] that support directly or indirectly human survival and the quality of life. Over the past decades in Europe, the demand of people for such ecosystem services was steadily increasing and recent trends show that this demand is also changing.[93] At the same time, however, **it can be observed that the ability of ecosystems to provide such services has considerably changed in the long-term** (**see: Figures 3.21).** Trends in the status of terrestrial ecosystem services show either a degraded or mixed status across Europe, with the exception of recent enhancements in timber production in forests and mountains, freshwater provision, water/erosion/natural hazard regulation and recreation/ecotourism in mountains, and climate regulation in forests.

Figure 3.21: Long-term trends in the status of European ecosystem services (1950-1990; 1990-present)

Services \ Ecosystems	Agro ecosystems	Forests	Grasslands	Heath and scrubs	Wetlands	Lakes and rivers
Provisioning						
Crops/timber	↓	↑			↓	
Livestock	↓	=	=	=	↓	
Wild foods	=	↓	↓		=	
Wood fuel		=		=		
Capture fisheries					=	=
Aquaculture					↓	↓
Genetic	=	↓	↓	=	=	
Freshwater		↓			↑	↑
Regulating						
Pollination	↑	↓	=			
Climate regulation		↑		=	=	=
Pest regulation	↑		=			
Erosion regulation		=	=	=		
Water regulation		=		↑	↑	=
Water purification					=	=
Hazard regulation					=	=
Cultural						
Recreation	↑	=	↓	↑	↑	=
Aesthetic	↑	=	=	=	↑	=

Status for period 1990–present Degraded · Mixed · Enhanced · Unknown · Not applicable

Trend between periods ↑ Positive change between the periods 1950–1990 and 1990 to present · ↓ Negative change between the periods 1950–1990 and 1990 to present · = No change between the two periods

Source: EEA (2010j), p.26

[92] Ecosystem services can be categorised in four main types: provisioning services, regulating services, habitat services and cultural services.

[93] e.g. an increase in the demand for crops from agro-ecosystems, timber and climate regulation from forests, water flow regulation from rivers and wetlands and recreation and tourism in most ecosystems; and a decrease in livestock production, freshwater capture fisheries and wild foods.

Marine ecosystems

Marine ecosystems - or large marine ecosystems (LME)[94] - consist of a complex set of habitats, each of which is defined by the wide range of physical, chemical and geological variations that are found in marine waters. Habitats are found in the highly productive near shore areas, in the water column where plants and animals follow the ocean currents and on the deep sea floor which is only inhabited by highly specialised organisms. Protection of habitats from physical destruction is vital to the survival of some of the most threatened coastal and marine species, but also to the general health of marine ecosystems.[95]

There is a great variety of aspects that represent **increasing threats and pressures for marine ecosystems,** many of which are addressed under other section of this study. The most important ones are:[96]

- land-use change through on-shore land-use practices, producing wide spread pressures on inter-tidal habitats such as salt marshes and other coastal wetlands;
- nutrient pollution and chemical pollution through land-based sources as well as discharges of nutrients, antibiotics and fungicides through aquaculture or maritime transport causing illegal operational oil discharges and accidental oil spills and marine litter pollution;
- increasing exploitation e.g. due to renewable energy production through wave and tidal amplitude installations or off shore wind energy parks (**see: Box 3.7**) and oil or gas exploitation and an overexploitation of fish stocks;
- introduction of invasive alien species, e.g. through ships' ballast-water discharges and hull fouling;
- raising sea surface temperatures, sea-level rise or coastal land-cover changes due to climate change.

Box 3.7: Environmental impacts of off-shore wind parks

There is some concern regarding the environmental impacts of wave and tidal amplitude installations and off-shore wind park platforms, because they involve large structures, often in coastal areas where the sea has many other uses. The environmental impact of individual wind parks has been studied in numerous environmental impact assessments, and is generally found to be small and in some cases even favourable because of the ability of the platforms to become artificial reefs. Evidence to date shows that, whereas, in general, wind energy does not represent a serious threat to wildlife, poorly sited or designed wind farms can pose a potential threat to vulnerable species and habitats, including those protected under the Habitats and Birds Directives. Birds, bats and marine mammals may be displaced from areas within and surrounding wind farms due to noise and vibration impacts. The scale and degree of disturbance determines the significance of the impact, as does the availability and quality of other suitable habitats nearby that can accommodate the displaced animals. During the construction phase, noise and vibration from pile driving and other works may affect the animals over a large area.

Source: EEA (2010b), pp.41-44

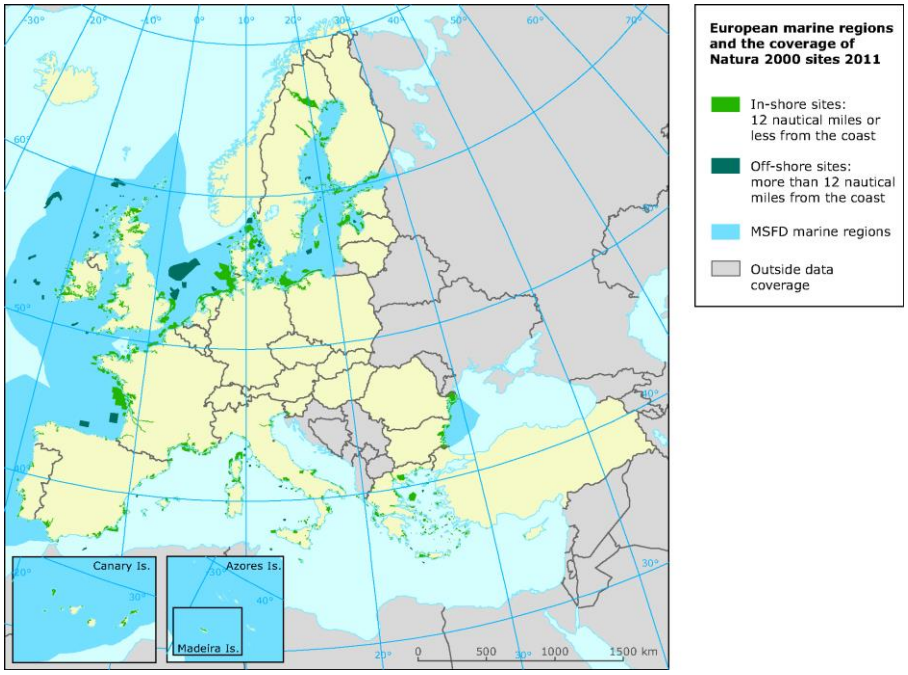
The transition area between land and the sea in coastal regions and islands is a unique ecosystem with very important habitats that are particularly vulnerable. They face increasing pressure due to the fact that of high population concentration which seasonally increases further

[94] Large marine ecosystems (LMEs) are regions of the world's oceans, encompassing coastal areas from river basins and estuaries to the seaward boundaries of continental shelves and the outer margins of the major ocean current systems. http://en.wikipedia.org/wiki/Large_marine_ecosystem
[95] EEA (2010b), p.9
[96] EEA (2010j), pp.16-24

due to the important role of these areas as holiday destinations and recreation areas. In EU countries with a sea border, almost half of the population lives in coastal areas and marine habitats are being destroyed to make way for maritime transport (e.g. port infrastructures, dredging etc.). In coastal areas, especially the wetlands provide key feeding areas for species of migratory birds and about 50 coastal habitat types and 150 species that prefer coastal ecosystems (other than birds) are listed in the annexes of the EU Habitats Directive. However, two-thirds of coastal habitat types and more than half of coastal species have an unfavourable conservation status.[97]

Already since more than a decade, there is awareness about **fully applying the EU Habitats and Birds Directives to the offshore marine environment,** especially with regards to the establishment of the Natura 2000 network. However, **progress in extending the marine Natura 2000 network has been significantly slower than on land** and the coverage of marine sites is much less comprehensive than the terrestrial one: in 2010, marine sites accounted for only 20% of the total designated area in Europe (167,561 ha in the EU27). Most of the designated marine Natura 2000 sites - approximately 75% of the designated area - are located within 12 nautical miles of the coast (**see: Map 3.11**). Yet, a coherent network of offshore areas is lacking.[98] A further expansion of the still significantly lagging behind marine network of conservation areas under Natura 2000 would not only significantly contribute to the target of halting the loss of biodiversity, but also to broader marine conservation and sustainable use objectives which are currently pursued by the ecosystems approaches under various EU-level policies (e.g. European Integrated Maritime Policy; Marine Strategy Framework Directive; EU's Atlantic Sea Basin Strategy).

Map 3.11: European marine regions and the coverage of Natura 2000 sites



Disclaimer: The marine regions and sub-regions shown in the map are identical to MSFD marine regions used for WG DIKE (Working Group on Data, Information and Knowledge Exchange) consultation of EU Member States on the 7 November 2011. A final decision regarding the map was not reached before the publication and changes might occur. The map does not represent any official Member State marine boundaries.

Source: EEA (http://www.eea.europa.eu/data-and-maps/)

[97] ESPON (2012c), pp.405-406
[98] EEA (2010j), p.15; ESPON (2012c), pp.405-406

3.5. Lowering resource use and waste generation and improving waste management

The average annual use of material resources for the EU-27 Member States is nearly 15 tonnes per person and the bulk of this ends up as materials accumulated in the economy, with the rest being converted into emissions or waste.

The European economy uses huge amounts of natural resources to function and the demand for materials is so intense that between 20 and 30 % of the resources are now imported. Europe has indeed become more efficient in managing material resources, but growth in the productivity of materials in the EU has been significantly slower than growth in the productivity of labour. At the other end of the materials chain, the EU economy generates more than five tons of waste per person every year which is generally a sign of a waste of resources. Environmental impacts of waste depend – besides the amount of waste generated – essentially on the characteristics how waste is managed. Waste collection, treatment and disposal of waste causes – if inappropriate – a variety of environmental pressures (e.g. GHG and other air pollutant emissions; emissions to water and soil), threatens biodiversity and exposes humans to harmful substances and disease-causing organisms, damaging their health. Increasing waste recovery by recycling and composting reduces demand for raw materials and resource extraction.[99]

Cross-border and transnational cooperation can make contributions to achieve a more sustainable way of producing and consuming in the EU and by this help to reduce pressures and negative impacts on the environment.

EU-wide trends for raw material consumption and resource productivity

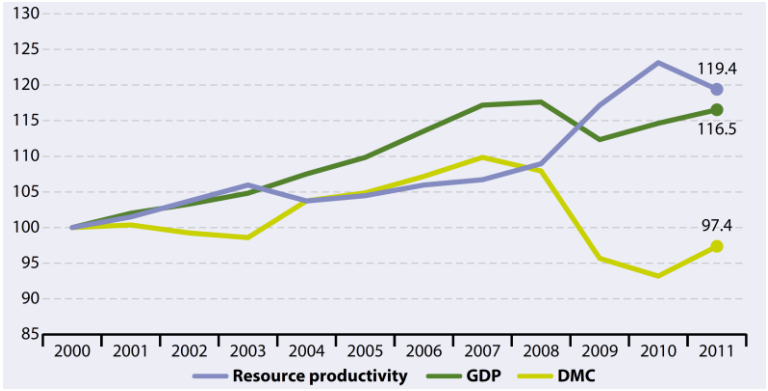
Raw material consumption[100] in the EU showed an annually variable but **raising development** between 2000 (16.4 tonnes per capita) and 2007 (17.4 tonnes per capita), followed by a significant drop since the onset of the economic crisis (2010: 14.8 tonnes per capita) due to fewer construction activities leading to a fall in the use of non-metallic minerals. With the slow economic recovery taking place in several EU countries, however, raw material consumption started again to increase in 2011. Each EU inhabitant consumed in 2011 an average of 15.3 tonnes of raw materials with non-metallic minerals accounting for 46%, fossil energy resources for 23%, biomass for 22% and metal ores for 10 %.[101]

Resource productivity[102] in the EU almost **increased by 20% between 2000** (1.34 EUR per kg) **and 2011** (1.60 EUR per kg), while in the same time the EU-economy grew slower with 16.5% GDP growth). Overall, this rise in resource productivity could suggest a decoupling of economic growth from resource use and environmental degradation, but in 2011 this trend was reversed when most European economies recovered from the financial crisis and domestic material consumption (DMC) increased substantially (**see: Figure 3.22**). There are large variations in resource productivity gains among Member States (**see: Figure 3.23**). They result

[99] EEA (2012a), p.4 ; EEA (2010g), p.29; European Commission, Eurostat (2013a), p.71
[100] The indicator raw material consumption (RMC) provides the most accurate picture on resource use because it 'corrects' imports and exports of products with the equivalent amount of domestic extraction of raw materials that were needed to manufacture the respective traded good.
[101] European Commission, Eurostat (2013a), p.68
[102] The indicator resource productivity is an aggregate measure of an economy's material efficiency and calculated by dividing GDP (deflated) by domestic material consumption (DMC). It provides insights into whether decoupling between natural resource use and economic growth is taking place.

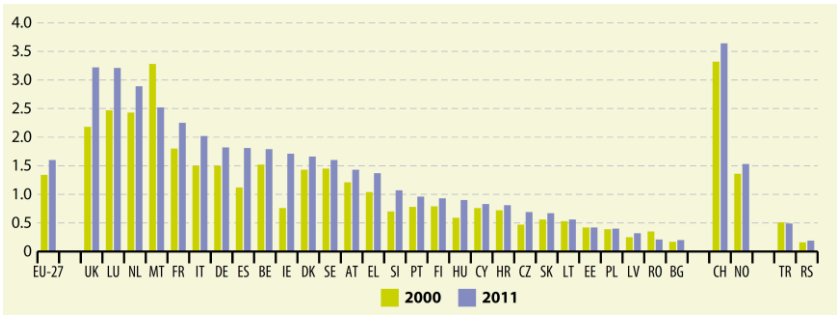
of a combination of factors such as the sectoral composition and national economic structure and specific resource endowments or the degree of outsourcing of production and the orientation (existence) of policies encouraging recycling and re-use of resources. The old Member States tend to show relatively high resource productivity levels (except FI), with Luxembourg and the United Kingdom taking the lead by using resources two times more efficiently than the EU average. The biggest resource productivity increases since 2000 have been observed in Ireland, Spain, Hungary and Slovenia. Most of the new EU Member States, where resource productivity has remained at relatively low levels (except Malta), show a significant potential for improvement.[103]

Figure 3.22: Resource productivity, EU-27 (index 2000 = 100)



NB: Data for resource productivity and domestic material consumption are estimates

Figure 3.23: Resource productivity, by country (EUR per kg)



NB: EU-27 data are estimates; 2001 data (instead of 2000) for HR and RS; 2008 data (instead of 2011) for NO; 2010 data (instead of 2011) for CH, TR and RS

Source: European Commission, Eurostat (2013a), pp.73-74

Towards a greening of the EU economy

Companies, public authorities and other organisations can themselves take a proactive approach to improve their environmental performance, mainly by applying environmental management systems which help them in establishing more sustainable production or service provision processes. These activities help Europe to become more energy and resource efficient and to overcome pressing environmental challenges. **Over the past decade, there is a rising interest from all types of organisation in Europe to apply environmental management systems.** This appears from information on the EU Eco-Management and Audit Scheme (EMAS),[104] which is a management instrument developed by the European Commission that promotes the

[103] European Commission, Eurostat (2013a), pp.73-74

[104] The Eco-Management and Audit Scheme (EMAS) is a voluntary tool for organisations with the objective to improve the environmental performance of organisations by having them commit to both evaluating and reducing their environmental impact, and continuously improving their environmental performance. It spans all economic and service sectors and is applicable worldwide.

voluntary application of certified environmental management systems either to the whole of an organisation or to specific sites.

Between 2003 and 2012, the number of EMAS-registered organisations implementing certified environmental management systems has grown by 4 % on average per year, while an even stronger growth in the same period is observed for the number of sites with an environmental management system (9% per year). The highest increase in EMAS registrations by organisations was observed in 2007 (11.4%) and participation by EU organisations continued to increase after this, but at a diminishing rate, until 2010, when the trend was reversed. In fact, the number of EMAS registered sites declined by 1.5 % between 2010 and 2012, suggesting that the number of companies withdrawing from EMAS outstripped a recent surge in uptake in mostly southern European countries. A review of the country-specific situation shows the following overall developments:[105]

- The core group of EMAS front runner countries which have mainly driven the trend in EMAS registrations consists of Germany, Italy and Spain, having exceptionally high total number of registrations.
- If the uptake is looked at by the numbers of EMAS registered organisations per million inhabitants (2013 data), then it appears that ratios in Cyprus (59.2), Austria (30.4), Spain (22.5), Italy (18.5), Germany (14.9) and Denmark (11.1) are impressive. These high ratios often correspond to a long-standing tradition voluntary of environmental management systems. However, a number of these Member States with very high EMAS registrations recorded considerable declines in their uptake from 2003 to 2012.[106] This decline is somehow compensated by a promising upward trend in the number of EMAS registrations in a few Southern European countries, namely Italy (+ 581%), Portugal (+ 425%), Greece (+ 389%) and Spain (+ 302%).

Moreover, also farming practices have become more and more sustainable in the EU since 2005, as illustrated by the increase in the share of organic farming. This dynamic development has also been reflected in growing sales of organic products in the EU food market.[107]

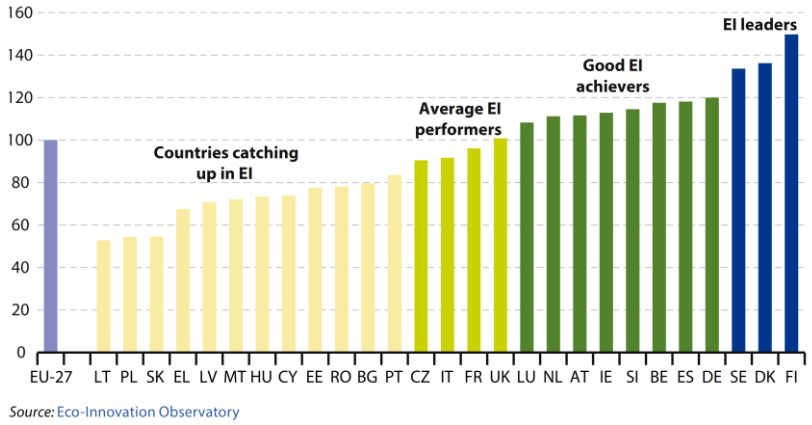
Eco-innovation helps to reduce the use of natural resources and decreases emissions of harmful substances, while also bringing new products to the market and therefore increasing economic productivity and job creation. There is no overall information source providing a regional level picture for such activities, but the "Eco-innovation Scoreboard" clustered EU Member States into four groups according to their overall eco-innovation performance (**see: Figure 3.24**):[108]

- Denmark, Sweden and Finland are the best performing countries in the EU and thus form the group of "Eco-Innovation Leaders", followed by a larger group of countries above the EU27 average being considered "good eco-innovation achievers" (DE, ES, BE, SI, IE, AT, NL, LU).
- Four EU-Member States are classified "good eco-innovation performers" (UK, FR, IT, CZ) and are located at or close to the EU27 average.

[105] European Commission, Eurostat (2013a), pp.92-93
[106] The rates of decline in these countries ranged from 46 % for Denmark and 44% for Sweden to 34% for Germany and 14% for Austria. This might either be due to long-term EMAS registrants facing difficulties in meeting the ongoing demand for improvements in environmental performance (as required by the scheme), or result from not yet fully realised improvement in companies having just introduced the scheme.
[107] European Commission, Eurostat (2013a), p.10
[108] European Commission, Eurostat (2013a), p.75

- The group of rather low scoring "catching-up countries" is made up of the other new Member States together with Portugal and Greece. Within this group, countries catching up quickly were Bulgaria and Romania due to substantial improvements in eco-innovation outputs (eco-innovation related media coverage) and eco-innovation activities (ISO 14001 registered organisations). Countries of that group which experienced a downward trend were Latvia, Malta and Hungary. This trend occurred mainly on the backdrop of decreasing eco-innovation inputs (government R&D appropriations and outlays) and environmental outcomes (for example water and energy productivity).

Figure 3.24: Classification of EU27 Member States under the Eco-Innovation Scoreboard, 2012 (index EU27 = 100)



Source: European Commission, Eurostat (2013a), p.75

This country-level scaling of the Eco-innovation Scoreboard also largely emerges from the results of the ESPON project "GREECO" (Territorial Potentials for a Greener Economy''), which examined **how regions in Europe are performing from a green economic perspective.**[109] Key findings from GREECO show that the degree of regional green economic performance is related to the economic development of a region, with lagging regions performing lower in green economic aspects and prosperous regions displaying a higher degree of performance. Although it seems that a certain degree of economic output is required to be able to put an emphasis on green issues, it also appears that investments in greening the regional economy will help improving the overall economic performance of lagging regions. Actors in cities and regions are key players in a green economy transition (i.e. by setting the context to inspire and guide new inclusive green businesses): regional and local authorities bear potentials and the necessary leverage through the definition of territorial actions under their competence, while local networks and initiatives should support a transition of both the supply and demand side of the green economy by supplying information and education support to SME's as well as concrete practical tools for engaging in greening initiatives.[110] From an aggregated mapping of the

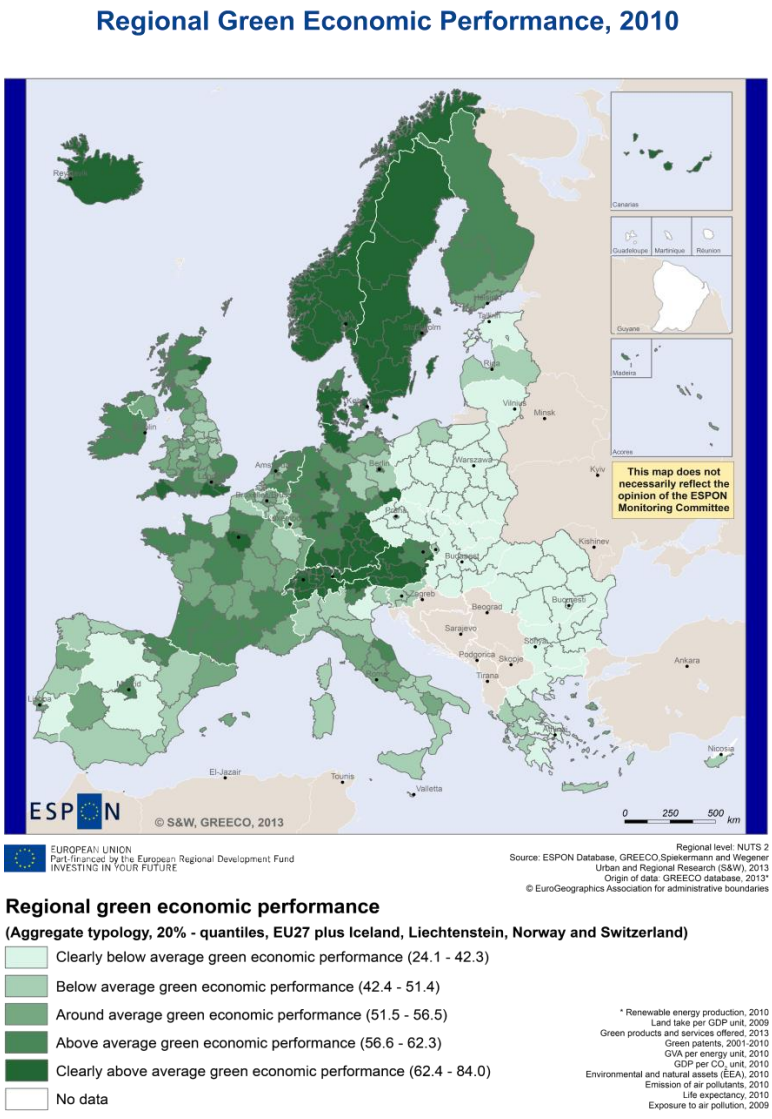
[109] The analysis under GREECO focusing on the five core spheres of the green economy, i.e. the territorial sphere (combined result of high renewable energies and high land productivity), the economic sphere (provision of green products & services by SMEs, number of green patents per billion GDP), the econosphere (high economic output per energy unit used & per CO2 unit emitted), the environmental sphere (high levels of environmental & natural assets combined with low emission levels) and the social sphere (i.e. low exposure to air pollution & relatively high life expectancy).
[110] http://www.espon.eu/main/Menu_Publications/Menu_MapsOfTheMonth/map1404.html.

situations under the five core spheres of the green economy examined, the following overall picture appears (**see: Map 3.12**).

Countries with above average green economic performance are mainly the Nordic countries, Switzerland, Austria and Ireland. Furthermore single regions located in the Netherlands, Italy, Germany, UK, France and Spain, including Paris and Madrid are performing well.

On the other hand, most Eastern European regions often have a low green economic performance because the performance in several of the five different spheres is below average. Going into further detail, urban regions tend to be stronger in the green economic performance than rural regions, although the differences are relatively small. Cities and regions hold significant assets that are key building blocks in green economy development.[111]

Map 3.12: GREECO - regions in Europe seen from a green economic perspective



Source: ESPON (http://www.espon.eu/main/Menu_Publications/Menu_MapsOfTheMonth/map1404.html.)

Waste generation and waste management

Efficient waste management reduces adverse environmental and health impacts of waste and improves resource efficiency in the EU. The long-term aim of the EU's waste policy is to reduce the amount of waste generated and when waste generation is unavoidable to promote it as a resource and achieve higher levels of recycling and the safe disposal of waste (**see: Box 3.8**). Overall, there are **two rather different long-term trends** observed in the EU: the first one is that **waste generation**, including hazardous waste, **is growing or stabilising** and the second one is that **municipal waste management is improving**.

[111] http://www.espon.eu/main/Menu_Publications/Menu_MapsOfTheMonth/map1404.html.

Box 3.8: The EU's approach to waste management

An overarching framework for the EU's waste policy was set out with the "Thematic Strategy on Waste Prevention and Recycling" COM(2005) 666 and its main pillars are the accompanying Directives on Landfill and Incineration. Within this context, the EU's approach to waste management is based on three principles: waste prevention, recycling and reuse, and improving final disposal and monitoring. Waste prevention can be achieved through cleaner technologies, eco-design, or more eco-efficient production and consumption patterns. Waste prevention and recycling, focused on materials technology, can also reduce the environmental impact of resources that are used through limiting raw materials extraction and transformation during production processes. Where possible, waste that cannot be recycled or reused should be safely incinerated with landfills only used as a last resort. Both these methods need close monitoring because of their potential for causing severe environmental damage.

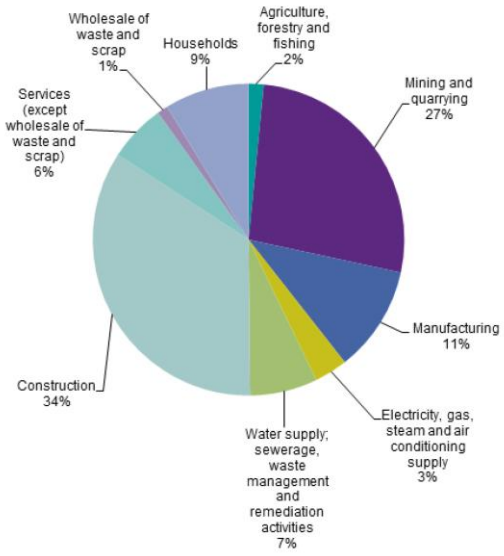
Source: European Commission, Eurostat (2013a), p.81 ; European Commission, Eurostat (2014e), p.8

(1) Growing or stabilising waste generation: This unclear overall trend can mainly be explained by different developments for different types of waste generated and also by the strong variations in waste generation among the EU28 Member States.

Most recent data from Eurostat indicates that in 2010 the total generation of waste from economic activities and households in the EU28 amounted to 2,506 million tonnes (**see: Figure 3.25**). This amount was slightly higher than in 2008 but lower than in 2004 and 2006. Relatively low figures for 2008 and also for 2010 may, at least in part, reflect the downturn in economic activity as a result of the financial and economic crisis.

Two activities generated particularly high levels of waste across the EU28 in 2010: the construction sector with 34.3% of the total and mining and quarrying with 26.8% of the total. The vast majority of waste generated within these activities was composed of mineral waste or soils (excavated earth, road construction waste, demolition waste, dredging spoil, waste rocks, tailings, etc.). The largest share of construction waste originated from eleven EU Member States, ranging from 27.6 % in Spain to 84.9 % in Luxembourg. Mining and quarrying waste had the largest shares in Bulgaria (89.7%), Romania (80.9%), Sweden (75.7%), Greece (63.6%), Finland (52.6%) and Poland (38.6%).[112]

Figure 3.25: Waste generation by economic activity and household, EU-28, 2010(%)



If major mineral wastes are excluded, then it appears that level of waste generated in the EU27 was 2.9 % lower in 2010 than in 2004. If the individual sectors are looked at, then it appears that waste generation from manufacturing decreased steadily from 2004 onwards, down to 19.8% overall by 2010. By contrast, waste generation from the waste and water management sector

[112] European Commission, Eurostat (2014e), p.6

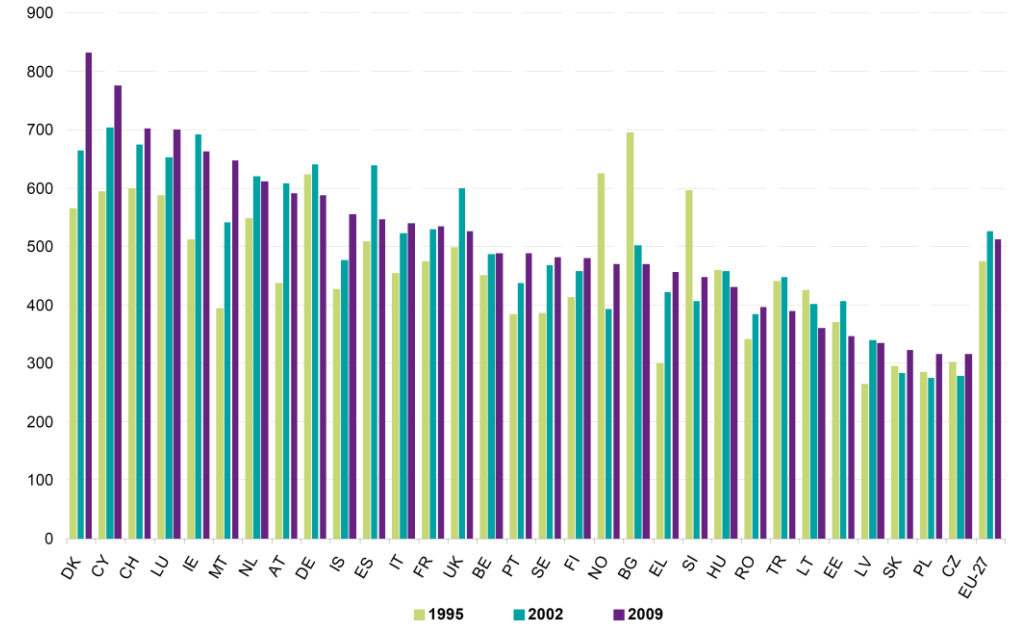
saw rapid growth, rising by 44.5 % over the same period. The quantity of waste generated by households increased slightly between 2004 and 2010.[113]

Among the total waste generated in 2010, some 4.0% of the total was classified as hazardous waste. Between 2004 and 2010, the EU28 presented an 11.7% increase in the amount of hazardous waste that was generated per inhabitant (i.e. all hazardous waste categories, including minerals). The highest increases are observed in Denmark (445.8%), Latvia (357.1%), Luxembourg (177.8%), Ireland (142.7%) and in the Netherlands (103.1%).[114]

When looking at the long-term development in municipal waste generation between 1995 and 2009 across a larger number of European countries, then the following trends appear (**see: Figure 3.26**):[115]

- The amount of municipal waste generated per capita increased in 23 of the 31 countries, rising steadily in 14 of these countries, with the highest annual growth rates recorded for Malta (3.9%), Greece (3.3%) and Denmark (3.0%).
- In 9 of the 31 countries the overall increasing trend was interrupted in the period around 2002. Of these, six countries showed an increase from 1995 to 2002, with the largest annual growth rates being in Austria, Ireland and Latvia, before the amounts stabilised or declined slightly between 2002 and 2009. Conversely, three countries (SK, CZ, PL) report decreasing waste generation for the period from 1995 to 2002 followed by an increase between 2002 and 2008.

Figure 3.26: Long-term development of municipal waste generation in the EU28, EFTA countries, Turkey and Western Balkan countries, 1995 – 2002 - 2009



Notes: FYR of Macedonia, Croatia and Bosnia and Herzegovina excluded due to the limited data available (only one or two reference years)
Relevant breaks in series:
Sharp decreases for Estonia (2001), Spain (2004), Lithuania (1999), Hungary (2000), Portugal (2002), Slovenia (2002) and Norway (2001).
Sharp increases for Latvia (2002) and Slovakia (2002).

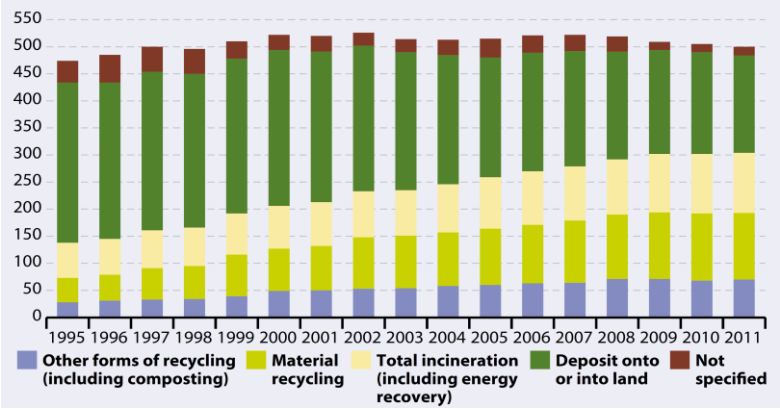
Source: European Commission, Eurostat (2011), p.1

[113] European Commission, Eurostat (2014e), pp.6, 7
[114] European Commission, Eurostat (2014e), p.7
[115] European Commission, Eurostat (2011), p.2

- Of the eight countries with an overall decrease from 1995 to 2009, only three (Bulgaria, Hungary, Lithuania) showed a decline in both periods before and after 2002. Bulgaria showed the largest reduction with a steady annual decline by 3.0% while in Hungary waste generation did not change significantly throughout the whole period (-0.5% per annum).
- In the five other cases the decline was not steady. The figures for Turkey and Germany show a small increase until 2002 by less than 0.5% per annum, followed by annual decreases of 2.0% and 1.2%, respectively. Slovenia and Norway reported larger overall reductions, but these developments are mainly due to a retrospective reassessment and methodological changes. Thus, the overall trend of these two countries is not assessable.

(2) Improved treatment practices of municipal waste: Municipal waste originates from everyday household waste and other sources such as commerce, offices and public institutions. Waste treatment practices have improved considerably in a long term perspective because the proportion of municipal waste being recycled (i.e. material recycling & other forms of recycling) has continuously increased between 1995 and 2008, but then started to stagnate between 2009 and 2011 albeit under conditions of a slightly decreasing overall volume of municipal waste (**see: Figure 3.27**).

Figure 3.27: Municipal waste generation and treatment, by treatment method, EU-27 (kg per capita)



Source: European Commission, Eurostat (2013a), p.80

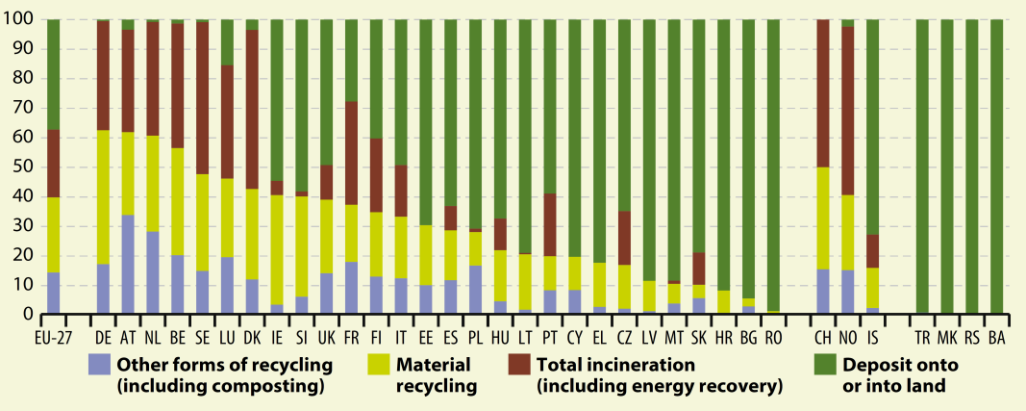
In 1995 still 17 % of municipal waste was recycled or composted in the EU plus Norway and Switzerland, whereas in 2008 this share was already at 40%[116] and has remained at that level until 2011. In parallel, the rates for landfilling being the least environment-friendly method of disposal decreased steadily from 62% in 1995 to 40% in 2008 in the EU27. Landfilling rates also decreased sharply in Norway and went down to zero in Switzerland. Landfilling was gradually replaced by recycling and composting and also by incineration with energy recovery. This positive development has been driven by changing EU and national legislation, for example, by establishing targets and instruments for waste recycling and recovery, landfill taxes and restrictions on wastes allowed to landfill, supported by rising prices for raw materials, recycled materials and fuels. Another important driver especially for the diversion from landfill was increased urbanisation and population densities.[117]

However, there is huge variation across the EU both in terms of the level and dynamics of municipal waste treatment (**see: Figure 3.28**). Croatia, Bulgaria and Romania landfill more than 90% of their municipal waste, with "combustion wastes" from energy sources accounting in Romania and Bulgaria for a significant share of landfilled waste. In contrast, less than 1% is landfilled in Germany, Netherlands and Sweden due mainly to strict rules such as landfill bans

[116] EEA (2010g), p.4
[117] EEA (2010g), pp.24-26; European Commission, Eurostat (2013a), pp.80-81

for untreated or combustible waste. Most old Member States (i.e. Denmark, Luxembourg, Germany, Netherlands, Sweden, Belgium, Austria and France, in particular) as well as Norway and Switzerland show relatively high recycling (including composting) and incineration rates, both above 30%. The large discrepancies across EU Member States reflect some gaps in the implementation of EU waste objectives into national legislation, which are due to a series of technical, market or administrative barriers.[118]

Figure 3.28: Municipal waste treatment, by type of treatment method, by country, 2011 (%)



Note: Data are estimates for DE, ES, FR, CY, LT, LU, PL, IE, IT, AT, RO, UK, IS and PT

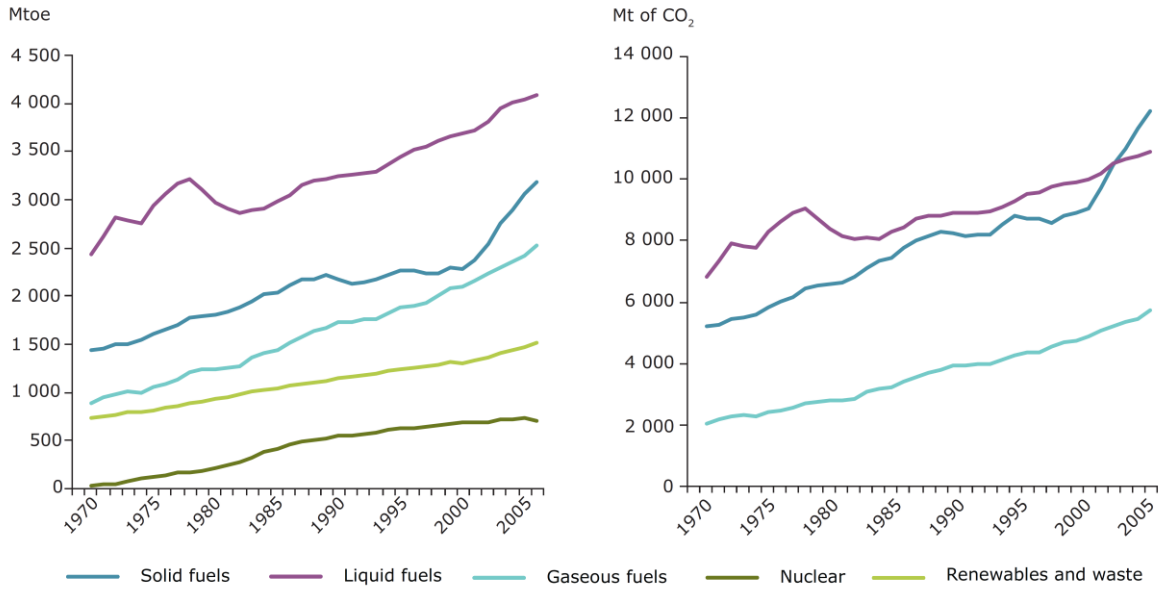
Source: European Commission, Eurostat (2013a), p.82

[118] European Commission, Eurostat (2013a), pp.80-81

4. Long-term territorial developments in the fields of climate change mitigation and climate change adaptation

The dominant cause of increases in the average temperature of the Earth over the last 250 years and thus also for future climate change are man-made greenhouse gas (GHG) emissions. They are a by-product of the combustion of fossil fuels from human activities (oil, gas and coal) and the consumption of these fuels has increased almost relentlessly in the past 40 years (**see: Figure 4.1**). But also farming, forest clearing and waste are sources of GHG emissions. Carbon dioxide (CO2) is the most important contributor to total GHGs and over the past 150 years there have only been a few periods in which CO2 emissions actually fell (i.e. global recession of the early 1930s; oil-shocks of the late 1970s and early 1980s). Otherwise, CO2 emissions have risen relentlessly throughout the period and especially since the 1950s.[119]

Figure 4.1: World primary energy consumption (left) and CO2 emissions from energy combustion (right), 1970–2007



Source: International Energy Agency, 2009a.

For some issues relating to the wider theme of climate change, long-term developments indicate that there has been an improvement of the EU-wide situation:[120]

- GHG emissions in the EU have fallen substantially since 1990, with the strongest drops having occurred in the early 1990s and between 2007 and 2011. The Europe 2020 target of cutting GHG emissions by 20% compared with 1990 levels by 2020 is clearly within reach.
- The biggest reductions of GHG emissions were achieved in the manufacturing, construction and energy industries. The waste and agriculture sectors have also reduced emissions, but they make up a smaller share of the total.
- Between 2005 and 2011, all Member States have increased their share of energy generated from biomass, wind, solar and the earth's heat. While the contribution of biomass is by far the largest, wind and solar energy have expanded fastest. Penetration

[119] EEA (2010f), pp.7-8
[120] European Commission, Eurostat (2013a), pp.14 ; EEA (2010f), pp.7-8

of renewable energies is highest in the electricity sector, where renewables covered a fifth of gross power generation in 2011.

For other issues, however no clearly positive overall trend pointing to an improvement in the EU-wide situation can be observed:[121]

- Concentrations of greenhouse gases in the atmosphere are rising and even though there is a time lag between emissions and temperature increase, global warming was speeding up continuously over the past four decades and still shows a clear upward trend.
- The only sector with growing GHG emissions is the transport sector and emissions from international aviation and maritime transport have risen particularly fast. Emissions from inland transport also remain above 1990 levels, but have shown a downward trend since 2007.
- There is no clear trend towards a lower energy demand in the EU because primary energy consumption has risen more or less continuously between 1990 and 2006, but fell to 1990 levels in 2011 and shows signs to again increase once the EU economy returns to higher economic growth.
- The use of solid fuels (i.e. hard coal and lignite) increased particularly fast since 2000 and coal has become the most climate-damaging energy source worldwide, outpacing CO2 emissions from crude oil and petroleum products. Also natural gas consumption increased very rapidly, but related emissions did not increase as rapidly because its carbon intensity to deliver the same amount of energy is much lower than that of coal and of oil.
- In the transport sector, the positive trend towards more renewable energy use has not continued. Although the share of renewable energy in transport grew steadily from 1% to about 4.8% between 2004 and 2010, the share went down by about a fifth to 3.8% in 2011 thus causing that the EU had missed its interim target.

The theme climate change is extremely complex and **territorial trends are analysed for two main dimensions** that are of key relevance for cross-border and transnational cooperation.

(1) **Climate change mitigation,** which aims to limit the magnitude and/or rate of long-term climate change. This can be achieved by actions directly reducing GHG-emissions (e.g. by switching to low-carbon energy sources such as renewable or nuclear energy; by increasing energy efficiency of buildings; by technological improvements increasing energy efficiency in production processes and transport), but also by actions increasing the capacity of carbon sinks through expanding forests or other measures removing greater amounts of carbon dioxide from the atmosphere.

(2) **Climate change adaptation** is a response to climate change that seeks to reduce the vulnerability of social and biological systems to adverse effects of global warming and to increase the resilience of these systems to change. Adaptation can take place before impacts of climate change are observed and involve, for example, risk analysis and monitoring to help defining and deciding on response actions (anticipatory adaptation), or it can be a response to those changes for example by relocating settlements to higher ground after a flooding has occurred (reactive adaptation).

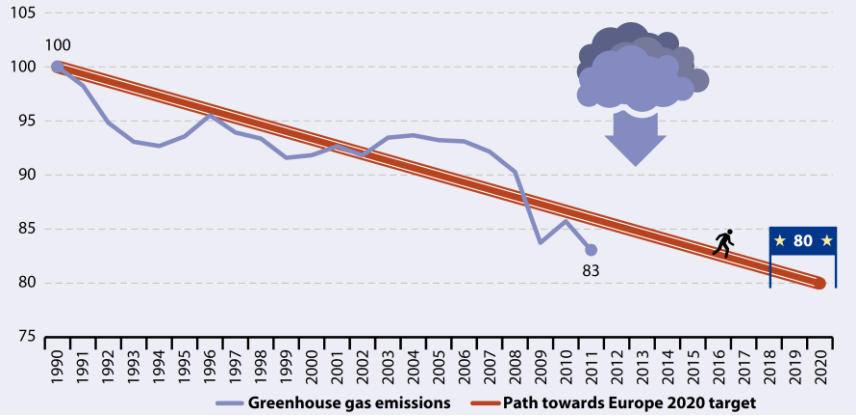
[121] European Commission, Eurostat (2013a), pp.14 1990; EEA (2010f), pp.7-8

4.1. Reducing human-induced GHG emissions through mitigation measures to limit the magnitude of climate change

At the heart of climate change mitigation policies are actions which help to directly reduce human-induced GHG emissions and thus to limit the magnitude of global warming.

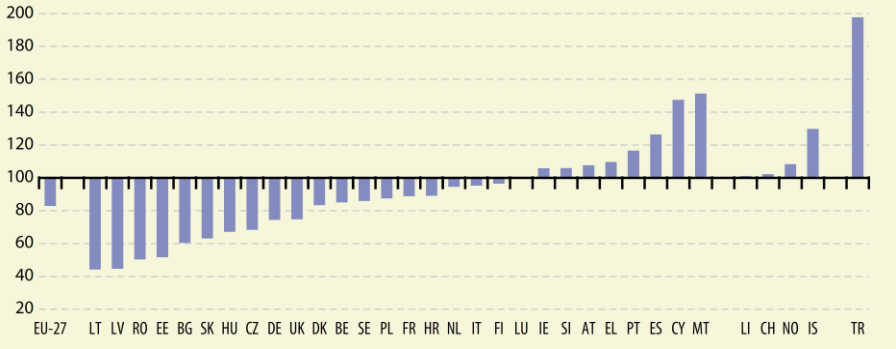
The **long-term evolution of GHG emissions (see: Figure 4.2)** shows that emissions have been decreasing in the EU27 and that 17% less GHGs was emitted in 2011 than in 1990. If the current rate of reduction is continued, then the EU will over-achieve its 2020 target to reduce GHG emissions by 20%. A wide majority of Member States has reduced national GHG emissions between 1990 and 2011 and reductions are highest in Eastern European countries, with Lithuania and Latvia leading with cuts of more than 50%. The large reduction in Eastern Europe occurred mainly during the early 1990s as a result of economic restructuring which involved a shift from heavy manufacturing industries to more service-based economies. By contrast, GHG emissions increased in nine Member States between 1990 and 2011 (see: Figure 4.3).[122]

Figure 4.2: Greenhouse gas emissions, EU-27 (index 1990 = 100)



NB: Total emissions, including international aviation, but excluding emissions from land use, land use change, and forestry (LULUCF). The EEA reports a reduction of 18.4 % in 2011 compared to 1990 level because it focuses on domestic emissions only and thus does not include emissions from international aviation. **Source:** European Commission, Eurostat (2013a), p.182

Figure 4.3: Greenhouse gas emissions, by country, 2011 (index 1990 =100)



NB: total emissions, including international aviation, but excluding emissions from land use, land use change, and forestry (LULUCF). **Source:** European Commission, Eurostat (2013a), p.184

[122] European Commission, Eurostat (2013a), pp.182-185; EEA (2010f), pp.4-5, 11-12

Climate change mitigation policies in the EU focus in overall terms on two main dimensions: first, measures to transform the energy sector into a more sustainable sector (i.e. through replacing fossil fuels by renewable energy sources) and, second, measures to reduce energy consumption. While the first dimension seems to be rather "well-managable" by policy, the second appears to be much more complicated to steer because energy consumption strongly evolves alongside economic cycles (i.e. energy use by the economy) and depends especially in the case of household energy consumption on a range of factors that are difficult to influence (e.g. climatic zone & duration of the heating season, type of fuels used, household incomes, living conditions etc.). Yet, a recent in-depth study carried out by INTERACT[123] shows a wide spectrum of issues relevant for climate change mitigation and also indicates ways of how cross-border and transnational cooperation can take action to contribute to the EU-wide climate and energy targets up to 2020 (**see: Annex 1**).

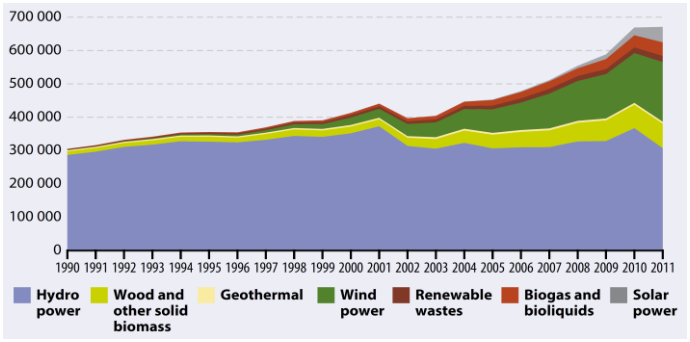
Renewable energy production and renewable energy use

Against the backdrop of rising energy prices, Europe has started a far-reaching modification of its overall energy landscape which creates significant opportunities for producing energy from renewable sources. Renewable energy sources (i.e. wind, hydro, solar and geothermal energy as well as biomass) produce negligible or zero GHG emissions, help to reduce the EU's dependence on energy imports and also offer significant potential to create employment and new sources of income. The installed capacity for renewable energy production has grown steadily over the past decade and the EU is now the world's biggest renewable energy investor. Wind and solar installations have started to be economically viable without subsidies, where conditions are favourable.[124]

The significant growth of energy production from renewable sources can be shown for the electricity sector, where the penetration of renewable energies is highest. About a fifth of the EU's gross electricity generation came from renewable sources in 2011 (20.4 %), which represents a 50% growth if compared to the share in 2000 (13.6%) and almost a four times faster growth than during the 1990s **(see: Figure 4.4).** Hydro power delivered slightly less than half of renewable electricity (45.8%), wind power a bit more than a quarter (26.7%).

The remaining quarter is provided from biomass and biogas (17%), solar energy (6.9%), renewable wastes (2.7%) and a small contribution comes from geothermal energy (0.9%). Wind and particularly solar energy have grown fastest since 2005.[125]

Figure 4.4: Gross electricity generation from renewable energy sources, EU-27, 1990–2011 (gigawatt hours)



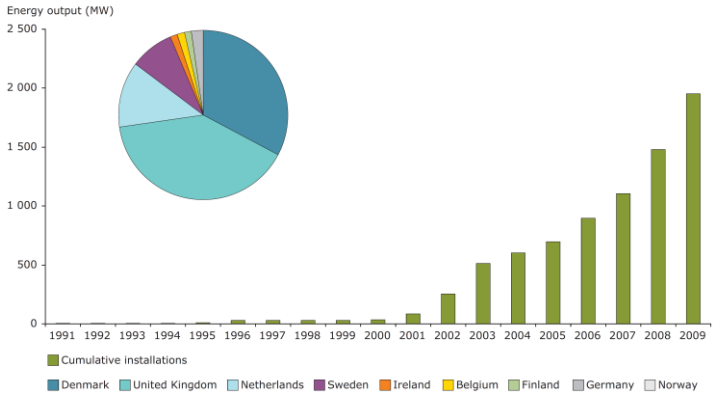
Source: European Commission, Eurostat (2013a), pp.188, 195

[123] http://www.interact-eu.net/energy/energy/406/6172 ; see also : Intelligent Energy Europe – INTERACT (2013):
[124] European Commission, Eurostat (2013a), pp.188-190
[125] European Commission, Eurostat (2013a), p.195

Off-shore wind energy production was still at a very low level during the 1990s, but it **started to grow rapidly since 2001** and reached some 4.8% of the EU's total electricity consumption in 2009. A minority of Member States are currently responsible for the bulk of the EU's wind power (**see: Figure 4.5**) and production is expected to at least triple by 2020. This could imply an annual expansion in wind farms, both on-shore and off-shore, of more than 10 GW per year until 2020. At date, off-shore platforms are primarily located in the North and Baltic Seas where wind energy potential is the greatest, which is also reflected by the geographical location of countries with high relative share of this type of energy production.

There is some concern regarding the environmental impacts of these platforms, because they involve large structures, often in coastal areas where the sea has many other uses. Yet, the expected further increase in off-shore wind energy production within the next 20 years will require considerable space allocation particularly in the North and Baltic Seas.[126]

Figure 4.5 Off-shore wind energy production and relative share of off-shore wind energy production by country



Source: EEA (2010b), p.43

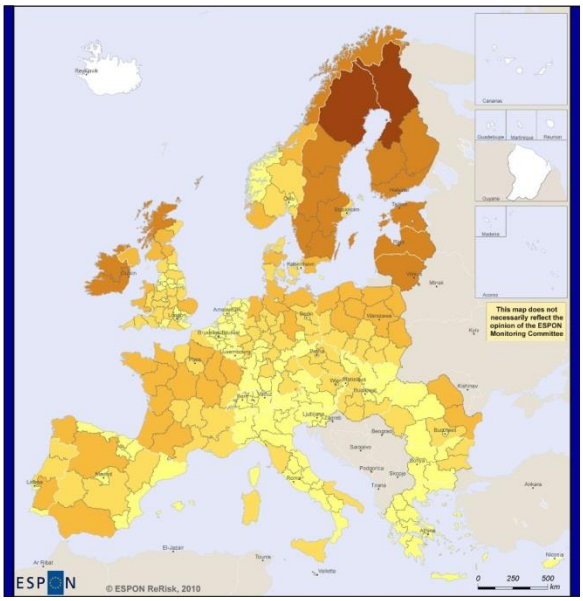
Seen from a regional perspective, it appears that many **regions in Europe have high potentials for producing energy through wind or solar power** (**see: Maps 4.1 & 4.2**). Regions with the highest potential for producing electricity from on-shore wind power are located in Sweden, Finland, Ireland, Estonia, Latvia and Lithuania as well as the north of Norway and Scotland. Regions with greatest potential for electricity production from solar panels are found in the south and east of Europe, while the core area of Europe is scoring low. In both cases, however, most areas with high potentials are located in the EU's periphery and thus very distant from major urban markets where the electricity demand is high.[127] This obviously makes grid connection and grid access as well as the associated cost (i.e. transport & distribution costs, taxes) an important factor, which is also underlined by the EU's Maritime Strategy for the Atlantic Ocean Area (**see: Box 4.1**).

Box 4.1: Renewable energy potentials in the Atlantic Ocean Area[128]

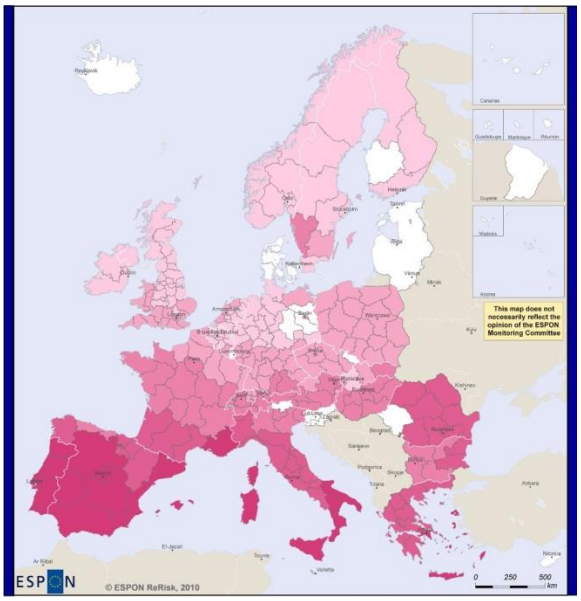
The Atlantic Ocean Area has stronger winds than other European seas. Not only does this offer a clean energy potential, but it can also contribute to reducing dependency on distant sources of fossil fuel. Wind turbines are included in EU's Strategic Energy Plan and already moving offshore in order to benefit from stronger winds and reduced landscape impact. The expansion of offshore wind farms in the Atlantic will offer key industrial opportunities for the ports that service them. By 2020, around 20% of the EU offshore wind installed capacity could be located in the Atlantic basin. The potential of powerful waves and strong tides needs to be exploited as well. The predictable nature of energy from tides can complement the fluctuating energy from wind. Islands can receive a high proportion of their energy from the sea. However successful deployment of large scale offshore renewable energy will only happen if grid connections are ensured to link the main production centres to the consumption.

[126] EEA (2010b), pp.41-44
[127] http://www.espon.eu/main/Menu_Publications/Menu_MapsOfTheMonth/map1101.html
[128] European Commission, 2011, p.3

Map 4.1: Regional wind power potential



Map 4.2: Regional photovoltaic potential



Source: ESPON (http://www.espon.eu/main/Menu_Publications/Menu_MapsOfTheMonth/map1101.html)

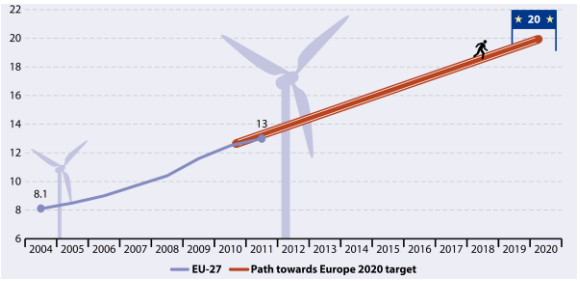
Also the share of renewable energy use in EU's gross final energy consumption increased by 4.9% between 2004 and 2011 and this favourable trend has put the EU on track to reach its 2020 target (**see: Figure 4.5**). The two main drivers for this increase were policy support schemes for renewable energy (e.g. through feed-in tariffs, grants, tax credits and quota systems) and shrinking costs due to increased global production volumes and technological advances[129], which together allowed renewable energy to reach a share of 13% in gross final energy consumption in 2011. However, **consumption of renewables varies greatly between the EU Member States (see: Map 4.3):**[130]

- The share of renewable energy in gross final energy consumption ranged in 2011 from 46.8% in Sweden to 0.4% in Malta. Differences stem from variations in the endowment with natural resources, mostly in the potential for building hydropower plants and in the availability of biomass.
- All Member States increased their renewable energy share between 2005 and 2011. Eight countries doubled their share, albeit all of them from a small base.
- Sweden and Bulgaria are the two Member States closest to reaching their target in 2011, closely followed by Romania, Lithuania and Norway. Farthest away from their targets are the UK and France.

From the above-shown it becomes clear that an increased production and use of renewable energy is an important factor shaping the future competitiveness of regions and cities, but also that the prospects and opportunities differ quite strongly across the European territory. Due to this, there is a strong need for well-informed decisions on policy and investment actions that have to be taken today and also cross-border and transnational cooperation can play a supporting role in this.

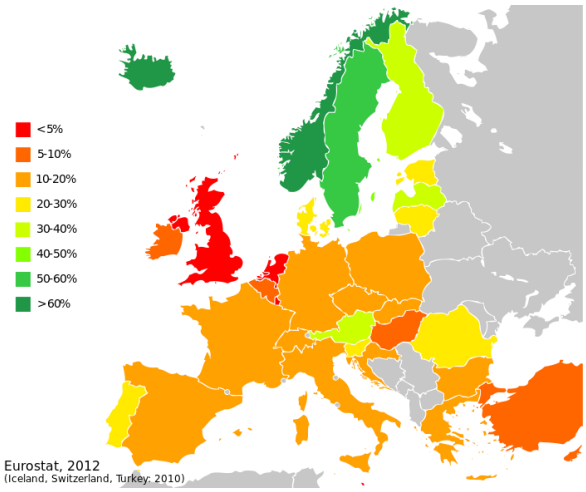
[129] e.g. substantial cuts in unit cost were observed for photovoltaic modules, having experienced a fall of prices by 76% between 2008 and 2012, but also for onshore wind turbines which became 25% cheaper during the same time period
[130] European Commission, Eurostat (2013a), pp.188-190

Figure 4.5: Share of renewable energy in gross final energy consumption, EU27 (%)



Source: European Commission, Eurostat (2013a), pp.188, 195

Map 4.3: Proportion of renewable energy in the EU28, Iceland, Turkey, Norway and Switzerland as % of total energy consumption



This also appears from the general conclusions of the ESPON research project "ReRisk" (Regions at Risk of Energy Poverty), which point to a larger number fields where regions and cities have clear potentials for action.[131]

- Neighbouring regions with different types of potential for renewable energy could cooperate to improve the reliability of energy supply from these sources in order to gain added value.
- Power plants which can deliver energy for direct consumption, without feeding the product into the general electricity grid, show potential to avoid energy poverty especially for islands, mountainous and peripheral regions of Europe. If the production stays off the grid and is consumed directly, additional cost for grid access is avoided by the consumer (i.e. transport and distribution costs, taxes).
- In densely populated urban areas, territorial strategies and urban policies can support the incorporation of wind and solar applications in the built environment to accelerate the deployment of renewable energy sources.
- Especially in regions and cities with low disposable income but considerable photovoltaic potential, spatial planning can consider the establishment of solar energy planning tools. These planning tools may provide the information necessary to achieve the greatest deployment of these technologies at the lowest cost possible and support at the same time a more sustainable territorial development.

Towards more energy efficient production processes

The shift towards a more climate-friendly low carbon economy holds many opportunities for Europe. More efficient energy use lowers production costs and thereby increases competiveness of EU businesses and raises the demand for new or better green technologies, which in turn induces further innovation and creates jobs in a sector in which the EU can also further intensify its exports on a growing global market. Furthermore, it can also help reduce the EU's

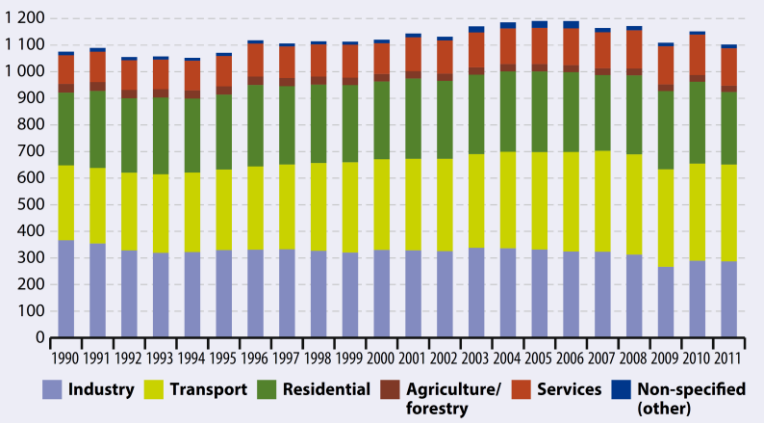
[131] http://www.espon.eu/main/Menu_Publications/Menu_MapsOfTheMonth/map1101.html

dependence on energy imports from a world market that is characterised by increasingly volatile prices for fossil fuels and also by threats to stable provisioning (regional conflicts and wars etc.).

There are several general indicators which suggest that production processes of the EU economy are slowly becoming more energy efficient and less GHG emitting, but regional-level data on long-term trends in more energy efficient production is not available.

A first general indicator is the **EU's final energy consumption** (see: Figure 4.6).[132] The long-term evolution shows that the amount of energy consumed by all end-use sectors in the EU increased by 2.5% between 1990 and 2010, but also that the EU experienced a 1.6% drop in final energy consumption between 2000 and 2011 that was most likely driven by the economic crisis. Within this overall development, however, the industrial and agricultural sectors have experienced large reductions in energy use between 1990 and 2011, by 21.7% and 27.7% respectively. This long-term trend reflects structural changes in the EU economy (i.e. gradual shift away from an energy-intensive industry to a service-based economy) and a shift towards less energy-intensive manufacturing modes, but more recently also the negative economic impact of the recession (esp. in 2009 and 2010).[133]

Figure 4.6: Final energy consumption, by sector, EU-27 (million tonnes of oil equivalent)



Source: European Commission, Eurostat (2013a), p.89

Another general indicator is **energy intensity** (i.e. the energy used to produce one unit of economic output[134]), which has declined substantially over the past decade. Between 2000 and 2011 energy consumption in the EU fell by 1.6 %, whereas GDP grew by 16.5 %. As a result, energy intensity recorded a drop of 15.5% over this period, indicating absolute decoupling of energy consumption from economic growth. This reduction in energy intensity has been influenced by improvements in energy efficiency (both in terms of final consumption and power generation) and a shift to renewables in the power generation mix, but it also reflects an

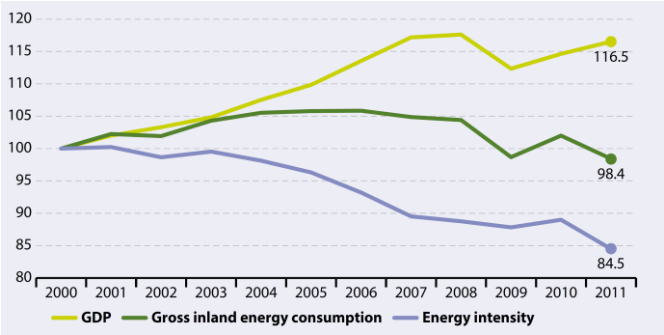
[132] Definition (Eurostat): Final energy consumption is the total energy consumed by end users, such as households, industry and agriculture. It is the energy which reaches the final consumer's door. Final energy consumption excludes energy used by the energy sector, including for deliveries, and transformation. It also excludes fuel transformed in the electrical power stations of industrial auto-producers and coke transformed into blast-furnace gas where this is not part of overall industrial consumption but of the transformation sector.

[133] European Commission, Eurostat (2013a), pp.89-90, 193

[134] Total energy intensity is measured as the ratio between the gross inland consumption of energy and GDP. Energy consumption encompasses the consumption of various fuel types including solid fuels, liquid fuels, gas, nuclear and renewables.

increase in eco-efficiency that has resulted from structural economic changes within the EU, including also a transition towards less energy-intensive and higher value-added industries.[135]

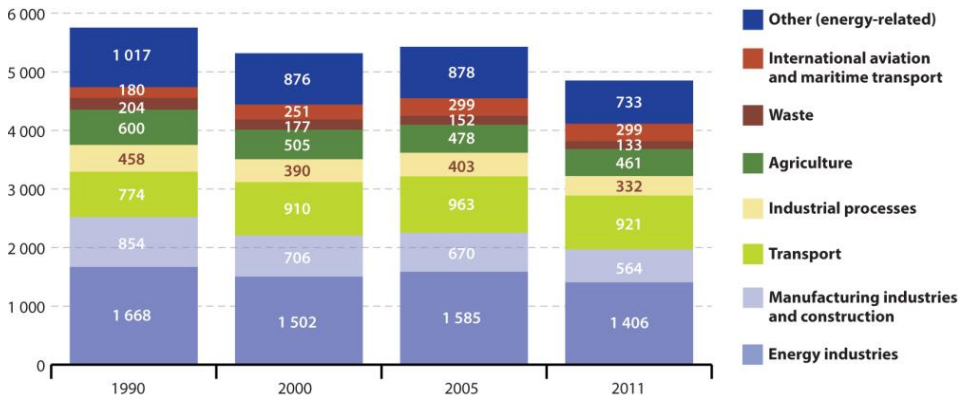
Figure 4.7: Energy intensity of the economy, EU-27 (index 2000=100)



Source: European Commission, Eurostat (2013a), p.58

Finally, also the **long-term development of sector-specific reductions in GHG-emissions** suggests that a more climate friendly economy is on its way. The latest figures from Eurostat[136] indicate that in absolute terms manufacturing industries and construction achieved the largest reduction of almost 290 million tonnes of CO2 equivalent between 1990 and 2011 (**see: Figure 4.8**).

Figure 4.8: Greenhouse gas emissions, by sector, EU-27, 1990, 2000, 2005, 2011 (million tonnes of CO2 equivalent)



Source: European Commission, Eurostat (2014f), p.2

Energy efficiency in the housing sector and public buildings

Despite the progress made in reducing energy consumption, substantial cost-efficient potential for improvements in energy efficiency remain. One important aspect is the refurbishment of residential and commercial buildings. Energy use in buildings has seen a rising trend over the past 20 years and the building sector (residential & non-residential buildings) has become one of the key energy consumers in Europe: nearly 40% of final energy consumption and 36% of all GHG emissions is attributable to housing, offices, shops and other buildings across the public and

[135] European Commission, Eurostat (2013a), p.58
[136] European Commission, Eurostat (2014f), p.9

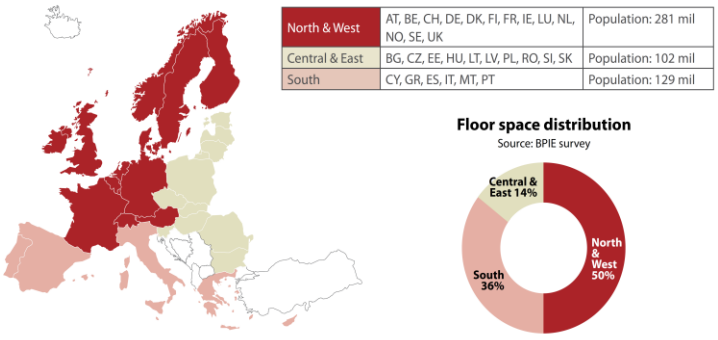
private sector.[137] European households alone were responsible in 2009 for 68% of the total final energy use in buildings and space heating was the dominant energy end-use in homes, being responsible for around 70% of the total household energy consumption. The building sector thus presents, after the energy sector itself, the second-largest opportunity in Europe for making cost-effective energy savings.

If this need for increasing the energy efficiency of Europe's building stock is looked at from a geographical perspective, then the following overall picture appears form data in a report of the "Buildings Performance Institute Europe" (BPIE):[138]

- The report estimates that there are 25 billion m2 of useful floor space in the EU27, Switzerland and Norway. In the total European building stock, residential buildings account for 75 % (of which 64 % are single family houses & 36 % are apartment blocks) and non-residential buildings account for 25%, with the latter showing a more complex and heterogeneous composition than the residential sector.
- Half of the total estimated floor space is located in the north-west of Europe while the remaining 36% and 14% are contained in the south and central-east of Europe respectively (**see: Figure 4.9**). Approximately 65% of the total floor space is concentrated in the five countries with the largest share of the total population (i.e. 61% for FR, DE, IT, ES and UK).
- A substantial share of the European residential building stock is older than 50 years and many buildings in use today are even hundreds of years old. Data on typical heating consumption levels shows that the largest energy saving potential is associated with the older building stock, but in some cases buildings from the 1960s are worse in energy efficiency than buildings from earlier decades. Especially the North and West region of Europe shows with 42% the highest share of buildings being constructed before the 1960s (**see: Figure 4.10**). Countries with the largest components of older buildings are the UK, Denmark, Sweden, France, Czech Republic and Bulgaria, while the highest rates of most recently constructed buildings (1990-2010) are found in Ireland, Spain, Poland and Finland. Countries with the highest rate of construction in the 'modern' period (1961-1990) seem to be Estonia, Hungary, Latvia and Finland.

Public actors at national, regional and local levels play a crucial role when it comes to increasing the energy efficiency of residential and non-residential buildings, especially if the provisions of the EU's new "Energy Performance of Buildings Directive" of 2010 (EPBD) and the new "Energy Efficiency Directive" (EED), with its requirements for "National Renovation Roadmaps", are considered.

Figure 4.9: The European building stock at a glance



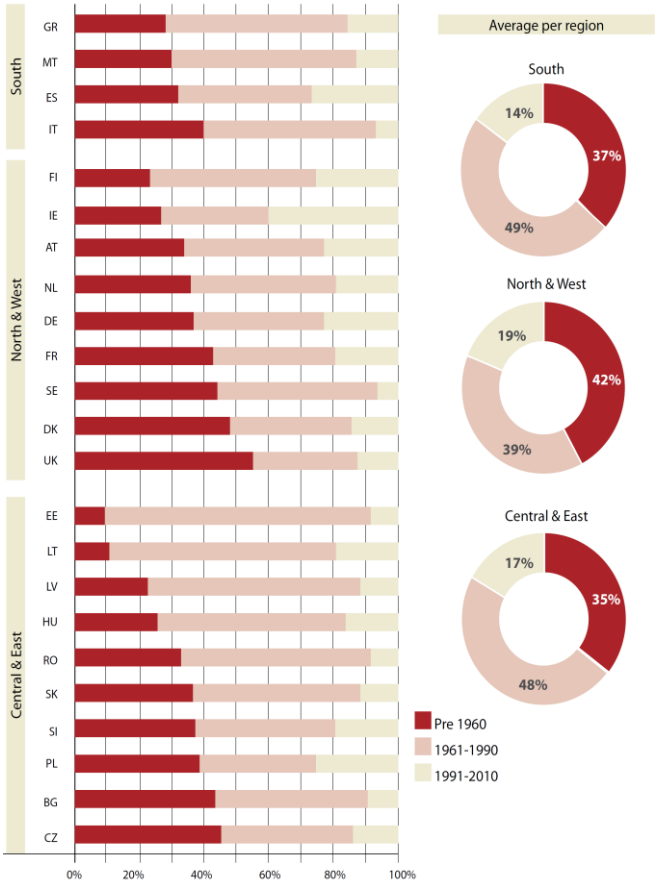
Source: BPIE (2011), p.8

[137] European Commission, DG Energy (2014), p.21
[138] BPIE (2011), pp.8, 9, 29, 35

Most EU Member States have in recent years modified their housing and construction policies and also their urban planning policies under the influence of EU-legislation on energy efficiency and especially on the energy performance of buildings. Up to now, the existing EU-level and domestic legislations mainly focussed on improving energy efficiency and renewable energy use in the context of new constructions. With the forthcoming transposition of the EU's Energy Efficiency Directive into national legislation by June 2014, however, this strong focus on new constructions is about to change.

Also **a review of the past and present policy situation reveals** that still substantial improvements are needed throughout the EU. Since the implementation of the first EU Energy Performance of Buildings Directive in 2002, requirements for certification, inspections, training or renovation were imposed to the Member States. An important aspect was the putting into place of energy performance certification (EPC) schemes and all countries now have functional schemes in place (**see: Figure 4.11**). However, five countries have not yet fully implemented the scheme for all requested types of buildings and only eleven countries currently have national EPC register databases, while ten countries have databases at regional/ local level or development plans underway. Data on the number of issued EPCs show that the current share of dwellings with an issued EPC in different countries can vary from under 1% to just above 24%. Furthermore, a BPIE survey-based screening of about 333 national funding schemes that cover a wide range of financial instruments from grants to VAT reduction and apply to a range of building types reveals that the measures are indeed encouraging, but many of them are only modest in their ambition. The major concern is that the use of financial instruments today only achieves the business-as-usual case in Europe with very few financial instruments providing enough funding for deep renovations, and ultimately do not correspond to Europe's 2050 aspirations.[139]

Figure 4.10: Age profile of residential floor space in Europe



Source: BPIE (2011), p.36

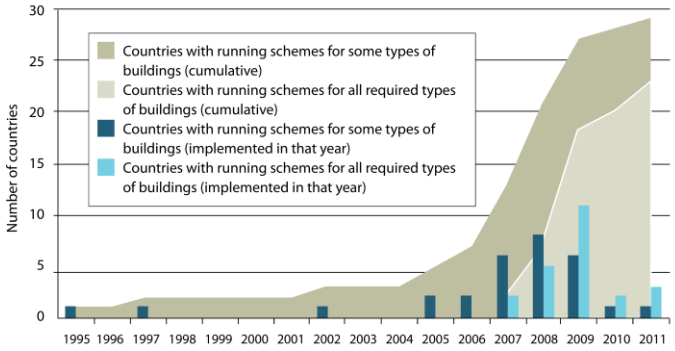
Within the EU's residential building stock, **especially the social housing sector[140] offers huge potentials to reduce energy consumption and GHG emissions.** The social housing sector represents 12% of the EU's total housing stock. According to estimations of the "European

[139] BPIE (2011), pp.12-13

[140] Social housing is used here as an umbrella term referring to rental housing which may be owned and managed by public authorities (i.e. the state or regional and local authorities), by non-profit organisations or by a combination of the two, usually with the aim of providing affordable housing and as a potential remedy to housing inequality.

federation of public, cooperative and social housing", a 30% reduction in energy consumption could be delivered by 2020 if only 4% of the housing stock is refurbished annually, backed up with a sustained change in residents' behaviour.[141] Especially a further increase of the older social housing stock's energetic sustainability requires holistic policy approaches at city level (interdisciplinary or interdepartmental). They have to take account of site-specific context settings, but at the same time they also need to be connected to a more wide-ranging urban development strategy. Also well-coordinated regional-level policies are needed if such holistic social housing interventions are to be designed and delivered effectively.

Figure 4.11: Implementation timeline for energy performance certification (EPC) schemes according to the Energy Performance of Buildings Directive 2002/91/EC.

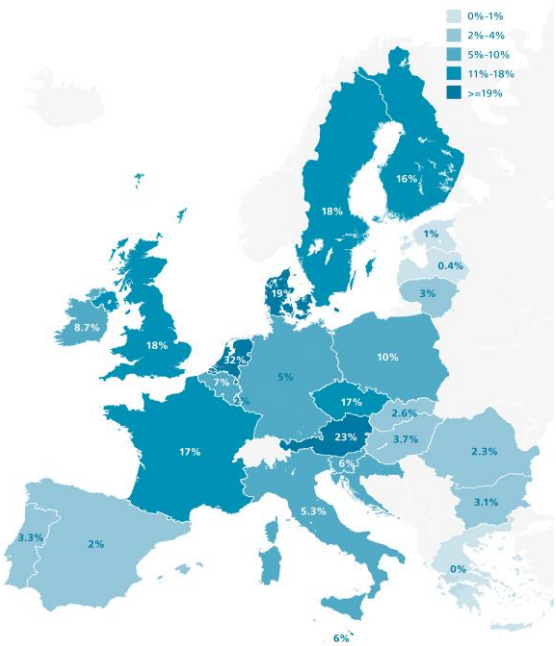


Source: BPIE (2011), p.12

However, the potential to act on energy efficiency in the social housing segment is geographically quite diverse. This is because different historical traditions of social housing provision in EU Member States have led to variable shares of social housing in the total housing stock **(see: Map 4.4).**

Nine countries have shares equal or higher than 10% (NL, AT, FR, CZ, UK, FI, SE, PL, DK), while the others are clearly below or have none (EL). Furthermore, the current set-up of national social housing sectors is quite diverse in terms of tenures (i.e. for rent, sale of dwellings, provision of intermediate tenures), providers (i.e. ranging from local authorities and public companies to non-profit or limited-profit associations and companies, cooperatives and, in some cases, even private for profit developers and investors), beneficiaries and policy conceptions or funding arrangements.[142]

Map 4.4: Social rental housing as percentage of total housing stock



Source: CECODHAS Housing Europe (2011), p.23

[141] http://www.housingeurope.eu/issue/2298
[142] CECODHAS Housing Europe (2011)

4.2. Reducing the vulnerability of regional social and biological systems to adverse climate change impacts through adaptation

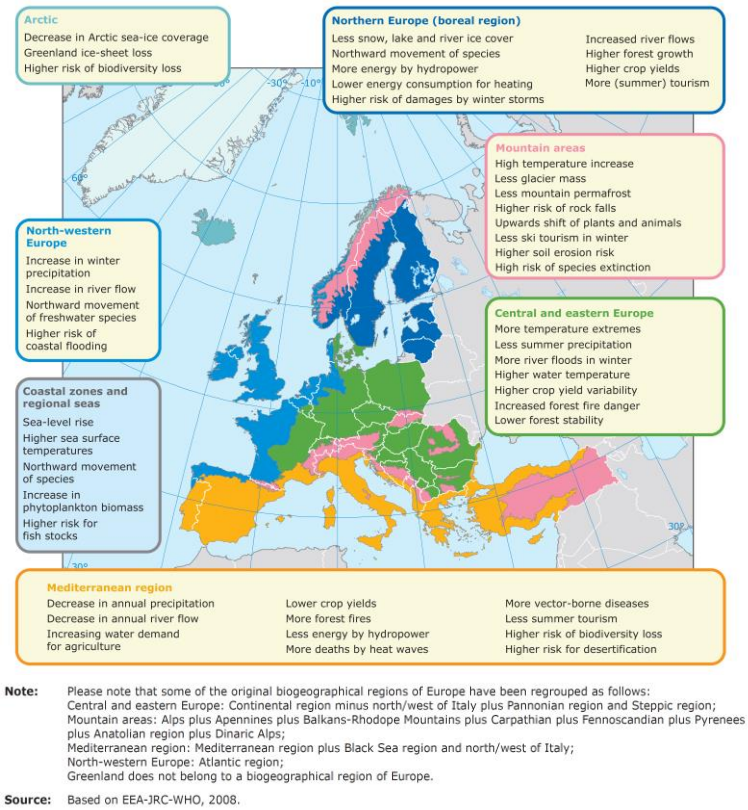
From the global increase of temperature and the ongoing and future climate change result a broad variety of risks which affect natural and human systems across the globe. A task common to all world regions is that such climate risks have to be evaluated and that strategies for the prevention of and reaction to adverse effects associated to such risks need to be developed.

Current projections point to global climate change risks which affect individual continents quite differently (e.g. continuous increase of temperature; polar cap melting; attenuation of the North Atlantic Drift; changes of the planet's ecology; cumulation of extreme weather phenomena etc.). Associated to these are a multitude of other risks that directly or indirectly affect human beings and their health (e.g. famine, mortality due to increased summer heat or temperature decreases in winter, changes in the disease burden e.g. from vector-, water- or food-borne disease, increases in the risk of accidents etc.), the natural and physical environment in which we are living (e.g. change of terrestrial & marine ecosystems, damage to buildings & infrastructures etc.) and particular economic branches that are strongly depending on natural resources (i.e. agriculture, fishing, forestry, real estate and tourism being affected by less precipitation or droughts).

Also Europe faces significant challenges from the already ongoing and future climate change, ranging from gradual ones (e.g. increase in temperature, loss of biodiversity, rise of sea level) to sudden and extreme events (e.g. storms, flooding, droughts).

Climate change will directly or indirectly affect the natural environment and human systems in Europe, but the types of risk associated to climate change impacts are very different in different regions (**see: Figure 4.12**). Consequences of climate change will be felt from the Arctic area to Southern Europe, with vulnerability hotspots being the Mediterranean basin and north-western and central-eastern Europe. In particular the many coastal zones and areas prone to river floods as well as cities and mountain areas are affected. Risks may lead to rising cost resulting from heavy damage to the built environment or to major infrastructures and from health problems or fatalities (e.g. resulting

Figure 4.12: Key past and projected impacts of climate change and effects on sectors for the main bio-geographical regions of Europe



Note: Please note that some of the original biogeographical regions of Europe have been regrouped as follows:
Central and eastern Europe: Continental region minus north/west of Italy plus Pannonian region and Steppic region;
Mountain areas: Alps plus Apennines plus Balkans-Rhodope Mountains plus Carpathian plus Fennoscandian plus Pyrenees plus Anatolian region plus Dinaric Alps;
Mediterranean region: Mediterranean region plus Black Sea region and north/west of Italy;
North-western Europe: Atlantic region;
Greenland does not belong to a biogeographical region of Europe.

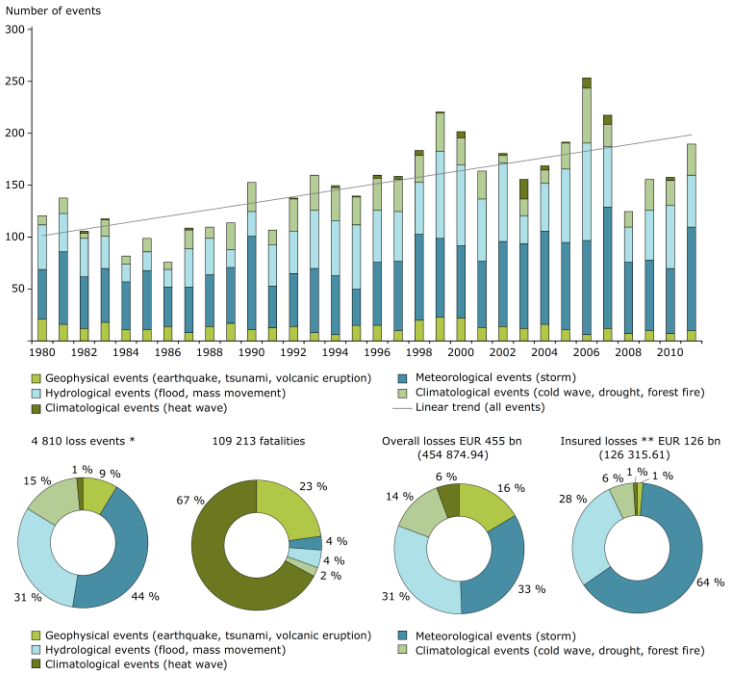
Source: Based on EEA-JRC-WHO, 2008.

Source: EEA (2010a), p.8

from heat waves, floods or water scarcity). But also a loss of ecosystems and of quality of life as well as changing settlement patterns especially in regions and areas that are highly vulnerable such as coastal zones, flood plains or mountains and finally reduced economic opportunities (e.g. through lower crop yields and changing patterns of tourism etc.).[143]

Social cost and economic losses linked to weather and climate-related events already show an upward trend. This emerges from a long-term review of natural disasters that occurred between 1980 and 2011 and a quantification of the cost that incurred within EEA member countries (**see: Figure 4.13**).

Figure 4.13: Natural disasters in EEA member countries, 1980–2011



Source: EEA (2012b), p.229

Whereas the number and impacts of weather and climate-related events increased considerably especially between 1998 and 2011, the number of geophysical hazards remained more stable. Hydro-meteorological events (storms, floods, landslides) account for about 75% of natural disasters that have occurred in Europe since 1980 and around 64% of the reported damage costs, while climatological events (extreme temperatures; droughts and forest fires) account for another 16% of the disasters and 20% of the damage costs. Moreover, also damage costs from extreme weather events in EEA member countries have increased from € 9 billion in the 1980s to more than € 13 billion in the 2000s (values adjusted to 2011 inflation). Yet, it is unclear to what extent the observed increase in overall losses during recent decades is already attributable to changing climatic conditions rather than to other factors.[144]

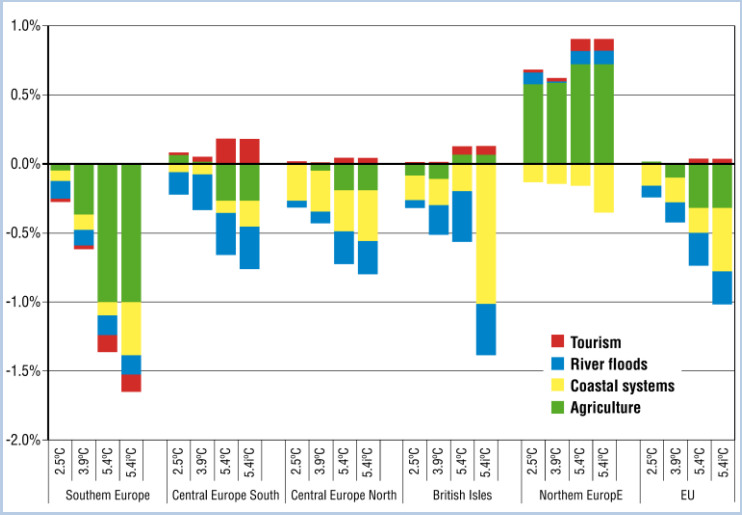
Key findings from the EU-level climate impact assessment project PESETA[145] suggest that **these trends of the past are expected to further increase in the medium- and long-term future, albeit with strong sectoral and macro-regional differences within the EU (see: Box 4.2)**. PESETA elaborated the first regionally focused multi-sectoral integrated assessment of the impacts of climate change in the European economy. On ground of climate scenarios with a perspective up to the 2020s and the 2080s, the project provides useful insights for adaptation

[143] EEA (2010a), p.6
[144] EEA (2012b), pp.229-230 (i.e. between 1980 and 2011, the economic toll of natural disasters in the whole of Europe approached € 445 billion in 2011 values)
[145] European Commission, Joint Research Centre - Institute for Prospective Technological Studies (2009)

policies on a pan-European scale with the geographical resolution relevant to national stakeholders.[146]

Box 4.2: Key findings from the PESTA project

Without public adaptation to climate change and if the climate of the 2080s occurred today, the annual damage of climate change to the EU economy in terms of GDP loss is estimated to be between 20 billion € for the 2.5°C scenario and 65 billion € for the 5.4°C scenario. Yet those figures underestimate the losses in terms of welfare. For instance the repairing of damages to residential buildings due to river floods increases production while reducing the consumption possibilities of households and, therefore, their welfare. The future climate as today would lead to an EU annual welfare loss of between 0.2% (for the 2.5°C scenario) and 1% (for the 5.4°C scenario with high sea level rise of 88 cm). The aggregated estimates of impacts mask large sectoral and macro-regional variability (**Figure**).



For the **sectoral pattern of damages,** the following is observed under the 5.4°C scenario with high sea level rise (5.4i°C in Figure): most losses occur because of the damages in the agricultural sector (production losses), river floods (damages to residential buildings) and, particularly, coastal systems (sea floods and migration costs).

The **Southern European** area is the region with highest welfare losses, ranging between 0.3% and 1.6%. Welfare in this region steeply deteriorates in the scenario with the highest temperature increase. All impact categories are negative, the damages in the agricultural sector being the most important ones. Tourism revenues could diminish up to 5 billion € per year.

Central Europe is also affected by climate change. The welfare losses in the **Central Europe South** region range between 0.1% and 0.6%. The damage due to river floods seems to be the most important impact category. The warmest scenario would largely damage the agricultural sector. The tourism sector would benefit from climate change. The **Central Europe North** region would experience welfare losses between 0.3% and 0.7%. The major negative impacts are damages to coastal systems. Impacts due to river floods could reach a cost of 5 billion € per year. The projected impact on the tourism sector is slightly positive.

The **British Isles** would face welfare losses in a similar range as Central Europe, with the exception of the 5.4°C scenario with high SLR, where the welfare loss would reach 1.3%. Impacts due to river floods are quite negative in all scenarios, as well as impacts to coastal systems, particularly under an sea level rise of 88 cm. The impacts on the tourism sector are positive, with up to 4.5 billion € in additional tourist revenues.

Northern Europe is the only EU area with welfare gains in all scenarios, ranging between 0.5% and 0.7%, mainly thanks to the large positive impacts in the agricultural sector, fewer river floods damages and higher tourism revenues. However, damages in coastal systems could be significant.

Source: European Commission, Joint Research Centre - Institute for Prospective Technological Studies (2009), pp.93-95

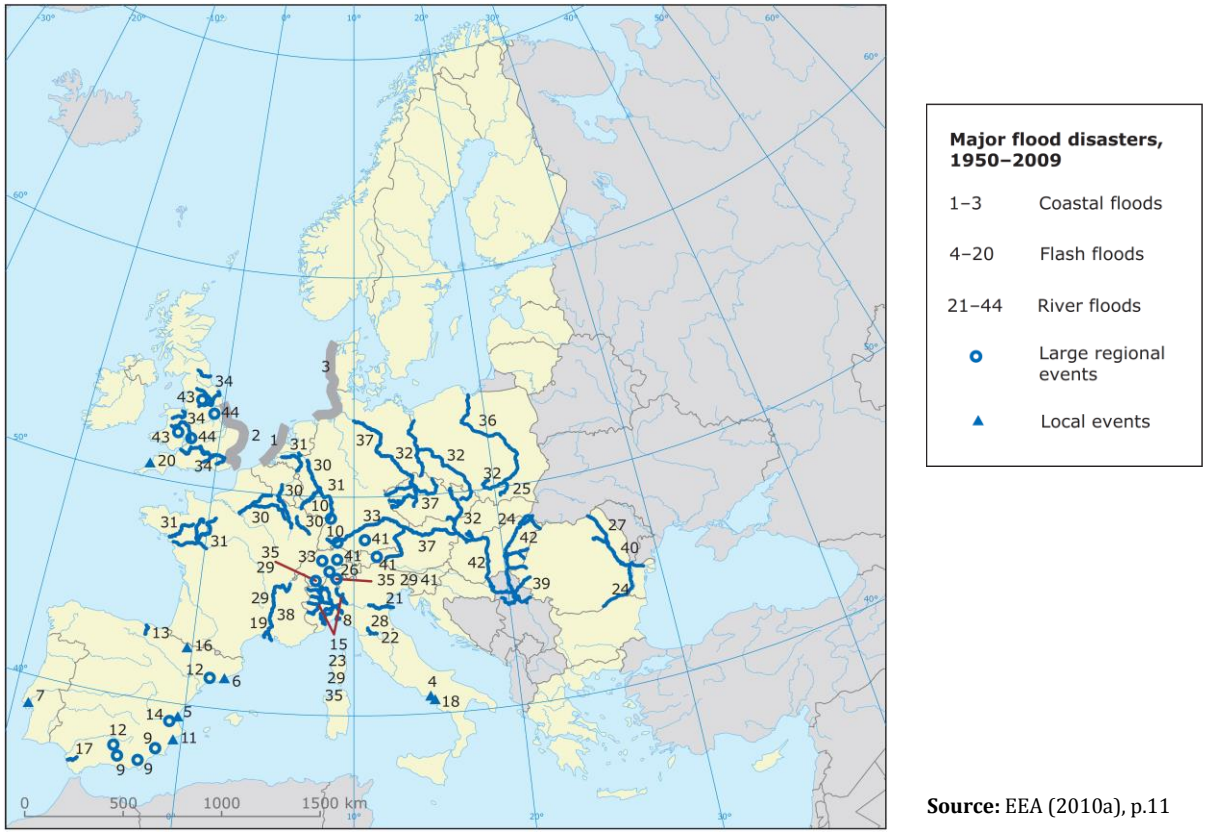
[146] For the climate scenarios of the PESETA study, two time frames have been considered: the perspective up to the 2020s was studied with one climate scenario, whereas for the 2080s perspective four climate scenarios have been considered to reflect the uncertainty associated with the driving forces of global emissions and the sensitivity of climate models to GHG concentration. The four 2080s scenarios are distinguished by the EU temperature increase: 2.5°C, 3.9°C, 4.1°C and 5.4°C. Compared to the preindustrial level, the global temperature increase of the PESETA scenarios are in a range between 2.6°C and 3.4°C.

River floods, droughts, heat waves and forest fires

River floods are the most common natural disaster in Europe and global warming is generally expected to increase the magnitude and frequency of extreme precipitation events, which may then also lead to more intense and frequent river floods. Improved monitoring and reporting systems have also improved data on the number of river floods and on the caused damage. Since 1990, for example, 259 major river floods have been reported in Europe of which 165 have been reported since 2000.

Floods in the years 1998–2008 have resulted in more than 700 fatalities, 2.2 million affected people and direct economic losses of more than € 55 billion at 2008 values. Twenty-two major disasters occurred in the period 2003–2008 alone, resulting in more than 200 fatalities and direct economic losses of about € 17 billion.[147] An overview on major flood disasters between 1950 and 2009[148] (**see: Map 4.5**) shows that flash floods most often occurred in the south of the EU, whereas river floods both in form of large regional events[149] or local events most often occurred in the central-western and eastern part of the EU.

Map 4.5: Major flood disasters in the EU, Switzerland and Norway, 1950–2009



Source: EEA (2010a), p.11

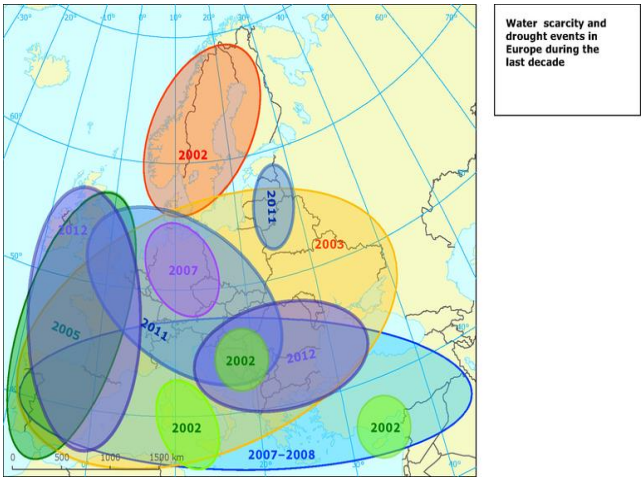
The PESTA project forecasts that by the 2080s river flooding would affect 250,000 to 400,000 additional people per year in Europe, more than doubling the number with respect to the period 1961–1990. In general terms, the higher the mean temperature increase, the higher the

[147] EEA (2010a), pp.10-11
[148] A disaster is classified as major if the number of fatalities is more than 70 and/or direct economic losses are greater than EUR 700 million as of 2009.
[149] Large regional events are those usually affecting several river basins with flooded areas possibly extending over more than one country and producing widespread flooding.

projected increase in people exposed by floods. An increase in people affected by river floods would occur mainly in the Central Europe regions and the British Isles. The total additional damage from river floods in the 2080s is estimated to range between € 7.7 billion and € 15 billion, which also represent more than doubling of the annual average damages over the period 1961–1990. The regional pattern of economic damages is similar to that of people affected. While Northern Europe is expected to have fewer damages, Central Europe and the British Isles are likely to undergo significant increases in expected damages.[150]

Droughts and water scarcity have direct impacts on citizens and a number of economic sectors. Severe drought events that affected more than 800,000 km2 of the EU territory occurred in 1989, 1990 and 1991 and even more frequently between 2002 and 2012 (**see: Figure 4.14**).

Figure 4.14: Main drought events in Europe between 2002–2012



Source: EEA (2012b). p.121

A comparison of the impacts of droughts in the EU between 1976–1990 and 1991–2006 shows a doubling in both area and population affected. South-eastern Europe is increasingly facing long periods of drought, creating economic problems. During the 2003 drought, for example, much of Southern and Central Europe experienced a substantial drop in crop yields — the largest negative deviation from the long-term trend in Europe in the past 43 years. In the period 2004–2006 severe droughts hit the south-western part of Europe including the Iberian Peninsula, France and the southern part of the United Kingdom. In 2008, Cyprus suffered a fourth consecutive year of low rainfall and the drought situation reached a critical level in the summer. To ease the crisis 30 water tankers sailed in from Greece and households were supplied with water for around twelve hours only three times a week.[151]

Droughts and extreme low discharge levels are projected to become more frequent by 2100, particularly in the south of Europe and in summer where they will lead to particular challenges in terms of energy provision and energy use (**see: Box 4.3**). But also in northern-central Europe, droughts and low discharge levels will have knock-on effects on river navigation, water supply, energy supplies (i.e. through reduced hydropower or problems with cooling water availability) and agriculture in several regions in Europe.

Decreasing water availability will exacerbate water stress, which can further increase in the absence of sustainable approaches to the management of Europe's water resources. Increasing irrigation efficiency can indeed reduce irrigation water withdrawals to some degree, but will not be sufficient to compensate for climate-induced increases in water stress. Furthermore, environmental flows being important for the healthy maintenance of aquatic ecosystems are

[150] European Commission, Joint Research Centre - Institute for Prospective Technological Studies (2009), pp.19 & 45-49
[151] EEA (2010c), pp.6, 12

threatened by climate change impacts and socio-economic developments such as changes in land use and demography.[152]

Box 4.3: Southern Europe – energy provision challenge during hot summer periods

The ESPON research project "ReRisk" (Regions at Risk of Energy Poverty) highlights that the future impact of climate change might be severe for some southern regions belonging to Spain, Greece, Portugal and France in terms of energy production and demand, but also offer new potentials for renewable energy sources. In these regions, summers are going to be relatively more complicated for energy companies, due to diminishing water reserves, higher average temperatures and heat waves, and consequently, forest fires. The supply problems will coincide in time with higher peaks of electricity demand, derived from a more extended use of air-conditioning. Solar cooling technologies can play here a decisive role for energy demand development in these regions.

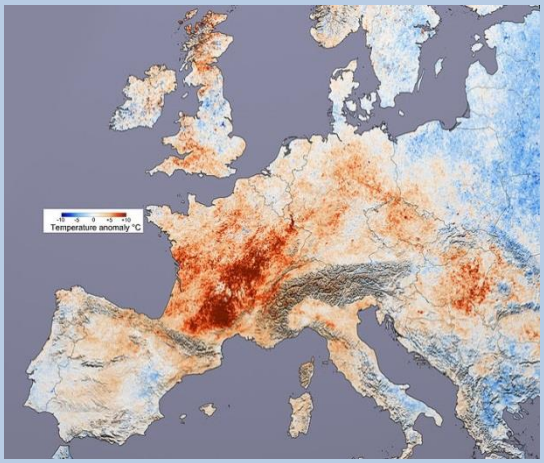
Source: http://www.espon.eu/main/Menu_Publications/Menu_MapsOfTheMonth/map1101.html

Heat waves are commonly associated with the southern parts of Europe, where cities are already under water stress and have the highest population growth. However, more recent developments suggest that there may not be any longer a simple north-south distribution of this threat (**see: Box 4.4**):

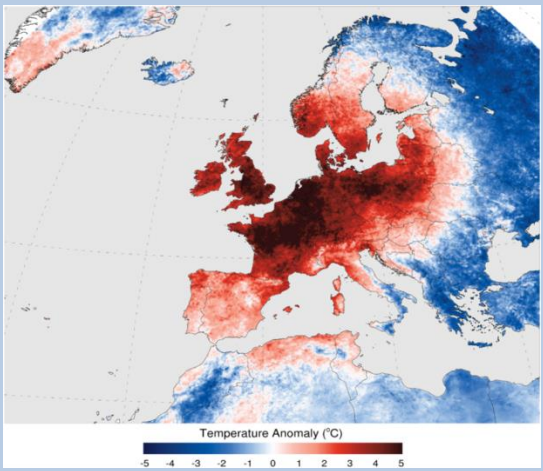
- The 2003 European heat wave was the hottest summer on record in Europe since at least 1540. France was hit especially hard. The heat wave led to health crises in several countries and combined with drought to create a crop shortfall in parts of Southern Europe. Peer reviewed analysis places the European death toll at 70,000.
- The 2006 European heat wave was a period of exceptionally hot weather that arrived at the end of June 2006 in certain European countries. The United Kingdom, France, Belgium, Netherlands, Luxembourg, Italy, Poland, the Czech Republic, Hungary, Germany and western part of Russia were most affected. Several records were broken. In the Netherlands, Belgium, Germany, Ireland, and the UK, July 2006 was the warmest month since official measurements began.

Box 4.4: Areas affected by the European heat waves of 2003 and 2006

2003 European heat wave



2006 European heat wave



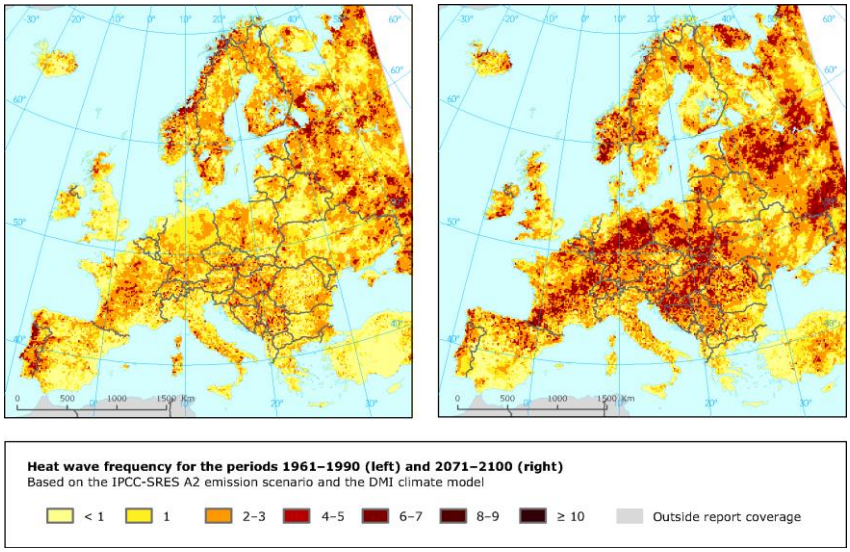
Sources: http://en.wikipedia.org/wiki/2003_European_heat_wave ; http://en.wikipedia.org/wiki/2006_European_heat_wave

[152] EEA (2010a), pp.13-14; EEA (2012b), p.213

Length, frequency and intensity of heat waves are very likely to increase in the future which can lead to a substantial increase in mortality over the next decades, especially in vulnerable groups, unless adaptation measures are taken.[153] And also in geographical terms, heatwaves are expected to expand further across Europe in the long-term (**see: Map 4.6**).

The human health impact assessment of the PESETA project also estimated the projected mortality from temperature changes for the 2020s and the 2080s across Europe. In the 2020s, without adaptation measures and acclimatisation, the estimated increases in heat-related mortality in Europe are projected to be over 25,000 extra deaths per year, with the rate of increase potentially higher in Central Europe South and Southern European regions. However, physiological and behavioural responses to the warmer climate would have a very significant effect in reducing this mortality (acclimatisation), potentially reducing the estimates by a factor of five to ten. For the perspective up to the 2080s, the range of estimates for the increase in mortality is between 50,000 and 160,000 (without acclimatisation), again decreasing by a factor of five or more if acclimatisation is included.[154]

Map 4.6: Heat waves: Occurrence of heat wave events with a duration of 7 days (left: 1961-1990 average; right: 2071-2100 average)



Source: EEA (http://www.eea.europa.eu/data-and-maps/)

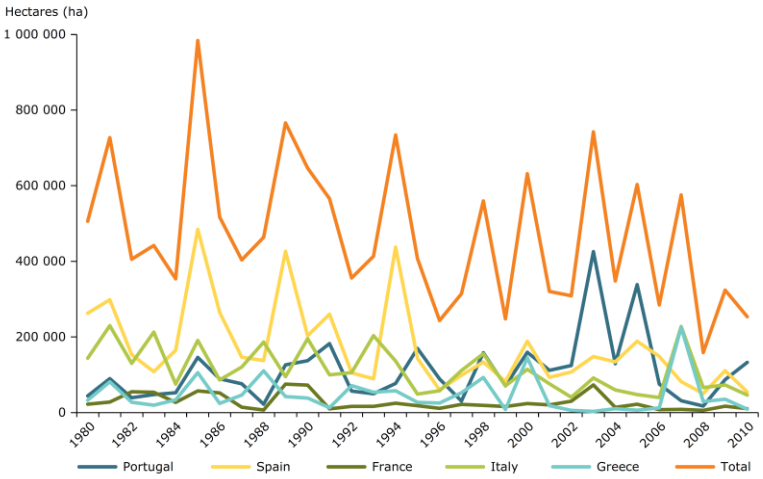
Forest fires are an integral part of forest ecosystem dynamics in many ecosystems where they are an essential element of forest renewal, but fire risk depends on many factors (i.e. vegetation, forest management practices and other socio-economic factors).

Climate change is expected to have a strong impact on forest fire regimes especially in southern Europe, where past fire events had strong negative impacts on already degraded ecosystems. There are five particularly affected countries in southern Europe (Greece, Spain, France, Italy and Portugal), but the area at risk within each country is considerably different. The number of fires in the Mediterranean region has increased over the period from 1980 to 2000, but it has decreased thereafter. Available figures show, however, that the surface of the total burnt area per year since 1980 is very different in these five southern Member States (**see: Figure 4.15**).

[153] EEA (2012b), p.189
[154] European Commission, Joint Research Centre - Institute for Prospective Technological Studies (2009), pp.20 & 71-83

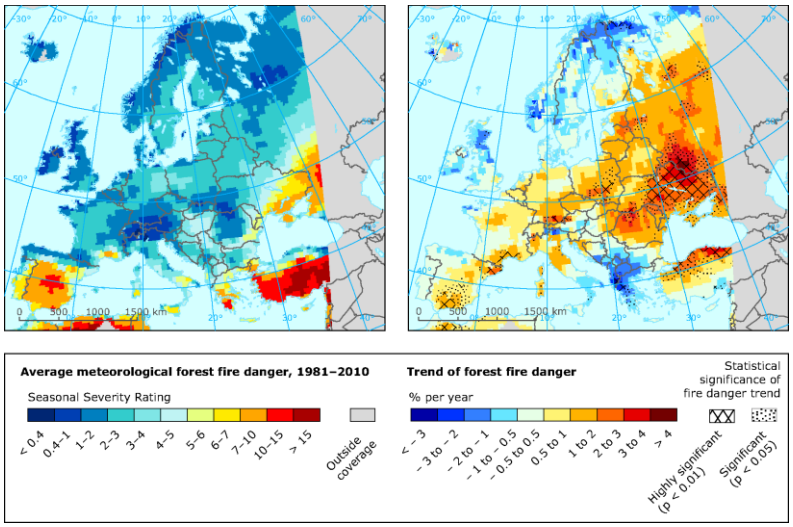
As shown above, climate change projections suggest substantial warming and increases in the number of droughts, heat waves and dry spells across most of the Mediterranean area. This would also increase the length and severity of the fire season and the probability of large fires in southern Europe, but also further expand the areas at risk of forest fire danger (**see: Map 4.7**).[155]

Figure 4.15: Burnt forest area in five southern European countries (1980–2010)



Source: EEA (2012b), p.178

Map 4.7: State of fire danger (1981-2010) and trend (by linear interpolation of the annual values)



Note: Fire danger is expressed by the Seasonal Severity Rating (SSR). Daily severity values can be averaged over the fire season using the SSR index, which allows objective comparison of fire danger from year to year and from region to region. The coarse scale of the map does not allow accounting for specific conditions of given sites, as for example in the Alpine region, where the complex topography may strongly affect local fire danger.

Source: EEA (2012b), p.179

Climate change risks in urban, mountainous and sparsely populated areas

(1) European cities are highly vulnerable to current and projected climate change impacts due to their physical structure and the high population density. Coastal and river floods, heat waves and water scarcity or extremely heavy rainfall affect urban areas in many ways, because most

[155] EEA (2012b), pp.178, 179

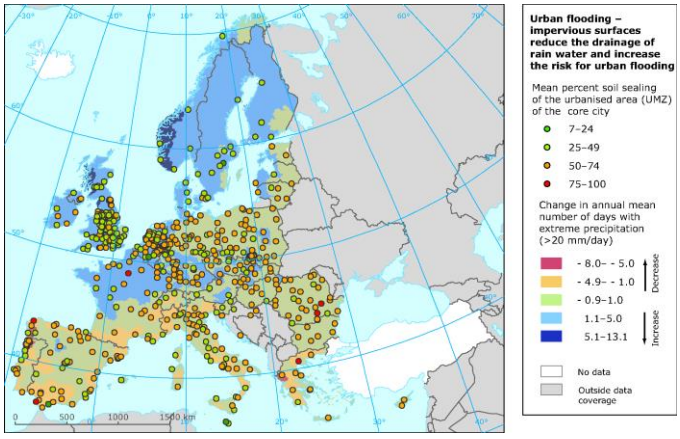
European cities are not built and designed in a way which allows them to cope with such drastic conditions. Extreme events can lead to deaths (esp. heat waves in case of vulnerable person groups such as elderly persons or younger children), have significant wide-ranging knock-on effects on urban infrastructures (i.e. water, energy, transport infrastructures, buildings) and the local economy, further exacerbate already existing environmental problems of many cities and increase health problems (e.g. poor air quality, water supply issues) and also increase social inequalities as the poor often live in riskier areas within cities and do not necessarily have the adequate resources to cope and adapt.[156]

Due to the high degree of soil sealing in most European cities, **flooding in urban centres** is already taking place at the occasion of extreme precipitation events and the percentage of the urban population that might be exposed to potential urban flooding is expected to further increase. Soil sealing also leads to the **"heat island effect"** in cities at the occasion of very high summer temperatures, as green city areas are typically cooler than high-density urban areas. Long-term projections show for both aspects that the zones of future risks will expand.

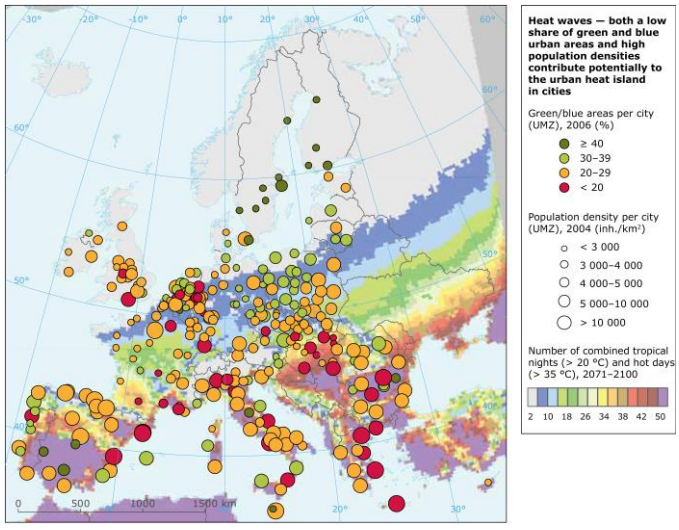
A high risk of **urban drainage flooding (see: Map 4.8)** exists in cities with a currently high soil sealing that are located in zones where an increase in the number of intensive rainfall events is expected. They particularly concentrate in north-western and northern Europe, but Norwegian and Swedish cities tend to be less vulnerable due to their rather low sealing degrees. Nevertheless, cities in areas with a decreasing number of such events but high soil sealing also will face a flooding risk, just less often.

A large number of cities with a large **urban heat island potential (see: Map 4.9)** is currently located in the north-west of Europe due to low shares of green and blue urban areas and particularly in south-eastern Europe where, in addition, population densities are higher. In the western part of the Mediterranean area, the potential seems to be quite variable, with a mix of cities with both strong and weak potential. If the expected future heat exposure changes are compared to the current urban heat island potential, then it appears that a large share of cities in

Map 4.8: Vulnerability to urban flooding



Map 4.9: Vulnerability to heat waves



Source: EEA (2012b), pp.225-227

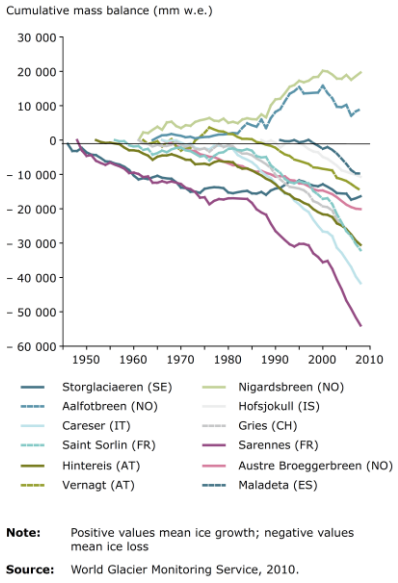
[156] EEA (2010a), pp.23-24; 36-37

eastern and southern Europe will experience relatively strong increases in heat load in the future. If the heat wave intensity also expands more to the north-west as shown in other projections, cities in the Benelux countries and the United Kingdom would also be more affected.[157]

(2) In mountainous regions, for example, the strong retreat of glaciers can cause instabilities resulting in such hazardous incidents as glacier lake outbursts, rock-ice avalanches and landslides (**see: Figure 4.16**).

This may cause severe damage to infrastructures and the built environment or endanger a provision of essential services to remote villages in high mountain zones or isolated valleys. Especially the observed and projected reductions in permafrost are also expected to increase natural hazards and damage to high-altitude infrastructure. Particularly affected is the Alpine area, where glaciers have lost about two-third of their volume between 1850 and 2009. The year 2003 showed exceptional mass loss with a decrease in mean ice thickness of almost 3m over nine measured Alpine glaciers. This rate was four times higher than the mean between 1980 and 2001 and exceeded the previous record of the year 1996 by almost 60 %. Glacier retreat is projected to continue.[158]

Figure 4.16: Cumulative specific net mass balance of selected glaciers from European glaciated regions, 1946–2008



Source: EEA (2010e), p.21

(3) In remote or sparsely populated areas (e.g. islands, outermost areas, northern Scandinavia), extreme events linked to climate change can also have strong adverse effects. Evidence from case studies of the ESPON project GEOSPECS highlights that climate-induced damages and disruptions to transport infrastructures are of particular importance, because they are the vital "life-links" of these areas which allow delivering essential goods and services to the population. This can pose serious problems in disaster situations (i.e. loss of access to health, emergency and disaster relief services for people in remote settlements), but also have severe knock-on effects on the regional economy which strongly depends upon good transport connections to ensure continuous export of the natural resources extracted in these regions. Furthermore, increasing maintenance and repair costs for damaged infrastructure can put an additional financial burden on regional economies that already have to face higher transport costs and higher costs for supplying services of general interest.[159]

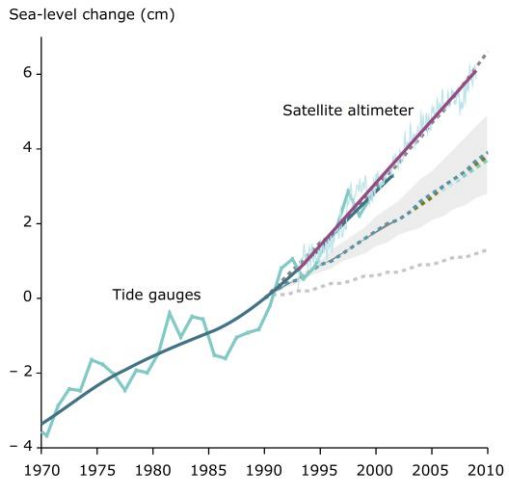
[157] EEA (2012b), pp.225-227
[158] EEA (2010a), p.24; EEA (2010e), p.20
[159] ESPON (2012c), pp.1046-1047

Climate change risks in coastal areas

Coastal areas contain high population densities, significant economic activities and important ecosystem services. The value of the economic assets within 500 m of the coastline is estimated at € 500-1000 billion. In addition, 35% (€ 3.5 trillion) of the total GDP of the 22 European coastal member states is generated in the area within 50 km of the coast, an area which hosts moreover 1/3rd of the EU population.[160] Coastal areas are already subject to coastal flooding, but climate change will have the potential to pose increasing risks to human and natural systems of coastal zones in the future: these may include changes in sea surface temperatures, further sea-level rise and changes in frequency and/or intensity of storm surges, the loss of flat and low-lying areas, a wider landward intrusion of saltwater, coastal erosion and a damaging or complete loss of coastal eco-systems.

To date, many studies and reports are dedicated to climate change adaptation and **sea level rise in coastal zones.** Sea level rise is already taking place **(see: Figure 4.17 and Map 4.10),** but sea level is not rising uniformly at all locations, with some locations experiencing much greater than average rise. Sea level is also projected to rise considerably during this century and beyond, but the projections for global mean sea-level rise in the 21st century vary starkly in a range between 20cm and about 2m. However, it is likely that 21st century sea-level rise will be greater than during the 20th century and it is more likely to be less than 1 m than to be more than 1 m. Coastal impacts also depend on the vertical movement of the land, which can either add to or subtract from climate-induced sea-level change, depending on the particular location.[161]

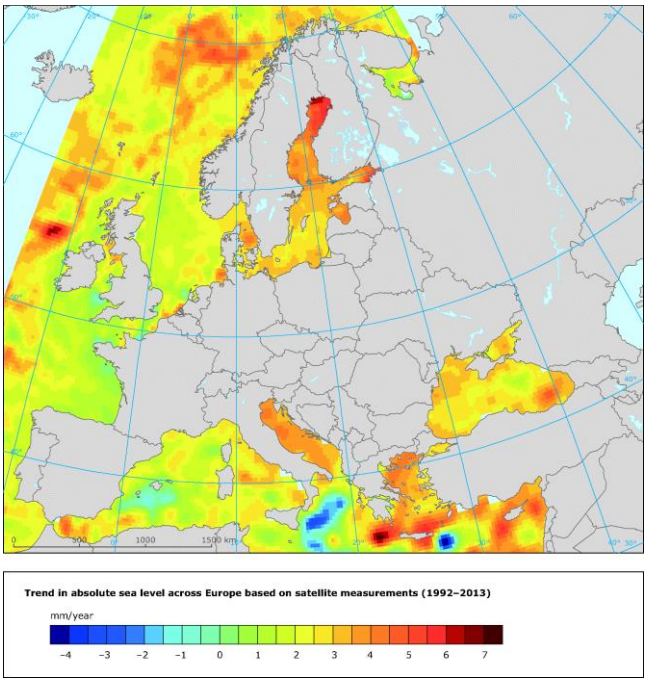
Figure 4.17: Observed and projected change in sea level 1970–2008, relative to the sea level in 1990



Note: The solid lines are based on observations smoothed to remove the effects of inter-annual variability (light lines connect data points). Data in most recent years are obtained from satellite-based sensors. The envelope of IPCC (2001) projections is shown for comparison; this includes the broken lines as individual projections and the shading as the uncertainty around the projections.

Source: EEA (2010e), p.19

Map 4.10: Trend in absolute sea level across Europe based on satellite measurements (1992–2013)



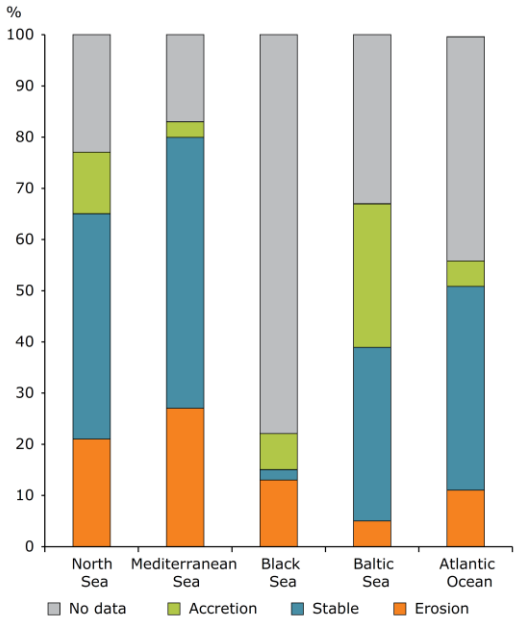
Source: EEA (http://www.eea.europa.eu/data-and-maps/)

[160] European Commission, DG Maritime Affairs and Fisheries (2009), p.3
[161] EEA (2012b), p.102

Coastal erosion takes place mainly during strong winds, high waves and high tides and storm surge conditions, and results in coastline retreat and loss of land. Due to an increasing human use of the coastal zone in Europe, coastal erosion has turned from a natural phenomenon into a problem of growing importance for societies which causes significant economic loss and ecological damage.

Dynamics of coastlines for all European seas (**see: Figure 4.18**) shows that the largest percentage of eroding coasts is found along the Mediterranean and North Seas. The Baltic Sea is the only sea where the proportion of accumulative coasts (accretion) is larger than that of eroding coasts, mostly due to the isostatic land uplift in the northern parts of the Baltic. In total, ca. 15% of the European coastline was eroding, and about the same length was accreting (almost exclusively in northern Europe); 40% was stable, and data was missing for the remaining 30%. Projections foresee that coastal erosion will be increased by climate change, with sea-level rise being one of the most important drivers for accelerated erosion.

Figure 4.18: Coastline dynamics in Europe



Source: EEA (2012b), p.111

This is mainly due to an increase in sediment demand, as retreating coastline and higher sea levels will raise extreme water levels, allow waves to break nearer to the coast and transmit more wave energy to the shoreline. Other climate change drivers that may exacerbate erosion rates are increased storminess, higher waves and changes in prevalent wind and wave directions.[162]

Considering the enormous economic and ecological values at stake, it is thus not surprising that **EU coastal Member States are undertaking substantial investments to safeguard Europe's coastal zones from flooding and erosion.** To date these are mainly "protective measures", but also "accommodate" and "retreat" measures are increasingly being examined as alternative strategies (**see: Figure 4.19**).

Figure 4.19: Basic types of adaptation measures to sea level rise, flooding and erosion

	Protect = effort to continue use of vulnerable areas	*Accommodate* = effort to continue living in vulnerable areas by adjusting living and working habits	*Retreat* = effort to abandon vulnerable areas
Hard	Dikes, seawalls, groins, breakwaters, salt water intrusion barriers	Building on pilings, adapting drainage, emergency flood shelters	Relocating threatened buildings
Soft	Sand nourishments, dune building, wetland restoration or creation	New building codes, growing flood or salt tolerant crops, early warning and evacuation systems, risk-based hazard insurance	Land use restriction, set-back zones

Source: European Commission, DG Maritime Affairs and Fisheries (2009), p.7

[162] EEA (2012b), p.111

If one looks across the **past and present-time national adaptation policies in the period 1995-2015,** one can summarise the main coastal protection approaches for the marine basins of Europe (**see: Table 4.1**) and observe the following for the overall adaptation expenditure. The total coastal protection and climate change adaptation expenditure to safeguard Europe's coastal zones from flooding and erosion (including the Outermost regions) amounts to € 15.8 billion over the period 1998-2015 (or on average € 0.88 billion per year). This total amount can be split between the 'normal' coastal protection expenditure (app. 2/3) and the amounts spent on specific 'hot-spots' (app. 1/3). If both aspects are looked at separately, then the following overall trends emerge (**see: Figure 4.20**):[163]

- Over the period 1998-2015, the accumulated normal expenses amounts to € 10.47 billion. In general, the evolution of normal coastal protection and adaptation expenditure over this period increases over time. National authorities mobilised on average close to 63% of the normal coastal protection cost, whereas 32% is taken care of by sub-national authorities, 1% by local and private actors and 4% by the EU.
- Hot-spot protection totals € 5.3 billion over the period 1998-2015 and additional investments were made to protect a number of coastal hot-spots from flooding and erosion.[164] The evolution of the hot-spot related expenditure is different to the evolution of normal coastal protection expenditure, because it is concentrated over time and also shows expenditure peaks in certain years.
- When comparing the contribution of individual countries for the period 1998-2015, it turns out that the majority of coastal protection activities in financial terms is situated within five countries (**see: Figure 4.21**). If the amounts spent to normal coastal protection and climate adaptation as well as to hot-spots are compared, it appears that the Netherlands has by far the highest normal expenditure, whereas Italy has spent most in terms of hot-spot and overall expenditure.

More and more coastal Member States have also started to **investigate how a more integrated approach can be followed to capture various climate change effects** and **what cost such adaptation measures would involve in the long term** to protect coastal zones against sea level rise and flooding. There are many national-level studies which attempt to estimate this long-term adaptation cost and also two EU-wide studies address these aspects, i.e. the PESETA-study[165] and the ClimateCost study.[166] However, the cost-quantification results vary greatly. This is partly due to the uncertainty that is underlying the sea-level response to a given emissions and temperature outcomes scenario or the influence of other factors (e.g. polar ice melt), but partly also related to scope of damages and types of adaptation measures considered in the cost estimations. Furthermore, some analyses develop quite different views about the costs and benefits of the required adaptation investments and conclude on quite variable country-by-county policy recommendations (i.e. passive or active policy in one or the other case).[167]

[163] European Commission, DG Maritime Affairs and Fisheries (2009), pp.7, 9-13
[164] i.e. Venice (Italy): € 4.2 billion (2002-2011). Hamburg (Germany): € 660 million (1998-2015). London (UK): € 380 million (2006-2015). Zwin and Ostend (Belgium): € 66 million (2002-2012). Danube Delta (Romania): € 45 million (2006-2015). Slovenian saltpan: € 20 million (2007-2013). The Netherlands may also be put in the list of hot-spot protection, in particular the comprehensive protection plan proposed by the Delta commission (2008). However as this plan has not yet been committed by the Dutch government and it is unlikely to come into effect before 2015, it has not been considered.
[165] European Commission, Joint Research Centre - Institute for Prospective Technological Studies (2009)
[166] ClimateCost (2011)
[167] see on this for example: Costa/Tekken/Kropp (2009)

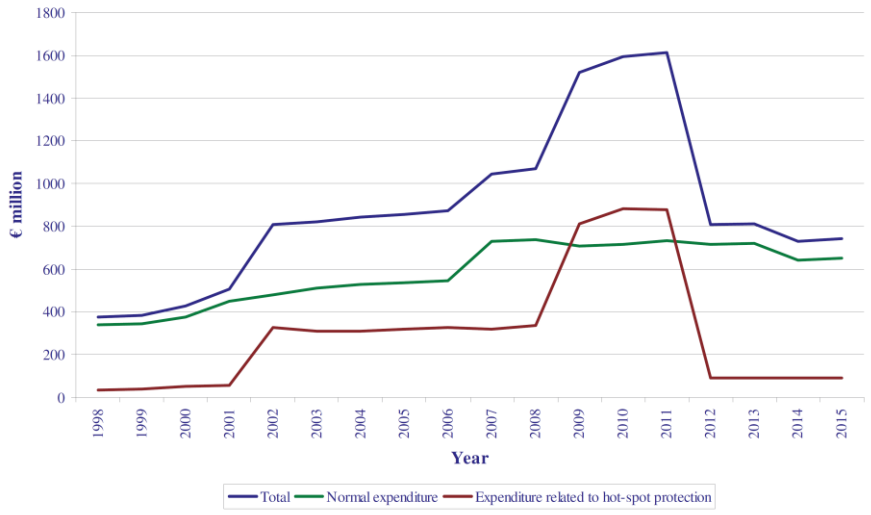
Table 4.1:
Trends for climate change vulnerability, current coastal protection approaches and normal coastal protection expenditure in main European marine basins

Marine basin	Trends in the climate change vulnerability	Current main coastal protection approach	Evolution of annual normal coastal protection expenditure (1998-2015)
Baltic Sea	Along the Baltic coastline, the overall vulnerability to coastal flooding and erosion due to sea level rise is expected to be low, most climate change impacts are projected for marine species as migration from the semi-enclosed Baltic Sea will be difficult when the sea surface temperature rises.	In the Baltic Sea area coastal risk reduction measures mainly relate to spatial planning.	No (additional) expenditure has been made to date or is expected to be made in the near future. This is primarily related to the approach followed by these countries as they consider climate change still too uncertain to proactively invest in.
North Sea	Significant sea level rise expectations, storm surges, many low-lying areas (more than 85% in BE and NL) and high economic and population concentrations make flood-risk a major concern for the North Sea countries.	North Sea countries mostly use a mixture of hard and soft protective measures	Countries have been defending their coasts since decades. Therefore, their current and future coastal protection and climate adaptation expenditures are high but remain rather stable totalling € 6.4 billion for the period 1998-2015.
Atlantic Ocean	In the Atlantic marine basin, the main climate risk is flooding due to sea level rise and changes in both the direction and the power of waves; southern countries could become more exposed to freshwater shortage in the future due to prolonged and more intense periods of drought.	Some countries implement protective measures, other countries combine 'protect' and 'accommodate' in the Atlantic Ocean area	About half of the member states have recently slightly increased their coastal protection expenditure or foresee limited additional investments in the near future, yet in absolute terms this may be relatively low.
Mediterranean Sea	Medium sea level rise is projected for the Mediterranean marine basin where few parts of the coastline are situated below 5 metre elevation; the area is however highly exposed to erosion; freshwater shortage is the most significant issue in the Mediterranean; large areas are affected by salt water intrusion and dry periods projected to increase in length and frequency put additional pressure on freshwater availability.	In the Mediterranean area countries mostly rely on ad-hoc hard defences.	About half of the member states have recently slightly increased their coastal protection expenditure or foresee limited additional investments in the near future, yet in absolute terms this may be relatively low.
Black Sea	Erosion is at present the most significant climate related problem for the Black Sea marine basin; furthermore, the area is vulnerable to the impacts of sea level rise on intertidal habitats and eco-systems due to the low intertidal range and limited scope for on-shore migration	In the Black Sea area countries mostly rely on ad-hoc hard defences.	About half of the member states have recently slightly increased their coastal protection expenditure or foresee limited additional investments in the near future, yet in absolute terms this may be relatively low.
Outermost regions	The characteristics of the Outermost regions such as the high concentration of population and socio-economic activities along the coastline, remoteness from the mainland, insularity, small size, difficult topography and economic dependence on a few products and sectors (often tourist related) in combination with their sensitivity to different extreme weather conditions (e.g. cyclones, drought, floods and volcanic eruptions) make these islands particular vulnerable to climate change; for some islands, also the loss of biodiversity is a major concern.	Outermost regions mostly combine hard and soft protective measures	

Source: Own elaboration on ground of information from European Commission, DG Maritime Affairs and Fisheries (2009), pp.3, 4, 7, 10, 11

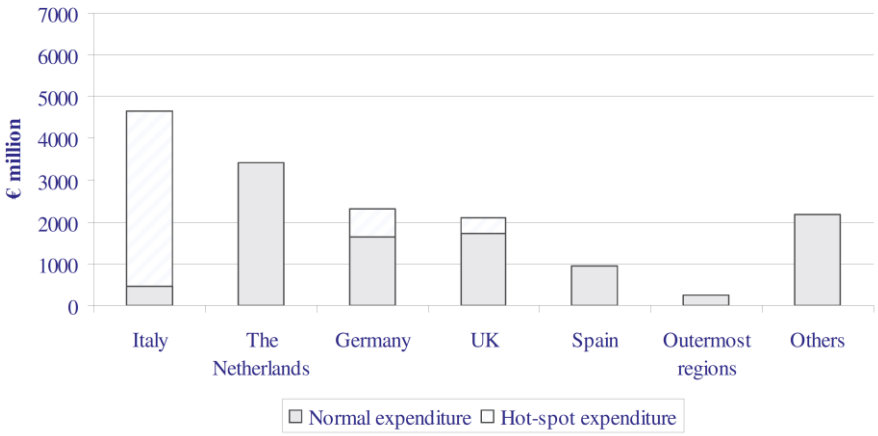
Taking the example of ClimateCost, the study gives a mid-estimate for the annual costs in Europe to be up to €11 billion for the 2050s, rising to €25 billion by the 2080s (i.e. combined effects of climate and socio-economic change, based on current prices, with no discounting). These costs include direct impacts, salinisation, cost of moving and land loss. However, additional unquantified costs will occur due to ecosystem losses and possible knock-on effects of damage on supply chains. These impacts have a strong distributional pattern. Countries in north-west Europe have the greatest potential damages and costs, although many of these countries are the most prepared for climate change in the European Union. In addition, sea-level rise will affect coastal ecosystems. Wetlands act as natural flood barriers and feeding grounds, and have recreational value. The analysis has estimated that, by the 2080s, over 35% of EU wetlands could be lost unless protective measures are undertaken. Where hard defences are also present, coastal squeeze could result. [168]

Figure 4.20: Normal versus hot-spot coastal protection expenditure in coastal member states



Year	*Total expenditure (€ million)*	*Hot-spot expenditure (% total)*
1998	375	9%
1999	384	10%
2000	427	12%
2001	507	12%
2002	809	40%
2003	821	38%
2004	843	37%
2005	857	37%
2006	873	38%
2007	1046	30%
2008	1072	31%
2009	1522	53%
2010	1597	55%
2011	1611	54%
2012	807	11%
2013	813	12%
2014	731	12%
2015	741	12%
1998-2015	*15837*	*34%*

Figure 4.21: Top 5 countries in terms of cumulative coastal protection and climate adaptation expenditure (1998-2015)



Source: European Commission, DG Maritime Affairs and Fisheries (2009), pp.12, 13

[168] ClimateCost (2011)

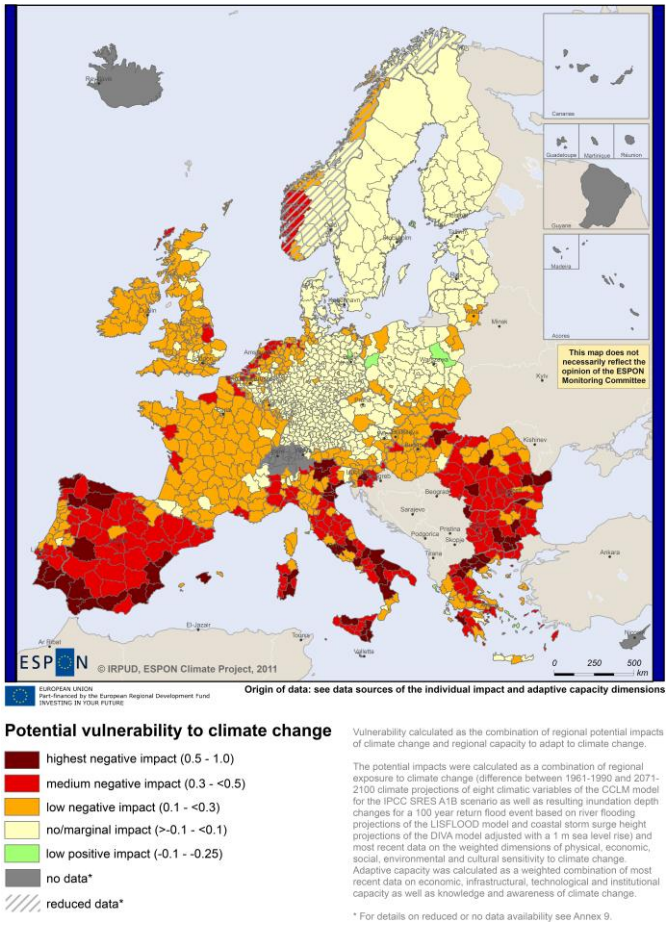
A concluding view on the "potential regional vulnerability to climate change"

The ESPON research project "Climate"[169] conducted an innovative, integrated and pan-European climate change vulnerability assessment with a clear territorial dimension and is considered by the EEA a good example for policy-oriented research that takes up the challenge of climate change's multi-dimensional nature.[170] One of the most important key messages is that Europe's climate change vulnerability seems to run counter to territorial cohesion. The assessment indicates that climate change would deepen the existing socio-economic imbalances between the core of Europe and its southern and southeastern parts mainly because many economically lagging regions are also the most vulnerable for climate change.

This conclusion is derived from **the potential vulnerability of European to climate change,** which is obtained by combining the results for the "aggregated regional impact of climate change" to the results for the "regional adaptive capacity to climate change" **(see: Box 5.5)**. The underlying rationale of this approach is that a region with a high climate change impact may only be moderately vulnerable if it is well adapted to the anticipated climatic changes, while high impacts would result in high vulnerability to climate change if a region also has a low adaptive capacity. **The spatial patterns of the potential vulnerability** of Europe's regions to climate change show an obvious south-north gradient **(see: Map 4.11)**:[171]

For regions in Scandinavia and Western European countries a low vulnerability is expected, which is due to the considerable adaptive capacity of these countries that compensates for the potential impacts projected for these regions. Particularly those countries for which a medium to high negative impact is projected seem to be less able to adapt than others for which the severity of the problem is less visible. In consequence, a medium to high vulnerability may be expected in the Mediterranean region, but also in South-East Europe. In this overall climate change would trigger a deepening of the existing socio-economic imbalances between the core of Europe and its Southern and South-eastern periphery.

Map 4.11: Potential vulnerability to climate change in Europe



Source: ESPON (2011), p.24

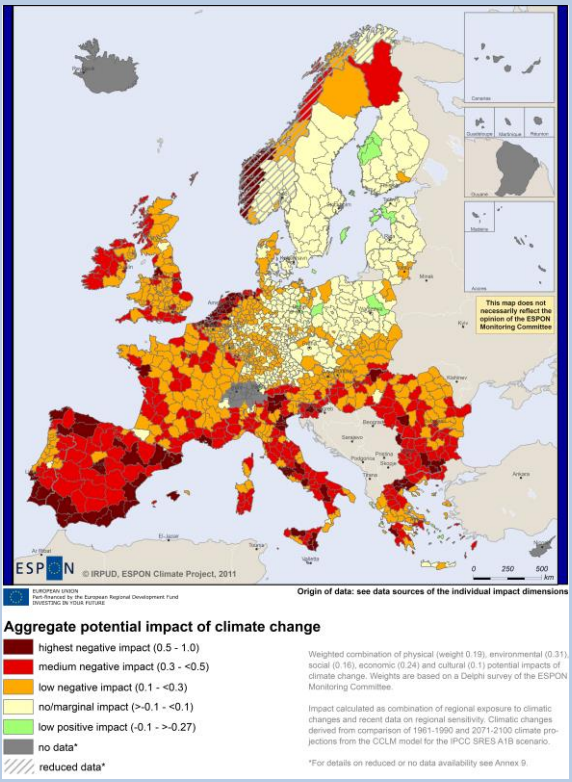
[169] ESPON (2011)
[170] EEA (2012b), p.216
[171] ESPON (2011), p.22

Box 4.5: Individual results for "regional impact of climate change" and "adaptive capacity to climate change"

The aggregate potential impact of climate change takes into account the physical, environmental, economic, social and cultural impacts.

The potential impact of climate change on Europe's regions differs considerably: hot spots are mostly in the South of Europe – i.e. the big agglomerations and summer tourist resorts at the coastline. However, other specific types of regions (e.g. mountains, i.e. in Norway, but also the densely populated Dutch coastline) are particularly impacted, but partly for other reasons (sea level rise, economic dependency on summer and/or winter tourism). There seems to be a moderate negative impact in some areas in northern Scandinavia. This results mainly from the sensitivity of the environment and flood prone infrastructure. All in all, two climate change regions clearly come out in this map: North-western Europe and the Mediterranean region.

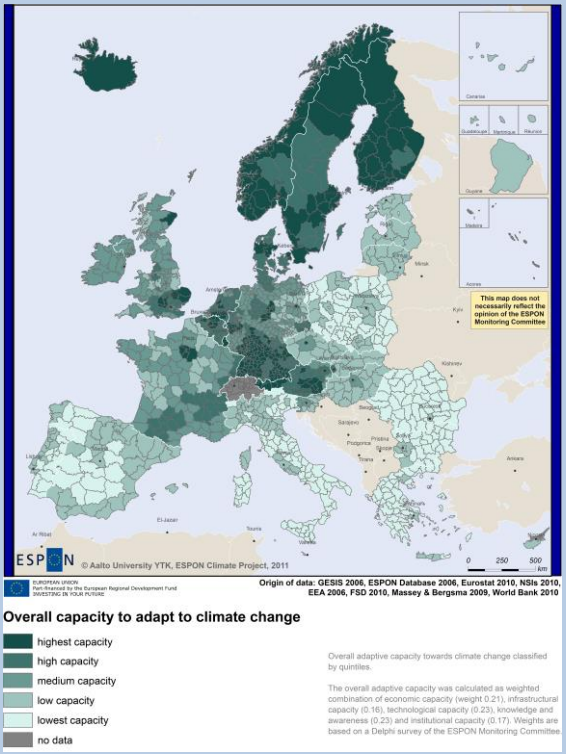
Many central, eastern and northern European regions face virtually no negative impacts or are even witnessing positive potential impacts of climate change.



The adaptive capacity in regard to climate change takes into account the economic, socio-cultural, institutional and technological ability of a region to adapt to the impacts of a changing regional climate.

Measures to enhance adaptive capacity relate to the development of awareness, ability or action in a broader manner than just by focusing on the aspects that are measured here by indicators of adaptive capacity.

European regions' adaptive capacity displays several trends. In general terms, the Nordic countries have higher capacity than most of the Southern European countries. Also Eastern European countries, on the whole, have lower capacity than Western or Northern European countries. Overall, the countries around the Mediterranean appear to have lower capacity than the countries around the Baltic Sea region. Generally, though, regions with concentrations of population, economic and research activities have higher adaptive capacities than more rural regions.



Source: ESPON (2011)

As the East of Europe is also affected by demographic changes (in particular outmigration and ageing), this may lead to an additional increase in sensitivity and therefore decrease Eastern Europe's adaptive capacity, since an ageing of the population makes the population more sensitive (i.e. to heat) and less capable to adapt.

With respect to the action potentials of ETC, the "Climate" project observed that operational programmes gave stronger emphasis to climate risk prevention only in the period 2007-2013, although not yet sufficiently. For transnational cooperation programmes it is observed that the theme of climate change is indeed recognised in both the analysis chapter and the strategy, but also that they do not sufficiently address risk prevention. Also for cross-border cooperation it is observed that, according to the visible priorities of the different programmes, it seems that the status of risk prevention and management is generally low or negligible and that the potentials are not being exploited. However, cross-border programmes can address spatially relevant hazards with cross-border dimensions, notably by helping to overcome climate change adaptation competition or contradicting adaptation measures that can emerge due to the existence of political borders through enhancing horizontal co-operation in the fields of risk management and civil protection (**see Box 4.6**).[172]

Box 4.6: Cross-border areas with needs for action – combining the findings from the ESPON projects "CLIMATE" and "GEOSPECS"

GEOSPECS highlights that especially the Luxembourg and Geneva cross-border metropolitan regions have one of the highest adaptive capacity levels among European cross-border areas due to their high-income, knowledge-intensive and innovation-oriented economies, which at the same time reduces their potential vulnerability to climate change. However, the CLIMATE maps also show that along many other borders climate change vulnerabilities are significantly different between adjacent border areas. This may be caused by differences in the climate impact sensitivity due to differences in the economic structure, settlement patterns and population concentrations on either side of a border, or it may be the result of adaptive capacities varying considerably across borders. Such differences suggest that there is a clear need for cross-border policy interventions which are targeted at improving the situation for the relevant climate change issues at stake, be they specific types of impacts (e.g. physical, environmental, economic, social and cultural impacts) or the regional adaptive capacities. The maps allow to identify EU borders with strong differences in adaptive capacity where strong cooperation would be needed (DE-PL, DE-CZ, HU-AT, AT-CZ, AT-SK, IT-CH, FR-IT), to which also some other borders may be added due to strong differences in the aggregated climate change impact that still persist in the potential vulnerability to climate change (ES-PT, ES-FR).

Source: ESPON (2012c), pp.1041-1043 ; ESPON (2011)

[172] ESPON (2011), p.161

5. Long-term territorial developments in the fields of regional accessibility and sustainable mobility

Long-term territorial developments in both of these transport-related fields are highly relevant for cross-border and transnational cooperation. But in order to be well understood, they have to be considered and analysed in the wider context of the Common Transport Policy (CTP) which has undergone a very dynamic evolution since the mid-1980s.

Transport has been one of the Community's common policies ever since the Rome Treaties of 1958, but the actual implementation of the CTP had only progressed very slowly until the first half of the 1980s. With the carriage of goods and passengers' movement having increased at an intensive pace since the 1970s across the European continent and in particular in Western Europe, transport-related concerns arrived more and more in the middle of Community-level policy making towards the mid-1980s.

A decisive turning point was reached in 1983 when the European Parliament initiated proceedings against the Council that failed to create a common transport market. This led to the European Court of Justice's judgement of 22 May 1985 (Case 13/83), which urged the Council to take action in this policy field. Community-level action became all the more pressing because a more efficient transportation of persons and goods was a key success factor for the realisation of the Internal Market up to 1992, which had become the strategic integration project of the recently enlarged Community with now 12 Member States. In 1985, the European Commission published its "White Paper on the completion of the Internal Market" which also included recommendations on ensuring the freedom to provide services in the common transport market.

These developments have kick-started a dynamic process of fully completing the common transport market and of further developing the CTP. This process was driven by the publication of various Commission "white papers" and the adoption of many EU-level legislative acts on different transport domains. During the following three decades (1985-2014), **Community-level action in the field of transport was focussed on three basic pillars (see: Annex 2):**

(1) The starting establishment of a common transport market between 1985 and 1992 and its further completion and liberalisation until the early years of the new millennium.
(2) The planning of and direct support for the establishment of a Trans-European Transport Network (TEN-T), which started already in the second half of the 1980s and has recently undergone the most radical shift since its inception with the establishment of the new Connecting Europe Facility (CEF)
(3) The introduction of the concept of "sustainable mobility" already in 1992 and a further development and expansion of this concept especially since 2002 until today.

Alongside this long-term development process, **also the territorial impact of the CTP had significantly increased.** This also stimulated more intense territorial research on matters relating to the CTP. The CTP's territorial impact was for the first time comprehensively analysed by a study of DG Regio on the spatial impact of Community policies and the costs of non-co-ordination.[173] This early analysis showed that the CTP's main types of intervention (i.e.

[173] The study covered the period 1985 up to 1999 and analysed the territorial impact for interventions in the fields of road and rail-bound transport (passenger & freight), air transport, deep-sea maritime transport and short sea shipping, inland waterway transport, the development of European transport infrastructures (i.e. TEN-T, TINA), intermodal transport, the emerging sea port policy, the transport-related liberalisation measures, transport-related research activities and technological development (e.g.

legislation on liberalisation and technical harmonisation, Community-level planning & funding of the TEN-T; transport-related research & development/deployment of intelligent transport systems) had a wide range of implications for different types of territories. The most important territorial impacts were identified for the development of the TEN-T and its linear and punctual elements (i.e. motorways, railway lines, inland waterways, seaports, airports, intermodal terminals, other interconnection points) and for the necessary introduction of environmental concerns into the CTP through the concept of sustainable mobility.[174]

Both territorial impact dimensions of the CTP have until today significantly increased their relevance for regional economic development and spatial planning policies and are thus also important reference frameworks for transport-related activities that are promoted in the context of cross-border and transnational cooperation.

The **territorial impact of TEN-T and transport infrastructure development** more generally was further explored by territorial research under the early Study Programme on European Spatial Planning (SPESP) and especially by a number of study projects of the ESPON 2006 and ESPON 2013 programmes. The latter focused on the territorial impact of Trans-European Networks in general (including also the TEN-T)[175] and in particular on questions relating to transport infrastructure development and regional accessibility.[176] These ESPON studies also show that numerous other research projects were realised on this matter in recent times at the transnational, national and regional levels.[177] Overall, there is a broad variety of indicators for measuring regional accessibility (**see: Annex 3**)[178] and also sufficient information sources exist which allow assessing EU-wide territorial accessibility trends. However, information is clearly more abundant for the period 2000-2014 than for the period 1990-2000.

On **the territorial dimension and impact of the sustainable mobility concept**, however, there is up to now rather limited territorial research which comprehensively addresses the complex interplay of the various related aspects. This might partly be due to the fact that some aspects are addressed by territorial research on transport infrastructure development (e.g. stagnating modal split in intra-EU freight & passenger transport, promotion of inter-modality etc.). But for many other aspects a more coherent EU-wide assessment of their territorial implications would be needed (e.g. interrelations between high individual cars use and public transport use; alternative modes for individual mobility; road congestion on major transport axes and in or around European metropolitan areas; territorial factors influencing on road safety).

European satellite navigation system Galileo; European Rail Traffic Management System ERTMS; the SESAR programme to improve air traffic control infrastructure). European Commission, Directorate General for Regional Policy (2001): pp. 43-74

[174] Also liberalisation measures were considered to have a territorial impact which, however, was difficult to assess in overall terms due to the fact that the degree of liberalisation and the basic conditions for each sector (i.e. tax systems, legislation of work, or of manpower) varied considerably among the Member States.

[175] ESPON (2004b)

[176] ESPON (2004a); ESPON (2012a); ESPON (2012b)

[177] A comprehensive overview on the broad variety of studies in the field of transportations is given in ESPON (2012b), pp.20-55

[178] See on this in more detail: Spiekermann/Wegener (2006); Schürmann/Talaat (2000)

5.1. Reducing peripherality and isolation in the European Union through improving regional accessibility

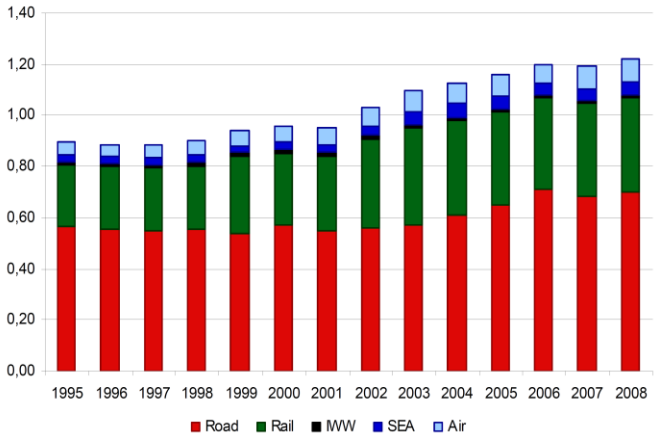
In Europe and the European Union more specifically, there was and still is a considerable gap in accessibility between central and peripheral regions. This is because of the highly unbalanced European transport system, which originates partly from the geophysical settings of the continent (i.e. large peninsulas, mountain ranges, rivers) and partly also from historical factors which led to the design of either monocentric or polycentric national transport systems (i.e. due to political decisions for linking major urban centres settlement patterns or due to military considerations etc.).[179]

Since World War II **countries across Europe have invested considerable amounts of money for establishing new and for improving existing transport infrastructures,** mainly with a view to further develop the accessibility of all parts of their national territory. Transport infrastructures are traditionally considered to play an important role for regional economic growth, as (…) *one of the fundamental assumptions of regional economics is that regions with better access to the locations of input materials and markets will, ceteris paribus, be more productive, more competitive and hence more successful than regions with inferior accessibility.* According to this assumption, which has also been demonstrated by past empirical studies, (…) *the position of a region with respect to major transport networks, and in particular improvements of its accessibility, are essential for its economic development.*[180] This basic nexus also stimulates European states to continue developing their transport infrastructures, mainly because they strongly influence decisions on where to work, live and invest and because a high level of territorial accessibility is seen as a central agglomeration benefit and driver in the socio-economic development of a country, region, city or corridor relative to other places in Europe.[181]

However, transport infrastructure investment activities are quite different across European states and individual transport modes This can be shown by taking a look at the period between 1995 and 2010 **(see: Figure 5.1).**

During these 15 years, the total investment in transport infrastructure has been on average between 0.9% and 1.2% of the total European GDP. However, the level of investment was substantially lower in Western European Countries than in the Eastern European countries. As regards the focus and sources of funding, it is observed that about (…) *1/3 of all invested funds in transport were merely spent on infrastructure maintenance, and only about 60% were specifically dedicated to providing new infrastructure.*

Figure 5.1: Transport infrastructure investment in the EU per mode as a share of GDP 1995-2008



Source: ESPON (2012b),p.6

[179] Spiekermann/Wegener (2008)
[180] Spiekermann/Wegener (1996), p.37
[181] ESPON (2009), p.5

The funding of new infrastructure proceeded mostly from National budgets of Member States (almost 90%), and only 5% of total expenditure was assumed by European funds (Cohesion Fund and ERDF) despite the fact that 50% of total investment was devoted to new infrastructure in TEN-T networks. The analysis per mode reveals that around 60% of total investment has been devoted to Road mode, 20% to Rail and 10% equally split between Air and Water modes (including maintenance) (…). *However, almost half of the investment on TEN-T was devoted over the last 10 years to rail, and around 35% to road. This was especially important in Western European countries, where the development of High Speed Rail networks required large investments (around € 20 million per kilometre of HSR, against € 5 million per kilometre for motorways, on average). In Eastern European countries, investment on roads was still dominant.*[182] Also some of the financially larger cross-border INTERREG and ETC programmes have contributed quite significantly to the establishment of new roads and to a further improvement or upgrading of existing road infrastructures during the period 1990-2013, but this will be assessed in more detail in another part of the present study (**see: Chapter 6**).

A first although not surprising feature of this intense transport infrastructure investment policy is the **impressing densification of the European road network over the past 55 years.** This appears from a series of maps that were recently drawn up by an EU-financed research project which aimed at constructing a historical database of European road networks since 1960 for the purpose of spatial economic analysis (**see: Annex 4**).[183] Another salient feature of transport infrastructure development is the **considerable increase of the overall length of the European high-speed rail network over the past three decades** from only 643 km in 1985 (in FR, IT) to now 7,343 km in 2013 (in DE, FR, IT, BE, ES, NL, UK, AT). At the same time, however, one can observe that the length of other rail lines in use in the EU28 decreased from 237,671 km in 1990 to 220,583 km in 2000 and to 215,734 km in 2013.[184]

At the European level, questions relating to territorial accessibility increasingly gained importance in the 1980s and especially during 1990s. This happened first in the discussions on the centre-periphery pattern that was observed on the EC/EU territory and then in the context of the ongoing work on and adoption of the European Spatial Development Perspective (ESDP), which introduced and widely promoted the polycentric development concept.[185] Further attention was given to accessibility in the first Territorial Agenda of the European Union of 2007 ("Towards a More Competitive and Sustainable Europe of Diverse Regions"), in the European Commission's "Green Paper on Territorial Cohesion" of 2008 and latest in the new Territorial Agenda of the European Union 2020 ("Towards an Inclusive, Smart and Sustainable Europe of Diverse Regions") of 2011, where accessibility is seen as key factor in improving the territorial balance in Europe and the attractiveness of Members States, their regions and cities.[186]

But how has regional accessibility evolved in reality during the past two decades across the EU and which are the main territorial trends observed?

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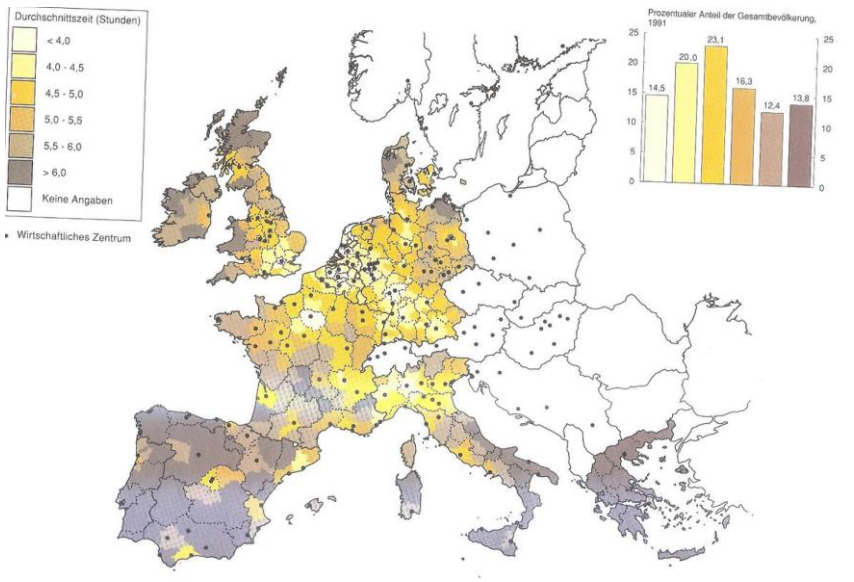
[182] ESPON (2012b), p.6
[183] Stelder (2013)
[184] European Commission, Eurostat (2014c), pp.78-79
[185] The polycentric development concept is a more sophisticated understanding of the relationship between places as the simple core-periphery opposition, because it can be considered a goal to be reached for spatial and transport policies in an attempt to understand as deeply as possible the local context of development in relation with globalisation. ESDP guidelines for EU spatial development were the (i) development of a polycentric and balanced urban system and strengthening of the partnership between urban and rural areas and (ii) the promotion of integrated transport and communication concepts, which support the polycentric development of the EU territory and are an important precondition for enabling European cities and regions to pursue their integration into EMU. See: ESPON (2004a), pp.111,112
[186] ESPON (2012a), pp.6, 7; ESPON (2012b), pp.7,8; ESPON (2009), p.4

Evolution of regional accessibility between 1991 and 2001

The Community's regional policy addressed regional accessibility for the first time in the late 1980s through a concept which attempted to give the notion of peripherality an operational content.[187] Then, in 1994, the Commission's "5th Periodic Report on the social and economic situation and development of the regions" further refined and extended this early concept with a new indicator of peripherality: it measured the accessibility of 194 major economic centres in the Community for business travellers from over a thousand NUTS 3 regions by estimating the average time required to travel to each of these major centres by road, rail or air (**see: Map 5.1**).

Map ...: Average travel time to 194 economic centres (1991), in mean time (h) and % of the total population[188]



A mapping and analysis of the **1991 situation for the EEC12** shows that mainly travellers from the large agglomerations in the heart of Europe (e.g. Brussels, Paris, London, the Rhine-Ruhr and Rhine-Main areas, Stuttgart, Munich and Milan) could on average travel in the least time to business destinations across Europe. But also more peripherally located larger centres with international airports like Glasgow, Copenhagen, Berlin, Athens, Rome and Madrid were relatively well-connected when air travel had been taken into account. The integration of such cities into the European air transport network was considered crucial for their further development.[189]

Apart from the large capitals, however, all regions of the Southern and Western edges of the Community, as well as almost all its islands, remain handicapped with regard to overall access to the 194 growth centres. In these regions, often sparsely populated, the economic repercussions of heavy investments in the transport infrastructures are often insufficient to justify private or public expenditure. Nevertheless, a minimum degree of access is required in order to sustain economic activity in such peripheral areas. Furthermore, the average time required to travel to the 194 economic centres was also relatively high for a small number of regions which were geographically close to the Community's centre (e.g. Mecklenburg-Vorpommern in Germany and the Southern interior of France, being economically weak and often sparsely populated with under-developed transport links).[190]

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[187] This concept was first developed in the Commission's 3rd Periodic Report on the social and economic situation and development of the regions (of 1987) which classified regions as "central", "intermediate" or "peripheral" according to an average of their physical distance to all other regions, weighted by GDP.

[188] The present map was drawn from the German hard copy version of the 5th Periodic Report, because the still accessible English version only contains a black-and-white map of rather poor visual quality.

[189] European Commission, DG XVI (1994), p.112

[190] European Commission, DG XVI (1994), p.112

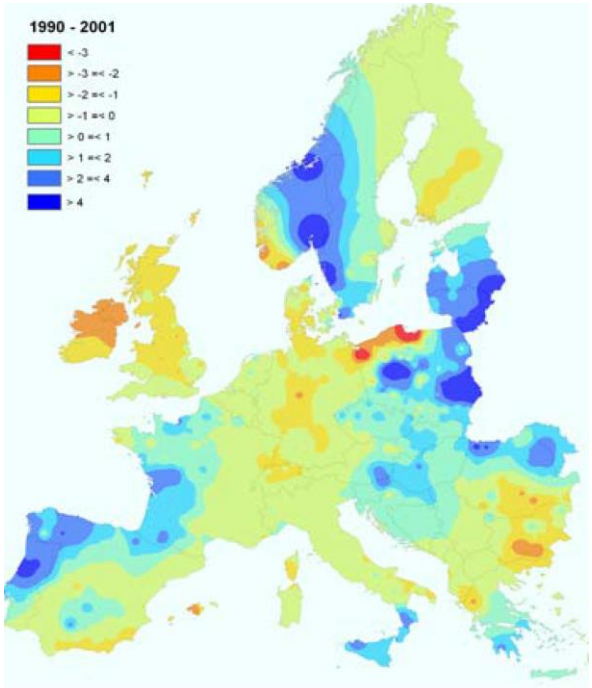
The above-observed general densification of the European road network also led to changes in **road network accessibility and potential accessibility by road** between 1990 and 2001. The geographically different developments are now briefly outlined for the EU15.

As regards network accessibility (**see: Map 5.2**), a reverse picture appears for the first time in this period which is different from developments observed in previous decades.[191]

There was a clear catching up of Portugal, western France, southern Italy, Greece and Eastern Europe, whereas countries in the centre of Europe show a modest decline. An improvement is also observed in a large part of Norway, mainly due to the effect of the Great Belt Bridge which opened in 2000. Within the EU at 15 Member States, in essence, there was a system wide gain of the periphery which also means that the priority targets of regional policy to improve specific regional or local networks in areas that were most in need had in general been reached.

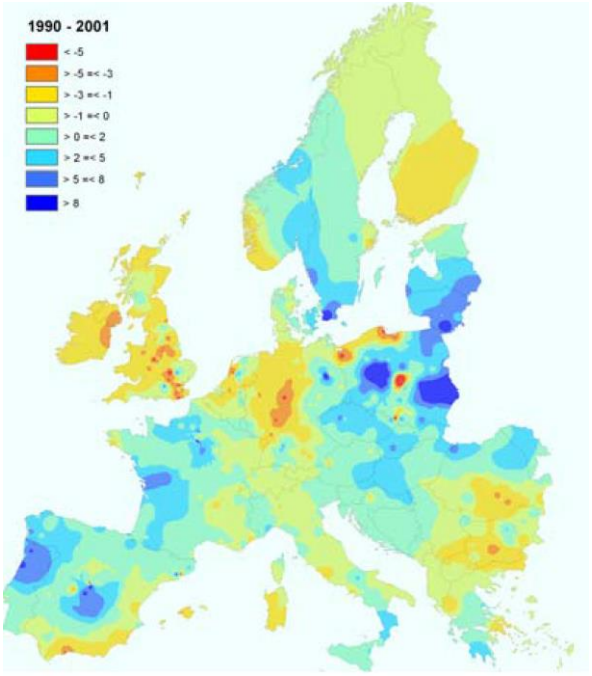
When looking now at the **changes in potential accessibility (see: Map 5.3)**, one can observe that the pure network effects and the catching up of the periphery largely return: *the UK, Netherlands and the main center of Germany lose potential relative to (central) Spain, West France and Poland* (…), but the (…) *positive effects of the Great Belt Bridge for Scandinavia, however, are less when expressed in market reach.*[192] However, a slightly more positive gain in potential is observed along many internal or external borders of the EU15. This also points to positive effects which resulted from the sometimes considerable support that the early INTERREG programmes had dedicated to road network investments (i.e. FR-ES south-eastern Pyrenees, FR-IT, FR-BE, FR-DE, DE-NL, DE-CZ, DE-PL).

Map 5.2: Changes in road network accessibility (*)



(*) This map illustrates the pure network effect of road infrastructure improvements and depicts directly which regions have gained the most in reduced travel time/costs to all other regions.

Map 5.3: Changes in potential road accessibility



Source (Maps 5.2 & 5.3): Stelder (2013), pp.12-13

[191] Between 1970 and 1980, accessibility gains are observed for Denmark, Northern Finland and in mid-south Germany, but also improvements in South-East Spain which are comparable with what happened in South Italy in the decade before (1960-1970). Between 1980 and 1990 it is the clusters in the UK and the Netherlands who gain, added with North Italy and a catching up of Greece due to a better highway connection with the North through Yugoslavia.

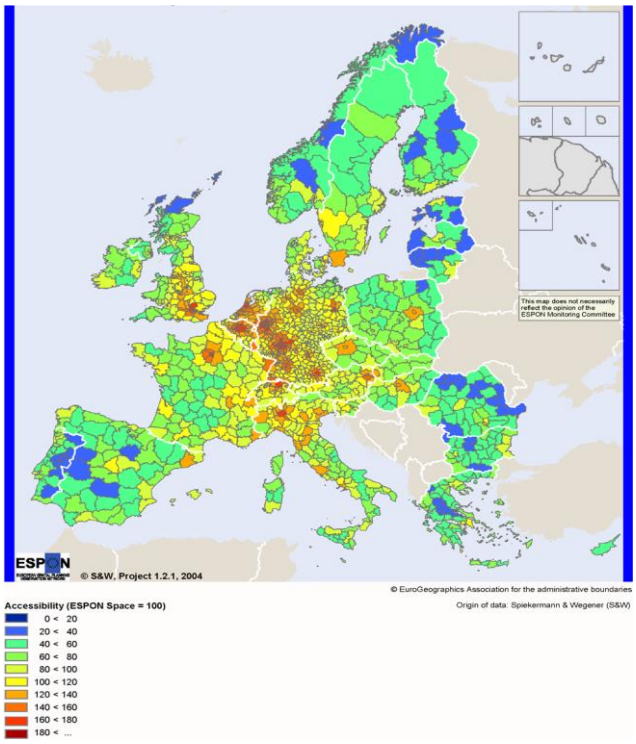
[192] Stelder (2013), p.14

Although the Internal Market and Schengen processes did foresee the removal of border controls between the EU Member States to ease the transnational and cross-border movement of goods and people, **waiting times at border crossing points had been an important issue with considerable relevance for accessibility in the 1990s.** Waiting times often caused delays especially in freight transportation (i.e. high transit time, mainly due to the long processing times at rail border-crossing points between two different railway systems), but to some extent also for passenger trips. Long waiting times of 30 minutes or more were not unusual even between EU Member States, but waiting times at borders between the EU and eastern European accession countries or between accession countries were a major problem which heavily affected road travel times and thus also regional accessibility.[193]

Therefore, during the 1990s, significant efforts were made along many of the former external EU15 borders with the Eastern accession countries to improve existing border-crossing points and to create new border crossing possibilities, often with support from the pre-accession instrument PHARE or from INTERREG. In Poland, for example, where passenger car border traffic and heavy goods vehicle border traffic increased by respectively 471% and 505% during the period 1990-2001, the number of generally accessible road border crossings increased from 32 to 69 (1990-2001: 216%) and rail border crossings for passenger traffic from 15 to 23 (1990-2001: 153%).[194]

If the situation in 1991 is now compared to **the status of regional accessibility in 2001,** one can observe the following overall picture for both the EU15 and the accession countries that were expected to join the in the near future. When road, rail and air are considered together by the indicator multimodal potential accessibility **(see: Map 5.4),**[195] it appears that the pattern of regional accessibility in the "old" EU12 Member States has not substantially changed. With the accession of Sweden, Finland and Austria, however, an area with a better than average accessibility in the south-east (Austria) and, more important, a vast area in the north with clearly below average accessibility (northern regions of Sweden and Finland) was added to the EU.

Map 5.4: Multimodal potential accessibility, 2001 (*)



(*) All three transport networks are included (road, rail, air). Accessibility has been standardised to the average accessibility of the ESPON space. Regions coloured in green have a below-average multimodal potential accessibility, regions in yellow and red an above average accessibility.
Source: ESPON (2004a), p.285

[193] Some data for 1998 could be found on average car and lorry waiting times for the directions DE→PL (110 minutes & 440 minutes respectively), PL→DE (90 minutes & 360 minutes respectively), which have to be compared to waiting times for the directions AT→DE (5 minutes for both) or DE→BE (5 minutes & 10 minutes respectively). Schürmann/Talaat (2000),pp.11,36
[194] Rietveld/Stough (2005), pp.191-197
[195] It is not possible to compare one to one the two maps of 1991 and 2001, as different criteria and in particular a different geographical scope is applied in each case.

European regions and cities with clearly above average accessibility continue to be located mainly (…) *in an arc stretching from Liverpool and London via Paris, Lyon, and the Benelux regions, along the Rhine in Germany to Northern Italy. However some agglomerations in more remote areas such as Madrid, Barcelona, Dublin, Glasgow, Copenhagen, Malmö, Göteborg, Oslo, Rome, Naples Thessalonica and Athens are also classified as being central or at least intermediate because their international airports improve their accessibility. At the same time the European periphery begins in regions that are usually considered as being central. Several regions in Germany, Austria and France have below average accessibility values, some of them are even extremely peripheral. Many regions in Portugal, Spain, Ireland, Scotland, Wales, Norway, Sweden, Finland, Southern Italy and Greece have very low accessibility values. Those regions do not have good access to international flight services. Nearly all regions of the candidate countries do have below average accessibilities. The only exceptions are the capital cities and partly their surrounding regions because of international airports and important connections. For all other regions the combined effect of low quality surface transport infrastructure and lack of air accessibility leads to the low performance in terms of accessibility. In general, the enlargement of the European Union leads to a decrease in average accessibility.*[196]

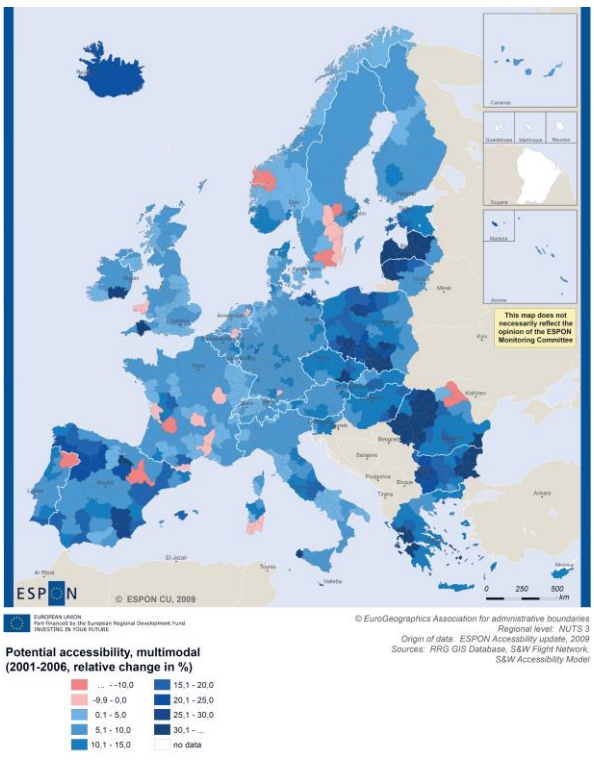
Evolution of regional accessibility between 2001 and 2014

During this period the EU's overall territorial situation has substantially changed with the accession of 13 new Member States (in 2004, 2003 and 2013), in particular with respect to regional accessibility.

The enlarged EU is now characterised by a new Eastern periphery, which adds to the traditional northern and south-western periphery of the previous decade. Most regions of the new EU Member States had a clearly below-average multimodal potential accessibility in 2001 and the only exceptions to this were their capital city regions and a few adjoining regions.

However, the **short-term evolution of multimodal potential accessibility** between 2001 and the year immediately before the EU-accession of Romania and Bulgaria **suggests (see: Map 5.5) that in overall terms potential regional accessibility increased** within Europe by 8.7% and that the highest relative changes (…) *occurred in regions of the Eastern EU Member States, mainly based on relative growth in road and air transport accessibility.*[197]

Map 5.5: Multimodal potential accessibility, relative change 2001-2006



Source: ESPON (2009), p.18

[196] ESPON (2004a), p.284
[197] ESPON (2009), p.18

However, also many Spanish regions had high relative increases, a combination of improvements in rail and air accessibility. Looking at regions in countries of the European core area, a relatively low improvement in multimodal accessibility was detected. The reduction of accessibility by air experienced in several French regions was however often compensated by growth in rail accessibility.[198]

Overall, these impressions from the first years of the new millennium suggest that **the traditional European core-periphery picture is starting to change slowly** and that a process towards a more even accessibility of places, regions and cities is underway in the EU. Yet, there are **still different patterns of regional accessibility in European territory,** depending upon which transport mode is considered:[199]

- **Air accessibility increased by 7.8%** and contributed much to a more polycentric accessibility pattern in the EU, mainly because of the growing availability of air connections at a much more affordable or even very low cost (i.e. if compared to the situation 1990-2000). Highest relative accessibility improvements were found in parts of Spain, Italy and Greece, and particularly in most regions of the newer EU Member States.
- **Accessibility by rail showed an average growth of 13.1% between 2001 and 2006.** The highest relative gains occurred in many peripheral regions showing absolute values below average (e.g. IE, ES, PT, the central regions in Greece as well as the southern regions of Italy and the Nordic countries). Moreover, recent high-speed projects led also in Southern Germany to significant relative gains for regions in terms of improved accessibility. However, areas in the core of Europe had in absolute terms still the highest level of potential accessibility in 2006, while below-average accessibility was found in Ireland, Spain, Portugal, Southern Italy and most regions of the newer EU Member States. Lowest accessibility by rail was found in the sparsely populated northern parts of the Nordic countries, the Baltic States and most regions of Romania, Bulgaria and Greece.
- **Road accessibility increased by 7.4% between 2001 and 2006.** The most important relative increases were noticed in northern Greece, the Western part of Poland and the Czech Republic, where the combination of infrastructure projects and reduction of border crossing waiting had combined positive effects. Regions with already high levels of road accessibility did not encounter strong relative gains. Yet, road accessibility still showed a clear core-periphery pattern in 2006 and the high potential accessibility was observed mainly in North West Europe (i.e. BE, NL, western parts of Germany, northern and eastern parts of France, South-east of England), but also in parts of the Alpine Space area (i.e. CH, western parts of Austria, northern parts of Italy).

Despite this rather positive overall development in the period 2001-2006, one has to note that **national borders still constitute an important barrier for regional accessibility, especially since the EU enlargements of 2004 and 2007.** The joining of new Member States increased the overall challenge of establishing an efficient EU-wide transport network through integrating former national networks, most of which were however still functioning nationally. And it is at national borders where problems associated to this challenge naturally manifests (i.e. lack of continuity & coordination of services provided, missing links, interoperability problems preventing efficient public transports etc.[200]).

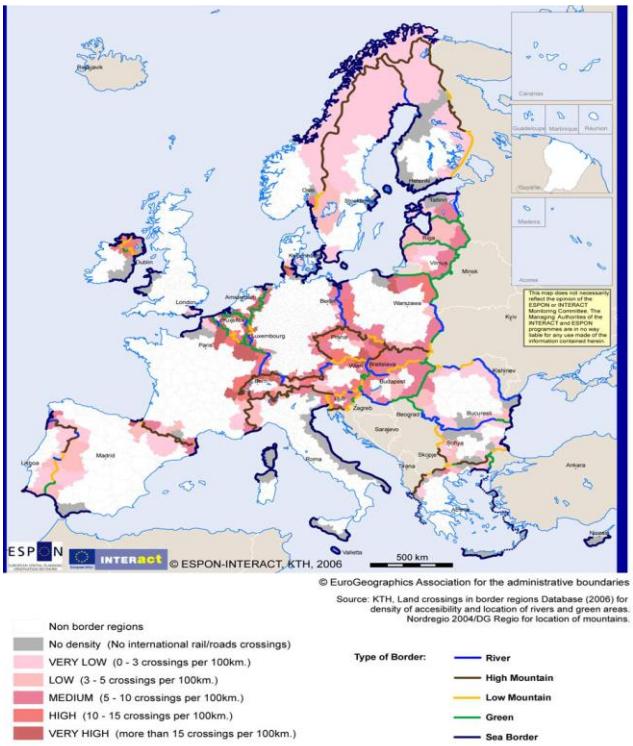
[198] ESPON (2009), p.18
[199] ESPON (2009), pp.5, 8-16
[200] ESPON (2004a), p.112

Although border-regional and cross-border road and rail infrastructures as well as border crossing points had already been improved during the 1990s along many land borders of the new EU Member States, one could observe that the density of border crossing possibilities (road, rail and river crossings) was still low or very low at several borders in 2005/2006 **(see: Maps 5.6 & 5.7):** this holds true for some new internal EU-borders (esp. LT-LV) and several segments of the new Eastern external EU-borders, but especially for borders with and between Bulgaria and Romania.

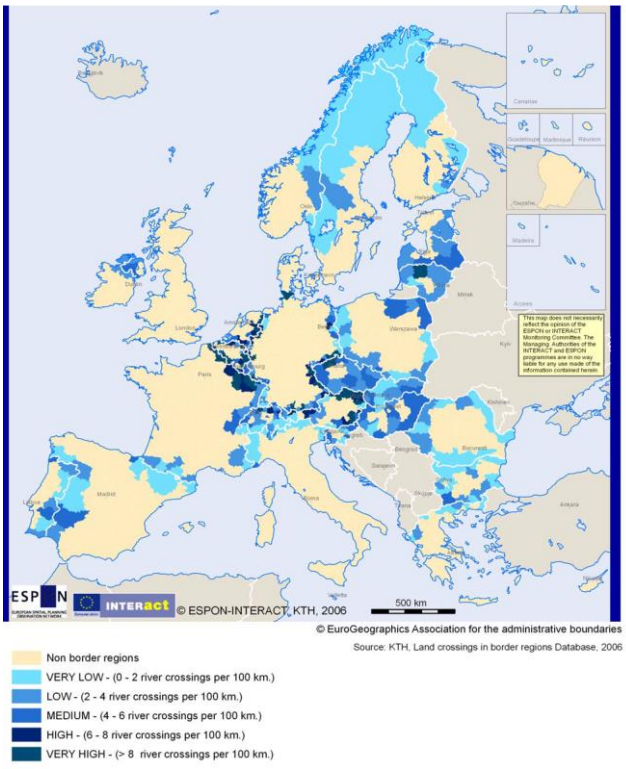
This lack of border crossing possibilities also affected cross-border economic exchanges, face-to-face social interactions and cooperation between neighbouring border regions.[201] And still today, the general accessibility of many border regions in the new EU Member States appears to be low. This is the case in extensive parts of the Baltic States where travel times to regional centres exceed 100 minutes (mostly in border areas LT-LV, LV-EE), but also in border areas of the Czech Republic neighbouring Poland and Bavaria which have clearly lower accessibility values.[202]

Weak capacities of border crossing points, together with very heavy administrative procedures, continue to affect a smooth functioning of the trans-European and interregional transport chain, mainly due to high waiting times at borders. This is observed at several new internal EU-borders between the eastern Member States, but especially at the

Map 5.6: Geographic type of border of NUTS 3 regions plus density of border crossings (roads an rail crossings per 100 km) in border regions across EU27+2



Map 5.7: Density of river crossings per 100 km, in NUTS 3 land border regions



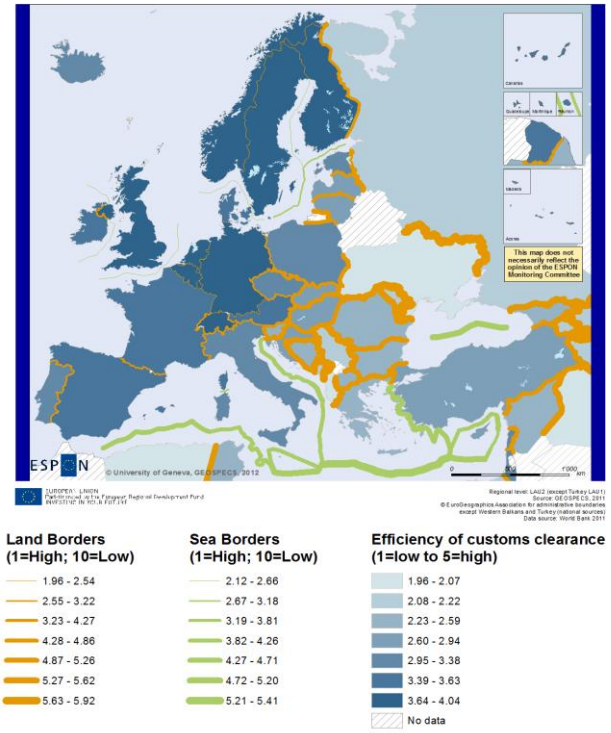
Source (Maps ...&...) : ESPON-INTERACT (2007b), pp.41, 43

[201] ESPON-INTERACT (2007a), p.19
[202] ESPON (2012b), p.127

external EU-borders with other neighbouring countries in the East. In the moment of the first enlargement in 2004, for example, one could notice an average waiting time at borders of 24 hours for trucks, albeit with great variations between individual borders.[203]

Problems tend to persist, as recent ESPON studies observed significant delays for passport control, visas or custom declarations[204] and localised the most significant inefficiencies of customs clearance processes at the borders of the Balkans and Romania (**see: Map 5.8**). Excessive border waiting times not only cause economic losses, they also have harmful effects on the population living near these border crossing points (i.e. public health, air pollution, spread of disease etc.).[205]

Map 5.8: Efficiency of customs clearance processes along European borders (2009)



Source: ESPON (2012c), p.561

Despite this, however, it remains to be seen **in how far this trend of an improving accessibility has also continued over the remainder of the period (i.e. 2007-2014).** There are **three developments which suggest that a positive answer can be given in this respect.**

(1) For **the accessibility potential by air,** the largest improvements between 2001 and 2011 have taken place in regions that have smaller airports. This is particular true for the countries in Eastern Europe in which many airports have been developed outside the capital regions.[206]

(2) Another development supporting a positive development is that **the overall length of the motorway network in the EU28[207] has increased by a further 16,275 km between 2000 and 2011.** Half of this motorway network extension took place between 2005 and 2011 (i.e. 8,171 km) and represents 63% of the total network increase in the period 1990-2000 (i.e. 12,954 km in the EU28). The strongest increase between 2000 and 2011 was observed in Ireland, where the motorway network had become nearby nine times longer (i.e. from 103 to 900 km). But also in a number of other EU Member States, the absolute network length has either tripled (i.e. PL, RO, HU, HR) or nearby doubled (i.e. in PT, SI, EL) between 2000 and 2011. These significant motorway network extensions have also clearly contributed to increase the overall levels of road accessibility. This is also confirmed by the findings of a recent ESPON study,[208] although the following analysis suggests that less positive road accessibility gains occurred in Ireland and northern Scandinavia.

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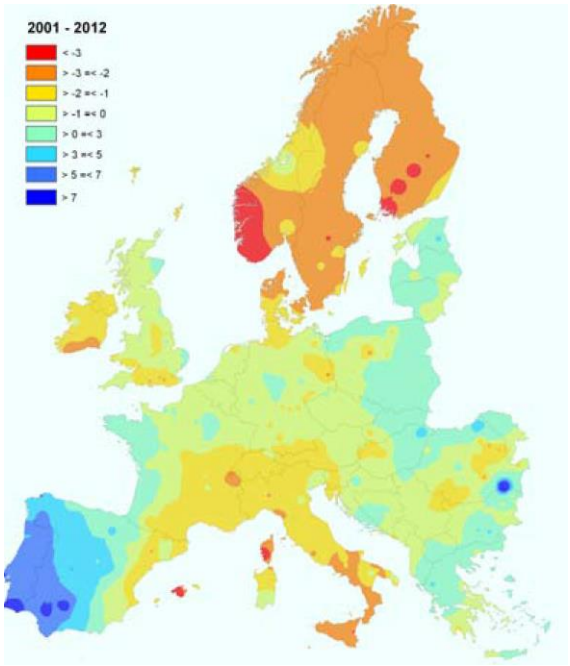
[203] ESPON (2004a), p.237
[204] ESPON (2012b), p.11
[205] see: International Road Transport Union IRU (https://www.iru.org/en_bwt)
[206] ESPON (2012a), Annex Volume 1, p.8
[207] European Commission, Eurostat (2014c), p.76
[208] ESPON (2012a), Annex Volume 1, p.8

If one looks first at the **change in road network accessibility between 2001 and 2012** (**see: Map 5.9**), one can notice the (…) *clear effect of intensive highway construction in the whole of Portugal and large parts of Spain and again a modest further catching up of Eastern Europe and the north of Greece.* In countries in the centre of Europe, (…) *highways are mainly maintained and broadened but relatively few new highways are added. Also remarkable is the relative decline of Scandinavia. The Great Belt Bridge was a major improvement but due to its low population density the need for further road improvement is limited. Only some parts of Norway are an exception to this due to more investment in tunnels.*[209] Still, the system wide gain of the EU27 periphery relative to the centre clearly appears, which also suggests a positive impact of the financial means mobilised under the EU's Cohesion Policy (i.e. although limited if compared to total national spendings).

If the **changes in potential road accessibility** are considered (**see: Map 5.10**), one can again observe similarities with the pure network effects. However, also the UK has a clear gain in potential that is not visible in the map on network accessibility.[210]

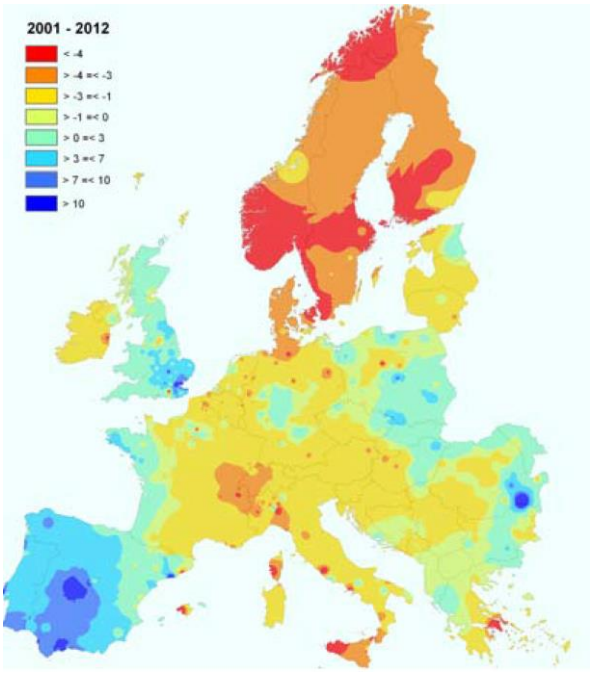
Also differences appear at several EU-borders, as a slightly more positive gain in potential is noticed in the central and south-eastern Pyrenees (only Spain) and along the borders of Romania and Bulgaria. But along many borders of countries in the center of the EU and at the borders between the three Baltic States, a less positive development is observed.

Map 5.9: Changes in road network accessibility (*)



(*) This map illustrates the pure network effect of road infrastructure improvements and depicts directly which regions have gained the most in reduced travel time/costs to all other regions.

Map 5.10: Changes in potential road accessibility



Source (Maps … & …): Stelder (2013), pp.12-13

(3) A final supporting factor is that **the overall length of the high-speed rail (HSR) network increased by more than 4,600 km between 2000 and 2013 in the EU28**[211] (from 2,708 km to 7,343 km). Only between 2006-2013, the network length increased by 2,159 km which

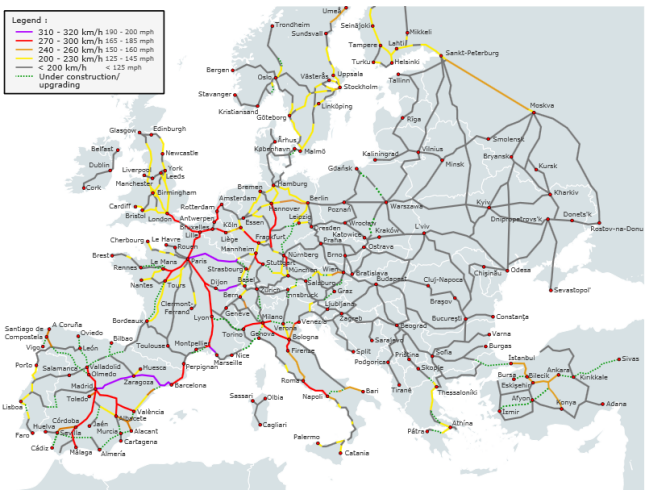
[209] Stelder (2013), p.11
[210] Stelder (2013), p.14
[211] European Commission, Eurostat (2014c), pp.78-79

represents 128% of the total increase that took place over the previous decade (1990-2000: + 1,684 km).

Between 2000 and 2013, also the number of EU Member States with operating high-speed rail networks increased from five in 2000 (DE, FR, IT, BE, ES) to eight in 2013 (+ NL, UK, AT). Yet, it seems that the overall HST accessibility across the EU is not very balanced in territorial terms.

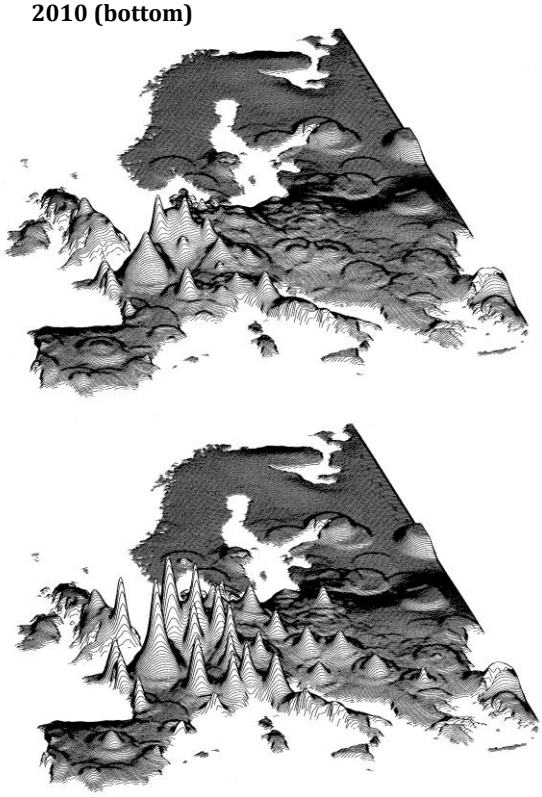
This can be seen if the real HSR-network in 2013 (**see: Figure 5.2**) is compared to the results of a very early analysis of the expected evolution of territorial HSR accessibility up to 2010 (**see: Figure 5.3**), which is still of actuality today. In 1993, at the time of the launching of the TEN-T network policy, large differences in HSR accessibility existed: city centres and urban regions had the highest accessibility, which then strongly decreased towards the rural areas having in general the lowest accessibility. Moreover, areas in central Europe, both urban and rural, had a higher accessibility than regions at the EU15 periphery. For the 2010 forecast, it was simply assumed that HSR network of the TEN-T will be in operation. From this appears that the overall accessibility pattern will not be much different, but that the polarising effect of the new network becomes apparent. Only urban regions that are also nodes of the network have benefited, while the regions in-between have not.[212]

Figure 5.2: High-speed railway network in Europe, 2013[213] (*)



(*) The map depicts the actual operational high-speed network instead of the designed one which may be higher.

Figure 5.3: Daily accessibility by rail (number of persons reached in five hours)[214], status in 1993 (top) and forecast for 2010 (bottom)



Source: Spiekermann/Wegener (1996), p.40

[212] Spiekermann/Wegener (1996), pp.39, 40

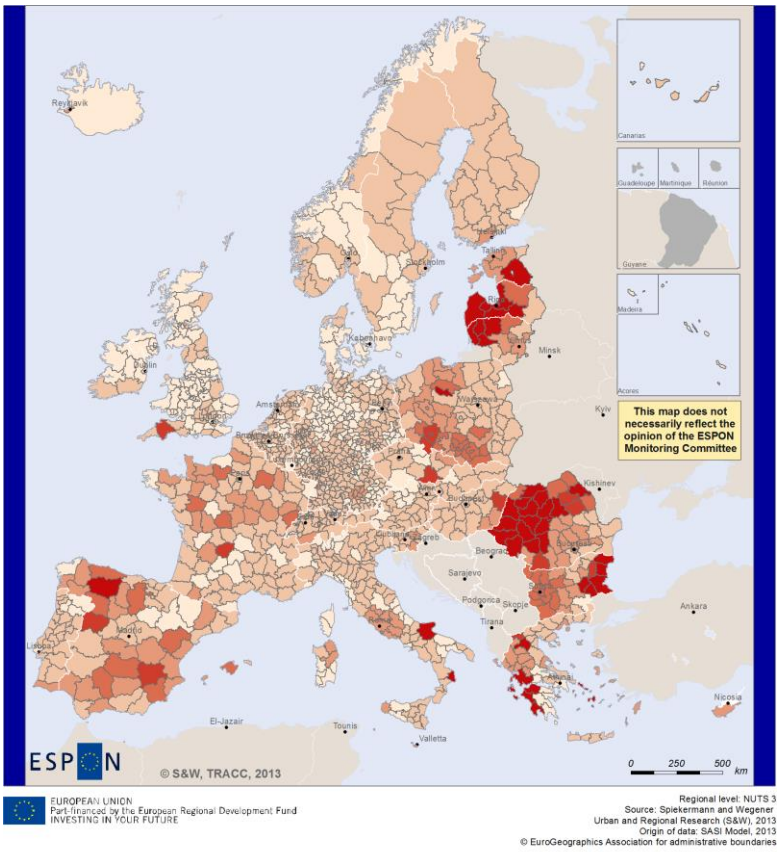
[213] http://en.wikipedia.org/wiki/High-speed_rail_in_Europe#mediaviewer/File:High_Speed_Railroad_Map_of_Europe_2013.svg

[214] Daily accessibility indicators were calculated for the years 1993 and 2010 for each of the 70 000 raster cells, while taking account of the population at and travel time to all other 70 000 cells. The accessibility surfaces so derived were presented in three-dimensional form. Spiekermann/Wegener (1996), p.39

If the actual improvement of overall rail accessibility in the period 2001-2011 is considered, then it appears that the pattern of change confirms the effects of HSR-investments on the Iberian Peninsula and in France, Italy, Germany and Belgium where gains in accessibility potential often exceed 50%.[215] In the EU-periphery, however, there are still many areas which have low general rail accessibility to urban functions and this is particularly visible in eastern Europe. Here, but also in other peripheral parts of the EU, the low general rail accessibility is often compensated for by better road accessibility to urban functions **(see: Annex 5)**.

Finally, if again all three transport modes are looked at together, then **the following regional-level changes appear for multimodal potential accessibility in the entire period 2001-2011 (see: Map 5.11):** the tendency is (…) *that higher relative gains did occur in less central areas, but not everywhere in the periphery* (…) and that (…) *central areas did grow less in relative terms in multimodal accessibility.*[216] The strongest accessibility gains are observed in the three Baltic States, most often also in the NUTS 3 regions situated at their internal EU borders, and in larger parts of Romania and Bulgaria as well as in Greece. For the latter three countries, also accessibility gains occur in some of their NUTS 3 border regions either situated at the internal EU borders (BG-RO, RO-HU) or at Greek external EU-borders with neighbouring countries of the Balkans. More substantial but comparatively lower accessibility gains also occur in Spain (north-west and southern Spain) and in Poland, with both of these countries also showing an improving accessibility in several NUTS 3 border regions with neighbouring EU-Member States (esp. ES-PT, PL-CZ).

Map 5.11: Potential accessibility to population multimodal, relative change 2001 – 2011



Source:
ESPON (2012a), Annex Volume 1, p.10

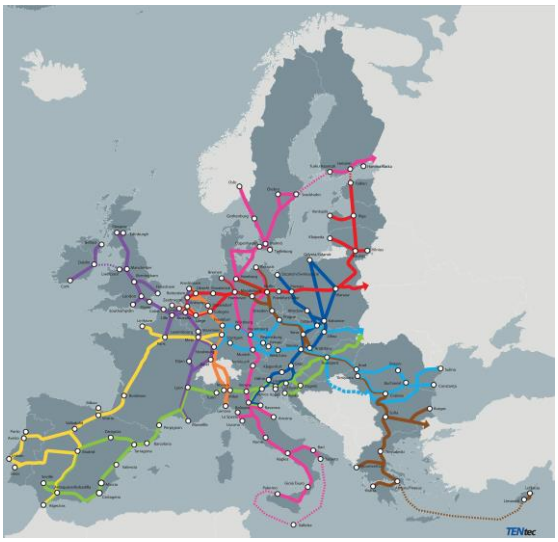
[215] ESPON (2012a), Annex Volume 1, p.8
[216] ESPON (2012a), Annex Volume 1, p.8

Outlook beyond 2014

For the medium-term future up to 2020, a strong increase of EU-support for transport infrastructures under the new Connecting Europe Facility (CEF) was decided: the total amount triples from € 8 billion in the period 2007-2013 to € 26 billion in the period 2014-2020.[217]

This is the largest single amount of EU funding ever earmarked for transport infrastructure and represents the most radical shift in EU transport infrastructure policy since its inception in the 1980s. The funding will be concentrated along nine major transport corridors (**see: Figure 5.4**) which, taken together, will form a core transport network and act as the economic life-blood of the Single Market. The funding will remove bottlenecks, revolutionise East West connections and streamline cross border transport operations for businesses and citizens throughout the EU. The new core network of the EU to be established by 2030 will

Figure 5.4: TEN-T Core Network Corridors



- connect 94 main European ports with rail and road links,
- connect 38 key airports with rail connections into major cities,
- upgrade further 15,000 km of railway line to high speed,
- deliver 35 cross-border projects to reduce bottlenecks.

For the first tranche of the new funding for transport to be made available, the European Commission has already invited the Member States on September 2014 to propose projects to use € 11.9 billion of EU funding to improve European transport connections.[218]

Still, it remains to be seen if this substantial investment programme will stimulate a more balanced socio-economic development of regions and also territorial cohesion in the EU28. Ever since the launching of the EU's TEN-T development programme back in the 1990s there had been critical voices which argued (…) *that many of the new connections fail to link peripheral countries to the core and instead strengthen the ties between central regions, reinforcing their accessibility advantage.* (…) Other analysts pointed out that (…) *it has yet to be ascertained that the reduction of barriers between regions has disadvantaged peripheral regions. From a theoretical point of view, both equalising and polarising can occur. A new motorway or high-speed rail connection between a peripheral and a central region, for instance, makes it easier for producers in the peripheral region to market their products in large cities; however, it may also expose the region to the competition of more advanced products from the centre and so endanger formerly secure regional monopolies. These issues have received new attention through the enlargements of the European Union in 2004 and 2007 and the recent economic crisis.*[219]

This dual opinion also emerges from the evidence of recent ESPON research on transport accessibility. While there is broad agreement that more accessible regions are more competitive

[217] http://ec.europa.eu/transport/themes/infrastructure/news/corridors_en.htm
[218] The funding will be attributed to the most competitive projects. The projects will receive EU funds but must be co-financed by Member States.
[219] ESPON (2012a), Annex Volume 1, p.11; also: Spiekermann/Wegener (2006), p.15

and economically successful, research results also suggest that the empirical relationship (…) *between transport infrastructure and economic development has become more complex than ever. There are successful regions in the European core confirming the theoretical expectation that location matters. However, there are also centrally located regions suffering from industrial decline and high unemployment. On the other side of the spectrum the poorest regions, as theory would predict, are at the periphery, but there are also prosperous peripheral regions such as the Scandinavian countries. To make things even more difficult, some of the economically fastest growing regions are among the most peripheral ones.*[220] To explain how these peripheral and more sparsely populated regions created their economic welfare, other research results point to the example of regions in the Nordic countries: they have overcome their peripheral position (…) *by capitalising on current strengths in relation to ICT, research, educational and environmental opportunities and less on improving their accessibility.*[221]

Moreover, ESPON research also points to a number of trends that are likely to diminish the positive impact that transport infrastructure investments will have on regional development through the assumed improvement of locational qualities and accessibility.[222] At the same time, however, also other trends are mentioned which tend to affirm the importance of transport infrastructure investments (**see: Box 5.1**).

Box 5.1:
Future trends influencing the impact of transport infrastructure on regional development

Trends likely to diminish the impact of transport infrastructure:
- An increased proportion of international freight comprises high-value goods for which transport cost is much less than for low-value bulk products. For modern industries the quality of transport services has replaced transport cost as the most important factor.
- Transport infrastructure improvements which reduce the variability of travel times, increase travel speeds or allow flexibility in scheduling are becoming more important for improving the competitiveness of service and manufacturing industries and are therefore valued more highly in locational decisions than changes resulting only in cost reductions.
- Telecommunications have reduced the need for some freight transports and person trips but they also increase the demand for transport by their ability to create new markets.
- With the shift from heavy-industry manufacturing to high-tech industries and services other less tangible location factors have come to the fore and have at least partly displaced traditional ones. These new location factors include factors related to leisure, culture, image and environment, i.e. quality of life, and factors related to access to information and specialised high-level services and the institutional and political environment.

Trends likely to increase the impact of transport infrastructure:
- The introduction of totally new, superior levels of transport such as the high-speed rail system create new locational advantages, but also disadvantages for regions not served by the new networks.
- Another factor adding to the importance of transport is the general increase in the volume of goods movements (due to changes in logistics such as just-in-time delivery) and travel (due to growing affluence and leisure time).
- In the future rising energy prices and the need to reduce greenhouse gas emission of transport may increase the importance of transport cost for regional development.

Source: ESPON (2012a), pp.1,2

[220] ESPON (2012b), p.59; see also: Spiekermann/Wegener (2006), p.16
[221] ESPON (2009), p.21
[222] i.e. the quality of transport infrastructure in terms of capacity, connectivity, travel speeds etc. determines the quality of locations relative to other locations, with results in a competitive advantage of locations being usually measured as accessibility.

5.2. Achieving an environmentally responsible transport system through promoting sustainable mobility

The previous section of this study has shown that transport plays an essential role for the socio-economic development of countries and regions, as it allows people to commute and travel and companies to trade and deliver goods. However, the EU's transport system is not yet sustainable.

Growing transport activities lead to rising energy consumption and put more and more pressure on natural resources and on society across the EU. Transport produces GHG emissions which negatively affect the climate and generates air pollution which harms building surfaces and the biosphere and leads to human health problems. Transport infrastructures fragment landscapes and ecosystems on a large scale and intense transport activities cause noise and time losses due to congestion as well as fatal accidents or injuries. All these adverse effects have impacts at different scales, ranging from global to local. Therefore, long-term development trends will now be analysed for those aspects relating to sustainable mobility which have a significant territorial dimension.

There is not yet a generally agreed definition for sustainable mobility, but one can take as first reference points the 2001 conclusions of the Gothenburg European Council[223] and especially the overall objective for sustainable transport as set out by the renewed EU Sustainable Development Strategy (EU SDS) of 2006: sustainable transport should "*ensure that our transport systems meet society's economic, social and environmental needs whilst minimising their undesirable impacts on the economy, society and the environment*". The overall scope for the required action to achieve this overall objective of the EU SDS is defined by eight operational objectives and targets **(see: Box 5.2).**

Box 5.2: Operational objectives and targets for sustainable transport in the renewed EU Sustainable Development Strategy

(1) Decoupling economic growth and the demand for transport with the aim of reducing environmental impacts.
(2) Achieving sustainable levels of transport energy use and reducing transport greenhouse gas emissions.
(3) Reducing pollutant emissions from transport to levels that minimise effects on human health and/or the environment.
(4) Achieving a balanced shift towards environment friendly transport modes to bring about a sustainable transport and mobility system.
(5) Reducing transport noise both at source and through mitigation measures to ensure overall exposure levels minimise impacts on health.
(6) Modernising the EU framework for public passenger transport services to encourage better efficiency and performance by 2010.
(7) In line with the EU strategy on CO2 emissions from light duty vehicles, the average new car fleet should achieve CO2 emissions of 140g/km (2008/09) and 120g/km (2012).
(8) Halving road transport deaths by 2010 compared with 2000.

Source: European Commission, Eurostat (2013a), p.201

[223] Point 29: *A sustainable transport policy should tackle rising volumes of traffic and levels of congestion, noise and pollution and encourage the use of environment-friendly modes of transport as well as the full internalisation of social and environmental costs. Action is needed to bring about a significant decoupling of transport growth and GDP growth, in particular by a shift from road to rail, water and public passenger transport.* (…).

A glance on transport energy consumption and climate impact

The most recent monitoring report of Eurostat on sustainable development indicates that there is **not yet a clear sing for an absolute decoupling of transport energy consumption from economic growth** and also that the **negative impacts of transport still have to be further reduced.** Energy consumption of transport per unit of GDP has fallen by 8.3 % since 2000 and transport energy use increased at a lower level (6.7% in overall terms between 2000 and 2011) than the EU-economy was growing in the same period (16.5 %). This implies at least a relative decoupling of energy consumption of transport from economic growth in the EU in this period.[224] But it is uncertain whether the absolute decoupling observed in 2010 and 2011[225] will be an ongoing trend or merely a consequence of the economic crisis. Road transport accounted for 82.4% of transport energy consumption in the EU27 in 2011, followed by international aviation with 12.3%. Since 2000 no substantial shift between the shares of the different transport modes has been visible.[226]

Transport was in 2012 among the three sectors being responsible for close to 70% of all **GHG emissions in the EU28,** ranging second with a share of 19.7% after the energy industries sector (31%) and before the manufacturing, construction and industrial processes sector (18.8%).[227] GHG emissions from the transport sector increased by 26% between 1990 and the peak year 2007, but emissions then fell by 6.0% until 2011. If both decades are compared to each other, one can notice that transport-related GHG emissions grew strongly by 17.5% during the 1990s and only by 1.1% between 2000 and 2011, with this slower growth being mostly a result of the economic downturn at the end of that decade.[228]

If transport modes are looked at one-by-one, it clearly appears that **the main driver behind all transport-related GHG emissions is road transport (see: Figure 5.5):** in 2012 this mode was responsible for close to 72% of all GHG emissions from the transport sector, but its overall share has slightly decreased since 1990 (75%). For some other modes the shares in all GHG emissions also decreased (rail) or remained stable (navigation) between 1990 and 2012, but for civil aviation one can notice a considerable increase from 8.7% in 1990 to 12.8% in 2012.

Figure 5.5: GHG Emissions from transport – EU-28, by mode (share %), including international bunkers

	TOTAL CIVIL AVIATION	Civil Aviation (domestic) (*)	International Bunkers – Aviation	ROAD TRANSPORTATION	RAILWAYS (***)	TOTAL NAVIGATION	Navigation (domestic) (*)	International Bunkers – Maritime Transport	OTHER TRANSPORTATION (****)	TOTAL TRANSPORT (*****)	TOTAL EMISSIONS (**)
1990	8.7	16.9	83.1	75.0	1.4	13.8	17.2	82.8	1.0	16.6	100
1995	9.8	14.4	85.6	75.5	1.0	12.8	16.5	83.5	0.8	19.0	100
1997	10.2	15.2	84.8	74.5	0.9	13.6	15.0	85.0	0.7	20.1	100
1998	10.5	14.7	85.3	74.2	0.9	13.7	15.0	85.0	0.7	20.9	100
1999	11.1	14.8	85.2	74.4	0.8	12.9	15.2	84.8	0.8	21.7	100
2000	11.6	14.4	85.6	73.6	0.8	13.2	13.2	86.8	0.8	21.8	100
2001	11.3	14.2	85.8	73.7	0.7	13.6	12.8	87.2	0.8	21.9	100
2002	10.9	14.0	86.0	73.9	0.7	13.7	12.4	87.6	0.8	22.3	100
2003	11.0	13.3	86.7	73.7	0.7	13.9	12.5	87.5	0.7	22.2	100
2004	11.5	12.9	87.1	72.9	0.7	14.2	12.0	88.0	0.8	22.8	100
2005	11.9	12.6	87.4	71.9	0.6	14.8	11.2	88.8	0.8	23.2	100
2006	12.2	12.2	87.8	71.1	0.6	15.2	10.8	89.2	0.8	23.6	100
2007	12.4	12.0	88.0	71.1	0.6	15.2	10.2	89.8	0.8	24.1	100
2008	12.6	11.7	88.3	70.7	0.6	15.3	9.8	90.2	0.8	24.2	100
2009	12.2	11.7	88.3	71.9	0.6	14.6	10.7	89.3	0.8	25.0	100
2010	12.2	11.6	88.4	72.1	0.6	14.3	11.0	89.0	0.8	24.3	100
2011	12.5	11.0	89.0	71.5	0.6	14.6	9.8	90.2	0.8	25.0	100
2012	12.8	10.7	89.3	71.9	0.6	13.9	10.6	89.4	0.8	24.3	100

Notes: (*) Excluding International Bunkers (international traffic departing from the EU); (**) Including International Bunkers but excluding LULUCF; (***) Excluding indirect emissions from electricity consumption; (****) Combustion emissions from all remaining transport activities including pipeline transportation, ground activities in airports and harbours, and off-road activities; (*****) Total transport share in total emissions.
Source: European Commission, Eurostat (2014c), p.131

[224] i.e. growth of both transport energy consumption and GDP, but with the latter growing stronger.
[225] i.e. reduction in transport energy consumption while the economy is growing.
[226] European Commission, Eurostat (2013a), p.202
[227] European Commission, Eurostat (2014c), p.125
[228] European Commission, Eurostat (2013a), p.209

A still non-sustainable pattern of modal split

Most recent Eurostat data of 2012 estimate total goods transport activities in the EU28 to have amounted to 3,768 billion tkm, with intra-EU road and sea transport activities being with respectively 44.9% and 37.2% of this total the first and second most important transport modes. Total passenger transport activities in the EU28 by any motorised means of transport are estimated to have amounted to 6,391 billion pkm or on average around 12,652 km per person in 2012 and passenger cars alone accounted for 72.2% of this total.[229]

Between 1995 and 2012, however, no substantial change towards a more sustainable pattern of modal split for **freight and passenger transport** is observed across the EU.

The overall pattern of **modal split in freight transport (see: Figure 5.6) remained more or less the same** in the period 1995-2012. Road transportation continues to be the most important mode for freight transport and has even further increased its overall share from 42% in 1995 to 44.9% in 2012. Rail, as the second most important terrestrial mode for freight transport, saw its share decreasing from 12.6% in 1995 down to 10.8% in 2012.

Figure 5.6: Evolution of modal split in freight transport between 1995 and 2012 (EU28, in %)

	ROAD	RAIL	INLAND WATER-WAYS	PIPE-LINES	SEA	AIR
1995	42.0	12.6	4.0	3.7	37.6	0.1
1998	42.7	11.9	4.0	3.8	37.5	0.1
1999	43.4	11.4	3.8	3.7	37.7	0.1
2000	43.3	11.5	3.8	3.6	37.7	0.1
2001	43.9	10.9	3.7	3.8	37.7	0.1
2002	44.5	10.6	3.7	3.6	37.6	0.1
2003	44.5	10.7	3.4	3.6	37.8	0.1
2004	45.1	10.8	3.5	3.4	37.0	0.1
2005	45.4	10.5	3.5	3.5	37.1	0.1
2006	45.4	10.7	3.4	3.3	37.1	0.1
2007	45.8	10.8	3.5	3.1	36.7	0.1
2008	45.9	10.8	3.5	3.1	36.6	0.1
2009	46.4	9.9	3.6	3.3	36.7	0.1
2010	45.7	10.2	4.0	3.2	36.9	0.1
2011	45.4	11.0	3.7	3.1	36.8	0.1
2012	44.9	10.8	4.0	3.0	37.2	0.1

Notes: Air and Sea: only domestic and intra-EU-28 transport; provisional estimates. Road: national and international haulage by vehicles registered in the EU28.

For the **modal split in passenger transport (see: Figure 5.7),** however, the evolution between 1995 and 2012 **shows a less sustainable trend.** Passenger cars remain by far the most important means of transport and this mode saw only a very minor decrease (-1%) in its overall share during the reference period. Buses and coaches, being still the second most important mode in 1995 (9.4%), saw their overall share drop down to 8.2% in 2012 and then ranked only at a third place. Conversely, air passenger transport within the EU saw a significant increase of its share, from 6.5% in 1995 to 9% in 2012. It nowadays has become the second most important mode for passenger transport.

Figure 5.7: Evolution of modal split in passenger transport between 1995 and 2012 (EU28, in %)

	PASSEN-GER CARS	P2W	BUS & COACH	RAILWAY	TRAM & METRO	AIR	SEA
1995	73.3	2.2	9.4	6.5	1.3	6.5	0.8
1997	73.3	2.2	9.1	6.3	1.3	7.0	0.8
1998	73.4	2.2	9.0	6.2	1.3	7.2	0.8
1999	73.5	2.2	8.8	6.1	1.3	7.3	0.7
2000	73.0	1.8	9.2	6.2	1.3	7.7	0.7
2001	73.5	1.8	9.0	6.2	1.3	7.5	0.7
2002	74.0	1.9	8.9	6.0	1.3	7.3	0.7
2003	74.0	1.9	8.8	5.9	1.3	7.5	0.7
2004	73.8	1.9	8.6	5.9	1.3	7.9	0.7
2005	73.0	2.0	8.6	6.0	1.3	8.4	0.7
2006	72.8	1.9	8.4	6.1	1.3	8.7	0.7
2007	72.6	1.8	8.5	6.1	1.4	8.9	0.7
2008	72.4	1.9	8.5	6.4	1.4	8.7	0.7
2009	73.5	1.9	8.2	6.2	1.4	8.1	0.7
2010	73.4	1.9	8.2	6.3	1.4	8.2	0.6
2011	72.5	1.9	8.2	6.4	1.4	8.9	0.6
2012	72.2	2.0	8.2	6.5	1.5	9.0	0.6

Notes: Air and Sea: only domestic and intra-EU-28 transport; provisional estimates. P2W: Powered two-wheelers.

Source (Figures 5.6 & 5.7): European Commission, Eurostat (2014c), pp.36, 46

Within the EU Member States, a shift towards road transport has been recorded between 2001 and 2011, especially in the newer Member States. The highest increases in the shares of road

[229] European Commission, Eurostat (2014c), p.19

freight transport were observed in Slovakia (23%), Poland (18%), Estonia (17%) and Bulgaria (13%). In contrast, eleven Member States presented a shift towards more environmentally friendly transport modes, most notably Belgium and Austria.[230]

The domination of road transport for both passenger and freight transport puts strong pressure on the entire EU road network and causes a variety of negative effects along the most frequented road transport axes and at the key nodal points where different axes meet.

This becomes evident in **the Alps and Pyrenees (see: Figure 5.8),** where the fragile mountainous environment and the population living close to the main road transit axes are particularly affected. For all Alpine main road transport axes together, one could observe a continuous growth and a more than doubling of road freight volumes between 1985 (30 million tons) to 2007 (73 million tons). Then, volumes sharply dropped between the crisis years 2008 and 2009 and stabilised at a level comparable to that of 2001 (63 million tons) in the years 2010-2012. While some axes observed a reduction in the number of transiting heavy goods vehicles between 1999 and 2012 (CH: St. Gotthard; FR: Montgenèvre-Fréjus-Mont-Blanc), others faced an increase in the same period albeit with annual variations (CH: Simplon, Gr. St. Bernard, St. Bernardino; AT: Brenner, Reschen). Also in the Pyrenees, a continuous increase in the number of freight transport vehicles crossing the mountains every day on various road axes is observed especially between 1997 and 2004. Then, some years of stagnation are observed (2005-2008) and finally a certain drop occurred in the years after the crisis. The bulk of road freight transit flows occur on the west and east coast crossings, which also holds true for the passenger car traffic that has seen a huge increase from 77.400 vehicles per day in 1997 to around 120.000 vehicles in 2011.

Figure 5.8: Road freight and road passenger flows in the Alps and Pyrenees

Road:
ALPS CROSSING FREIGHT TRAFFIC

ALPINE ARC: MONTGENÈVRE TO BRENNER

MILLION TONNES

	Switzerland		Austria	France	
	St. Gotthard	Simplon Gr. St. Bernard St. Bernardino	Brenner Reschen	Montgenèvre Fréjus Mont-Blanc	TOTAL
1985	1.9	0.8	15.0	12.3	30.0
1990	3.1	1.1	14.6	21.8	40.6
1995	5.5	1.1	21.0	25.8	53.4
1997	6.0	1.0	21.3	25.3	53.6
1998	6.5	1.2	23.9	26.3	57.9
1999	7.0	1.4	26.4	27.3	62.1
2000	7.6	1.3	26.6	27.2	62.7
2001	7.4	3.0	26.3	27.2	63.9
2002	7.5	3.0	*27.3*	*26.3*	64.1
2003	9.2	2.4	28.7	25.8	66.1
2004	9.9	2.6	33.5	22.3	68.3
2005	10.2	2.8	33.6	20.8	67.4
2006	10.0	2.9	36.1	22.3	71.3
2007	10.9	3.3	36.4	22.4	73.0
2008	10.8	3.3	35.1	21.5	70.7
2009	10.2	3.2	27.0	18.5	58.9
2010	10.8	3.5	28.7	20.2	63.2
2011	10.6	3.8	29.3	20.7	64.4
2012	10.0	3.6	30.5	19.5	63.6
AVERAGE ANNUAL CHANGE					
'85/'00	9.7 %	3.3 %	3.9 %	5.4 %	5.0 %
'00/'12	2.3 %	8.9 %	1.1 %	– 2.7 %	0.1 %
'11/'12	– 5.7 %	– 5.3 %	4.1 %	– 5.8 %	– 1.2 %

Note: France: Montgenèvre: from 1999 onwards.

NUMBER OF HEAVY GOODS VEHICLES (1 000)

	Switzerland		Austria	France	
	St. Gotthard	Simplon Gr. St. Bernard St. Bernardino	Brenner Reschen	Montgenèvre Fréjus Mont-Blanc	TOTAL
1999	1 101	216	1 639	1 674	4 630
2000	1 187	217	1 653	1 672	4 729
2003	1 004	287	1 775	1 572	4 638
2004	969	286	2 118	1 515	4 888
2005	925	279	2 121	1 435	4 760
2006	856	326	2 268	1 529	4 979
2007	963	299	2 277	1 531	5 070
2008	973	302	2 200	1 474	4 949
2009	900	280	1 842	1 253	4 275
2010	943	313	1 947	1 356	4 559
2011	927	332	1 980	1 389	4 628
2012	886	322	2 058	1 307	4 573

Road:
PYRENEES CROSSING TRAFFIC

GOODS TRAFFIC

VEHICLES PER DAY

	West coast Irun Biriatou	East coast La Jonquera Le Perthus	Other crossings	TOTAL
1997	5 657	6 729	880	13 266
1998	6 447	7 413	905	14 765
1999	6 914	8 018	914	15 846
2000	8 224	8 200	1 519	17 943
2001	8 806	8 050	1 172	18 028
2002	8 864	8 535	1 505	18 904
2003	9 276	8 920	1 758	19 954
2004	10 655	9 302	1 875	21 832
2005	9 970	9 243	1 825	21 038
2006	10 390	9 602	1 939	21 931
2008	10 670	9 484	1 334	21 488
2009	9 712	8 610	1 367	19 688
2011	9 414	8 945	1 044	19 402

PASSENGER CAR TRAFFIC

VEHICLES PER DAY

	West coast Irun Biriatou	East coast La Jonquera Le Perthus	Other crossings	TOTAL
1997	30 200	19 400	27 800	77 400
1998	30 230	20 601	33 168	83 999
1999	33 188	20 678	33 412	87 278
2000	40 923	24 390	31 962	97 275
2001	41 847	25 201	34 096	101 144
2002	41 812	28 544	37 654	108 010
2003	44 165	29 201	41 267	114 633
2004	45 041	30 923	41 196	117 160
2005	47 142	31 896	42 465	121 503
2006	47 172	32 180	43 228	122 580
2008	47 266	30 847	41 924	120 037
2009	47 907	31 465	42 452	121 823
2011	48 787	30 900	40 508	120 194

Note: 2007, 2010 not available.

Source: European Commission, Eurostat (2014c), pp.70-71

[230] European Commission, Eurostat (2013b), p.111

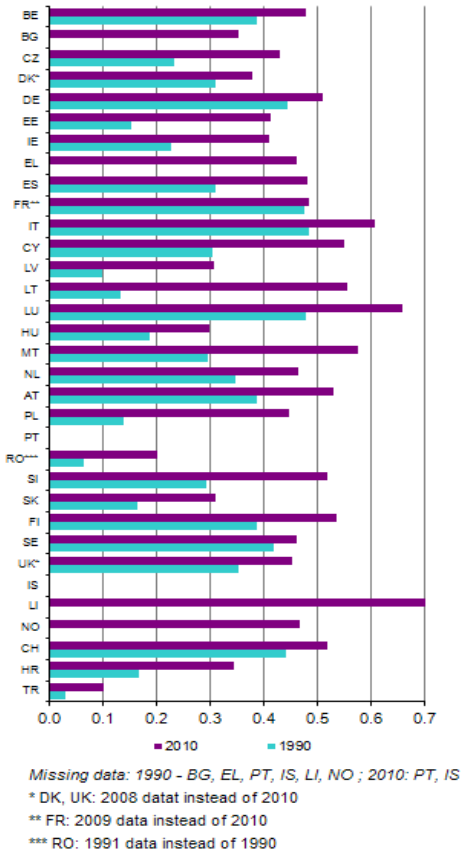
Evolution and territorial trends of individual car use

Individual car use provides access to work and essential services (e.g. education, health and shops) or to cultural, social and leisure activities. At the same time, however, individual car use leads to pollution and noise which harm human health, produces waste, uses large amounts of energy and causes accidents. Furthermore, individual cars use increases needs for adequate transport infrastructures (e.g. highways, roads, parking lots, etc.), which leads to land sealing and ecosystem fragmentation.[231] An approximation to the territorial dimension of individual car use can be obtained by taking a look at both the equipment side and the performance side.

The equipment side is well reflected by the **"motorisation rate"[232],** but it should be remembered that this indicator (…) *only measures car ownership* (…) and that it also (…) *makes no distinction between the types of vehicles, e.g. cars with "green technologies".*[233]

In a **long-term perspective** (**see: Figure 5.9**), one can observe that in nearby all EU Member States for which data is available, **national motorisation rates have often considerably increased between 1990 and 2010.** Romania registered the second highest average annual growth over the period among the EU27 Member States (+6.3% between 1991 and 2010), after Lithuania (+7.4%). At the opposite end of the scale, France was the country where the number of passenger cars per inhabitant remained the most stable over the period considered, with an average annual growth of 0.1% only. Sweden (+0.5%) and Germany (+0.7%) were the only other countries recording average annual growth between 1990 and 2010 of less than 1%. In general, the Eastern and Central Member States, as well as Turkey and Croatia have registered stronger growths over the period 1990-2010 than West European countries.[234]

Figure 5.9: Number of passenger cars per inhabitant, 1990 and 2010



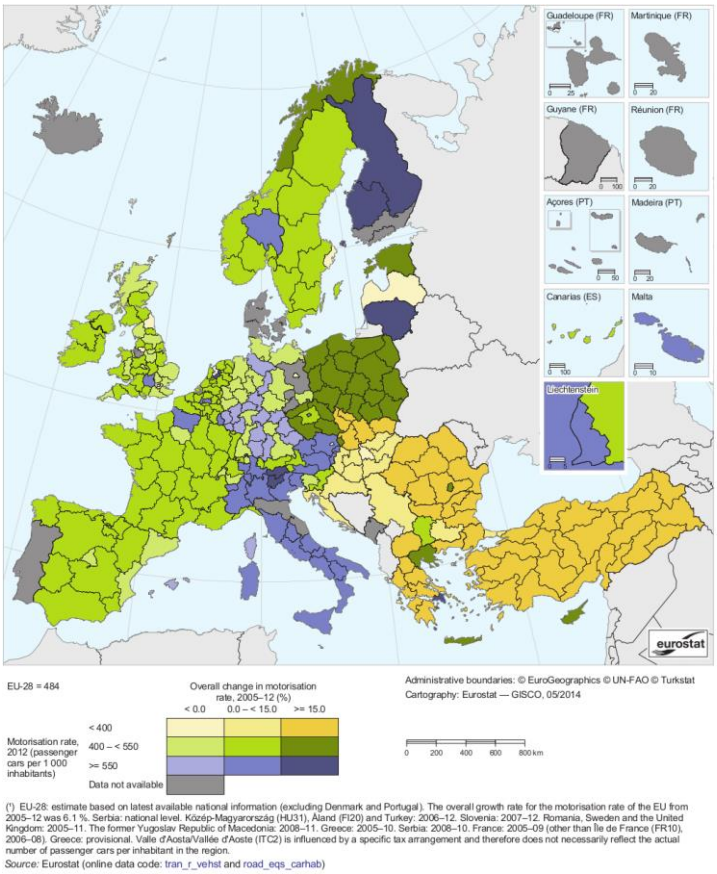
Source: Eurostat (2014b), p.3

However, these national-level figures of the long-term EU-wide evolution hide country-internal differences as well as other interesting trends in the 12 Member States that joined the EU in 2004 and 2007 (i.e. EU12) and in the 15 "old" EU Member States. They can be unveiled by taking a look at the **change of regional motorisation rates in the period 2005-2012** (**see: Map 5.12**).[235]

[231] Office for National Statistics of the United Kingdom (2014), p.24
[232] The motorisation rate is calculated as the number of passenger cars per inhabitant.
[233] Office for National Statistics of the United Kingdom (2014), p.24
[234] Eurostat (2014b), pp.5-6
[235] If not otherwise indicated, the following information was mainly drawn from: European Commission, Eurostat (2014a), pp.1-5

The development in the EU12 shows that the east-west differences in motorisation rates have narrowed rapidly. All 16 NUTS 2 regions across Poland saw their respective motorisation rates increase by more than 40% during this seven-year period and also in Slovakia gains of more than 30% were recorded for each region. High double-digit growth rates were also apparent in Romania (esp. the Nord-Est region with an increase by 57.4%), in all of the Czech regions (the lowest increase being recorded for the capital region of Praha), for all but one of the Bulgarian regions (except capital region of Yugozapaden) and for two Hungarian regions (Közép-Dunántúl and Nyugat-Dunántúl).

Map 5.12: Motorisation rates by NUTS 2 regions, 2005–2012 (*)



(*) EU-28: estimate based on latest available national information (excluding Denmark and Portugal). The overall growth rate for the motorisation rate of the EU from 2005–12 was 6.1 %. Serbia: national level. Közép-Magyarország (HU31), Åland (FI20) and Turkey: 2006–12. Slovenia: 2007–12. Romania, Sweden and the United Kingdom: 2005–11. The former Yugoslav Republic of Macedonia: 2008–11. Greece: 2005–10. Serbia: 2008–10. France: 2005–09 (other than Île de France (FR10), 2006–08). Greece: provisional. Valle d'Aosta/Vallée d'Aoste (ITC2) is influenced by a specific tax arrangement and therefore does not necessarily reflect the actual number of passenger cars per inhabitant in the region.

Source: Eurostat (online data code: tran_r_vehst and road_eqs_carhab)

(*) number of passenger cars per 1000 inhabitants in 2012, % overall change in motorisation rate from 2005–2012.

Source: Eurostat (2014a), p.2

At a country-wide level, also Estonia and Lithuania recorded double-digit growth rates. Only the capital regions of Hungary and Slovenia as well as Latvia as a whole (a single region at this level of analysis) registered a fall in their motorisation.

In the EU15, however, the growth in motorisation rates was geographically much more focussed and often also characterised by decline. The fastest growth in motorisation rates was recorded in regions of Italy, Greece, Finland and the Netherlands, whereas motorisation rates declined in many regions of Germany (systematically across all regions for which data are available) and the United Kingdom. Some of the largest declines were recorded in large cities and conurbations, such as Hamburg, Inner London, Greater Manchester, Berlin and Köln. Other regions that registered a fall in their motorisation rates included the capital regions of Belgium, France, Sweden, Spain, and Austria as well as four other Spanish regions (including the Comunidad Valenciana and Cataluña) and the French island of Corse.

For the **most recent situation in 2012,** data from Eurostat indicates that 484 passenger cars per thousand inhabitants were registered across the EU-28 (excluding information for Denmark and Portugal) and that for regional motorisation rates **a clear east-west divide was prevailing in the EU.**

A high reliance on passenger cars was noticed **across much of Italy, Austria, Germany** (several regions from the south and the west of Germany) **and Luxembourg,** but also in case of

many island regions in the EU[236] where relatively high figures may be explained by a lack of alternative modes of transport for inland travel (i.e. most of these islands had relatively underdeveloped rail infrastructures or no rail services at all). The highest regional motorisation rates are observed in the Valle d'Aosta in northern Italy which was almost 2.5 times as high as the EU-28 average (i.e. 1 205 passenger cars per thousand inhabitants)[237], followed by the Dutch region of Flevoland (816 passenger cars per thousand inhabitants) and then by the island region of Åland in Finland (733) and the Provincia Autonoma di Trento (711) in northern Italy.

Capital regions of the EU15 Member States in western and northern Europe are often characterised by low motorisation rates. Capital regions that registered average motorisation rates lower than the EU-28 average were the Inner London (7th lowest motorisation rate across NUTS 2 regions), Berlin (Germany), Hovedstaden (Denmark), Stockholm (Sweden), Wien (Austria), Noord-Holland (the Netherlands), Île de France (France), Southern and Eastern (Ireland) and the Région de Bruxelles-Capitale / Brussels Hoofdstedelijk Gewest (Belgium). This low motorisation is probably linked to congestion and to a stronger preference given to the use of public transport means. The only capital regions which appeared among the 20 regions with the highest motorisation rates were those of Lazio (Italy), Attiki (Greece; data are for 2010) and Luxembourg, with averages in the range of 650–700 passenger cars per thousand inhabitants in 2012.

Many regions adjacent to capital regions or large cities have relatively high motorisation rates. This can mainly be explained by a large numbers of people commuting to work to the neighbouring urban centres. Examples are the regions of Flevoland in the Netherlands, Niederösterreich in Austria, Berkshire, Buckinghamshire and Oxfordshire in the United Kingdom and Trier in Germany (from where many commuters cross the border to work in Luxembourg).

Especially the latter two aspects confirm and continue a trend that was already observed in several major capital city areas during the late 1980s and 1990s (e.g. Paris, Madrid, Lisbon, Greater London): car ownership was generally lower in these densely populated cities and especially at the heart of the metropolitan areas if compared their wider surroundings, although for the latter one could still notice sometimes high motorisation growth rates (**see: Figure 5.10**).[238]

Figure 510: Car ownership rate (cars per 1000 population) in Paris, Madrid, Lisbon and the UK and evolution

		Car Ownership Rate (96 & 97)	Trend (Paris : 97/83 ; Madrid : 96/87 ; Lisbon : 98/73 ; London : 97/81)
Paris	Paris City	310	+7%
	Metropolitan area	440	+16%
Madrid	Madrid City	290	+27%
	Metropolitan area	322	+40%
Lisbon	Lisbon City	272	+17%
	Metropolitan area	327	+92%
UK	London Metropolitan area	333	+18%
	Other UK cities	356	+52%

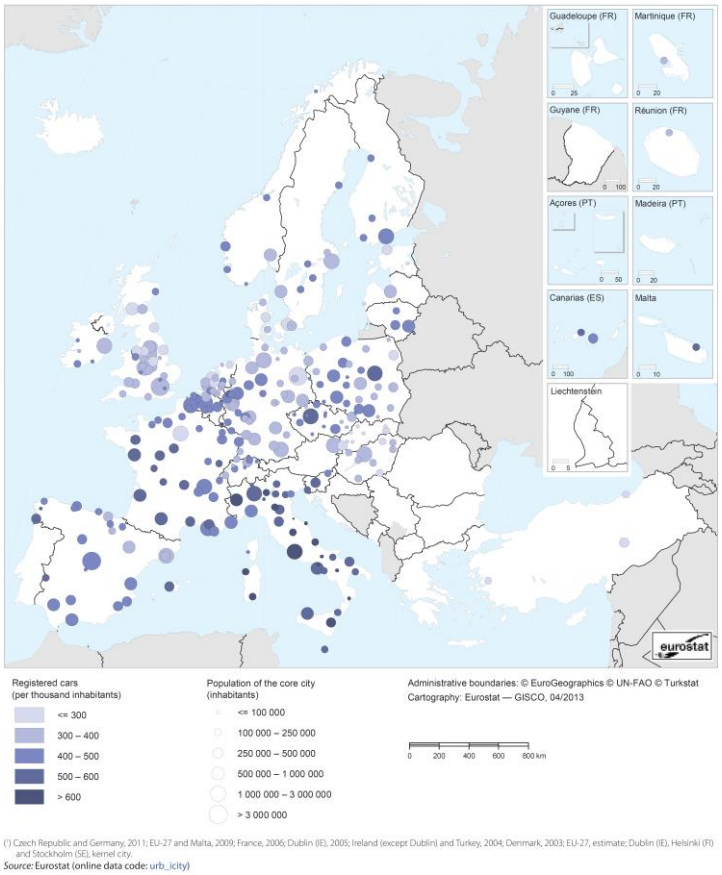
Source: EMTA (2000), p.7

For the general situation of individual **motorisation within European cities (see: Map 5.13),** 2008 figures from the urban audit **suggest that the use of cars remains very common especially in many Italian cities but also in Luxembourg, even when other modes of transport are used extensively.**

[236] Relatively high motorisation rates were reported for Åland in Finland, Sicilia and Sardegna in Italy, Corse in France, the Illes Balears in Spain, and Malta.
[237] This figure is influenced by a specific tax arrangement and therefore does not necessarily reflect the actual number of passenger cars per inhabitant in the region.
[238] EMTA (2000), p.6

Out of the 272 EU cities examined, 15 had motorisation rates exceeding 600 registered cars per thousand inhabitants. All except one (i.e. Luxembourg) of these cities were found in Italy and the highest motorisation rates are observed in Potenza (709) and Roma (708). *By contrast, 27 cities had motorisation rates of 300 registered cars per thousand inhabitants or less: eight of these were in Slovakia, six in the United Kingdom, three in the Netherlands and the remaining 10 spread across Denmark, Germany, Estonia, France, Latvia, Hungary and Poland. Among these 27 cities were the capital cities of Denmark, Germany, Estonia, France, the Netherlands and Slovakia.*[239]

Map 5.13: Number of registered cars per thousand inhabitants in the Urban Audit core cities, 2008



Source: European Commission, Eurostat (2013c), p.210

If we now turn our look at the **performance side of individual car use,** which is actually the main source of the caused environmental damage, then we can only draw up a picture at a country-wide level on ground of the most recent Eurostat data for the EU28 **(see: Annex 6)**.[240]

Individual car use is since decades by far the most important mode for passenger transport in the EU28: the volume of passenger-kilometres (pkm) travelled by car steadily increased between 1995 (3,937 billion pkm) and 2010 (4,721 billion pkm) and then only fell slightly in 2011 and 2012 to 4,613 billion pkm. Member States in which the car is used most are obviously those with the largest population: Germany, France Italy and the UK accounted alone for around 63% of all passenger-kilometres travelled in the EU28 in 2012. In their case the passenger-kilometre volumes either continuously increased between 1995 and 2012 (DE, FR) or they increased until 2005 (UK) or even 2010 (IT), but then sharply dropped (IT in 2011 & 2012) or stabilized at a lower level (UK in 2010-2012) most likely due to crisis. Also another five Member States have higher car travel volumes (i.e. ES, BE, NL, PL, SE) and accounted for 19% of all passenger-kilometres travelled in the EU28 in 2012. Some of these countries saw a continuous increase of car travel volumes between 1995 and 2012 (BE, SE, PL), while in others the volumes increased up to 2005 (NL) or 2012 (ES) and then either sharply dropped in 2011 and 2012 (ES) or stabilized at a slightly lower level with annual variations (NL).

[239] European Commission, Eurostat (2013c), p.208

[240] It should be highlighted that the data published by Eurostat in 2014 represents a considerable improvement to the situation of previous years. In 2013, for example, country-wide figures on the evolution of passenger transport by cars (i.e. passenger-km) were available for just 14 out of the 28 EU Member States and this most often only for some years of the reference period.

Evolution and territorial trends of public transport use

Public transport is of course a much more sustainable alternative to individual car use, because occupancy rates of buses and trams or trains are much higher than those of individual cars used for the same journey. However, the actual use of public transport depends very much upon the general offer of public transport services and in particular on the quality of the services offered. The latter aspect encompasses many factors (e.g. frequency and speed of services, quality of passenger information provided, comfort, tidiness and good organisation of waiting areas, convenience of interchange, stability of networks over time, communication about supply etc.), which altogether should create a better or equivalent opportunity for individual mobility and flexibility that is able to replace the choice of using cars. Also here, the territorial dimension of public transport can be approached by taking a look at three dimensions: the availability, the performance and the quality of public transport.

(1) For **the availability of public transport means**, a largely complementary dual pattern appears across the EU territory. The equipment level with road-bound public transport vehicles is in general higher in the EU-periphery where the rail network density is relatively low (and vice versa) and there are also larger areas where both elements are quite strongly developed (i.e. LU, UK, western PL, CZ, SK, HU). Noteworthy exceptions to these patterns are found in larger parts of Spain, Portugal and Croatia where the density of both elements is rather low.

For the **equipment with road-bound public transport vehicles** (i.e. motor coaches, buses and trolleybuses), most recent Eurostat data indicates that in the EU28 there were on average 1.7 public transport passenger vehicles on the road for each thousand inhabitants at the end of 2012.[241] **At the regional level,** however, **one can observe** significant variations and also **a relatively clear difference between regions in the western EU Member States and those in more central and eastern Member States (see: Map 5.14).**

- Eight NUTS 2 regions reported equipment rates for public transport passenger vehicles of at least 4.0 per thousand inhabitants. The highest rates were recorded in Malta (4.7 public transport passenger vehicles per thousand inhabitants) and Cyprus where no rail services exist, but also in Lithuania. A further five regions with equipment rates of at least 4.0 included the capital region of Bucuresti–Ilfov, the Greek island region of Ionia Nisia and three relatively remote regions of the United Kingdom (the Highlands and Islands; North Eastern Scotland; Cumbria).
- Of the 46 regions in the EU-28 with fewer than 1.0 public transport vehicles per thousand inhabitants, all except two were located within EU15 Member States. These exceptions were Podkarpackie in south-east Poland and Vzhodna Slovenija (eastern Slovenia). The lowest concentration of public transport services ran in a band from the Netherlands, through Germany and into Austria, while low rates were also recorded in several Spanish regions.

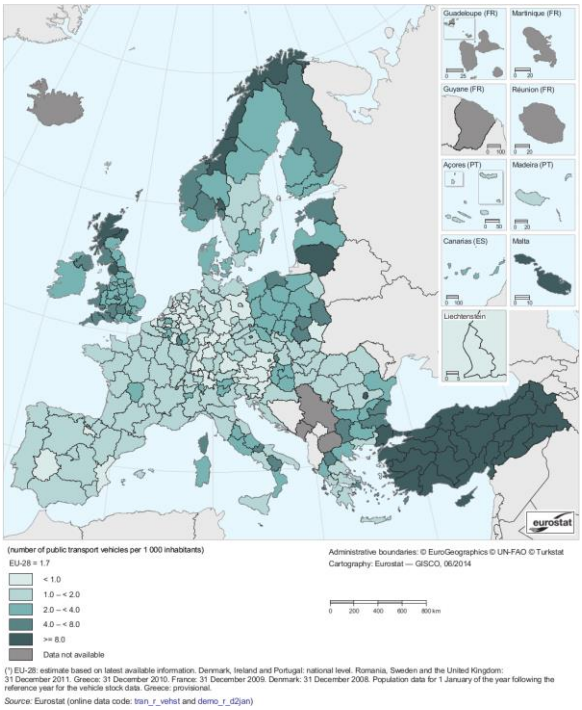
As regards the **endowment with rail transport infrastructure[242],** general figures from Eurostat[243] show that between 2006 and 2011 only nine Member States have further increased their railways networks[244] and that the county-level density of railway lines is high in the

[241] European Commission, Eurostat (2014a), pp.6-7
[242] This infrastructure serves not only rail-bound passenger transport, but also freight transportation.
[243] European Commission, Eurostat (2013b), p.139
[244] The highest increase was recorded in Italy (76%). In contrast, the highest decrease was recorded in the network of Latvia (–21%). In absolute terms, the highest increase was also recorded in the network of Italy (+ 12 330 km); while the highest decrease was observed in the network of France (– 1 419 km).

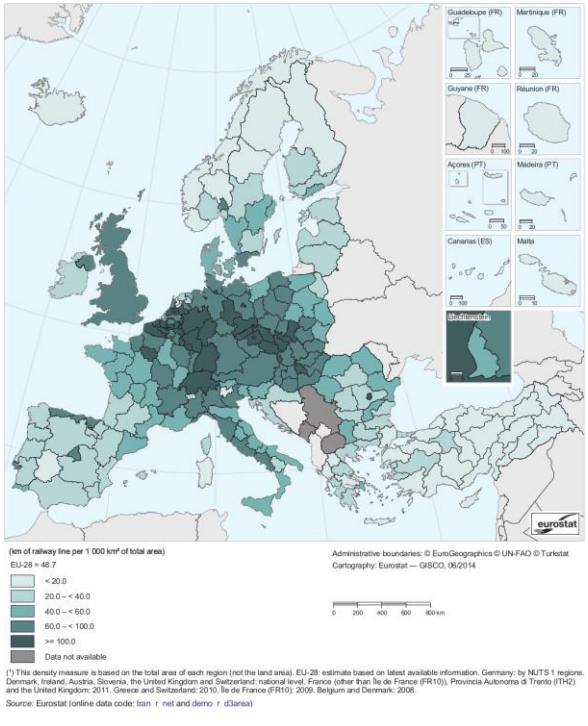
western and central parts of the EU,[245] but much lower in its peripheral parts. This divide re-appears when looking at the most recent regional-level figures for 2012,[246] which also reveal some noteworthy territorial features **(see: Map 5.15)**:

- The EU railway network concentrates on regions in the western-central part of the EU which have some of the highest population densities. Most of the regions with more than 100 km of railway lines per thousand km^2 of their total area are located in a band running from the Benelux countries into Germany, which then splits into two branches with one running south into Switzerland and the other running east into Poland, Hungary, the Czech Republic and Slovakia. The highest network densities were recorded in the capital regions of Germany, Belgium and the Czech Republic, followed by the city-state regions of Hamburg and Bremen.[247] The regions with the next densest rail networks were Severozápad in the north-west of the Czech Republic and the former industrial heartlands of the Province Hainaut in Belgium and Slaskie in Poland.
- In the peripheral areas of the EU, rail network density was considerably lower. Only the capital regions in Portugal, Spain and Romania as well as some northern Spanish regions (Asturias, Cantabria, Basque Country) have network densities between 60 and 100 km of railway lines per thousand km^2.

Map 5.14: Equipment rate for public transport vehicles (motor coaches, buses and trolleybuses), by NUTS 2 regions, 31 December 2012



Map 5.15: Density of rail networks, by NUTS 2 regions, 2012



Source: European Commission, Eurostat (2014a), pp.10, 16

[245] The highest network densities are recorded in the Czech Republic (124 km/1 000 km2), Belgium (118), Luxembourg (106) and Germany (106). In 2011, the largest railways networks were recorded in Germany (41 846 km), France (29 655), Italy (28 567) and Poland (20 113).

[246] European Commission, Eurostat (2014a), pp.17-18

[247] While these cities have traditionally had an extensive railway infrastructure due to their roles as capital cities or ports, the strikingly high values are to a large extent due to the small size of these regions within the NUTS classification combined with the fact that the density of urban infrastructure tends to be much higher than the density of inter-urban networks.

(2) The performance of public transport in the EU28 can again only be analysed at the national-level by using most recent data from Eurostat. This will be done by looking at the long-term evolution and current status of passenger-kilometre volumes that are recorded for the three main modes of public transport **(see: Annex 6):**

The use of road-bound public transport (buses & coaches) increased in the EU28 between 1995 (503.5 billion pkm) **and 2005** (548.8 billion pkm), **but then fell with slight variations until 2012** (525.7 billion pkm). The Member State where buses and coaches were used most in 2012 is Italy (102.8 billion pkm or 19.5% of the EU28 total). Five other countries also have higher levels of bus and coach use (i.e. UK, DE, ES, FR, PL). They accounted together for 47.4% of all passenger-kilometres travelled in the EU28 in 2012. For these six countries one can observe rather different evolutions between 1990 and 2012: passenger-kilometre volumes often steadily increased (IT, ES, FR) or remained relatively stable with annual variations (UK). In some other cases, however, a continuous decrease (DE) or a highly variable development over the entire period with a slight overall decrease in the end (PL) is observed. In most of the new EU Member States (except PL), interestingly, one can often observe that a sharp drop of road-bound public transport use (i.e. BG, EE, HR, LV, LT, RO, SI, SK) or a still significant reduction (i.e. CZ, HU) had taken place between 1990 and 2012. Only in Malta and Cyprus, bus and coach use either remained stable (MT) or recorded a slight increase in this time-period (CY).

The use of tram and metro in the EU28 increased continuously between 1995 (71.9 billion pkm) **and 2012** (94.1 billion pkm), **even after the 2008 crisis.** Member States where tram and metro were used most widely in 2012 are Germany, France and the UK, followed by a number of other countries with clearly lower but still significant volumes of passenger-kilometres travelled by tram and metro (i.e. CZ, RO, IT, ES). These seven countries account together for 77% of all passenger-kilometres travelled in the EU28 in 2012. Between 1995 and 2012, the country-level pkm-volumes either continuously increased (UK, RO, IT, FR, CZ) or showed only in recent years a slight decrease (2011/2012: ES, DE).

The use of rail in the EU28 first decreased between 1990 (404.1 billion pkm) **and 2000** (372 billion pkm), **but then started to increase again until 2012** (418.4 billion pkm). Around 65% of the total 2012 pkm-volume was delivered by rail under a public service obligation (PSO).[248] The highest PSO shares are observed in Ireland, Greece and Luxembourg (each at 100%) and a number of other countries (>90%: CZ, DK, EE, HU, NL, RO, SI, SK, UK), while the lowest PSO-shares existed in France (38.5%), Finland (43.8%) and Sweden (46.5%). The Member States where rail was used most widely in 2012 are Germany, France, the UK and Italy. They accounted together for around 68% of all passenger-kilometres travelled in the EU28. A further six countries had clearly lower but still significant pkm-volumes (i.e. BE, ES, NL, AT, PL, SE) and accounted together for 21.7% of all EU28 passenger-kilometres travelled by rail in 2012. In these ten countries, one can observe quite different evolutions between 1990 and 2012. In most countries the pkm-volumes either increased during the entire period (DE, FR, SE, UK) or increased and only experienced a slight reduction in 2011 or 2012 (BE, ES). In some other countries, however, the pkm-volumes showed a variable development over the entire period with a clearly higher level in the end (NL, AT), or first increased and then started to decrease (IT since 2005) or sharply decreased during the entire period (PL).

[248] Public Service Obligation means a requirement defined or determined by a competent authority in order to ensure public passenger transport services in the general interest that an operator, if it were considering its own commercial interests, would not assume or would not assume to the same extent or under the same conditions without reward.

(3) The **quality of public transport services and the role of other ways of moving (e.g. walking, cycling)** can be assessed on ground of national-level data from an Eurobarometer survey and of city-level data from an Urban Audit survey **(see: Annex 7)**.

An Eurobarometer survey of 2010 shows that **the propensity to use motorised public transport on a daily basis** was above the EU27 average (22%) in 15 Member States, with the highest levels being observed in the Czech Republic (37%), Latvia (36%) and in Hungary (35%). In the other 12 Member States, however, this preference was below or even considerably below the average (e.g. lowest in CY 5% and between 10-15% in SI, NL, DK, FI, IE and DE). **Also non-motorised individual transport was important in several countries,** as a third of the respondents in Bulgaria, Slovakia, Latvia, Romania and the Netherlands (32%-34%) said that they mainly got around on a daily basis by walking or cycling. In the Netherlands, interviewees who used a bicycle as their main means of transport largely outnumbered those who said that they usually walked (31% "cycling" vs. 3% "walking); in the other four countries, most respondents said that they usually walked (e.g. Latvia: 25%" walking" vs. 8% "cycling").[249]

As regards **the quality of public transport services in European cities**, one can get a good impression from a recent urban audit survey which covered 69 cities across the EU. In 13 of these cities, more than four fifths of respondents indicated their satisfaction with public transport services. These included two cities in each of France, Austria, Finland and Sweden, as well as one city each in Germany, Spain, Luxembourg, the Netherlands and Slovenia. The highest levels of satisfaction were found in the Finnish city of Oulu / Uleåborg and the Swedish city of Malmö where 90% of respondents were very or rather satisfied. Less than half of the respondents were satisfied with public transport services in nine of the EU cities surveyed, including three Italian cities, two Greek cities, and one city each in Bulgaria, Germany, Lithuania and Romania: five of these were capital cities, namely Sofia (Bulgaria), Athina (Greece), Roma (Italy), Vilnius (Lithuania) and Bucureşti (Romania). The lowest satisfaction was recorded in Napoli (Italy), where just over one fifth of respondents expressed their satisfaction with public transport services, which is around half the proportion that were not at all satisfied.[250]

Traffic congestion in urban areas and on major transport axes

Traffic congestion on roads causes enormous cost in the EU which is estimated at around € 120 billion or some 2% of GDP, but also a broad variety of other negative effects.[251] Congestion and its associated negative effects manifest in particular within and around the densely populated major urban areas of the EU and also on the main European transport axes.

Intelligent transport systems (ITS) are important tools for preventing and alleviating road congestion and thus help to ensure more sustainable mobility within the EU. ITS apply

[249] European Commission, Eurobarometer (2011), pp. 7-8: Note that virtually all respondents ranked motorised individual transport by car as their main mode of transport.
[250] European Commission, Eurostat (2013c), p.208
[251] Delays which result in late arrival of motorists and passengers for employment, meetings and education. Inability to forecast travel time accurately lead drivers to allocate more time to travel "just in case". Wasted fuel, increasing air pollution and CO2 emissions due to increased idling, acceleration and braking. Wear and tear on vehicles due to idling in traffic and frequent acceleration or braking which leads to more frequent repairs and replacements. Stressed and frustrated motorists, encouraging road rage and reduced health of motorists. Blocked traffic hindering the passage of emergency vehicles travelling to their destinations where they are urgently needed. Traffic deviating from congested main arteries to secondary roads and side streets as alternative routes which then also negatively affects areas aside the congested arteries.

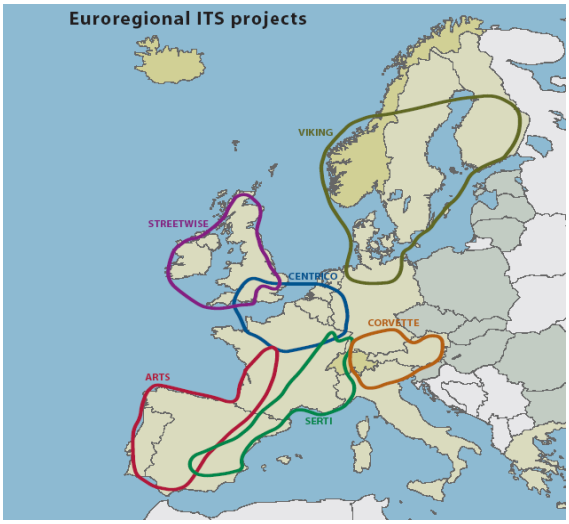
information and communication technologies to transport[252] and include the introduction of demand management, tolling systems, IT monitoring or control and information systems. ITS for road transport, the so-called road telematics, have been developed for more than 20 years and some applications are now widespread and well-known.[253]

In order **to act on urban road congestion**, most of the larger European cities and also many medium-sized towns have already deployed a variety of intelligent transport telematics applications (i.e. real-time road-user information; improved parking management; ITS-based enhancement of public transport; ITS for traffic and congestion monitoring and management systems integrated with traffic control centres etc.). Experience from the EU-funded CIVITAS project[254] shows that such applications generate significant efficiency benefits for both public and private transport, especially if they are backed up with demand management measures in the city context (e.g. access restrictions, road pricing, parking policies and marketing campaigns etc.). Urban areas and cities usually act individually in order to find the right responses that are adapted to their specific circumstances. But in several of the cross-border metropolitan areas of Europe which have high levels of daily commuter flows, mutual coordination and cooperation across national borders might be required in the field of urban transport telematics applications.

In order **to achieve less congested and more sustainable transportation on major European road axes,** it was quite early recognised that more systematic Community-level action is needed to overcome the still fragmented patchwork of regional and national road traffic management systems that are in place throughout Europe.

First concrete steps in this direction were already made in the 1990s through individual projects with limited coordination that were funded from the funded in the context of the TEN-T Multiannual Programme. In the years of the new millennium, the TEMPO programme (2001-2006)[255] supported a more harmonised cross-country deployment of ITS on the Trans-European Road network in the context of six so-called "Euro-regional projects" (**see: Figure 5.11**). TEMPO installed a border-crossing road monitoring infrastructure (i.e. with road monitoring equipment to collect basic traffic and road condition data), established a European network of traffic control centres

Figure 5.11: "Euro-regional projects" of TEMPO



[252] Computers, electronics, satellites and sensors are playing an increasingly important role in transport systems and the main innovation is the integration of existing technologies to create new services. ITS as such are instruments that can be used for different purposes under different conditions. They can be applied in every transport mode (road, rail, air, water) and services can be used by both passenger and freight transport.

[253] http://ec.europa.eu/transport/themes/its/index_en.htm

[254] CIVITAS has helped introduce numerous innovations and measures that have already made transport more eco-friendly in over 60 European metropolitan areas dubbed 'demonstration cities'. CIVITAS started in early 2002 within the 5th European Community Framework Programme and was continued under the follower framework programmes. Over the last ten years, CIVITAS has managed to test over 800 measures and urban transport solutions, supported by the intensive exchange of good practices in the field. The project empowered citizens to convince politicians on adopting these innovations, upgrading the quality and sustainability of urban transport for numerous European cities.

[255] TEMPO supported studies and a number of "Euro-regional projects" with € 192 million from the TEN-T Multiannual Programme, which have triggered a total investment in ITS of € 1.2 billion € in the six-year period.

with advanced data communication, developed and implemented traffic management plans for the larger regions covered and set up the Traffic Message Channel (RDS-TMC) at a large scale. After the 2004 EU-enlargement, a seventh project called "CONNECT" was started which covered Slovenia, Hungary, the Czech Republic, Slovakia, Poland, eastern Austria and the east of Germany.[256]

Despite these improvements and efforts, however, **traffic congestion remains a major challenge across Europe and recent trends do not indicate a lasting reduction.** A lively picture of congestion in cities across Europe can be obtained from the 2013 annual report on the "TOMTOM European Congestion Index". It indicates that around half of the cities with congestion levels above or equal to the European-wide average were located in North West Europe.[257]

Moreover, while drawing on seven years of data, the "INRIX National Traffic Scorecard Annual Report" for 2013[258] points to a worrying trend in Europe. After 7 years of modest congestion due to the economic recession, it is observed for 2013 that congestion is on its way back and that traffic is particularly worst in areas and specific locations where congestion levels remained elevated even at the deepest depths of the recession.

Countries and metropolitan areas **(see: Table 5.1)** experiencing economic growth and employment generally recorded increases in traffic congestion, whereas economies still struggling with high unemployment and low or negative growth in 2013 typically recorded lower traffic congestion than in 2012. Congestion attracts more congestion, because the 2013 data illustrate clearly that the corridors where traffic typically breaks down are the first to feel the increases in demand that comes with a growing economy. Should growth continue, it is expected that those congested corridors will get longer in length, have delays more hours of each day, and see slower traffic while being congested.

Table 5.1: INRIX ranking of metropolitan areas for hours wasted in congestion (annual change 2013-2012)

2013 Rank	2012 Rank	Metropolitan Area	Hours Wasted in 2013	Annual Change in Hours
1	1	Bruxelles	83	No change
2	3	London Commmuter Zone	81	9
3	2	Antwerp	77	1
4	4	Rotterdam	63	-8
5	5	Stuttgart	60	-5
6	9	Köln	56	-2
7	13	Milano	55	5
8	6	Paris	55	-8
9	10	Gent	54	1
10	15	Karlsruhe	52	4
11	8	Amsterdam	50	-9
12	11	s Gravenhage	49	-3
13	14	Dusseldorf	48	-2
14	12	Hamburg	48	-2
15	7	Utrecht	48	-12
16	19	Gr. Manchester	45	1
17	18	Munchen	44	No change
18	17	Lyon	43	-3
19	22	Grenoble	41	1
20	20	Charleroi	41	-1
21	16	Bordeaux	41	-5
22	23	Ruhrgebiet	40	No change
23	21	Toulouse	39	-1
24	24	Merseyside	38	1
25	25	S. Nottinghamshire	38	2

Source: INRIX, http://www.inrix.com/scorecard/key-findings-us/

Evolution and territorial trends for road accidents

Europe's roads are busier than ever, with today around 44% of the goods transported on roads and 70% of passengers on the roads travelling in cars. Increased road mobility comes along at a high price, with thousands of lives lost each year on Europe's roads and even many more persons injured in road accidents.

[256] http://ec.europa.eu/transport/themes/its/road/deployment_en.htm.
[257] TomTom International BV (2013)
[258] http://www.inrix.com/scorecard/key-findings-us/

Between 1990 and 2012, however, **the absolute number of road fatalities has continuously decreased in the EU28,** from 77,337 in 1990 to 57,082 (2000) and then to 30,686 (2010) and finally down to 28,126 in 2012.[259] Despite this marked long-term improvement, the latest figure for people killed in road accidents is still considerably higher than all fatalities in rail and air transport taken together and represents an annual loss in human lives that was equivalent to the size of a medium town. Moreover, if the ambitious goal set in the European Road Safety Action Programme 2001–2010 is considered (i.e. to halve fatalities between 2001 and 2010), one has to observe that the reduction from 54,000 fatalities in 2001 to 31,456 fatalities in 2010 did not allow to meet this goal in reality. Therefore, still significant efforts are needed to attain the 2020 goal of fewer than 15,500 fatalities and even more has to be done to reach the new goal formulated for 2050 in the 2011 Transport White Paper (i.e. to reduce fatalities to close to zero).[260] However, these general figures hide a considerable variation in the relative risk of fatal road accidents or of injuries in road accidents that exists between the EU Member States and also between their regions.

As regards **fatal road accidents at a country-wide level in the EU28[261],** one can observe the strongest decreases in absolute numbers of road fatalities have taken place between 2001 and 2012 in Latvia (68.3%), Spain (65.5%), Denmark (61.3%) and Ireland (60.7%). But also in a number of other countries, the decreases are situated clearly above the EU28 average of 48.8% (i.e. > 50% and < 60%: EE, FR, LT, LU, HU, PT, SI, SK, SE). The lowest decrease is observed Romania (16.7%), but also low decreases are observed in Malta (31.3%), Poland (35.5%) and Croatia (39.7%). For the most recent situation in 2012, one observes the highest numbers in road fatalities per million inhabitants in Romania and Lithuania with 102 and 101 respectively. But also a number of other countries are significantly above the EU28 average of 56, most of which are new Member States (i.e. > 70: CZ, BG, LV, HR, EL, PL). On the opposite, the lowest numbers of road fatalities per million inhabitants are observed in Malta (26) and in the UK (28), but also in Denmark (30) and Sweden (30).

If the most recent data available on **regional-level road fatalities (see: Map 5.16)** is considered and also interpreted alongside more general context settings, then **a largely bi-polar situation appears in the EU:[262]**

- **Road fatalities rates are in general low in particular around major cities and in other urbanised areas** which combine high traffic volumes, a high motorway density, a higher proportion of public transport or other modes and a high quality of emergency and healthcare systems. This is the case **especially in many northern and western European regions in Scandinavia, Germany, the Netherlands, the UK and Ireland.** Around major cities and transport hubs (e.g. seaports), high traffic volumes cause congestion, which reduces average speeds and, therefore, also the likelihood of fatalities when accidents occur. Also the quality of the road network is high in these urbanised areas. In particular the dense motorways, being in general much safer than secondary roads, contribute to keeping the number of road fatalities relatively low, despite high total traffic volumes. Also speed limits in highly urbanised regions and within cities as well as close-by emergency services and hospitals can explain a relatively low number of fatal road accidents, although road accidents are in general more frequent in city traffic.

[259] European Commission, Eurostat (2014c), p.102
[260] European Commission, Eurostat (2013a), pp.14-15 ; European Commission, Eurostat (2014c), p.102
[261] European Commission, Eurostat (2014c), p.102
[262] European Commission, Eurostat (2014d), p.2

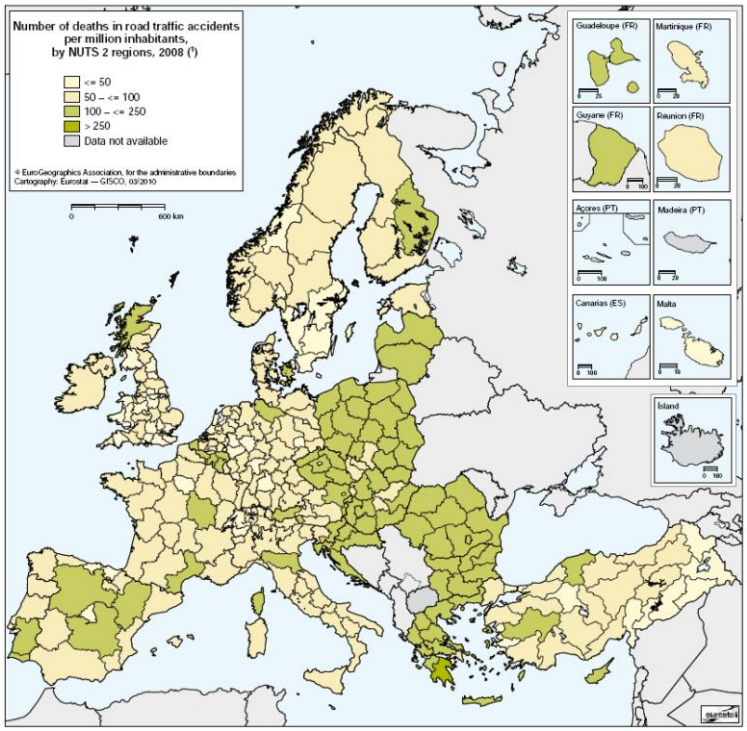
- **Fatality rates are high in regions with low motorway density,** such as all of Romania, Hungary and the Czech Republic except their capitals, the whole of Bulgaria, Poland, the Baltic Member States, some of the eastern federal states of Germany and many rural areas in France and Spain. Also physical geography might be another reason for explaining the differences in per-inhabitant fatality levels in those areas, because driving in mountainous regions like the Alps, the Pyrenees and the Carpathians is often more dangerous than in flat areas. The higher number of accidents and fatalities is in some of these regions also due to the presence of a high volume of tourist traffic that adds to local traffic and, hence, tends to increase the number of accidents.

If one looks at the EU-wide situation for persons injured in road accidents in 2012 (see: Map 5.17), a nearby opposite territorial picture appears which is in stark contrast to the above-described situation for only road fatalities. [263]

- The highest injury ratios are observed in 16 NUTS 2 regions, where at least 6.0 persons per thousand inhabitants were harmed in road accidents. These regions included all but two of the Austrian regions (the exceptions were the capital region of Wien and the relatively flat easternmost region of Burgenland) and other regions generally spread across Belgium, Germany and Italy. In the latter three countries, we also find the majority of those regions where still between 4.0 and 6.0 persons per thousand inhabitants were injured in road accidents.
- By contrast, there were 32 regions in the EU where less than 1.0 person was injured in road accidents per thousand inhabitants. These regions are most often found in the Netherlands (i.e. all regions having low ratios of persons injured in road accidents) and in France (esp. in the north and east), but to some extent also in Denmark and Poland or Spain.

[263] European Commission, Eurostat (2014a), pp.9, 11

Map 5.16: Number of deaths in road traffic accidents per million inhabitants, by NUTS 2 regions, 2008

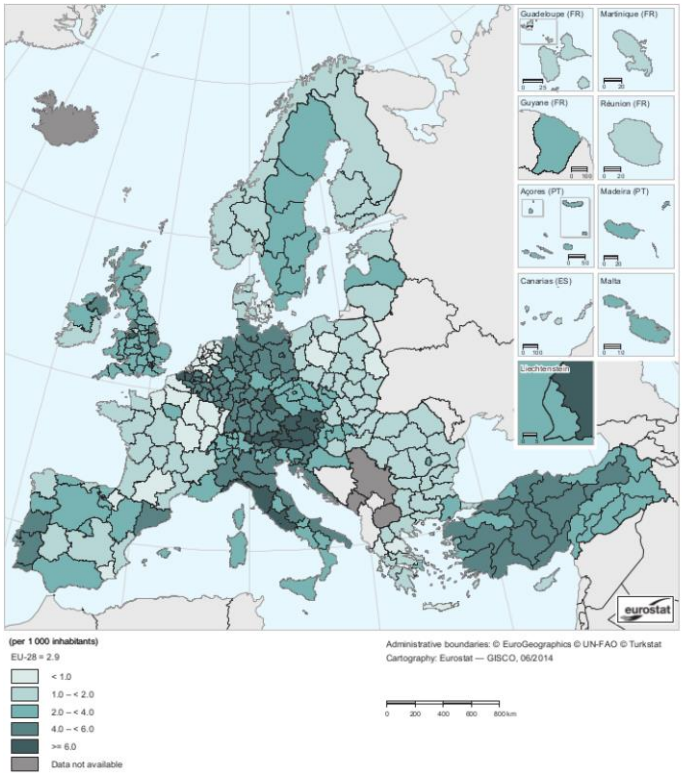


(1) Ireland, national level.

Source: Eurostat (tran_r_acci).

Source; European Commission, Eurostat (2014d), p.1

Map 5.17: Persons injured in road accidents, by NUTS 2 regions in 2012 (per 1 000 inhabitants)



(1) EU-28: estimate based on latest available information. France (other than the départements d'outre mer (FR9)): 2011. Greece and the départements d'outre mer (FR9): 2010. Denmark and the Netherlands: 2008. Greece: provisional.

Source: Eurostat (online data code: tran_r_acci and demo_r_d2jan)

Source: European Commission, Eurostat (2014a), p.10

6. INTERREG and ETC investments in the fields of environment, climate change, regional accessibility and sustainable mobility

Carrying out a long-term analysis on INTERREG and ETC investments[264] that is focused on the themes environment, climate change, accessibility and sustainable mobility was very challenging, mainly because of a number of problems that existed with respect to the general availability and the specific nature or the uniformity of financial data.

First, the sources with detailed financial data on the periods 1990-1993 and 1994-1999 are very scarce and the availability of information only becomes better for the time after 2000. However, as regards the most important publicly available EU-wide sources (i.e. Annual Reports on the Structural Funds & technical annexes), we observe that the way or level of detail in the reporting on INTERREG- and ETC-programme expenditure varies considerably, even for the most recent years. Sometimes there is only short or country-wise reporting, but very seldom there is detailed programme-level reporting within an aggregated INTERREG- or ETC-wide context.

Second, the data to be used by a financial analysis should ideally always be the data that reflects the end-status of a given programming period (i.e. the actually paid expenditure). This data should in principle exist for the periods 1990-1993, 1994-1999 and 2000-2006, but not yet for the period 2007-2013. However, due to the observed reporting weaknesses, such final expenditure data is not publicly available. What is more frequently available is data on the initial "earmarking" of support (i.e. planned allocation of Community assistance in general and at programme-level) and also information on the proportion of support committed in a specific year or over a certain time-period (i.e. commitment rates). The latter information was used by our analysis if it reflected a status relatively close to the end of a given programming period.

Third, considerable problems emerged when it came to finding and exploiting aggregated financial expenditure data that directly relates to the specific topics addressed by our analysis. Sufficiently differentiated data was very scarce for the periods 1990-1993 and 1994-1999, but more thematically differentiated data was already available for the periods 2000-2006 and 2007-2013. This is because financial data was allocated from 2000 onwards to the thematic "fields of intervention" that are defined by the European Commission at various levels of detail (i.e. one digit, two digit and three digit). However, especially in the period 2000-2006, the practical use of these fields of intervention by INTERREG programmes was very arbitrary and expenditure was not always "booked" into the right thematic categories.[265] Moreover, between the periods 2000-2006 and 2007-2013, many of these fields of intervention were changing their definition which creates difficulties in establishing a thematic aggregation of financial data.

Due to all this, we decided to present the now following long-term financial analysis at the level of individual programming periods and not separately for each of the addressed themes.

[264] The term "investments" comprises both (1) expenditure for physical infrastructures and equipment or other tangible assets and (2) expenditure for "soft co-operation" which leads to a variety of non-physical but still tangible outcomes (e.g. establishment of topical cross-border networks, information platforms or clusters, to the design or application of specific policy tools and new techniques or processes and to the joint elaboration of studies, policy concepts or development plans) and also to the less tangible outcomes (i.e. individual and organisational learning effects). This wide view also closely follows the approach adopted by the ex-post evaluation of INTERREG III. See also: Panteia (2010b), p.42

[265] See on observed problems the practical use: Panteia (2010b), pp.97.88, 90

6.1. Cross-border and transnational investments in the programming periods 1990-1993 and 1994-1999

For analysing the programming period 1990-1993, we mainly used official data from hard copy sources in our archives that in nearby all cases are not any longer publicly accessible. Still, they allowed drawing up a relatively accurate overall picture for the general themes "environment" and "transport/communication". For the programming 1994-1999, we exploited the few still publicly accessible sources (i.e. ex-post evaluation, annual reports). To overcome problems as regards the adequacy and thematic differentiation of financial data, we had to carry out estimations for expenditure on the general themes "environment" (where possible also for climate change) and "transport & sustainable mobility".

Cross-border programmes in the period 1990-1993

INTERREG I (1990-1993) focused only on cross-border cooperation and was the largest of the 14 Community Initiatives in the programming period 1989-1993: the total Structural Funds Contribution (SFC) for the 31 approved INTERREG I programmes amounted to ECU 1,034 million in 1992 prices.[266] The initial funding demand from Member States exceeded the budget available to the Commission by over 35%[267] and the ex-post evaluation of INTERREG I pointed out that the originally allocated amount had to be increased in 15 of the 31 programmes (essentially through national contributions).[268]

An "info-pack" published by the Commission's former DG XVI in 1993 provides further information on the breakdown of the total SFC per funding source and theme. Out of the SFC of ECU 1,034 million, a total of ECU 926 million were spent in the areas eligible under the former Structural Funds objectives 1, 2 and 5b and came from the ERDF (824 MECU), the ESF (30 MECU) and the EAGGF Guidance Section (61 MECU). A further ECU 119 million were mobilised under Article 10 of the ERDF-Regulation to support actions in areas that were not eligible under the Structural Funds objectives 1, 2 and 5b. The objective 1 regions – those regions whose GDP per capita was less than 75% of the Community average – accounted for 83% of the SFC.[269] As regards the new German Länder, however, they were not eligible for INTERREG I because a specific Structural Funds support programme was already in place for them up to the end of 1993, from which also some preparatory cross-border actions were supported.[270]

For the main themes of funding (**see: Figure 6.1**), one can see that measures on communication / transport and enterprise development were with 62.4 % the clearly dominant fields of intervention. Also support for measures in the fields of tourism and environment accounted for around 10% each. Between the different programmes, however, huge variations existed with respect to the thematic allocation of the SFC.

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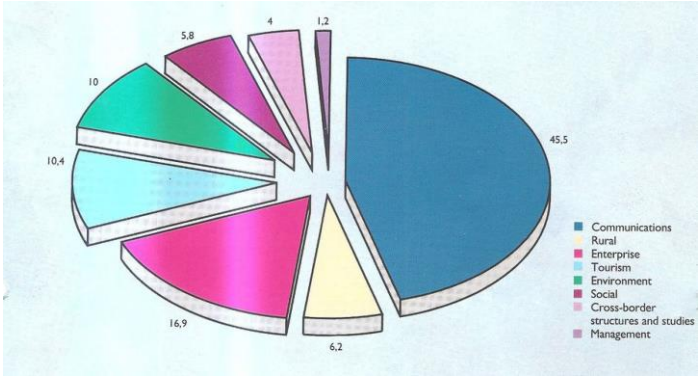
[266] The available publications indicate different amounts for the total Community support: ECU 1,034 million in 1992 prices (European Commission, DG XVI, 1993; AEBR/European Commission, 1995, p.38), ECU 1,014 million from the ERDF, ESF, EAGGF and Article 10 ERDF-Regulation (European Commission, 1993a, p.28) and ECU 1,082 million coming from the ERDF, ESF and EAGGF (INTERACT, 2010, p.6). The differences might partly be explainable by a different use of reference year prices, although only one of these publications clearly indicates the used reference year for prices. Our analysis uses the amount of ECU 1,034 million in 1992 prices, because for this figure the most abundant and coherent information was available at the programme-level.
[267] European Commission, DG XVI (1993)
[268] INTERACT (2010), p.6
[269] European Commission, DG XVI (1993)
[270] European Commission, DG XVI (1995), p.2

Although the figure only reflects the status of the initial programming of the SFC, one can see from later publications that this thematic profile was largely confirmed by the actual INTERREG expenditure towards the end of the first funding phase:[271]

Figure 6.1: Breakdown of the total Structural Funds Contribution (SFC) for INTERREG I by sector of activity



Source: European Commission, DG XVI (1993).

- 45% for transport & communication;
- 28% for business and tourism;
- 11% for training and other activities
- 10% for environment;
- 6% for rural development.

Three quarters of the INTERREG I expenditure went to the former Objective 1 regions and the rest to other border regions. Around 30% of the support was spent at the external EU-borders (esp. Greece with 24%), whereas 55% of the total support for internal EU-borders went to the programme "Spain-Portugal".[272]

Due to the relatively high degree of correspondence between the initial programming and the spending profiles, we will now **estimate the absolute amounts of INTERREG I investments for "environment" (incl. eventual measures on climate change) and "accessibility" (incl. eventual measures on sustainable mobility)** on ground of the initial thematic breakdown per programme (**see: Table 6.1**).

Around 10% of the total SFC for the 31 INTERREG I programmes was dedicated to measures in the field of environment (app. ECU 103 million). More than half of the INTERREG I programmes (i.e. 17) earmarked shares that were significantly above the INTERREG I average and one programme had a share that still came close to this average (i.e. "Denmark-Bornholm"). The programmes that stood out with particularly high shares were "Italy-Slovenia" (62.5%) and "Germany-Luxembourg" (61.2%). An assessment of the funding share that was dedicated to actions in the field of climate change mitigation or adaptation cannot be provided on ground of the available information.

Measures in the field of accessibility accounted for 45.5% of the total SFC (app. ECU 470 million) of the 31 INTERREG I programmes. Only four INTERREG I programmes earmarked shares that were significantly above the INTERREG I average (i.e. "Spain-Portugal", "Greece", "Corsica-Sardinia", "Germany-Denmark"). Especially in the cases of "Spain-Portugal" and "Greece", substantial road-building programmes were carried out (i.e. road construction parallel to the border GR, ES-PT) which sometimes also involved the closure of cross-border missing links (e.g. construction of international bridge in Valenca ES/PT; improved cross-border access

[271] European Commission (1995), Explanatory Memorandum "INTERREG II" Initiative; AEBR/European Commission (1995), p.39
[272] European Commission, DG XVI (1995), pp.2-3

through Guadania bridge ES/PT).[273] Also the two Germany-Netherlands programmes "Rhine-Waal" and "EUREGIO" had shares that came close to this average. The support allowed - among others - to close gaps in the cross-border road network ("EUREGIO") and to explore cooperation potentials among container terminals on both sides of the border ("Rhine-Waal").[274] A further five INTERREG programmes envisaged to dedicate between one fourth to one third of their SFC to transport and communications actions (i.e. "Germany-Bavaria", "DE-NL Rhine-Northern Meuse", "DE-NL Ems-Dollard", "Franche Comté-Switzerland", "France-Spain"). An interesting feature worth to be highlighted is that one third of the INTERREG I programmes did not foresee any expenditure in the field of transport and communications. As regards the latter programmes, however, it should be noted that the "Ireland-UK (Northern Ireland)" programme supported with ECU 12 million from the tourism priority a major infrastructure project linking the inland waterways of the Shannon river system (IE) with the Erne river system (UK).[275]

Table 6.1: Structural Funds Contribution (SFC) for INTERREG I: programme-level and thematic breakdown

Programme	Total cost in MECU and 1992 prices	Total SFC (*) in MECU and 1992 prices	Environment (incl. Climate Change) in % of total SFC (**)	Accessibility (incl. Sustainable Mobility) in % of total SFC (**)
1 Spain-Portugal	592,83	410,82	7.7	76.4
2 Greece	339,49	242,25	0	67.4
3 Ireland-UK (Northern Ireland)	141,42	81,11	15.7	0
4 France-Spain	62,44	31,22	0	30
5 Corsica-Sardinia	43,47	21,63	0	59.7
6 France-Italy	61,80	22,34	5.2	6.3
7 Belgium (West Flanders)-France (Nord Pas-de-Calais)	28,33	13,87	20.6	4.5
8 Belgium (Wallonie)-France (Nord Pas-de-Calais)	32,09	15,86	2.1	0
9 Belgium (Wallonie)-France (Champagne-Ardennes)	14,66	6,51	0	3.3
10 France-Belgium-Luxembourg	50,87	19,37	36.1	0
11 Germany-France-Switzerland	18,89	9,41	28	13.3
12 France-Germany (Pamina)	8,22	3,84	23.9	0
13 France (Lorraine)-Germany	19,66	9,83	0	0
14 France-United Kingdom	53,69	21,98	28.6	7.9
15 France (Rhône Alpes)-Switzerland	6,30	2,12	15.9	0
16 France (Franche Comté)-Switzerland	10,00	3,23	30.3	26.2
17 Belgium-Netherlands (Middengebied)	24,21	11,63	21.8	13.5
18 Belgium-Netherlands (Scheldemond)	9,07	4,06	17.4	20
19 Belgium-Netherlands-Germany (Meuse-Rhine)	49,94	23,48	37.2	14
20 Germany-Netherlands (Ems-Dollard)	32,89	13,07	5.1	27.5
21 Germany-Netherlands (Rhine-Waal)	6,94	3,47	5	40
22 Germany-Netherlands (Rhine-Northern Meuse)	6,94	3,47	18.2	28
23 Germany-Netherlands (Euregio)	26,02	10,99	12.5	44.5
24 Germany-Denmark	11,52	5,76	9.3	53.7
25 Denmark (Bornholm)	7,41	2,13	0	20.4
26 Italy-Slovenia	5,04	2,35	62.5	0
27 Italy-Austria	19,3	4,48	19	0
28 Italy-Switzerland	40,74	9,4	5.4	17.8
29 Germany (Bavaria-CZ-AT)	37,04	15,38	0	32.3
30 Germany-Switzerland (Hochrhein-Bodensee)	4,86	2,42	13.2	0
31 Germany-Luxembourg	9,28	4,62	61.2	0
Total, all 31 programmes	**1775,36**	**1032,1**	**10,00**	**45,50**

(*) The total Community contribution for all 31 programmes was ECU 1,034 million, of which ECU 926 million came from the ERDF, ESF and EAGGF (for areas eligible under the objectives 1, 2 and 5b) and a further ECU 119 million from Article 10 of the ERDF-Regulation (for areas not eligible under the objectives 1, 2 and 5b). The difference in the calculated total for all 31 programmes (i.e. ECU 1.9 million) cannot be explained on ground of the available information.
(**) The percentages were directly taken from the programme fact sheets, as no absolute figures were provided in the source.

Source: Own elaboration on ground of data provided in the programme factsheets of: European Commission, DG XVI (1993).

[273] European Commission, DG XVI (1993); AEBR/European Commission (1995), p.170
[274] AEBR/European Commission (1995), p.170
[275] AEBR/European Commission (1995), p.171

Cross-border programmes in the period 1994-1999

The thematic financial analysis for INTERREG IIA was very challenging, because only two main sources with coherent and mutually corresponding financial data exist for the entire Community Initiative. However, both sources have their limitations which directly affect our analysis. The 11th Annual Report on the Structural Funds[276] indeed provides general and programme-specific financial data for the period 1994-1999, but no theme-specific breakdown of the funding at the level of the individual INTERREG II strands. The ex-post evaluation of INTERREG II has made such a thematic breakdown for Strand-A programmes at the level of four larger intervention categories,[277] but these categories are too broad for our analysis and the breakdown is only indicated in percentages for specific types of programmes.

To overcome these weaknesses, we had to develop a specific estimation approach for determining the committed Structural Funds contribution (CSFC) that went to measures on environment and climate change as well as to measures on accessibility and sustainable mobility. We focused our analysis on the two most relevant intervention categories "improving the quality of life"[278] and "reducing isolation"[279] and applied the estimation approach to each of the three main groups of Strand-A programmes that were defined by the ex-post evaluation, i.e. the programmes covering areas characterised by a low, medium or high degree of isolation (**see: Annexes 8-10**). As the estimation result still comprised funding for other interventions that are not in the focus of our analysis, we also had to eliminate the proportion of Community funding that went to those measures. This was done by reviewing the programme-level assessments that were elaborated under the INTERREG II ex-post evaluation.[280]

The **58 INTERREG IIA programmes** were initially allocated a total SFC of € 2,660 million and at the end of 1999 they have reached with 92% a relatively satisfactory average commitment rate (CR), resulting in a total CSFC of € 2,453 million. The large majority of programmes did not experience significant changes in their strategy contents or their basic financial allocations. Only the four INTERREG IIA programmes "BE-FR (PACTE)", "FR-UK (Nord Pas-de-Calais/Kent)", "Italy-Albania" and "Greece-Italy" experienced absorption problems and carried out substantial re-programming. This also involved substantial shifts in the thematic funding allocation. The Strand-A programmes covered very different borders (i.e. internal & external, land & maritime borders) and the cooperation areas also showed different degrees of isolation (low, medium, high). Both aspects strongly affected the scope and intensity of cross-border functional interactions and also the level of cooperation that was prevailing at the outset (**see: Table 6.2**).

The fields of "environment & climate change" and "accessibility & sustainable mobility" were addressed quite differently by these highly diverse INTERREG IIA programmes and the intervention focus was very much depending on what was perceived to be the main territorial development challenge at the outset of the programming period.

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[276] European Commission, Directorate General for Regional Policy (2000), pp.213-214
[277] LRDP (2003), p.18
[278] The category "improving quality of life" included interventions in the fields of environment and climate change adaptation (cooperation of emergency services), but also other interventions that promoted cross-border health and social services or cross-border cultural relations.
[279] The category "reducing or eliminating isolation" comprised interventions that improved cross-border transport networks, accessibility and sustainable mobility, but also other interventions that improved cross-border energy, telecom or public utilities networks.
[280] An estimation of the proportion used figures indicated in the 11 reports on larger "groups of borders". See: LRDP (2003)

Table 6.2: Programme-level breakdown of Community funding for INTERREG IIA (31.12.1999)

Programme	Type of border covered (*)		Degree of isolation (**)	Financial programming and execution (***)		
				SFC (1995/96) in million € (rounded)	CSFC (1994-1999) in million € (rounded)	CR
1 ES-PT	IB	LB	medium	569	550	97
2 EL (external borders)	EB	LB	high	344	320	93
3 IE-UK (Northern Ireland)	IB	LB	medium	165	163	99
4 EL-IT	IB	MB	high	158	92	58
5 DE-PL-CZ (Saxony)	EB	LB	high	152	152	100
6 ES-Morocco	EB	MB	medium	104	104	100
7 IE-UK (Wales)	IB	MB	medium	85	84	98
8 IT-Albania	EB	MB	high	82	73	89
9 DE-PL (Brandenburg)	EB	LB	high	75	67	90
10 BE-FR (PACTE)	IB	LB	low	74	29	40
11 DE-PL (POMERANIA)	EB	LB	high	65	63	96
12 ES-FR (Pyrénées)	IB	LB	medium	63	60	95
13 FR-IT (Alpes)	IB	LB	medium	58	56	97
14 FR-UK (Nord Pas-de-Calais/Kent)	IB	MB	medium	45	8	17
15 BE-DE-NL (Maas-Rhein)	IB	LB	low	37	37	100
16 FR-UK (Rives Manche)	IB	MB	medium	34	37	109
17 BE-NL (Middengebied)	IB	LB	low	34	36	106
18 FR-IT (Corsica/Sardinia)	IB	MB	medium	35	35	101
19 BE-FR-LU (PED)	IB	LB	low	31	31	100
20 DE-FR-CH (Oberrhein Mitte-Süd)	IB	LB	low	26	24	93
21 DE-AT (Bavaria-Austria)	IB	LB	low	25	26	103
22 DE-FR (Saar-Lor-Westpfalz)	IB	LB	low	25	25	100
23 DE-NL (EUROREGIO)	IB	LB	low	23	23	102
24 DE-NL (Ems-Dollart)	IB	LB	low	23	23	100
25 IT-CH	EB	LB	medium	20	20	100
26 FR-IT (Corsical/Tuscany)	IB	MB	medium	19	19	101
27 BE-FR (West Flanders)	IB	LB	low	18	19	105
28 DE-CZ (Bavaria)	EB	LB	high	17	17	100
29 IT-SI	EB	LB	high	16	16	100
30 DK-SE (Øresund)	IB	MB	medium	14	14	100
31 FI-RU (Karelia)	EB	LB	high	14	14	100
32 BE-FR (Ardennes)	IB	LB	low	13	13	100
33 DE-NL (Rhein-Waal)	IB	LB	low	12	12	101
34 DE-FR (PAMINA)	IB	LB	low	12	12	104
35 IT-AT	IB	LB	medium	12	14	113
36 BE-NL (Scheldemond)	IB	LB	low	12	12	99
37 FI-SE-NO (North Calotte)	IB	LB	medium	11	11	99
38 AT-HU	EB	LB	high	11	12	101
39 DK-DE (Sønderjylland/Schleswig)	IB	LB	low	11	11	100
40 FI-SE-NO-RU (Barents)	EB	LB	high	11	11	99
41 FI-RU (South East Finland/St.Petersburg)	EB	LB	high	10	10	100
42 AT-SI	EB	LB	high	9	9	105
43 DE-LU	IB	LB	low	8	8	100
44 FR-CH (Jura)	EB	LB	medium	7	7	100
45 FI-SE-NO (Kvarken&MittSkandia)	IB	LB	medium	7	7	100
46 DE-NL (Rhein-Maas-Nord)	IB	LB	low	6	6	100
47 AT-SK	EB	LB	high	6	6	101
48 SE-NO (Ett Gränslöst Samarbete)	EB	LB	medium	6	6	101
49 FI-EE	EB	MB	medium	6	6	98
50 SE-NO (Nordens Gröna Bälte)	EB	LB	medium	6	6	99
51 FR-CH (Rhône-Alpes)	EB	LB	medium	5	7	121
52 DK-DE (Storstrøm/Ostholstein)	IB	MB	low	5	5	100
53 DE-AT-CH (Bodensee/Hochrhein/Alpenrhein)	IB	LB	low	5	5	100
54 AT-CZ	EB	LB	high	5	5	100
55 SE-NO (Inre Skandinavia)	EB	LB	medium	5	5	100
56 FI-SE (Island)	IB	MB	medium	4	5	100
57 DK-DE (Fyn/KERN)	IB	MB	low	2	2	91
58 DK (Bornholm)-Baltic	EB	MB	medium	2	2	100
59 UK-Morocco (Gibraltar)	EB	MB	medium	1	1	97
Total, all programmes:	**35 IBs 24 EBs**	**44 LBs 15 MBs**	**20 low 24 medium 25 high**	**2,660**	**2,453**	**92**

(*) **IB** = internal EU-border; **EB** = external EU-border; **LB** = land border; **MB** = maritime border
(**) **High** = insufficient transport communication links; **Medium** = links available but day-to-day contact not feasible; **Low** = sufficient links available and day-to-day contact feasible
(***) **SFC =** Structural Funds Contribution ERDF/ESF/EAGGF/FIFG (as decided in year of approval 1995/96); **CSFC =** Committed Structural Funds Contribution (1994-1999); **CR =** Commitment Rate (1994-1999)

Sources: Own elaboration on ground of information from the 11th report on the Structural Funds 1999 (European Commission, Directorate General for Regional Policy, 2000: pp.213-214) and from the ex-post evaluation of INTERRG II (LRDP, 2003).

All 59 cross-border programmes have spent an estimated € 378.6 million of the committed Structural Funds support on measures in the field of "environment & climate change", which represents 15.4% of the committed total support for INTERREG IIA in the period 1994-1999. The total amount was obtained by aggregating the estimated Community support that the three main groups of INTERREG IIA programmes have spent on this theme (**see: Annexes 8-10**).

Group 1: For the **20 INTERREG IIA programmes covering areas with a low degree of isolation,** an improvement of the quality of life was an important aspect of their strategies (i.e. 24% of their initial SFC). Although these programmes were most often small or middle-sized in financial terms (i.e. SFC between € 1 million and € 45 million), they have spent an estimated € 86.2 million on this intervention category over the period 1994-1999. Around one third of this funding was dedicated to social infrastructures and cultural measures. **One can therefore estimate that around € 56.9 million of the committed Community support was spent on measures in the field of environment and climate change.** The majority of the programmes have realised a broad range of projects which often resulted in significant but localised positive environmental effects (e.g. improved degree of freshwater supply; increased treatment capacity for wastewater or solid waste; networking of nature parks improved quality of emission monitoring etc.).[281]

Group 2: The **24 programmes covering areas with a medium degree of isolation** partly belong to a group of financially larger programmes (i.e. 6 programmes with a SFC between € 58 million and € 569 million) and partly to the group of small and medium-sized programmes (i.e. 18 programmes with a SFC between € 1 million and € 45 million). Although all programmes addressed quality of life improvement not strongly in their strategies (17% of their initial SFC), they have spent a substantial amount of committed funding in this intervention category (estimated total CSFC for 1994-1999: € 208.5 million). Measures that supported social infrastructures and cultural activities accounted for only 5% of the total CSFC in this category.[282] **One can therefore estimate that around € 198 million of the committed Community support was spent on measures in the field of environment and climate change.** Also here the supported measures have contributed to improve the environmental situation in the respective areas, but interventions were relatively often characterised by a combination of stand-alone projects and some co-operative projects. Stand-alone projects led in general to an establishment of additional sewage water treatment or solid waste disposal capacities and better fresh water treatment systems, while cooperation projects helped to establish cross-border maritime and nature parks or supported the design and set-up of joint surveillance and monitoring systems for environment and nature protection.[283]

Group 3: The **15 programmes covering areas with a high degree of isolation** partly belong to the group of financially larger programmes (i.e. 6 programmes with a SFC between € 65 million and € 344 million) and partly also to the group of smaller programmes (i.e. 9 programmes with a SFC between € 5 million and € 17 million). These programmes had

[281] LRDP (2003), pp.76-77
[282] A review of the programme reports of the INTERREG II ex-post evaluation shows the following overall funding profile for measures on social infrastructures and cultural cooperation: the 9 financially largest programmes (i.e. those covering around 90% of the group's total SFC) dedicated all of their funding under this intervention category to environmental measures, whereas the 15 smaller programmes (i.e. those covering only 10% of the group's total SFC) dedicated on average 50% of their funding under this category also to measures on social infrastructures and cultural cooperation.
[283] LRDP (2003), pp.76-77

generally given less priority to improving the quality of life in their strategies (i.e. 15% of their initial SFC), but they have spent an estimated € 130.2 million on this intervention category over the period 1994-1999. Measures supporting social infrastructures and cultural activities accounted for only a little more than 5% of this funding.[284] Accordingly, one can **estimate that around € 123.7 million of the committed Community support was spent on measures in the field of environment and climate change.** Environmental measures were a clear strategy focus under some of the German external border programmes and the largest amounts of funding in absolute terms were spent under the programmes "Greece-external borders", "DE-PL-CZ", "DE-PL (Brandenburg)" and "GR-IT". Projects were often stand-alone projects which improved the local environment through establishing additional waste disposal or sewage water treatment capacities. Successful co-operation in the field of environmental protection was mostly realised under financially smaller programmes (e.g. Austrian external borders), but also by some of the financially larger programmes (e.g. German external borders). The realised activities have generated in all areas positive effects on the environmental conditions, especially where severe problems were tackled through initiatives in the field of forest protection, flooding prevention or water quality monitoring.[285]

All 59 cross-border programmes have spent an estimated € 703 million of the committed Structural Funds support on measures in the field of "transport, accessibility and sustainable mobility". This represents 28.7% of the committed total support for INTERREG IIA in the period 1994-1999. Also here, the total amount was obtained by aggregating the estimated Community support that the three main groups of INTERREG IIA programmes have spent on this theme (**see: Annexes 8-10**).

Group 1: The **20 INTERREG IIA programmes covering areas with a low degree of isolation** had favourable context conditions and did not allocate much funding to measures in this thematic field (i.e. 10% of their initial SFC). As these programmes were most often small or middle-sized in financial terms (i.e. SFC between € 1 million and € 45 million), they could not realise larger investments in transport infrastructures or in energy, telecom and public utility networks (i.e. the latter were only realised by financially larger programmes that covered areas with a medium or high degree of isolation[286]). It is therefore estimated that **around € 33 million of the committed Community support in the period 1994-1999 was spent on transport-related measures.** Nearly all programmes have realised measures which improved sustainable mobility, for example through establishing new cross-border public transport services or through better coordinating existing services (e.g. harmonisation and integration of routing or pricing systems and of time-schedules) and also through other "soft activities" (e.g. coordination studies, etc.). Only in a few exceptional cases have these programmes also eliminated minor bottlenecks or closed missing links.[287]

Group 2: Communication links were available in the **24 programme areas with a medium degree of isolation**, but day-to-day contact was often not feasible due to geographical obstacles (i.e. mountain ranges, maritime separations, peripheral location & long distances) which increased travel time and cost or lowered the frequency of communication services.

[284] A review of the programme reports of the INTERREG II ex-post evaluation shows the following overall funding profile for measures on social infrastructures and cultural cooperation: the 6 financially largest programmes (i.e. those covering around 90% of the group's total SFC) dedicated around 3% of their funding to such measures under this intervention category, whereas the 9 smaller programmes (i.e. those covering around 10% of the group's total SFC) dedicated on average 24% of their funding to such measures under this intervention category.
[285] LRDP (2003), pp.76-77
[286] i.e. Spain/Portugal, Spain/Morocco, Greece external borders; Italy/Albania, Greece/Italy, UK-Northern Ireland/Ireland.
[287] LRDP (2003), pp.58-61

Accordingly, this programme group allocated a substantial share of funding to reduce isolation (i.e. 31% of the initial SFC) and has spent an estimated € 378 million on measures that improved transport-networks as well as energy, telecom or public utility networks. If the amount of funding for the latter is deduced (**see: Table 6.3**), then one can estimate that **around € 346 million of the committed Community support in the period 1994-1999 was spent on transport-related measures.** The five financially largest programmes achieved the most significant results (i.e. elimination of bottlenecks, establishment of missing cross-border links, reduction of travel times etc.)[288], while the medium-sized and smaller programmes mostly implemented soft actions (i.e. studies, planning, policy framing & lobbying).[289]

Group 3: The **15 programmes covering areas with a high degree of isolation** were often characterised by a remote location, insufficient transport communication links (i.e. lack of or no significant border crossings, tunnels, ferry services etc.) and sometimes also by insufficient or low quality energy, telecom or public utility networks. As a consequence, they have allocated a substantial share of their funding to reduce isolation (i.e. 42% of their initial SFC) and spent an estimated € 364.5 million of the committed Community support on the different measures covered by this intervention category. If again the amount of funding for energy, telecom and public utility networks is deduced (**see: Table 6.3**), then one can estimate that **around € 324 million of the committed Community support was spent on transport-related measures.** Especially under programmes with a high SFC, the measures often supported large-scale investments that led to an extension or improvement of road networks, an improvement of border crossing points or an upgrading of rail interconnections and heliports (on islands). This allowed to establish missing cross-border links or to remove bottlenecks, which often resulted in a substantial reduction of travel time between the two sides of the border or in much shorter waiting times at border crossing points.[290]

Table 6.3: Expenditure for transport networks (TRAN) & energy, telecom and public utility networks (ETPUN) under selected INTERREG IIA programmes

Programme	Degree of isolation	CSFC total, 1994-1999 (*)	TRAN, final ERDF contribution in 2000/2001 (**)	ETPUN, final ERDF contribution in 2000/2001 (**)
ES-PT	medium	€ 550 million	M 3.1: € 187 million	M 3.2: € 10 million
IE-UK (NoIr)	medium	€ 163 million	SP 3 - M 1: € 34 million	SP 3 - M 2: € 23 million
Sub-total for ETPUN in programmes with "medium degree of isolation"				**€ 32 million**
ES-Morocco	high	€ 104 million	M 3.1: € 25 million M 3.3: € 29 million	M 3.2: € 506.000
EL (external borders)	high	€ 320 million (of which 88% for ERDF = € 303 million)	M 1.1: € 98 million M 1.2: € 26 million M 1.3: € 12 million M 1.4: € 2 million	M 1.5: € 24 million M 1.6: € 8 million
EL-IT	high	€ 92 million (of which 92% for ERDF = € 143 million)	M 1.1: € 35 million M 1.3: € 3 million	M 1.2: € 5 million
IT-Albania	high	€ 73million (of which 91% for ERDF = € 75 million)	M 1.1: € 22 million M 1.6: € 19 million	M 1.5: € 3 million
Sub-total for ETPUN in programmes with "high degree of isolation"				**€ 40.5 million**

(*) CSFC = Committed Structural Funds Contribution ERDF/ESF/EAGGF/FIFG (1994-1999)
(**) Own calculation on ground of information drawn from the programme-specific reports of the INTERREG II ex-post evaluation (LRDP, 2003)

[288] i.e. "Spain-Portugal", "Spain-Morocco", "Ireland-UK (Wales)", "Ireland-UK (Northern Ireland)" and "Italy/France (Corsica-Sardinia)".
[289] LRDP (2003), pp.58-61
[290] LRDP (2003), pp.58-61

Transnational programmes in the period 1997-1999

The committed total Community support for all INTERREG IIC programmes amounted to around € 417 million and was spread as follows across the three main thematic fields: general transnational cooperation on spatial planning with around € 124 million (for 7 operation programmes), flood mitigation with around € 148 million (for 2 operation programmes) and drought prevention with around € 145 million (for 4 operational programmes).

The seven **INTERREG IIC programmes** on cooperation in spatial planning **have altogether spent around € 28.8 million** of the committed Community support **on measures in the field of "transport, accessibility and sustainable mobility",** which represents 7% of the total Community funding allocated to all three types of INTERREG IIC programmes. The three types of **INTERREG IIC programmes have altogether spent around € 318.7 million on measures in the field of "environment & climate change",** which represents 76% of the total Community funding allocated to all three types of INTERREG IIC programmes. Estimations for the theme-specific funding profile of the **four smaller ERDF-Article 10 pilot programmes** "Alpine Space", "Archimed", "Mediterranean Gateway" and "Northern Periphery" cannot be provided on ground of the existing information sources.

For the first generation of **INTERREG IIC programmes that promoted transnational cooperation in spatial planning,** it was very difficult to elaborate a precise thematic financial analysis on ground of the two main information sources that exist for INTERREG II. The ex-post evaluation of INTERREG II only contains partial information at this level, wherefore theme-specific financial data had to be "reconstructed" (**see: Annex 11**).

- According to the reconstructed data, **it can be estimated that INTERREG IIC programmes have spent around € 24.6 million of the committed Community support on measures in the field of "environment & climate change".** The largest number of projects was generated under the heading "Enhancement of the natural and cultural heritage; environmental issues; flood prevention and drought mitigation". These projects were very diverse from the point of view of issues tackled, but also with regard to the outputs and achievements produced (e.g. knowledge bases, studies, pilot projects and experimental realisations, policy recommendations, physical investments in the field of water management). A further distinction can be made between the issues tackled by these projects: projects related to the enhancement of cultural heritage, projects related to the integrated management of coastal areas and projects related to the management of rural areas, including the protection of the natural heritage.[291]
- For measures in the field of **"transport, accessibility and sustainable mobility",** it can be estimated that **INTERREG IIC programmes have spent around € 28.8 million of the committed Community support**. Projects in this field sometimes concentrated on the issue of transnational corridors which was particular important as it is situated at the interface of transport issues and spatial planning issues. Other categories of transport-related projects focussed on maritime transport, air transport or rail transport, addressed multimodal transport and a transnational integration of logistics chains or looked at issues such as low-speed or high-speed transport. All transnational projects had rather similar outcomes such as the realisation of studies and long-term forecasts in a transnational perspective, the definition of pilot actions and projects for

[291] LRDP (2003), pp.193-201

the medium-term and proposals for future cooperation and improvements of planning methods pertaining to transport.[292]

The **INTERREG IIC programmes on water management issues** (flood prevention & drought mitigation) have made **substantial investments in the field of climate change mitigation, which altogether amount to around € 294.1 million of the committed Community support** (**see: Table 6.4**).

The **two flood prevention programmes** covered the catchment area of the Rhine-Meuse river system ("IRMA") and southern France and Northern Italy ("Flood prevention France-Italy"). These programmes supported mainly projects carrying out physical works on main river beds and tributaries to reduce flood risk and funded investments in weather radars, carried out pilot projects for instance in the restoration of the natural courses and tributaries and other "soft projects" facilitating decision-making and increasing public awareness (e.g. elaboration of analyses, simulations and forecasts /modelling, dissemination of information, promotion of transnational cooperation etc.).[293]

The **four drought mitigation programmes** for "Portugal", "Spain", "Italy" and "Greece" were financed through EAGGF resources (i.e. for a modernisation of land watering systems) and ERDF resources (i.e. for promoting spatial planning in fragile zones, for the protection of the environment related to water management issues and for the promotion of a rational and equitable distribution of hydro resources). They realised physical infrastructure works (i.e. construction of dams, improvement of water networks for irrigation and residential water supply), implemented new technologies and out pilot actions (i.e. construction of hydro-meteorological measurement stations and of monitoring networks, re-use of treated water for agriculture, pilot actions with demonstrative character in irrigation techniques etc.). Furthermore, they also supported knowledge-gathering and planning-related activities (i.e. studies, evaluation models, information systems etc.) as well as awareness-raising and exchange of experience activities (e.g. manuals for farmers on irrigation techniques, training courses, the provision of advice and consulting etc.).[294]

Table 6.4: Expenditure of INTERREG IIC programmes on flood prevention and drought mitigation

Programme	Total cost	SFC in € million	CSFC (1994-1999) in € million	CR in %
INTERREG IIC (Flood prevention): IRMA	361,8	141.1	141.1	100
INTERREG IIC (Flood prevention): France-Italy	20.6	7.4	7.4	100
INTERREG IIC (Drought mitigation): Greece	17.8	13.4	13.4	100
INTERREG IIC (Drought mitigation): Italy	36.2	18.1	18.1	100
INTERREG IIC (Drought mitigation): Spain	143.8	107.7	107.7	100
INTERREG IIC (Drought mitigation): Portugal	8.6	6.4	6.4	100
Total CSFC, all water management programmes: € 294.1 million				

SFC = Structural Funds Contribution (as decided in year of approval 1997/98/99);
CSFC = Committed Structural Funds Contribution (1994-1999);
CR = Commitment Rate (1994-1999)

Sources: Own elaboration on ground of information from the 11th report on the Structural Funds 1999 (European Commission, Directorate General for Regional Policy, 2000: pp.213-214)

[292] LRDP (2003), pp.185-190
[293] LRDP (2003), p.201
[294] LRDP (2003), p.201

6.2. Cross-border and transnational investments in the programming periods 2000-2006 and 2000-2013

For the financial analysis of the two funding periods 2000-2006 and 2007-2013, different approaches had to be adopted mainly for the following reasons.

A **first reason** for this relates to the structure of the datasets which were available for two funding periods 2000-2006 and 2007-2013.

- The analysis of the period 2000-2006 and more specifically of the INTERREG IIIA programmes was conducted on the basis of a dataset provided by DG REGIO within a study on ERDF and Cohesion Fund regional expenditure prepared by SWECO.[295] The structure of this data, however, made it only possible to analyse the committed resources at country-level. In order to compensate for the lack of theme-specific and programme-level data, further sources were considered in the financial analysis of the 2000-2006 programming period: various reports of the INTERREG III ex-post evaluation[296] and an ESPON-INERACT study on cross-border cooperation.[297]
- The financial analysis of the 2007-2013 programming period was conducted exclusively on the basis of the categorisation data (in its raw form) reported in the 2012 Annual Implementation Reports by the Managing Authorities that was made available by DG REGIO for the forthcoming ex-post evaluation.[298] The analysis of the committed resources cannot therefore reach the final programming stage since data reported in the 2013 Annual Implementation Reports are out of its scope. However, as the aim of this analysis is to give a picture of the thematic focus of the programmes, the available financial information is relevant and also allows realising an analysis for individual programmes and sub-themes.

For both programming periods, the committed resources were analysed with no appraisal of the expenditures actually made because the available datasets did not include this kind of financial information.

A **second** more **technical reason** is related to the evolution of the coding system which allows monitoring the financial commitments by the programmes.

- For the 2000-2006 programming period, it was possible to analyse the committed resources by fields of intervention reaching a two-digit code level. This, however, did not allow investigating the climate change and sustainable mobility sub-themes.
- For the 2007-2013 programming period, the now more developed categorisation system made it possible to analyse the committed resources by priority themes and sub-themes. This allowed analysing the theme of climate change, also with some differentiated insight into climate change adaptation and mitigation. Beyond accessibility, it was now also possible considering the sub-theme sustainable mobility.

The details on the selection and grouping of the relevant codes in the two programming periods are provided in an Annex (**see: Annex 12**).

[295] SWECO (2008)
[296] Panteia (2010): First Interim Report, Second Interim Report, Final Report.
[297] ESPON-INTERACT (2007a)
[298] http://ec.europa.eu/regional_policy/impact/evaluation/data_en.cfm

Furthermore, **for the financial analysis of cross-border programmes** in the periods 2000-2006 and 2007-2013, **we considered the enlargement factor of key importance.** It was therefore decided to analyse the themes "environment and climate change" and "accessibility and sustainable mobility" by looking at two country groups: EU15 and EU10 for the period 2000-2006, and EU15 and EU12 for the period 2007-2013. The following approach was adopted to achieve a separation at the programme level: in the case of a cross-border area involving EU15 and EU12 Member States, the CBC area was considered as belonging to the EU12 group because of the 'new' cross-border challenge the area is facing. The group differentiation will be highlighted in each sub-paragraph on cross-border cooperation, but it generates an overestimation of the EU12 group's financial weight in the period 2007-2013, which does however not affect the analysis if we consider the period-wise logic adopted.

Such a differentiated analysis can be justified by the socio-economic disparities that existed between regions belonging to both groups of countries and also because of the unequal historical opportunities to cooperate, which could have influenced that specific themes were given different weight in cooperation and also in the allocation of INTERREG or ETC-resources. The further analysis aims at verifying this hypothesis.

6.2.1. Thematic spending profile of cross-border and transnational programmes in the period 2000-2006

In the 2000-2006 period INTERREG III supported 79 programmes, comprising 62 cross-border (Strand A), 13 transnational (Strand B) and 4 other interregional and networking programmes.[299]. The total support of ERDF to these programmes reached 2.2% of the total budget of the EU Structural Funds, or € 5.6 billion.

The 2000-2006 period was featured by the participation of 10 new Member States (hereafter EU10) having joined the EU in 2004 (Cyprus, Czech Republic, Estonia, Latvia, Lithuania, Hungary, Malta, Poland, Slovenia and Slovakia). Major changes occurred therefore in this period. Enlargement increased the socio-economic differences across the now further expanded EU territory and also caused an increase of the number of internal and external EU borders. In this transitional phase, priority was given to strengthening cooperation across the new Eastern borders of the European Union with a new PHARE-CBC Regulation being introduced to facilitate coordination with INTERREG.

Cross-border programmes in the period 2000-2006

ERDF commitments to cross-border (Strand A) programmes in the period 2000-2006 amounted to € 4 billion, corresponding to two thirds of the whole INTERREG III financial package.

The 64 INTERREG IIIA programmes varied considerably in financial size, ranging from budgets of less than one million Euros (i.e. Gibraltar-Morocco programme, allocating less than € 350,000 of ERDF funds) to budgets approaching a billion Euros (Spain-Portugal programme,

[299] Out of the scope of this study are the INTERREG III Strand C interregional co-operation programmes as well as three networking programmes (URBACT, INTERACT and ESPON).

allocating nearly € 824 million of ERDF funds). The average total budget for INTERREG IIIA programmes was € 104.2 million, including an average ERDF contribution of € 63.6 million.

10 new Member States participated in INTERREG IIIA (i.e. Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia) which represented 15.8% of the total EU population and have **committed 18.5% of the EU resources** in cross-border cooperation.

As the dataset did not allow investigating the thematic focus of the single programmes in terms of committed resources, the thematic analysis of the INTERREG IIIA cross-border programmes was carried out on ground of the results of an ESPON-INTERACT study[300]. This study used INTERREG IIIA project summary descriptions and programme web pages to reclassify projects according to ten themes (**see: Figure 6.2**). On the basis of the project classification, the priority of interest given by each programme to the different themes was established. The themes are:

- Transport;
- Information Technology (IT);
- Energy;
- Environment / Quality of life;
- Hazards;
- Culture and cross-border social interaction;
- Growth, employment and competitiveness;
- Knowledge sharing / Innovation/ Research;
- Education /Training;
- Remote and rural development.

Among these themes two correspond to our theme **environment** (i.e. environment, quality of life), while energy and the hazards theme more closely correspond to our focus on **climate change**. Transport is clearly linked to **accessibility,** but this typology does not make it possible to further investigate the theme sustainable mobility.

From the overview appears that **only very few programmes had put accessibility as first, second or third thematic focus.** Highest priority was given to this theme only under the two programmes Greece-Italy and Italy-Albania, while a further four programmes had accessibility at a third level (SE-FI/Skargarden; PL-DE/Mecklenburg; SK-CZ; PL-CZ).

More than half INTERREG IIIA programmes have environment as first, second or third thematic focus. They are very mixed and include programmes between EU15 countries e.g. 'Euregio Maas-Rhein', programmes between EU15 and EU10 countries e.g. 'Austria - Slovakia', programmes between EU15 countries and third countries e.g. 'Greece - Albania'', programmes among EU10 countries and third countries e.g. 'Hungary – Slovakia - Ukraine'. **The programmes with a thematic focus on climate change are much more limited in number.** Looking at the first six positions, 'energy' appears only once, whereas 'hazards' has six occurrences. **A stronger aptitude to give priority to climate change can be attributed to the programmes participated by EU10 countries**, like 'Mecklenburg-Vorpommern - Poland', 'Czech Republic - Poland', 'Hungary - Slovakia-Ukraine', 'Hungary – Romania – Serbia - Montenegro', 'Latvia – Lithuania - Belarus'.

[300] ESPON-INTERACT (2007a)

Figure 6.2: Priority of interest per INTERREG IIIA programme areas by theme

		1ST	2ND	3RD	4TH	5TH	6TH	7TH	8TH	9TH	10TH
1	Skärgården	CULT	E&Q	TRP	RDVPT	KLDG	GWTH				
2	Kvarken – Mittskandia	GWTH	CULT	E&Q	KLDG	EDU	TRP	ITC	RDVPT	EGY	HZD
3	Bavaria – Austria	KLDG	RDVPT	GWTH	CULT	EDU	E&Q	TRP	EGY	ITC	HZD
4	Austria – Czech Republic	KLDG	GWTH	CULT	RDVPT	EDU	E&Q	TRP	EGY	ITC	
5	Austria – Slovenia	GWTH	CULT	KLDG	E&Q	EDU	RDVPT	TRP	EGY	ITC	
6	Austria – Hungary	GWTH	KLDG	E&Q	CULT	EDU	TRP	EGY	RDVPT	HZD	
7	Austria – Slovakia	KLDG	E&Q	CULT	GWTH	TRP	RDVPT	EDU	EGY	ITC	
8	Sweden – Norway	CULT	E&Q	GWTH	KLDG	EDU	TRP	ITC	RDVPT	EGY	HZD
9	Ems – Dollart region	GWTH	KLDG	CULT	E&Q	EDU	TRP	RDVPT	HZD		
10	Alperhein/Bodensee/Hochrhein	KLDG	E&Q	GWTH	CULT	EDU	RDVPT	TRP	EGY	ITC	
11	Saxony – Poland	KLDG	GWTH	EDU	CULT	RDVPT	TRP	E&Q	ITC	EGY	
12	Sachsen – Czech Republic	CULT	EDU	E&Q	KLDG	GWTH	TRP	RDVPT	EGY	HZD	ITC
13	Rhein-Waal and Rhein-Maas-Noord	KLDG	GWTH	CULT	E&Q	EDU	TRP	RDVPT	ITC	HZD	EGY
14	Brandenburg – Lubuskia	KLDG	E&Q	CULT	EDU	GWTH	TRP	HZD	EGY		
15	Italy – Austria	GWTH	CULT	E&Q	RDVPT	KLD	EDU	TRP	HZD	ITC	
16	Alcotra (Italy-France)	CULT	GWTH	E&Q	RDVPT	EDU	HZD	KLD	TRP	ITC	
17	Islands (Italy – France)	CULT	E&Q	GWTH	TRP	KLD	EDU	HZD	EGY	ITC	
18	Italy - Slovenia	GWTH	EDU	KLDG	E&Q	CULT	TRP	RDVPT	EGY	ITC	HZD
19	Ireland – Northern Ireland	GWTH	CULT	KLDG	E&Q	EDU	RDVPT	TRP	EGY	ITC	HZD
20	Ireland – Wales	GWTH	KLDG	EDU	E&Q	EDU	CULT	ITC	RDVPT	TRP	EGY
21	Pamina	KLDG	CULT	GWTH	EDU	E&Q	ITC	RDVPT	TRP		
22	Oberrhein Mitte Süd	KLDG	EDU	CULT	E&Q	GWTH	TRP	RDVPT	EGY	ITC	HZD
23	Bavaria – Czech Republic	CULT	KLDG	GWTH	E&Q	TRP	EDU	RDVPT	EGY	ITC	HZD
24	Fyn – KERN	E&Q	GWTH	KLDG	EDU	CULT	ITC	RDVPT	TRP	ITC	
25	Sonderjylland –Schleswig	EDU	GWTH	KLDG	CULT	E&Q	TRP	RDVPT	EGY	ITC	HZD
26	Storstrom – Ostholstein-Lubeck	KLD	GWTH	EDU	E&Q	CULT					
27	Germany-Lux.-Germanophone Belgium	GWTH	E&Q	CULT	KLDG	RDVPT	EDU	HZD			
28	Saarland-Mosel/Lorraine-Western Palatinate	GWTH	E&Q	CULT	KLDG	EDU	TRP	EGY			
29	Spain – Portugal	E&Q	KLDG	GWTH	CULT	TRP	EDU	RDVPT	EGY	ITC	HZD
30	Spain – Morocco	GWTH	CULT	E&Q	KLDG	EDU	TRP	RDVPT	HZD		
31	Italy – Switzerland	GWTH	E&Q	CULT	KLDG	TRP	EDU	TRP	ITC	HZD	
32	Öresund region	KLDG	GWTH	CULT	EDU	E&Q	TRP	ITC	RDVPT	HZD	
33	Greece – Albania	E&Q	CULT	KLDG	HZD	GWTH	TRP	RDVPT	EDU	ITC	
34	Greece – FYROM	E&Q	KLDG	CULT	EDU	HZD	GWTH	TRP	EGY	ITC	RDVPT
35	Greece – Bulgaria	E&Q	KLDG	CULT	EDU	GWTH	TRP	HZD	RDVPT	ITC	
36	Greece – Cyprus	CULT	KLDG	E&Q	HZD	GWTH	EDU	ITC			
37	Mecklembourg Vorpommern – Poland	GWTH	CULT	TRP	KLDG	EDU	E&Q	RDVPT	ITC		
38	Euregio Maas-Rhein	E&Q	GWTH	CULT	KLDG	EDU	TRP	RDVPT	ITC		
39	EUregio Karelia	CULT	GWTH	KLDG	E&Q	EDU	TRP	ITC	RDVPT	EGY	HZD
40	South East Finland – Russia	GWTH	KLDG	E&Q	TRP	CULT	EDU	RDVPT	EGY	HZD	
41	France – Switzerland	KLDG	CULT	EDU	E&Q	GWTH	RDVPT	TRP	EGY	ITC	
42	France – Spain	KLDG	GWTH	CULT	E&Q	EDU	RDVPT	TRP	ITC	EGY	HZD
43	Nord	GWTH	KLDG	CULT	EDU	TRP	E&Q	ITC	EGY	RDVPT	HZD
44	Finland – Estonia	KLDG	EDU	GWTH	CULT	E&Q	ITC	HZD	TRP	RDVPT	
45	Grensregio Vlaanderen-Nederland	E&Q	GWTH	CULT	KLDG	EDU	RDVPT	HZD	TRP		
46	Wallonia – Lorraine – Luxembourg	KLDG	E&Q	EDU	GWTH	CULT	ITC	HZD	TRP	EGY	
47	Kent-Sussex – Nord Pas de Calais-Picardie	CULT	KLDG	E&Q	GWTH	EDU	ITC	HZD	TRP	RDVPT	EGY
48	Gibraltar – Morocco	KLDG	E&Q								
49	France/Wallonia – Flanders	GWTH	CULT	E&Q	KLDG	EDU	RDVPT	ITC	HZD		
50	Italy – Albania	TRP	E&Q	GWTH	KLDG	CULT	EGY				
51	Greece – Italy	TRP	KLDG	E&Q	ITC						
52	Greece – Turkey										
53	Italy/Balkans-Adriatic	KLDG	GWTH	E&Q	CULT	EDU	TRP				
54	Czech Republic – Poland	GWTH	KLDG	TRP	CULT	E&Q	HZD	RDVPT	ITC	EGY	
55	Poland – Slovakia										
56	Slovakia – Czech Republic	CULT	KLDG	TRP	GWTH	E&Q	EDU	RDVPT			
57	Poland – Ukraine – Belarus										
58	Lithuania – Poland – Russia	CULT	GWTH	E&Q	KLDG	TRP	EDU	HZD	ITC		
59	Hungary/Slovakia/Ukraine	CULT	GWTH	E&Q	TRP	KLDG	EDU	RDVPT	EGY	ITC	HZD
60	Hungary – Romania – Serbia – Montenegro	GWTH	KLDG	E&Q	TRP	EDU	HZD	RDVPT	ITC	CULT	
61	Slovenia – Hungary – Croatia	GWTH	E&Q	EDU	KLDG	TRP	CULT	RDVPT	EGY		
62	Italy – Malta	CULT	GWTH	E&Q	TRP						
63	Estonia – Latvia – Russia	GWTH	KLDG	E&Q	CULT	EDU	ITC	TRP	RDVPT		
64	Latvia – Lithuania – Belarus	GWTH	E&Q	EGY	RDVPT	EDU	CULT	TRP	HZD		

Source:
ESPON INTERACT INTERREG IIIA Programmes Database, 2006

TRP	TRP	Transport
ITC	ITC	Information Technolgy (IT)
EGY	ENG	Energy
E&Q	E&Q	Environment & Quality of Life
HZD	HZD	Hazards
CULT	CULT	Culture & Cross-Border Social Interaction
GWTH	GWTH	Growth, Employment & Competitiveness
KLDG	KLD	Knowledge Sharing / Innovation / Research
EDU	EDU	Education / Training
RDVPT	RRD	Remote and Rural Development

Source: ESPON-INTERACT (2007a)

The analysis of the financial commitment by country is based on the creation of two groups: EU15 (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom) **and EU10** (Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia). The commitment of resources is country-based, and not programme-based, as it will be the case of the analysis of the following 2007-2013 programming period. This allows to focus specifically on the resources invested in EU10 countries, but does not allow to divide the programmes in two definite groups.

The codes associated to **the environment theme, correspond to more than € 1 billion, representing more than one fourth of the total cross-border programmes' committed resources**. **The analysis reveals a stronger focus on environment by the EU10 group.** EU15 reaches a percentage of 24.22%, whereas EU10 environment-related financial commitment percentage is higher, amounting to 30.92% (**see: Table 6.4**). Three codes strongly differ between groups. The first code 13 *promoting the adaptation and the development of the rural areas*, s*patial planning and rehabilitation*, *environmental infrastructure* is clearly related to the importance of rural development in the EU10 group of countries, where land improvement, renovation and development of villages and protection and conservation of the rural heritage, agricultural water resources management represented key issues in the 2000-2006 period. The second most chosen is code 35 on *Spatial planning and rehabilitation* and addresses the necessity to maintain, protect, rehabilitate, restore, improve and regenerate urban and rural sites or areas, also in consideration of their profile of natural or cultural heritage. The third one is code 34 *environmental infrastructure*, which demonstrates the higher priority given by the EU10 countries to the interventions aimed at reducing air and noise pollution, improving waste management, securing the collection, storage, treatment and distribution of drinkable water.

The analysis of the climate change sub-theme can be only very partial. Looking at *energy infrastructures* (code 33), it must be noted that it includes both standard infrastructures (electricity, gas, petroleum products, solid fuel) and sustainable infrastructures (renewable sources of energy and energy efficiency, cogeneration, energy control). This code, however, corresponds to very limited resources in both groups. A particularly modest focus was given by EU10 MS. Further sub-codes related to climate change are listed under other two-digit codes. The area of *forestry* (code 12), very limited in terms of financial commitment for both groups, includes *restoring forestry production potential damaged by natural disasters and introducing preventions instruments*. The financially more significant area *promoting the adaptation and the development of rural areas* (code 13) comprises, among its fourteen sub-codes, *restoring agricultural production potential damaged by natural disasters and introducing appropriate prevention instruments*. As a conclusion, the financial analysis does not provide a clear insight into the climate change orientation by the cross-border programmes in the period 2000-2006.

In the period 2000-2006 it does not seem appropriate to associate the area of intervention *tourism* with the environment theme, because the sub-codes do not show any relevance with environmental issues. However, as tourism will be associated with environment in the analysis of the following period, it seems necessary to analyse this code already in the period 2000-2006.[301] At EU level, tourism corresponds to 10.96% of the financial commitment

[301] In order to make a later comparison possible, we considered tourism as belonging to the broad concept of environment, even if a modest relation between the tourism related fields of intervention and tourism was observed in the 2000-2006 programming period (the codes are: 71 Physical investment - information centres, tourist accommodation, catering, facilities; 172 Non-physical investment - development and provision of tourist services, sporting, cultural and leisure activities, heritage; 173 Shared services for

by INTERREG IIIA programmes, with a slightly higher focus by EU10 (12.34%) than by EU15 (10.65%).

Table 6.4: INTERREG IIIA programme commitments (ERDF) for "Environment & Climate Change"

Areas of intervention	% of total commitment EU	% of total commitment EU 15	% of total commitment EU10
11 Agriculture	0.63	0.74	0.16
12 Forestry	0.62	0.56	0.92
13 Promoting the adaptation and the development of the rural areas	10.27	9.45	13.87
14 Fisheries	0.28	0.35	0.01
33 Energy infrastructures (production, delivery)	1.47	1.67	0.61
34 Environmental infrastructure (including water)	5.39	4.92	7.46
35 Spatial planning and rehabilitation	6.79	6.54	7.89
Total	**25.46%**	**24.22%**	**30.92%**

Source: Own elaboration on the ground of ERDF commitment data provided by DG REGIO

Looking now at the accessibility and sustainable mobility themes, it has to be noted that according to the already mentioned ESPON-INTERACT study **the great majority of the programmes focusing on transport were those in which EU10 countries participated**. This seems to be logic if one considers the framework conditions that were prevailing at the beginning of the programming period. A summary analysis of these starting conditions was conducted in the framework of the INTERREG III ex post evaluation, which also provides more information on the differences among the cross-border programmes in terms of 'permeability'.[302] Three groups of programmes were identified: programmes with favourable, less favourable and unfavourable framework conditions. The great majority of EU10 cross-border programmes were attributed to the latter group because of a low overall level of permeability, with limited availability of border crossing possibilities (e.g. rail and road border crossing possibilities). The analysis of the financial commitment at country level shows that these needs were clearly answered by the cross-border programmes.

At EU level, accessibility and sustainable mobility received investments amounting to almost € 685 million (i.e. 16.89%) of the INTERREG IIIA budget. The analysis confirms the stronger focus by the EU10 group on accessibility-related projects (see: Table 6.5). Greece is on the first position, but four EU10 countries follow in the ranking of EU countries most focused on accessibility. They are Hungary (24.93%), Poland (23.25%), Czech Republic (21.40%), Slovakia (17.43%). EU10 average percentage of *Transport infrastructure* financial commitment is 20.93%. Within this group, Poland commits more than half of EU10 countries' financial resources to accessibility.

As reported in the INTERREG 2000-2006 ex-post evaluation[303], cross-border programmes involving EU10 countries allowed developing infrastructures, improving road connections, or establishing smaller bridges for crossing an existing border river, therefore enhancing the

the tourism industry - including promotional activities, networking, conferences and trade fairs; 174 Tourism-specific vocational training).

[302] Panteia (2010b), pp. 190-192.

[303] Panteia (2010b), pp. 44-45.

connectivity of less accessible parts of the EU area or increasing the efficiency of cross-border transport flows in areas located immediately at the border (**see: Box 6.1**).

Table 6.5: INTERREG IIIA programme commitments (ERDF) for "Accessibility & Sustainable Mobility"

Areas of intervention	% of total commitment EU	% of total commitment EU 15	% of total commitment EU10
31 Transport infrastructure *311 Rail* *312 Roads* *3121 National roads* *3122 Regional/local roads* *3123 Cycle tracks* *313 Motorways* *314 Airports* *315 Ports* *316 Waterways* *317 Urban transport* *318 Multimodal transport* *319 Intelligent transport systems*	**16.89%**	**15.97%**	**20.93%**

Source: Own elaboration on the ground of ERDF commitment data provided by DG REGIO

Box 6.1: Transport infrastructure measures under INTERREG IIIA programmes at new internal borders

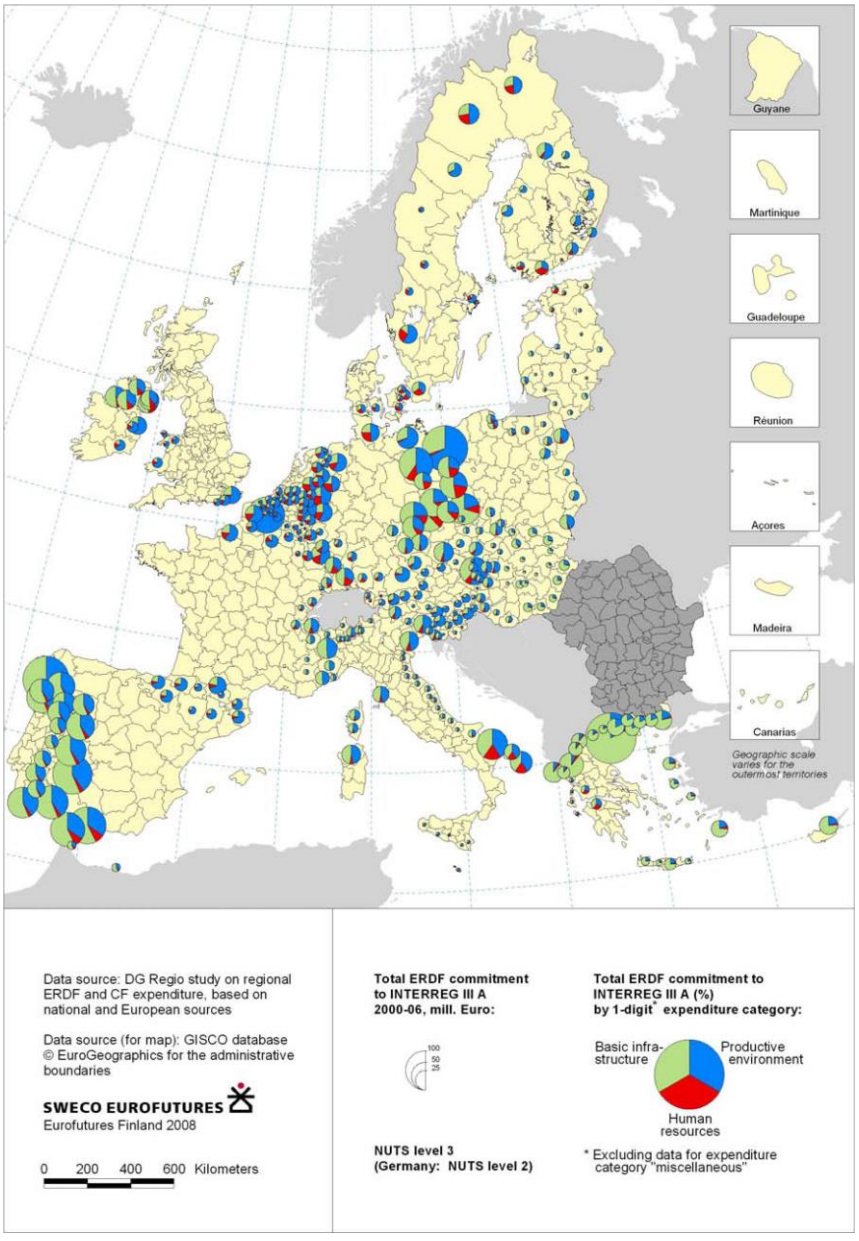
The **Poland–Czech Republic** programme has substantially developed the road network in areas close to the border. A total of 51.3 km roads had been built or reconstructed and 35 cross-border and border road connections between both counties were established. These investments led to an improvement of transport communication between both countries. Under the programme **Austria-Slovakia**, a small cross-border bridge was constructed over the border river March at Hohenau / Moravsky Svaty Jan which replaced a previously existing swimming raft (pontoon bridge) that had been a temporary solution of little reliability. In case of floods, the pontoon bridge could not be used and time-consuming traffic diversions were necessary. Whilst the investment funding for constructing the bridge was made available from Slovak funds, INTERREG funding helped to ensure that adequate environmental protection measures and infrastructures were put into place to cope with the sensitive environmental situation in the area. The newly established bridge creates a permanent and un-interrupted possibility to cross the border, which can be used by car and freight transport not exceeding 7.5t and by buses up to 18t. The bridge has thus immediately led to more reliable and efficient traffic connections between the neighbouring border regions, improved their accessibility and connectivity and establishes also a basic pre-condition for a long-term socioeconomic development of this part of the programme area.

Source: INTERREG 2000-2006 ex post evaluation

A financial analysis of the **sustainable mobility theme only could not be carried out** because it was impossible to capture the resources committed under the sub-codes *cycle tracks*, *urban transport*, *multimodal transport*, *intelligent transport systems.* The INTERREG 2000-2006 ex-post evaluation recognised, however, the capacity of this strand to **support small-scale investments producing soft cooperation outcomes related to transport services**, improving cross-border public transport services or exploring common development perspectives. Examples include cross-border harmonisation of time schedules or the establishment of joint ticketing /pricing systems between region-wide public transport systems on either side of the border.

To conclude the financial analysis of the INTERREG IIIA programmes, it is necessary to emphasise **the importance of the basic infrastructure category in the programming period 2000-2006**. It comprises, together with transport infrastructures, also telecommunication infrastructure and information society, energy infrastructure, environmental infrastructure, spatial planning and rehabilitation, social and public health infrastructure. This broad category corresponds to 43% of the resources committed at EU level. If Greece is again on the top in terms of focus of resources on infrastructure, **seven EU10 countries are among the first ten** i.e. Cyprus (73%), Hungary (56%), Lithuania (55%), Czech Republic (51%), Slovakia (49%), Latvia (48%) and Poland (44%). Together with Greece, Portugal and Spain are two southern EU15 countries very focused on basic infrastructure. The macro-level results of the analysis of the INTERREG IIIA financial commitment at NUTS3 level offers a global view on the importance of the investments in cross-border basic infrastructures in the different European territories (**see: Map 6.1**).

Map 6.1: Total ERDF commitment to INTERREG III A in 2000-2006



Source: Sweco (2008), p.24

Transnational programmes in the period 2000-2006

ERDF commitments to transnational (Strand B) programmes in the period 2000-2006 amount to € 1.36 billion. The 13 INTERREG IIIB programmes have very different financial sizes (**see: Table 6.6**). North West Europe has a global budget of more than € 650 million (with more than € 330 million of ERDF funds), whereas the Indian Ocean whole financial package is smaller than € 6 million (with € 5 million of ERDF funds).

Table 6.6: Transnational Cooperation programmes' allocations

Programme	Countries	ERDF commitments in € million
South West Europe	ES-FR-PT-UK	67.25
Western Mediterranean (MEDOC)	ES-FR-IT-PT-UK	119.35
Madeira-Açores-Canarias	ES-PT	145.36
Baltic Sea	DE-DK-PL-SE-FI-EE-LV-LT	147.57
Northern Periphery	IE-FI-SE-UK	22.63
North Sea Region	UK-SE-DE-DK-NL-BE	134.65
Alpine Space	AT-FR-DE-IT-SI	57.20
Atlantic Area	ES-FR-IE-PT-UK	119.99
North West Europe	BE-FR-DE-IE-LU-NL-UK	330.58
Central, Adriatic, Danubian and South-East European Space (CADSES)	AT-DE-EL-IT-CZ-HU-PL-SK-SI-BG-RO-HR-AL-BA-MD-ME-MK-RS-UA	153.74
Caribbean	FR	11.54
Archimed	CY-EL-IT-MT-TR-LB-SY-IL-JO-EG-PS	52.56
Indian Ocean	FR	5.09
Total		**1,367.53**

Source: Adapted from INTERREG 2000-2006 ex post evaluation

The analysis of the allocations in terms of thematic focus, based on the INTERREG III ex-post evaluation[304], is more general if compared to the previous paragraph dedicated to the Strand A. In general terms, it has to be noted that **Strand B programmes rather spread allocations among a wide range of themes.** Thus, they did not achieve a strong focus of their financial support and tended to disperse their efforts.

The promotion of the environment is grouped with the good management of cultural heritage, and amounts to 42% of the overall IIIB programmes allocations. This high percentage is confirmed by the fact that the management of natural resources and the promotion of the environment were declared to be among the three most relevant topics for the elaboration of Strand B programme strategies.

The range of environmental issues raised was very wide. The Baltic Sea Region programme, which main environmental issues are listed below, is a good example of a programme covering a variety of environmental topics (**see: Box 6.2**). Outcomes were mainly of soft cooperation type e.g. workshops, studies and databases, policy papers and planning strategies, with limited small scale infrastructure investments. They produced changes in policy making or in the behaviour of the individuals, also with relevance to climate change themes like prevention of disasters or energy. Furthermore, transnational projects frequently facilitated the implementation of the EU environmental legislation at regional and local levels.

[304] Panteia (2009), pp. 70-73.

Box 6.2: Scope of issues addressed by projects of the Baltic Sea Programme

The projects of the **Baltic Sea programme** focussed on a wide array of issues relating to sustainable development, environmental protection and a wise management of natural resources:

- Sustainable forest management ("BalicForest", "Advantge Hartwood").
- Comprehensive multi-sectoral planning for the sustainable management of river basins and fresh water resources ("Trabant", "Watersketch", "Bernet-Catch").
- Improved management of solid or hazardous waste ("Joccov", "BSR-HazControl") or of waste water (e.g. "Bernet").
- Energy management and the use of biomass for energy production (e.g. "ET-Bioenergy" "BBN", "BEEN", "MunEM", "EastWind", "BEE", "Escobalt", "BTN") and sustainable city management ("Matryoshka", "Matruschka", "Sustainment").
- Regional impacts of climate change ("Astra", "Seareg") or the management of natural or other man-caused/technical disasters (e.g. "Eurobaltic" & "Eurobaltic II").
- Integrated management of the Baltic Sea costal zones, a more sustainable use of the Baltic Sea's marine resources (e.g. "S-Man2000", "Balance" "CoastSust" "BaltCoast) and a tackling of marine pollution originating originating from off-shore/on-shore sources ("Baltic Master", "BSB", "Coastman", "BERAS").

Source: INTERREG 2000-2006 ex post evaluation

The development of **efficient and sustainable transport systems is grouped with the improved access to the information society, and amounts to 21% of the overall IIIB programmes allocations.** A particularly high expenditure rate has to be mentioned with reference to this topic (93% of the total budget), thus indicating a high efficiency of accessibility and connectivity projects. It is also interesting to note that the *development of efficient and sustainable transport systems* was declared to be the most relevant topic for the elaboration of Strand B programme strategies (82% of the programmes). Transnational programmes promoted sustainable mobility solutions (i.e. through the promotion of transport multimodality), and contributed to the preparation of macro-regional strategies e.g. Baltic Sea Region. In case of North West Europe, the financial size of the programme did not only allow to generate soft cooperation outputs, but also to guarantee business support and infrastructural investments higher than € 7 million. Six short-sea shipping lines were established and this led to an annual increase in port hinterland traffic, with 900 long-term jobs created in the field of maritime transport.

6.2.2. Thematic spending profile of cross-border and transnational programmes in the period 2007-2013

In the programming period 2007-2013, according to information of DG REGIO, a total of € 8.7 billion of ERDF resources had been invested in the ETC-objective to support 70 programmes. They comprised 53 cross-border programmes, 13 transnational programmes and another four interregional and networking programmes as in the period 2000-2006.

The 2007-2013 period was featured by the now full participation of 12 new Member States (hereafter EU12) having joined the EU respectively in 2004 (Cyprus, Czech Republic, Estonia, Latvia, Lithuania, Hungary, Malta, Poland, Slovenia and Slovakia) and in 2007 (Bulgaria, Romania).

Cross-border programmes in the period 2007-2013

The financial commitment registered in the Commission's system for electronic data exchange of data[305] until the year 2012 for the cross-border programmes amount to € 5.2 billion. As highlighted above, the 2007-2013 categorisation system of intervention fields allows analysing the financial commitment in terms of the themes "environment & climate change" and "accessibility & sustainable mobility".

It was emphasised that this programming period is featured by the participation of 12 new EU Member States (EU12). Now, in order to provide a useful analysis, it appears necessary to divide the cross-border programmes in two groups. Programmes including new Member States i.e. Bulgaria, Cyprus, Czech Republic, Estonia, Latvia, Lithuania, Hungary, Malta, Poland, Romania, Slovenia and Slovakia should be distinguished from the group of cross-border programmes participated only by EU15 Member States. It is worth noting that all programmes having a common border with a EU12 country have been excluded from the EU15 group. As a consequence, programmes involving a border between a EU12 and a EU15 country are to find in the EU12 group. The presence of external borders i.e. border with third countries has not influenced the composition of the two groups. This grouping was necessary to distinguish two fundamental constellations.

The first group covers **cross-border areas with a well-established tradition of cooperation** and is composed of 29 programmes with total ERDF commitments of almost € 2.7 billion **(see: Table 6.7).** The programmes range from € 258 million (Programme Spain – Portugal) to € 11 million (Programme Amazonia – French Managing Authority). If the European continent is considered, the programme having the smallest resources (€ 15 million) is Fehmarnbelt Region, involving Danish and German territories.

The second group covers **cross-border areas with a more recent tradition of integration,** which face different challenges and needs in terms of socio-economic development. This group is made up of 25 programmes with total ERDF commitments of more than € 2.5 billion **(see: Table 6.8).** The programmes range from € 224 million (Programme Hungary-Romania) to € 26 million (Programme Slovenia-Hungary).

Table 6.7: Cross-border cooperation programmes EU15 (excl. borders with EU12), financial commitment

Programme	EU Countries	Total Commitment in € million
'Botnia - Atlantica'	SE-FI	29.05
'Northern Ireland, the Border Region of Ireland and Western Scotland'	UK-EI	161.34
'United Kingdom - Ireland' - (PEACE III)	UK-EI	213.56
'Belgium - Netherlands'	BE-NL	94.04
'Fehmarnbelt Region'	DK-DE	14.78
'Italy - Austria'	IT-AT	56.57
'France (Channel) -England'	FR-UK	153.39
'Alpenrhein - Bodensee - Hochrhein'	AT-DE	22.96
'Belgium - France'	BE-FR	140.63
'Öresund - Kattegat - Skagerrak'	DK-SE	111.85
'Syddanmark - Schleswig-K.E.R.N.'	DK-DE	43.84
'Netherlands - Germany'	NL-DE	143.11
'Ireland - Wales'	EI-UK	51.47

[305] System for electronic exchange of data concerning shared Fund management between Member States and the European Commission for the period 2007-2013 (CSF).

Programme	EU Countries	Total Commitment in € million
'North'	FI-SE	34.27
'Euregio Maas-Rhein'	BE-DE-NL	72.05
'Germany (Bavaria) - Austria'	AT-DE	42.18
'Italy - France (Alps - ALCOTRA)'	IT-FR	144.03
'Italy -Maritime France'	IT-FR	96.07
'Spain - external borders 2008-2013' cross-border cooperation'	ES	88.63
'Spain - Portugal'	ES-PT	257.72
'France - Spain - Andorra'	FR-ES	163.89
'Italy-Switzerland'	IT	63.83
'Two Seas'	NL-UK-BE-FR	164.45
'Amazonia'	FR	11.36
'France-Switzerland INTERREG IVA'	FR	28.10
'INTERREG IV Upper Rhine'	DE-FR	72.24
'Great Region'	BE-DE-FR-LUX	101.96
'Sweden - Norway'	SE	37.57
'Grece-Italy'	GR-IT	59.54
EU15 (excluding borders with EU12)		**2,674.47**

Source: Own elaboration on the ground of ERDF commitment data 2012 provided by DG REGIO

Table 6.8: Cross-border cooperation programmes EU12 (incl. borders with EU15), financial commitment

Programme	Countries	Total Commitment in € million
'Central Baltic'	FI-LV-SE	100.00
'Estonia - Latvia'	EE-LV	37.44
'Hungary - Romania'	HU-RO	224.47
'Hungary - Slovak Republic'	HU-SK	140.35
'Latvia - Lithuania'	LV-LT	63.15
'Lithuania - Poland'	LT-PL	72.16
'Poland - Czech Republic'	CZ-PL	168.05
Austria-Slovak Republic	AT-SK	52.73
'Austria - Hungary'	AT-HU	77.49
Cross-Border 'Slovenia - Hungary'	SI-HU	26.34
'Poland - Germany (Saxony)'	PL-DE	98.58
Operational Programme 'Italy-Malta'	IT-MT	30.15
'Slovakia - Czech Republic'	SK-CZ	82.10
'Poland - Germany'	PL-DE	113.31
'Austria - Czech Republic'	AT-CZ	91.37
'Poland - Slovakia'	PL-SK	140.27
'Slovenia - Austria'	SI-AT	66.66
'South Baltic'	DK-DE-SE-PL-LT	61.15
'Romania-Bulgaria'	RO-BG	210.07
'Poland (Woievodship Zachodniopomorskie) - Germany (Mecklenburg-Vorpommern, Brandenburg)'	PL-DE	116.23
'Greece –Cyprus'	GR-CY	48.07
'Czech Republic -Germany'	CZ-DE	105.47
'Italy - Slovenia'	IT-SI	114.22
'Germany (Saxony) - Czech Republic'	DE-SK	196.04
'Greece - Bulgaria'	GR-BG	115.92
EU12 (including borders with EU15)		**2,551.77**

Source: Own elaboration on the ground of ERDF commitment data 2012 provided by DG REGIO

The analysis of the financial commitment under the two themes **"environment" and "climate change"** does not reveal any significant difference between the two groups. **The codes 39-54 correspond to € 995.81 million, representing 19.07% of the total financial commitment of cross-border programmes**. The EU15 share is of 18.35%, while the EU12 share in the total commitments is slightly higher, amounting to 19.79% **(see: Table 6.9).** Differences between the two groups become evident only when the single codes are analysed.

For the **theme environment** more specifically, important codes for EU12 cross-border programmes are related to *water treatment (waste water)* and to *integrated prevention and pollution control,* respectively corresponding to code 46 and code 48. This reveals that programmes involving new Member States consider of prime importance the reduction of pollution. In EU15, both codes correspond to a much lower percentage, showing that pollution represents a less dramatic need, at least if seen in a cross-border perspective. *Promotion of biodiversity and nature protection (including Natura 2000*, code 51) is important for both groups. It turns to be the most significant code, if the EU15 group is considered, and this confirms that there is a focus on advanced environmental needs and challenges. *Promotion of clean urban transport* (code 52), that is overlapping with the accessibility theme, corresponds to very limited financial commitment in the EU15 group and is near to zero in the EU12 group.

Table 6.9: Cross-border programme commitments directly related to "Environment & Climate Change"

Priority themes (fields of intervention)	% of total commitment EU	% of total commitment EU15	% of total commitment EU12
39 Renewable energy: wind	0.12%	0.04%	0.21%
40 Renewable energy: solar	0.22%	0.13%	0.32%
41 Renewable energy: biomass	0.53%	0.62%	0.44%
42 Renewable energy: hydroelectric. geothermal and other	0.41%	0.65%	0.15%
43 Energy efficiency. co-generation. energy management	1.93%	2.49%	1.35%
44 Management of household and industrial waste	0.46%	0.41%	0.51%
45 Management and distribution of water (drinking water)	0.65%	0.44%	0.86%
46 Water treatment (waste water)	1.53%	0.81%	2.28%
47 Air quality	0.31%	0.29%	0.33%
48 Integrated prevention and pollution control	1.40%	0.76%	2.08%
49 Mitigation and adaptation to climate change	0.52%	0.97%	0.05%
50 Rehabilitation of industrial sites and contaminated land	0.10%	0.07%	0.13%
51 Promotion of biodiversity and nature protection (including Natura 2000)	3.47%	4.01%	2.91%
52 Promotion of clean urban transport	0.28%	0.43%	0.11%
53 Risk prevention (including the drafting and implementation of plans and measures to prevent and manage natural and technological risks)	3.75%	3.55%	3.95%
54 Other measures to preserve the environment and prevent risks	3.39%	2.70%	4.11%
Total	**19.07%**	**18.35%**	**19.79%**

Source: Own elaboration on the ground of ERDF commitment data 2012 provided by DG REGIO

Interventions associated with the theme **climate change were allocated more than half of the resources dedicated to the whole of the environment & climate change themes.** This is true for both groups, EU15 and EU12 **(see: Table 6.10.).** Already the "Strategic Evaluation on

Environment and Risk Prevention under Structural and Cohesion Funds for the period 2007-2013" identified on ground of an analysis of the financial allocations during the programming period 2000-2006, among others, the necessity to enhance cross-border management of water resources to avoiding major impacts from natural risks and to enhance cross-border cooperation and investment in coordination and response plans and systems especially in Greece and Poland.[306]

It appears from our analysis that the codes dedicated to *risk prevention* (code 52) and *other measures to preserve the environment and prevent risks* (code 54) are very important in both groups, indeed, with a predominance by EU12. The code *mitigation and adaptation to climate change* (code 49) is near to zero for the EU12 group, while it corresponds to a fifth position within the EU15 group for the whole of the themes environment and climate change. The general picture indicates the capacity of the cross-border programmes to confront with the climate change challenges. If energy is analysed, it emerges that in EU15 *Energy efficiency, co-generation, energy management* (code 43) is a code of particular importance, suggesting a higher capacity to orient the environment-related interventions towards the sustainable growth.

Table 6.10: Cross-border programme commitments, differentiated between the themes "Environment" & "Climate Change"

Priority themes (fields of intervention)	% of total commitment EU	% of total commitment EU 15	% of total commitment EU12
39-54 (Environment & Climate Change)	**19.07 %**	**18.75%**	**19.57%**
39-43; 49; 53-54 (Climate Change only)	**10.86%**	**11.13%**	**10.58%**

Source: Own elaboration on the ground of ERDF commitment data 2012 provided by DG REGIO

EU15 and EU12 groups of cross-border programmes slightly diverge if the environment theme is considered in a broader meaning (see: Table 6.11), i.e. if the promotion of natural assets and the protection/development of natural heritage for tourism purposes and also the maintenance and restoration of the cultural heritage and especially the urban/rural regeneration integrated projects are included. **When the environment becomes a factor integrated in a strategy of promotion or regeneration, EU15 cross-border programmes tend to show a stronger aptitude to focus their financial resources.**

Table 6.11: Cross-border programme commitments for the broad concept of the "Environment" theme

Priority themes (fields of intervention)	% of total commitment EU	% of total commitment EU 15	% of total commitment EU12
39-54; 55-56; 58; 61 (Environment & Climate Change)	**28.66%**	**29.66%**	**27.62%**

Source: Own elaboration on the ground of ERDF commitment data 2012 provided by DG REGIO

[306] GHK (2006), pp. xiii; 34-36

Different to the previous themes, however, **clear differences in the intervention focus appear between the two groups for the themes "Accessibility" and "Sustainable Mobility" (see: Table 6.12).** At the EU-wide level, the codes 16-32 correspond to **€ 668.45 million, representing 12.79% of the total cross-border programmes' financial commitment**. Interventions on accessibility and sustainable mobility thus appear to be less significant than interventions on environment and climate change.

If the cross-border programmes with a participation of EU12 countries are analysed more specifically, this general picture changes dramatically. **With € 528.72 million, investments in "accessibility" and "sustainable mobility" represent for the EU12 programmes 20.72% of the total financial commitment.** Conversely, this theme is of modest importance for the EU15 programmes, representing only 5.22% of the commitment.

If the most important priority themes are again analysed individually, a second point clearly emerges. In the EU15, investments for *regional/local roads* (code 23) have a weight of 1.19% in terms of commitment, which is followed by *Ports* (code 30) with a value of 1.12%. **In the EU12 group, it is evident that priority is given to traditional infrastructures.** The whole field of accessibility is dominated indeed by investments for *regional/local roads*, with a percentage of 14.52% of the whole financial commitment. Investments for *railways* (code 16) have a much more limited importance, but they turn out to have more resources in the EU12 group than in the EU15 group. The figures also show that **sustainable mobility is not neglected by the EU12 cross-border programmes.** On the contrary, the percentage of the sustainable mobility-related commitment is higher than in the group EU15. Investments for the priority theme *cycle tracks* (code 24) have a percentage of 2.67%.

Table 6.12: Cross-border programme commitments directly related to "Accessibility & Sustainable Mobility"

Priority themes (fields of intervention)	% of total commitment EU	% of total commitment EU 15	% of total commitment EU12
16 Railways	0.80%	0.38%	1.24%
17 Railways (TEN-T)	0.00%	0.00%	0.00%
18 Mobile rail assets	0.05%	0.10%	0.00%
19 Mobile rail assets (TEN-T)	0.00%	0.00%	0.00%
20 Motorways	0.06%	0.11%	0.00%
21 Motorways (TEN-T)	0.00%	0.00%	0.00%
22 National roads	0.02%	0.02%	0.03%
23 Regional/local roads	7.70%	1.19%	14.52%
24 Cycle tracks	1.56%	0.51%	2.67%
25 Urban transport	0.21%	0.40%	0.01%
26 Multimodal transport	0.67%	0.70%	0.64%
27 Multimodal transport (TEN-T)	0.04%	0.07%	0.00%
28 Intelligent transport systems	0.49%	0.44%	0.54%
29 Airports	0.00%	0.01%	0.00%
30 Ports	0.76%	1.12%	0.39%
31 Inland waterways (regional and local)	0.36%	0.18%	0.54%
32 Inland waterways (TEN-T)	0.07%	0.00%	0.15%
Total	**12.79%**	**5.22.%**	**20.72%**

Source: Own elaboration on the ground of ERDF commitment data 2012 provided by DG REGIO

The overall picture therefore clearly suggests that **accessibility is, under all perspectives, a key theme for the cross-border programmes participated by the new EU Member States.** This matter of fact is not surprising given our previous analysis of the core-periphery disparity in Europe, which reveals that 'core' countries are all among EU15 while EU12 countries tend to belong to the periphery. Moreover, the EU12 focus on road investment is a pragmatic response given to the low general rail accessibility to urban functions that is particularly visible in eastern European countries, where national priorities in rail networks and territorial conditions (i.e. population density) often make the establishment of high-speed train connections less attractive than in the EU core countries. The low general rail accessibility is therefore often compensated for by better road accessibility to urban functions, also for travelling across borders.

Table 6.13: Cross-border programme commitments, differentiated between the themes "Accessibility" and "Sustainable Mobility"

Priority themes (fields of intervention)	% of total commitment EU	% of total commitment EU 15	% of total commitment EU12
16-32 (Accessibility & Sustainable Mobility)	12.79%	5.22%	20.72%
24-28 (Sustainable Mobility only)	2.97%	2.12%	3.86%

Source: Own elaboration on the ground of ERDF commitment data 2012 provided by DG REGIO

Transnational programmes in the period 2007-2013

The registered commitments until 2012 for transnational programmes amounts to more than € 1.7 billion, which corresponds roughly to one third of the cross-border programmes' commitment **(see: Table 6.14).** The 13 programmes range from about € 330 million for North West Europe, having a weight of almost 20% in the whole package of transnational programmes, to about € 26 million (Indian Ocean). Considering only the European continent, the programme committing the least resources is Northern Periphery (about € 35 million).

Table 6.14: Transnational programme commitments

Programme	EU Countries	Total Commitment in € million
Alpine Space	AT-FR-DE-IT-SI	96.94
Central Europe	AT-CZ-DE-HU-IT-PL-SK-SI	233.70
North Sea Region	UK-SE-DE-DK-NL-BE	131.12
Northern Periphery	IE-FI-SE-UK	34.83
Madeira-Açores-Canarias	ES-PT	51.16
South West Europe	ES-FR-PT-UK	90.73
Caribbean	FR	41.01
North West	BE-FR-DE-IE-LU-NL-UK	329.94
Mediterranean	CY-FR-EL-IT-MT-PT-SI-ES-UK-HR	185.76
Indian Ocean	FR	25.56
South East Europe	IT-AT-SI-HR-EL-BG-RO-HU-SK	218.73
Atlantic Area	ES-FR-IE-PT-UK	100.66
Baltic Sea Region	DE-DK-PL-SE-FI-EE-LV-LT	200.58
Total		**1,740.73**

Source: Own elaboration on the ground of ERDF commitment data 2012 provided by DG REGIO

Transnational cooperation programmes focus much more on the themes "environment & climate change" than cross-border programmes (see: Table 6.15).

With a financial commitment amounting to € 608.28 million, **the "environment & climate change" themes have together a weight of 34.94%**. The programme focusing most on these themes is North West Europe with a very significant amount of € 158 million allocated, then followed by the programmes North Sea Region and Baltic Sea Region.

Moreover, if the environment theme **is considered in a broader meaning** (i.e. by including the already mentioned tourism, culture and urban/rural priority themes), the overall share would even **reach the very high percentage of 43.17%** of the total transnational commitments.

The most significant feature is that **the theme climate change alone** holds a very high share in the total funding for both themes. With 25.78% of the total financial commitment, climate change **received more than one fourth of the total financial resources for transnational cooperation.** The most important intervention is mitigation and adaptation to climate change (code 49) with a percentage of 6.15%, which is a secondary code under cross-border programmes. This intervention is followed by other measures to preserve the environment and prevent risks (4.54%, code 54) and risk prevention (4.37%, code 53). The top three programmes on climate change are North Sea Region, North West Europe and Northern Periphery. This reveals a particular effort, by the northern transnational programmes, in the areas of mitigation/adaptation to climate change and environmental risk management.

Table 6.15: Transnational programme commitments differentiated between the themes "Environment" and "Climate Change"

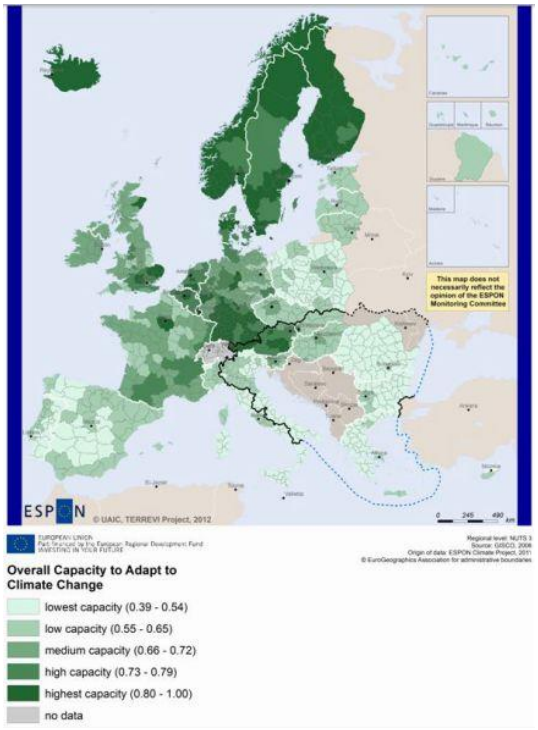
Programme	% of total commitment Environment & Climate Change Priority themes: 39-54	% of total commitment Climate Change only Priority themes: 39-43; 49; 53-54
Alpine Space	33.18%	28.73%
Central Europe	32.76%	24.63%
North Sea Region	43.32%	37.49%
Northern Periphery	34.80%	33.67%
Madeira-Açores-Canarias	36.25%	23.58%
South West Europe	33.74%	21.76%
Caribbean	27.18%	24.73%
North West Europe	48.14%	36.71%
Mediterranean	34.88%	29.77%
Indian Ocean	25.59%	19.18%
South East Europe	15.23%	12.11%
Atlantic Area	23.83%	10.83%
Baltic Sea Region	41.32%	20.84%
Total	**34.94%**	**25.78%**

Source: Own elaboration on the ground of ERDF commitment data 2012 provided by DG REGIO

The forthcoming ex-post evaluation should now analyse in-depth the impact of this significant effort of actions for mitigating climate change and adapting to climate change risks in transnational areas.

Of particular interest could be to compare the intervention focus especially of the northern programmes to an EU-wide situation which shows that northern countries have in general a high adaptive capacity to climate change. In comparison, eastern European countries, on the whole, have lower capacity than Western or Northern European countries and the countries around the Mediterranean, overall, appear to have lower capacity than the countries around the Baltic Sea region (**see: Map 6.2**). Here, also the low adaptive capacity especially of the south eastern European countries emerges. This situation contrasts with the investment focus of the South East Europe programme, which is the second-last programme in terms of percentage of commitment dedicated to climate change (only 12%). This case indicates that transnational cooperation did not seem to have addressed (or have the capacity) to answer a key territorial need.

Map 6.2: Combined adaptive capacity to climate change (South East TNC highlighted)



Source: ESPON 2013 Climate

Community funding for the themes **"accessibility & sustainable mobility" has the same importance in transnational cooperation than under cross-border cooperation, representing,** a share of **13.15% of the total** transnational financial **commitments (see: Table 6.16).**

There is, however, a significant difference in terms of **focus on sustainable mobility**. With more than € 153 million allocated, sustainable mobility alone reaches the percentage of 8.80%. The two most important types of interventions under this theme are very indicative of this approach. They are *intelligent transport systems* (2.81%) and *multimodal transport* (2.72%). The programmes with the highest focus on sustainable mobility are North Sea Region, Central Europe, North West Europe and Alpine Space.

Finally, there is a correspondence with the analysis of the cross-border cooperation programmes when the individual programmes are considered. Most programmes with the **highest focus on only accessibility** include a larger number of EU12 Member States – being particularly in need for improving their transport accessibility - as well as some of the southern and more peripheral EU15 Member States like Portugal, Spain and Greece (i.e. Central Europe, South East Europe, Mediterranean).

Table 6.16: Transnational programme commitments differentiated between the themes "Accessibility" & "Sustainable Mobility"

Programme	% of total commitment Accessibility & Sustainable Mobility Priority themes: 16-32	% of total commitment Sustainable Mobility only Priority themes: 24-28
Alpine Space	10.32%	10.32%
Central Europe	16.29%	11.34%
North Sea Region	17.46%	13.40%
Northern Periphery	6.25%	6.25%
Madeira-Açores-Canarias	0.89%	0.00%
South West Europe	4.91%	4.91%
Caribbean	1.02%	1.02%
North West Europe	16.96%	11.04%
Mediterranean	13.20%	4.60%
Indian Ocean	0.00%	0.00%
South East Europe	16.18%	9.79%
Atlantic Area	9.96%	7.50%
Baltic Sea Region	12.26%	9.05%
Total	**13.15%**	**8.80%**

Source: Own elaboration on the ground of ERDF commitment data 2012 provided by DG REGIO

7. Overall conclusions drawn from the long-term analysis of territorial developments and of INTERREG/ETC-investments

The overall conclusions of the Scoping Study **first** present **key findings from our long-term analysis of territorial developments and trends** for the themes environment, climate change, regional accessibility and sustainability, mainly with view to indicate needs and potentials for cross-border and territorial cooperation action in the programming period 2014-2020. These findings are also meant to further substantiate the theoretical analysis of action potentials that was carried out in the first step of the Scoping Study (**i.e. initial scoping, see Volume 1a and in particular the tables in the Annex**).

Second, also the **key findings stemming from our long-term analysis of INTERREG/ETC-investments** are presented with a view to identify shifts in the thematic funding allocation that have taken place within the individual cooperation stands or among different programme groups. However, the possibility to identify long-term funding trends for each of the individual themes is limited by the difference between categorisation systems used from 1990 until 2013 and especially the changes of the encoding systems that took place between 2000-2006 and 2007-2013. This means, in particular, that the themes "climate change" and "sustainable mobility" could only be explored in detail for the most recent period (2007-2013), whereas in the previous periods they are most often included under "environment" and "accessibility".

Finally, we also develop **recommendations for more detailed future investigations that could be carried by INTERACT** on issues relating to the themes that were addressed by the present scoping study.

Environment

The theme environment is extremely complex, wherefore long-term developments have been analysed for a number of sub-themes with a significant territorial dimension that are also relevant for cross-border and transnational cooperation. These sub-themes were water resources and water quality, air pollution and air quality, land cover and land use change, ecosystems and biodiversity and finally material resource use and waste.

The observed long-term developments and trends, both EU-wide and at the regional-level, draw a mixed overall picture: across all sub-themes there are aspects where developments indicate that the situation has clearly improved over time; but there are developments for a number of other aspects which indicate that a more positive status of the environment has not yet been achieved. Examples for the latter are:

- repeating periods of water stress the Mediterranean which are mainly aggravated by high tourism presence during the summer season, despite a largely sustainable water abstraction practice in the rest of the EU;
- multiple pressures affecting the quality of many freshwater bodies or coastal and transitional waters, also in case of tourist-used inland or coastal bathing water sites;
- still high population shares in urban areas affected by pollutant concentrations which are higher than selected limit/target values;

- a continuous increase of land take for urbanisation and infrastructures which reduces farmland and forests or semi-natural land and leads to adverse environmental effects, which also is an issue in a number of densely populated EU border areas;
- diverse threats and pressures affecting protected and non-protected terrestrial ecosystems which most often are found in border and mountain regions, but also growing threats and pressures affecting marine ecosystems;
- reduced ability of ecosystems to provide services that support directly or indirectly human survival and the quality of life.

Although there are overall developments indicating that progress is made towards greening the EU economy, it appears at the same time that regional levels in green economic performance are very different across Europe. Clearly below average performance levels are mainly found in eastern and south-eastern European regions and in some regions on the Iberian Peninsula. Moreover, considerable differences in performance levels do exist along many EU borders between neighbouring regions. Both of these observations indicate a clear potential where cooperation could be of added value.

Climate change

Man-made GHG emissions are the dominant cause for climate change and some EU-wide developments indicate a positive change (i.e. substantial drop of GHG emissions in the EU; increased share of energy generated from renewables). For a number of other climate change related issues, however, EU-wide developments do not indicate a shift towards a more positive overall situation (i.e. no clear trend towards a lower energy demand; increased use of solid fuels, particularly of climate harmful coal; rising GHG emissions from transport between 1990-2011; etc.). Long-term developments and trends relating to climate change have been analysed for two policy-oriented perspectives, because this allows best pointing to issues that are relevant for territorial development and thus also for cross-border and transnational cooperation.

The perspective of **climate change mitigation** mainly deals with limiting the magnitude and/or rate of long-term climate change, be this through actions that help to directly reducing GHG-emissions (e.g. switching to low-carbon energy sources, increased energy efficiency, technological improvements etc.) or through actions increasing the capacity of carbon sinks (e.g. reforestation & other measures removing greater amounts of carbon dioxide from the atmosphere).

Renewable energy production and renewable energy consumption in the EU have considerably increased especially during the past decade. Both aspects also offer clear potentials for promoting sustainable territorial development. In electricity production the most strongly growing segments are solar energy and wind energy (incl. off-shore wind energy), but the highest potentials for electricity production from these sources are mainly found in regions located in the EU's periphery. This obviously creates a challenge of bringing the produced electricity to the main energy consuming areas in the core of Europe, which makes grid access and related distribution cost a crucial factor for the competitiveness of new installations. The promotion of localised direct consumption, thus avoiding that the product is fed into the general electricity grid, is an important option in peripheral regions of Europe with high production potential (e.g. islands, mountainous and sparsely populated areas, urban areas with low disposable income), but also more generally throughout Europe.

There are clear EU-wide developments which indicate that production processes are becoming more energy efficient, but no territory-specific trends of this change can be detected because regional data on this matter is missing. Yet, a more climate-friendly low carbon economy holds many opportunities for cross-border and transnational territorial development: a more efficient energy use lowers production costs and thereby increases competiveness of EU businesses and raises the demand for new or better green technologies, which also induces further innovation and creates jobs in a sector with high global growth potentials.

Increasing the energy efficiency of residential and non-residential buildings represents another clear potential for regional and local-level mitigative action. Housing, offices, shops and other buildings currently account for nearly 40% of the EU's final energy consumption and for 36% of all GHG emissions. The largest energy saving potential is usually seen with the older building stock (i.e. built before the 1960s) and scope for action exists in many EU Member States, especially those having the highest shares of older buildings (=/> 40% UK, DK, SE, FR, CZ, BG, IT). Yet, this might not always have to be the main focus because it is observed that many buildings constructed after the 1960s also bear significant improvement potentials. Within the building sector, the social housing segment offers high potentials to reduce energy consumption and GHG emissions and thus scope for regional/local action. However, the scope for action is here geographically rather focussed (esp. NL, AT, FR, CZ, UK, FI, SE, PL, DK).

The perspective of **climate change adaptation** mainly deals with anticipating and reacting to the variety of effects and risks emerging from global warming which adversely affect natural and human systems all over the globe. The most widely known and also directly perceived climate change risks are sudden hydro-meteorological events (e.g. storms, floods, landslides) and climatological events (e.g. heat waves; droughts, forest fires), but there are also gradually developing and less directly perceived risks (e.g. sea level rise, loss of biodiversity, increase of human health risks due to diseases etc.).

These risks are expected to increase in the future, but they impact larger bio-geographical zones of Europe quite differently and thus also the types of territories that are found within them (i.e. urban areas, coastal areas, mountain areas, remote or sparsely populated areas). Across all regions, however, past developments in Europe show that the social and economic cost linked to the damage caused by extreme climate-related events has already an upward trend and long-term projections indicate that this cost is expected to further increase in the future.

Climate change adaptation is particularly important in areas where most of the EU's population and economic or cultural assets are concentrated. Especially urban regions and densely populated coastal areas are likely to accumulate various risks over increasingly longer time periods during the year (i.e. coastal & river flooding due to high precipitation and strom surges during autumn, winter and spring; heat waves, droughts and water scarcity in summer). Climate change adaptation is also crucial in areas hosting most of Europe's natural capital (e.g. rural border areas and mountain regions, less populated coastal zones, sparsely populated areas) mainly to reduce the vulnerability of ecosystems and to preserve their essential services rendered to society, but also for preserving their important potential in removing GHG emissions from the atmosphere.

If the various impacts that climate change has in different types of European territories is considered together with the variable capacity of regions to adapt to these impacts (i.e. economic, socio-cultural, institutional and technological ability of a region), then it appears that

most regions in Mediterranean countries together with some hot-spots in the north-western part of Europe (i.e. regions at the channel & north sea coast of NL, BE, UK, FR) show the highest potential vulnerability to climate change. This overall picture clearly goes counter to territorial cohesion, because it indicates that climate change would deepen existing socio-economic imbalances between economically lagging regions in the south and prosperous regions in the core of Europe.

Regional accessibility

The overall development shows that general regional accessibility improved within the EU between 1990 and 2013. This improvement happened not everywhere in the periphery and was also not induced equally by all modes of transport. And it also came along with an increased environmental cost and by drawing on the potentials of less sustainable modes of transport (esp. road and air transport).

Road network accessibility improved between 1990 and 2010, especially in the peripheral and isolated parts of the EU territory and also along many borders there. This trend was intense and widespread in the period 1990-2000 (i.e. covering the EU's West-North-South-East periphery), but less intense and also somewhat more focussed in the period 2001-2012 (i.e. mostly in the EU's West, East, South-East periphery). Despite this positive long-term development, there are sings which suggest that further road transport infrastructure investments will not necessarily lead to further strong increases in regional accessibility, also in the periphery. Still, further investments in secondary road connections that better link peripheral or isolated areas to the TEN-T or to further away urban centres might still be necessary especially in Eastern and south-Eastern Europe, given the long time it has taken the EU15 to make progress in this respect.

Intra-EU air transport played an important role in improving regional accessibility especially of peripheral and remote territories of the EU. This is mainly due to the nowadays much higher availability of more diverse and also cheap flight connections, which was not the case during most of the 1990s.

Regional accessibility by rail has improved and the most important driver behind this was the expansion of the European high-speed train (HST) network. Major accessibility gains took place in the period 2000-2013, because the HST-network expansion was clearly more significant and also more widespread in this period than during the previous decade (1990-2000). This indeed positive development comes along with a strong geographical concentration of higher rail accessibility gains, which exist especially in areas situated immediately along the main HST-lines. The EU-periphery remains to be characterised by many areas having low rail accessibility to urban functions which, however, is compensated there to some extent by better road accessibility to urban functions.

The above-shown improvements of regional accessibility between 1990 and 2013 also come along with environmental cost, be this in terms of a higher fragmentation of landscapes and further soil sealing (i.e. through road and rail infrastructure constructions) or in form of an increase of energy consumption and GHG-emissions resulting from higher road and air traffic.

Sustainable mobility

The long-term developments show that, despite improvements and technological progress, the EU's transport system and the related traffic flows are in overall terms not yet sustainable. There is a persisting and strong need to further reduce the negative impacts which transport has on the environment, climate and society. Cross-border and transnational cooperation have clear potentials to act on many problems and can therefor contribute to achieve more sustainable mobility in the EU.

There is still a non-sustainable pattern of modal split in passenger and freight transport, as road transport is clearly dominating both dimensions far ahead of other more sustainable modes of transport (rail, shipping, inland navigation). This puts strong pressure on the entire EU road network and causes a variety of negative effects in territories along the most frequented road transport axes and at the key nodal points where different axes meet. The Alps and the Pyrenees, characterised by a fragile mountainous environment and a majority of the population living close to the main road transit axes, are particularly affected of increasing traffic.

Individual car use remains very high in the EU, although one can observe marked territorial differences and also some encouraging signs. The development of motorisation rates show clear east-west differences, with a stronger development in the EU12 than in the EU15 where growth in motorisation rates was geographically much more focussed and often also characterised by decline. The latter phenomenon is particularly observed in capital regions of the western and northern EU15 Member States, which are often characterised by low motorisation rates. However, the four EU Member States with the highest population still account for around 63% of all passenger-kilometres travelled in the EU28 in 2012 (i.e. DE, FR, UK, IT).

Long-term developments show that public transport use has generally increased, but there are significant territorial differences in the mode-specific endowment with and the actual use of public transport. A largely complementary dual pattern becomes visible on the EU territory as regards the general availability of public transport means, with road-bound public transport being dominant in the EU-periphery and rail-bound public transport prevailing in the centre-east of the EU. The actual use of public transport shows stark differences across the EU, with no clear overall territorial patterns visible. As regards quality, there are clear indications showing that in many cities across Europe there is still considerable scope for improving public transport offers.

Traffic congestion in European cities and on major transport axes is a major problem estimated to causes cost in the EU of around € 120 billion or some 2% of the GDP. The deployment of intelligent transport telematics applications within urban areas and across pan-European transport corridors indeed helps to address this problem. But after 7 years of less congestion due to the crisis, recent developments again indicate a raising trend. Although road casualties have drastically reduced since 1990, accidents still cause an annual loss in human lives equivalent to the size of a medium town and also many thousands of injured people. Also here geography seems to matter: road fatalities rates are in general low around major cities and in other urbanised areas of northern and western Europe (i.e. Scandinavia, Germany, the Netherlands, the UK and Ireland), whereas much higher are found in other parts of Europe and especially in regions with low motorway density. A nearly opposite picture emerges for injuries in road accidents, as the densely populated core areas of Europe are clearly in a leading position.

Long-term trends in thematic cross-border funding

The long-term evolution of Community support for cross-border investments in the fields of environment, climate change, accessibility and sustainable transport during four generations of INTERREG / ETC-programmes (1990-1993; 1994-1999, 2000-2006, 2007-2013) shows **two important overall trends (see: Table 7.1):**

- The proportion of Community funding allocated to interventions in the fields of environment and climate change shows a clear upwards trend between 1990 and 2012, but variations occur in the last funding period which depend on how narrow or broad the theme environment is considered.
- Conversely, the proportion of Community funding allocated to interventions in the fields of accessibility and sustainable mobility shows a very considerable and continuous downward trend between 1990 and 2012.

Table 7.1: Long-term evolution of thematic cross-border investments (1990-2012)

Programming Period	Cross-border investments in the fields of environment & climate change (as percentage of the total committed Structural Funds for this cooperation Strand in the relevant funding period)	Cross-border investments in the fields of regional accessibility & sustainable mobility (as percentage of the total committed Structural Funds for this cooperation Strand in the relevant funding period)
1990-1993	**10.0%**	**45.5%**
1994-1999	**15.4%**	**28.7%**
2000-2006	**25.5%**	**16.9%**
2007-2013	**19.1% or 28.7%** **(*)**	**12.8%**

(*) The higher percentage also includes environment-related interventions under tourism culture and spatial planning (i.e. code 55 "promotion of natural assets", code 56 "protection and development of natural heritage", code 58 "protection and preservation of the cultural heritage" and code 61 "integrated projects for urban and rural regeneration").

From a comparison of the first three funding periods (i.e. 1990-1993; 1994-1999, 2000-2006), the following two general trends at the level of the cross-border programmes appear.[307]

(1) Most of the financially larger INTERREG I and INTERREG IIA programmes which covered Objective 1 border regions have clearly reduced their previously significant shares of funding for measures improving transport networks, having reached a more modest position in the period 2000-2006 (INTERREG IIIA).[308] Conversely, these programmes increased funding for other interventions among which are also found environmental measures. A relatively similar trend is observed for a number of maritime cross-border programmes (i.e. FR-IT programmes; FR-UK-programmes "Transmanche" and "Rives Manche"), where an increasing focus was put on measures relating to environment, natural heritage and natural resources protection and sustainable regional development. Under some other maritime programmes,

[307] see also: LRDP (2003), pp. 48-50

[308] Among the financially large INTERREG I-IIIA programmes for which this trend is observed are "Spain-Portugal", "Ireland/UK-Northern Ireland" and "Greece external borders". Exceptions are "Greece-Italy" and "Italy-Abania", where transport expenditure still remained the most important priority in 2000-2006.

however, investments in basic transport infrastructures remained a still important intervention focus (esp. "Corsica-Sardinia", "Corsica-Tuscany").[309]

(2) The funding pattern of the many other INTERREG I and INTERREG IIA programmes which covered both internal and external EU borders was generally characterised by stability and continuity, but also by variable degrees of a gradual re-focussing of the funding allocation between priorities and measures. Support to transport-related measures ranged here between modest and low, but always clearly behind the share of support dedicated to other themes (e.g. economic development & SMEs, technology & innovation, tourism, education/training & labour market, environment, socio-cultural aspects). A number of these programmes covering permeable borders were also quite active in the field of sustainable mobility (i.e. cross-border public transport). Finally, these programmes often also put a stronger focus on interventions improving their environmental conditions and preserving the natural or cultural heritage, which were very often closely linked to tourism development especially from INTERREG IIA onwards.

As our **financial analysis of the periods 2000-2006 and 2007-2013 has put particular emphasis on the enlargement factor,** conclusions on the developments and shifts in the thematic funding profiles are now also presented by differentiating between the two sub-groups of programmes considered (i.e. those involving only EU15 countries and those involving EU10/EU12 countries including borders with EU15 countries). From this comparison appear **the following general trends:**

(1) For the **themes "environment and climate change"** one can observe an increasing importance of funding between 1990 and 2006, but then a drop in importance in the period 2007-2013 if the environment theme is given a narrow interpretation. If, however, also other measures relating to the broad concept of environment are considered in the period 2007-2013,[310] then the overall trend becomes clearly positive throughout the entire period 1990-2012 (i.e. overall level at 28.7% and thus above the 2000-2006 level of 25.5%). Whereas in the period 2000-2006 the themes environment and climate change still attracted a clearly higher share of investments under the EU10 programmes (31%) than under EU15 programmes (24%), one can observe that a nearly balanced situation among both groups existed in period 2007-2013 for both the narrow and broader interpretation given to the environment theme.

(2) For the **individual theme "climate change"**, it was possible to carry out an in-depth analysis only for the period 2007-2013. One can observe a strong focus on this theme because half of the total resources dedicated to the themes "environment & climate change" were dedicated to climate change only, with a similar weight given to this by the programmes involving EU15 and EU12 countries. The financial commitments for energy-related investments in 2007-2013 can be cautiously compared with those in the period 2000-2006. They increased for both groups of countries, however with a stronger focus in programmes covering EU15 countries. The importance of the priority theme *energy efficiency, co-generation, energy management* for the EU15 programmes suggests a higher capacity to interpret the environment-related interventions in terms of sustainable growth.

[309] LRDP (2003), pp. 48-50

[310] i.e. the promotion of natural assets and the protection or development of natural heritage for tourism purposes and the maintenance and restoration of the cultural heritage and especially the urban/rural regeneration integrated projects (codes 55, 56, 58, 61).

(3) Overall one can observe a decreasing importance of funding for the **themes accessibility and sustainable mobility** between the periods 2000-2006 and 2007-2013, but more interesting findings come to the fore if this overall trend is looked at by the two groups of countries. Already in 2000-2006 there is a difference between the EU15 and EU10 programmes, but the still important transport-related investments in the programme Greece-Italy (and Italy-Albania) make the EU15 group largely comparable to the EU10 group. In 2007-2013, however, the difference becomes clearly evident as EU12 programmes invested much more on accessibility and sustainable mobility (20.7%) than EU15 programmes (5.2%). This is due to the priority theme *regional/local roads*, which attracts more than two thirds of the resources committed by programmes involving EU12 countries. This aspect shows that due to different socio-economic context conditions in the EU12 cross-border areas, the related programmes still had to address significant needs and gaps in this field. The focus is understandable if one considers that other lagging border regions in the EU15 countries took nearby 10 years to eliminate such needs and gaps before programmes started to reduce funding for transport infrastructures.

(4) As for the climate change it was possible to carry out an in-depth analysis of **the individual theme "sustainable mobility"** only for the period 2007-2013. The overall weight at EU level for such investments amounts to 3% of the total committed resources for cross-border cooperation. EU12 programmes committed a higher percentage than EU15, but for EU15 programmes these interventions represented 40% of the whole investments for the themes "accessibility and sustainable mobility" (only 19% for EU12).

Long-term trends in thematic transnational funding

The long-term evolution of Community support for transnational investments in the fields of environment, climate change, accessibility and sustainable transport during three generations of INTERREG / ETC-programmes (1997-1999, 2000-2006, 2007-2013) shows **two important overall trends (see: Table 7.2):**

- The evolution of the proportion of Community funding allocated to interventions in the fields of environment and climate change between 1997 and 2012 apparently indicates a downward trend. However, if also some specific context factors are considered, the real overall trend is rather characterised by an increase and then by a high-level stabilisation towards the end of the overall period.
- The evolution of the proportion of Community funding allocated to interventions in the fields of accessibility and sustainable mobility between 1997 and 2012 shows considerable variations, but apparently indicates a slight upward trend. If again some specific context factors are considered, then the real overall trend is rather characterised by a decrease of funding shares in the period 1990 and 2012.

If this overall picture is compared to that for cross-border cooperation, then one can observe similarities and a noteworthy difference: the overall trends in both funding dimensions are largely similar (up for "environment & climate change", down for "accessibility & sustainable mobility"), but transnational cooperation programmes dedicate on average a much higher share of funding to the themes "environment & climate change" than cross-border programmes.

As regards the high importance of funding for investments relating to **"environment & climate change",** it is observed that especially the individual theme climate change is given very high importance. This appears already in the 1997-2000 period, where the theme was strongly featured by two flood prevention programmes and four drought mitigation programmes which together received the bulk of Community support for INTERREG IIC. The outcomes of the following period (2000-2006) confirmed this importance and in the period 2007-2013, the climate change theme received more than one fourth of the total ERDF support for transnational cooperation, with a particular focus under the northern European programmes.

Table 7.2: Long-term evolution of thematic transnational investments (1990-2012)

Programming Period	Transnational investments in the fields of environment & climate change (as percentage of the total committed Structural Funds for this cooperation Strand in the relevant funding period)	Transnational investments in the fields of regional accessibility & sustainable mobility (as percentage of the total committed Structural Funds for this cooperation Strand in the relevant funding period)
1997-1999	**76%** **(*)**	**7%** **(**)**
2000-2006	**42%** **(***)**	**21%** **(***)**
2007-2013	**35% or 43%** **(****)**	**13%**

(*) The very high percentage needs to be interpreted with caution, as it is mainly a result of the significant amount of support allocated to the 6 INTERREG IIC programmes on flooding and drought prevention which represented together nearby 2.4 times the volume of Community funding allocated to the 7 INTERREG IIC programmes on spatial planning. If only the total Community support for the 7 INTERREG IIC programmes on spatial planning is considered, it decreases to around 20%.
(**) The low percentage needs to be interpreted with caution, because it was calculated by considering also Community funding for the 6 INTERREG IIC programmes on flooding and drought prevention. If only the total Community support for the 7 INTERREG IIC programmes on spatial planning is considered, it raised to 23%.
(***) The percentages for the period 2000-2006 tend to be lower: Community support for "environment & climate change" also included funding for a good management of cultural heritage and Community support for "accessibility & sustainable mobility" included support for an improved access to the information society.
(****) The higher percentage also includes environment-related interventions under tourism culture and spatial planning (i.e. code 55 "promotion of natural assets", code 56 "protection and development of natural heritage", code 58 "protection and preservation of the cultural heritage" and code 61 "integrated projects for urban and rural regeneration").

As for the theme **"accessibility & sustainable mobility",** transnational cooperation shows a particular feature: the considerable importance that is given to interventions in the field of sustainable mobility. Already in the period 1997-1999 it is possible to identify a focus on this theme because transnational cooperation outcomes addressed aspects such as multimodal transport development and a transnational integration of logistics chains or low-speed mobility and long-term traffic forecasts. This focus continued in the period 2000-2006, where a clear effort was made to promote multi-modal transport. In the period 2007-2013, two thirds of the total financial commitments for the themes "accessibility and sustainable mobility" were alone dedicated to interventions on *intelligent transport systems* and *multimodal transport*. The 2007-2013 programmes with the highest focus on sustainable mobility cover most often western European countries (i.e. North Sea Region, North West Europe and Alpine Space; exception is Central Europe), while a clear focus on accessibility appears in programmes including EU12 countries (i.e. Central Europe, South East Europe) and some southern EU15 countries (i.e. Mediterranean).

Recommendations for further in-depth research of INTERACT

The specifications for the overall INTERACT-assignment asked experts to identify cooperation areas which could be used as case studies in further investigations, for which the findings and data from the long-term analysis of territorial developments and of INTERREG / ETC investment shall be used.

The following paragraphs below give some practical hints for the launching and conceptualisation of such more detailed INTERACT-investigations and then present a list with concrete topics and potential case study programme areas.

Future in-depth investigations to be launched by INTERACT **should in general adopt a long-term perspective, be context-related** and further deepen issues on ground of **carefully selected case studies.**

- Future in-depth investigations should always **adopt a long-term perspective** in order to capture outcomes and wider changes that take a longer time to materialise. This is of particular relevance for our study themes "environment", "climate change" and "sustainable mobility", where substantial changes tend to take place only after a longer time period. But this also holds true for transport infrastructure investments which aim to eliminating missing links or bottlenecks (i.e. a typical "short-term" improvement), because the wider territorial impact of the achieved accessibility improvement and of further induced effects (e.g. on economic development) usually come to the fore only after some years of time.
- The analysis under future in-depth investigations should always be **context-related**, both at the level of a general analysis and at the level of individual case studies (see below). Looking at an intervention or a policy practice "out of its context" can often mean that wider cross-impacts or secondary effects (positive or negative ones) of such interventions are not sufficiently captured, especially in case of soft cooperation. A de-contextualised analysis can also easily lead to wrong conclusions or false assumptions about the transferability of a measure that had been successful in a given context. More importantly, de-contextualised analysis tends to neglect the particular "external" conditions or driving forces (hindering factors) that have shaped or influenced the success (non-success) of an intervention, which becomes an important issue in the funding period 2014-2020.[311] Finally, context relation matters especially in the case of cross-border analyses where the multi-dimensional reality of borders and the diversity of related border-effects have to be carefully considered when outcomes of interventions are assessed.
- **Case studies** on themes or sub-themes should be selected carefully, because they need to demonstrate how and to what extent ETC-interventions have generated change. Case studies need to explain why and how an intervention worked (or not) and also place the implementation process in a wider context, e.g. by relating it to a given level of cooperation maturity. Case studies also need to show what has really changed in relation to a previously existing problem or need and also in the wider economic, social and environmental context of the cooperation area. Case studies should therefore not only

[311] It is worth noting that in the 2014-2020 programming period the managing authorities are expected to demonstrate a stronger kowldedge of the external factors. They will have to be fully aware that the difference between the situation before and after the public intervention does not equal the effect of public intervention, but is also affected by other factors, as it is explained in the Gidance document "Monitoring and Evaluation of European Cohesion Policy– European Regional Development Fund and Cohesion Fund - Concepts and Recommendations" issued by DG REGIO in March 2014.

focus on replicating short-term outputs or immediate results of an intervention, but examine instead how such outcomes and other induced effects have actually helped to achieve a higher degree of territorial integration in cross-border or transnational areas.

Our Scoping Study as well as the other deliverables produced under this INTERACT-assignment show that **problems of data availability should not be underestimated.** Future more detailed INTERACT-investigations should therefore, prior to their launching, explore the general situation of data availability in order to set realistic conditions for research work.

Based upon the findings of the long-term analysis of territorial developments and ETC-funding trends, we have finally drawn up **a list with suggestions for potential study-themes that could be explored in the future (see: Table 7.3).**

Four segments of this list focus on the main themes examined by our study, i.e. "environment", "climate change", "accessibility" and "sustainable mobility". From these themes we selected a number of sub-themes for which a strong territorial dimension and also an ongoing cooperation need exists, while differentiating between cross-border and transnational cooperation. Future studies can be launched as a "package" for relatively similar sub-themes (i.e. covering cross-border and transnational cooperation), or on individual sub-themes if no correspondence exits between both cooperation types.

The **last segment of this list** focuses on the **cross-cutting theme "joint provision of services of general interest".** We decided to raise this theme separately, as research or evaluation literature on such joint approaches is up to now extremely scarce and because it would be a particular challenge for future INTERACT-assignments to examine such approaches in the context of the above-mentioned sub-themes. Whereas especially in the context of cross-border cooperation there are existing examples in the fields of environment and climate change and also further opportunities to intensify and expand cooperation, we could not really find practical examples or options to carry out transnational cooperation on a joint provision of public services.

A cross-border provision of public services exists for example in the fields of sewage water treatment and fresh-water provision along several old EU15 borders, but also along some of the "new" internal EU-borders. Not only do investments in such services improve the environment and the quality of life in the concerned areas, they also lead to considerable cost savings for both sides at the time of the installation, during the ongoing operation and in case of a required upgrading (esp. cross-border sewage water treatment). It would therefore be of interest to examine in-depth which key challenges emerged during the set-up and operation phase and also which long term benefits are created by the joint provision of these services. Some core questions to be explored in this respect are the following:

- Which were the territorial needs / problems that required the establishment of a joint cross-border service?
- Were there any substantial problems or hurdles (esp. legal constraints) during the implementation process?
- Did the realisation of the joint service necessitate the set-up of a body with an own legal personality based on national or EU-law (EGTC)?
- What is the main benefit resulting from operating the joint service?
- If no cross-border service would have been established, what would be the situation now?

- Which are aspects that can be transferred (or recommended) to other cross-border areas?

This part of the study process should definitively involve case study analysis and a limited number of field visits to be realised by the research team in order to get a more "close-to-reality-view" of some existing practices.

The study should also **explore new possibilities for establishing joint public services.** One potential field is decentralised (localised) energy generation on ground of renewables, which can be an interesting development opportunity especially in rural cross-border areas. Also other fields such as a joint treatment of solid waste or public transport could be examined. Of particular interest are the health care and educational sectors because many rural, peripheral or remote cross-border areas will increasingly experience problems in maintaining essential public services due to outward migration of the young and a further aging of the resident population. In order to avoid a future closure of still existing hospitals, kindergardens or primary/secondary education facilities in these areas, a "critical mass" in terms of population needs to be established in a cross-border perspective and also new close-by and age-adequate health care services have to be created. All in all, this will require that unconventional solutions are searched for and also tested in practice if a "desertification" of rural cross-border areas is to be avoided in the medium and long term.

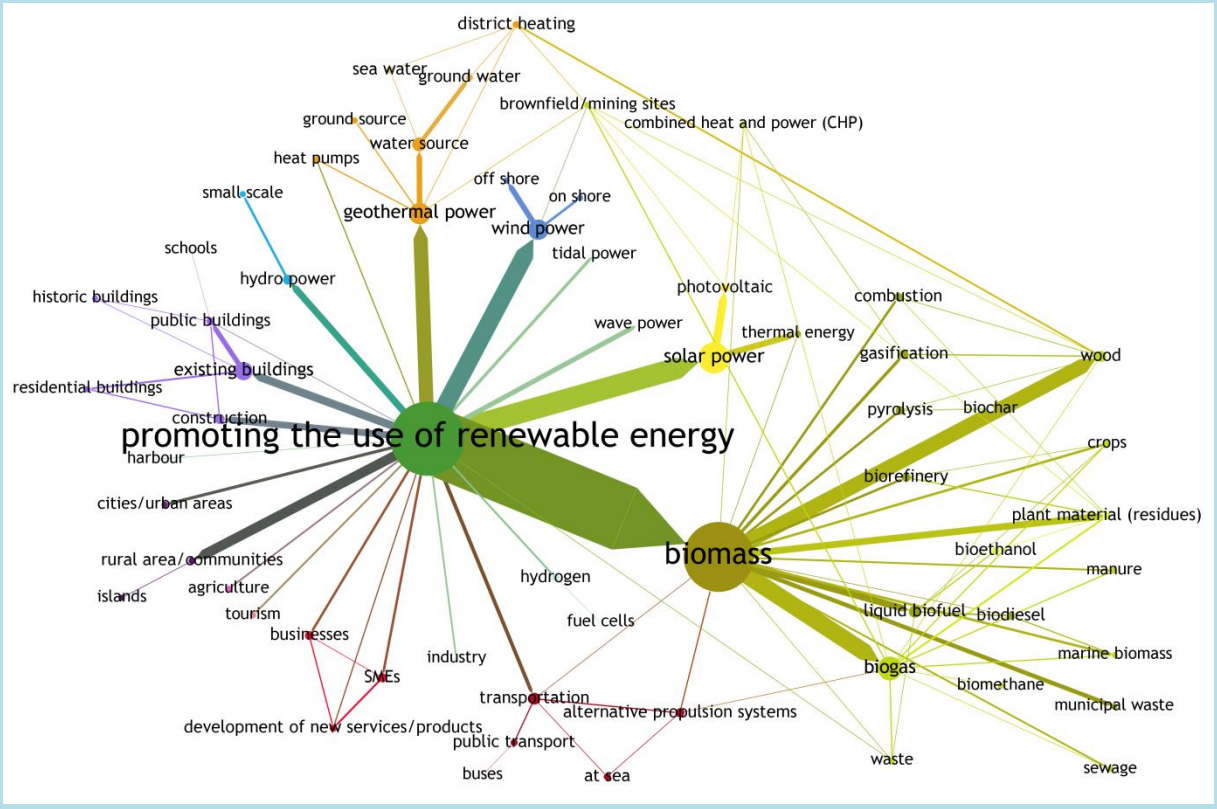
Table 7.3: Overview on potential sub-themes to be addressed by future INTERACT in-depth investigations

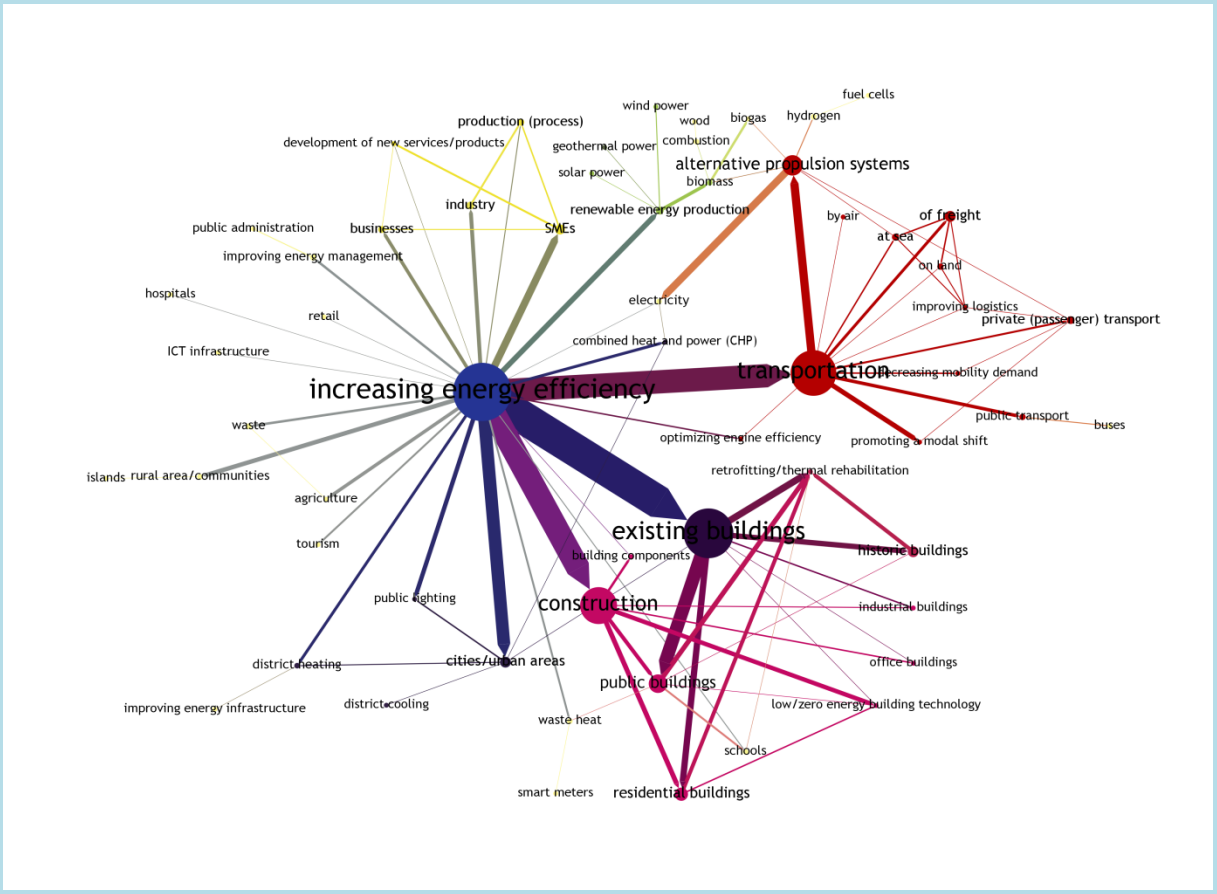
Themes	Cross-border cooperation (sub-themes and case study areas)	Transnational cooperation (sub-themes and case study areas)
Environment	**Sub-themes to be explored:** Preventing landscape fragmentation and preserving terrestrial ecosystems and biodiversity through green infrastructures. **Case study areas:** • Cross-border areas in North West Europe • Cross-border areas in South East Europe • Cross-border areas in mountain areas (Alps, Pyrenees, Carpathian, Nordic Mountains)	**Sub-themes to be explored:** Preservation of coastal and marine ecosystems and ecosystems services. **Case study areas:** • Baltic Sea Region • Atlantic Area • North Sea Area • Northern Periphery
Climate change	**Sub-theme to be explored:** Promoting renewable energy generation and energy efficiency (housing, production processes) in cross-border areas. **Case study areas:** • Cross-border areas in North West Europe • Cross-border areas in Alpine Space **Sub-theme to be explored**: Cross-border prevention and management of river flooding and other natural disasters. **Case study areas:** • Cross-border areas in Central Europe • Cross-border areas in North-West Europe • Cross-border areas in Alpine Space • Cross-border areas in South East Europe • Cross-border areas in the Mediterranean	**Sub-theme to be explored:** Increasing the resilience of rural and urban areas to water scarcity, droughts and heatwaves. **Case study areas:** • Mediterranean • South East Europe • North West Europe **Sub-theme to be explored:** Prevention and management of river and urban flooding. **Case study areas:** • Central Europe • North West Europe • Alpine Space • South East Europe
Regional Accessibility	**Sub-themes to be explored:** Improving road accessibility and efficiency of border crossing points. **Case study areas:** • Cross-border areas in Baltic Sea Region • Cross-border areas in Central Europe • Cross-border areas in South East Europe	**Sub-themes to be explored:** Improving European and international accessibility of transnational areas. **Case study areas:** • Baltic Sea Region • Central Europe • South East Europe • Mediterranean • South West Europe

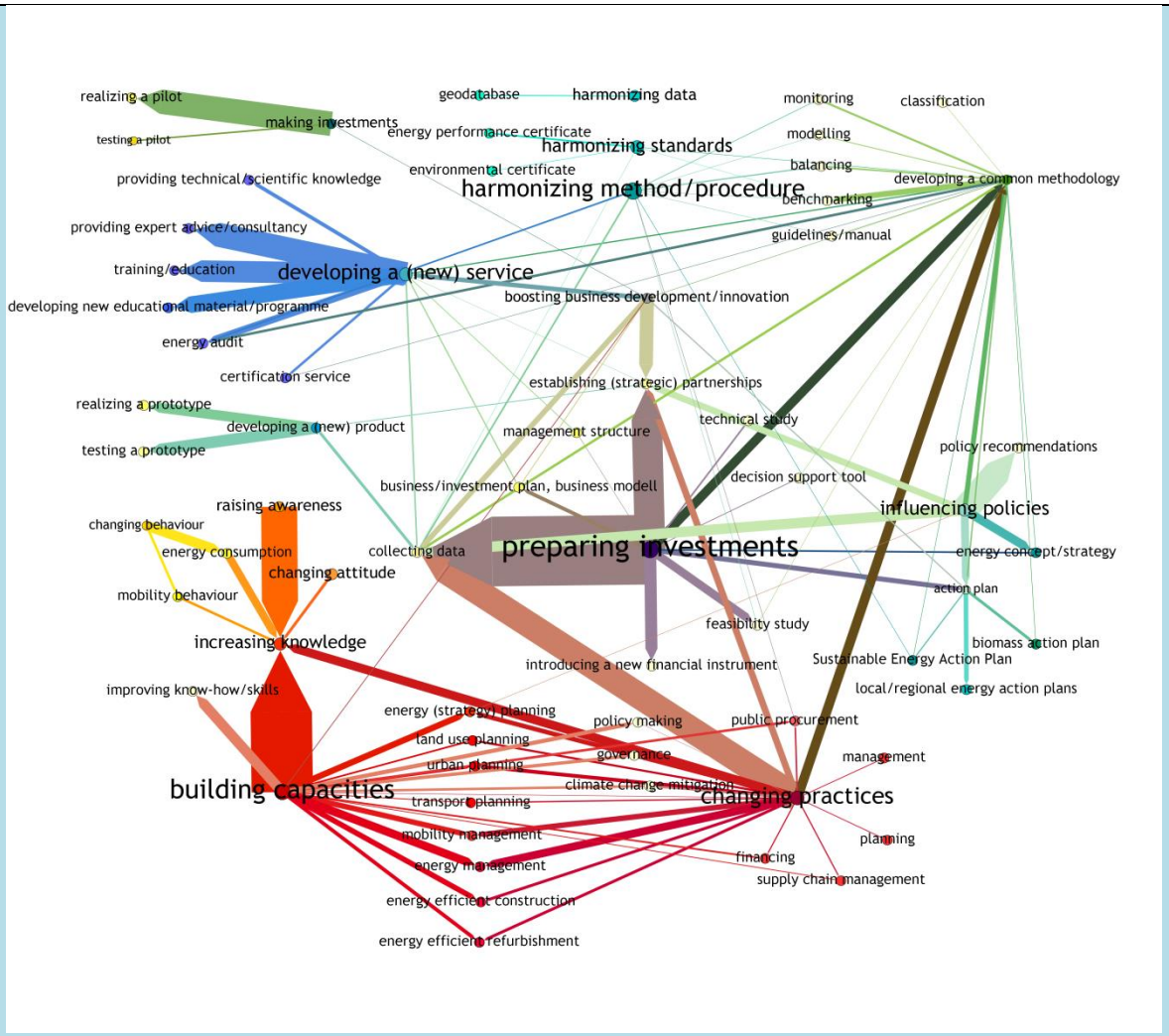
Sustainable mobility	**Sub-theme to be explored:** Promoting sustainable inter-urban mobility, efficient cross-border public transport services and other forms of sustainable (slow mobility, cycling, walking). **Case study areas:** • Cross-border metropolitan regions (CBMR) such as the CBMR Euregio Maas Rhein (DE-BE-NL), the CBMR Geneva (FR-CH), the CBMR Upper Rhine (FR-DE-CH), the CBMR Lille-Kortrijk-Tournai (FR-BE), the CBMR Oeresund (DK-SE), the CBMR Nice-San Remo-Monaco (FR-IT) or the CBMR Vienna-Bratislava (AT-SK). • Other cross-border cities in Europe.	**Sub-theme to be explored:** Designing and implementing urban sustainable mobility strategies among cities and territories in the transnational cooperation area by involving all types of transport operators and users. **Case study areas:** • Alpine Space • South East Europe • North West Europe **Sub-theme to be explored:** Promoting inter-modality, efficient logistics services and intelligent traffic management on larger transnational corridors. **Case study areas:** • Alpine Space • North West Europe • Central Europe • South West Europe **Sub-theme to be explored:** Promoting modal shift through stronger maritime transport and inland waterway transport or efficient / intelligent logistics services. **Case study areas:** • North West Europe • Mediterranean • Baltic Sea Region • Atlantic Area • North Sea Area • Northern Periphery
Joint provision of services of general interest	**Sub-themes to be explored:** • Joint installations for renewable energy generation (or cross-border provision) • Joint sewage water treatment plants • Joint fresh-water provision facilities • Joint waste management services or joint waste disposal facilities **Case study areas:** • Greater Region, Upper Rhine, Alpenrhein-Hochrhein-Bodensee • Euregios (DE-NL, DE-NL-BE) • Italy-Slovenia • Germany-Poland, Germany-Czech-Republic • Cross-border areas in the Danube Area	**??**

ANNEXES

ANNEX 1: Climate change mitigation - promoting renewable energy use, increasing energy efficiency and ways of acting in the context of ETC







Source: http://www.interact-eu.net/energy/energy/406/6172

ANNEX 2:
Main development phases and activities of the Common Transport Policy (1985-2014)

Pillar 1:
Completion of the common transport market and further liberalisation

Following the Commission's "White Paper on the completion of the Internal Market" of 1985, the Council adopted in November 1985 three main implementing guidelines for the CTP[312] as well as a "master plan" to reach these goals by 31 December 1992 for all modes of transport (land, sea, air), which also included a simplification of border controls and formalities as well as an improvement of transport safety. After a first period of intense Community-level legislative activity, the Commission adopted in December 1992 a "White Paper on the future development of the common transport policy". It placed the main emphasis on further opening national transport markets and on creating fair conditions of competition in the EU.[313] As regards the latter aspect, the Commission published in July 1998 a White Paper entitled "Fair payment for infrastructure use: a phased approach to a common transport infrastructure charging framework in the EU"[314]. The document drew attention to the large differences between Member States in terms of the imposition of transport charges which led to intra- and intermodal distortions of competition, but also to the fact that existing charging systems did not sufficiently take into account the ecological aspects of transport.

In 2002, ten years after the 1992 White Paper, many of the announced measures had been implemented and the objectives of establishing the freedom of services and of opening national transport markets were already closer in reach. Liberalisation progressed in the road sector (i.e. road cabotage had become a reality; increased competition in road transport has led to a reduction in prices) and the air sector (i.e. adoption of predefined steps for a progressive opening of the air market), but clear progress was also made for maritime transport between EU Member States and within EU states as well as for EU inland waterway transport. In the rail sector, however, the Single Market and further liberalisation had only been achieved in part. This was mainly due to the close direct link between rail operators and rail networks and because rail companies have been closely linked to the national states and administrations, which first required that a whole strategy of liberalisation had to be set up.

Pillar 2:
Planning of and support for the establishment of a trans-European Transport Network (TEN-T)

The 1985 Internal Market package in the field of transport already included first provisions on granting Community support for the development of transport infrastructures of Community interest. However, it was only with the Maastricht Treaty of 1992 that the European Union was given the task of developing Trans-European Networks (TEN) in the field of transport (TEN-T) and in the areas of telecommunication and energy. The TEN were generally expected to help developing the internal market, to reinforce economic and social cohesion through linking island, land-locked and peripheral regions with the central regions of the Union and to bring the EU territory within closer reach of neighbouring states.

The first Community guidelines for the TEN-T had been adopted in July 1996.[315] They set out the general parameters for the overall network, established the characteristics of the specific network for each transport mode and identified projects of common interest and priority projects that were eligible for Community funding. At the same time, the guidelines were also acting as a reference framework for the

[312] i.e. (1) to achieve the creation of a free transport market without quantitative restrictions by 1992 at the latest; (2) increasing bilateral and Community quotas; (3) eliminating distortion of competition. This included the development of infrastructure of Community interest, the simplification of border controls and formalities as well as improving safety.
[313] COM(92) 492
[314] COM(1998) 466
[315] Decision No 1692/96/EC of the European Parliament and of the Council of 23 July 1996 on Community guidelines for the development of the trans-European transport network.

Member States' own infrastructure policy. As the guidelines originally focussed on the old EU15 Member States only, the Commission also launched a process which intended to identify the broad lines of necessary TEN-T measures to be taken in the Central and Eastern European candidate countries as well as priorities and projects of common interest (i.e. "Transport Infrastructure Needs Assessment", TINA). The 1996 TEN-T guidelines were modified in 2001 with respect to seaports, inland ports and intermodal terminals to complete the Community transport development plan for all modes of transport.[316] A further and more thorough revision of the TEN-T guidelines took place in 2004,[317] mainly due to the serious delays and financing problems in particular for cross-border sections and in view of the 2004 and 2007 EU enlargements. The new guidelines increased number of priority projects to 30 which were all required to comply with EU environmental legislation and introduced the new concept of "motorways of the sea" with a view to making certain sea routes more efficient and integrating short sea shipping with rail transport. In 2010, new EU-guidelines for the development of the TEN-T were adopted[318] which now also covered traffic management systems and positioning and navigation systems networks corresponding to the different transport modes. In parallel to the various TEN-T guidelines, also regulations governing EC/EU funding from the TEN-T budget were adopted for the periods 1995–1999, 2000–2006 and 2007–2013. Further Community support came from the Cohesion Fund and the ERDF, which both contributed significantly to developing the TEN-T between 1994 and 2013.

After a substantial policy review launched in 2009, the new framework for the EU's transport infrastructure policy came into force in 2014: it mainly consists of the guidelines for the TEN-T[319] and of provisions for EU funding in the fields of transport, energy and telecommunication during the period 2014–2020 ("Connecting Europe Facility").[320] The TEN-T comprises a dual-layer structure consisting of the "comprehensive network" and of the "core transport network", with the latter being built on nine major corridors (i.e. two North-South corridors, three East-West corridors and four diagonal corridors). The core network will transform East-West connections, remove bottlenecks, upgrade infrastructure and streamline cross-border transport operations for passengers and businesses throughout the EU, improve connections between different modes of transport and contribute to the EU's climate change objectives. To deliver this new approach, also a "TEN-T planning methodology" and a document on a governance concept for implementing the core network had been issued.

Pillar 3:
Introduction and further development of the concept of "sustainable mobility"

A first step was made with Commission's "White Paper on the future development of the common transport policy" of 1992, which introduced an integrated approach for all modes of transport based on the concept of "sustainable mobility". Important factors motivating an inclusion of this new perspective into the CTP had been the European Council's declaration of Dublin on the "environmental imperative" of June 1990 by which the Community committed itself to the application of the principles of sustainable development, the new environmental provisions of the Treaty on the European Union (TEU) signed on 7 February 1992 in Maastricht[321] and the outcomes of the United Nations Conference on Environment and Development in Rio de Janeiro of June 1992. This new concept became more important during the following two decades due to the constant rise in GHG emissions from the transport sector.

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316 Decision No 1346/2001/EC of the European Parliament and of the Council of 22 May 2001 amending Decision No 1692/96/EC as regards seaports, inland ports and intermodal terminals as well as project No 8 in Annex III.
317 Decision No 884/2004/EC of the European Parliament and of the Council of 29 April 2004 amending Decision No 1692/96/EC on Community guidelines for the development of the trans-European transport network.
318 Decision No 661/2010/EU of the European Parliament and of the Council of 7 July 2010 on Union guidelines for the development of the trans-European transport network.
319 Regulation (EU) No 1315/2013 of the European Parliament and of the Council of 11 December 2013 on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU. Commission Delegated Regulation (EU) No 473/2014 of 17 January 2014 amending Regulation (EU) No 1315/2013 of the European Parliament and of the Council as regards supplementing Annex III thereto with new indicative maps.
320 Regulation (EU) No 1316/2013 of the European Parliament and of the Council of 11 December 2013 establishing the Connecting Europe Facility, amending Regulation (EU) No 913/2010 and repealing Regulations (EC) No 680/2007 and (EC) No 67/2010.
321 The newly introduced Treaty Article 13Or obliged the Community to integrate environment protection requirements into the definition and implementation of other Community policies including transport.

A decisive step was the Commission's White Paper of 2001 entitled "European Transport Policy for 2010: Time to decide"[322], which analysed the problems and challenges of the CTP in particular with regard to the then upcoming eastern EU-enlargement. It also predicted a massive rise in traffic, going hand-in-hand with traffic jams and overloading especially in the case of road and air transport as well as increasing health and environmental costs, all of which would seriously threaten an achievement of the EU's competitiveness and climate protection goals. In order to overcome these tendencies and to contribute to the creation of an economically efficient but environmentally and socially responsible transport system, the Commission put forward a package of 60 measures. At the time of the mid-term review of the 2001 Transport White Paper, the European Commission also opened a broad debate on key issues of urban mobility[323] which then led to the adoption of an "Action Plan on Urban Mobility" in September 2009. In parallel, already in July 2008, the Commission presented its "Greening Transport" package which comprised a series of communications, including a strategy for the internalisation of the external costs of all transport modes. This package is an important first step towards an intermodal effort to tackle the problem of external costs, which still is one of the most fundamental and controversial issues that the CTP currently faces.

In 2011, the Commission presented its White Paper entitled "Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system".[324] The document sets out ambitious goals to be reached by 2050 in order to dramatically reduce Europe's dependence on imported oil and to cut carbon emissions in transport by 60%.[325] It also proposes 40 concrete initiatives for the next decade which aim to build a competitive transport system that will increase mobility, remove major barriers in key areas and fuel growth and employment. As a follow-up to the 2011 White Paper, the European Commission came up in 2013 with an Urban Mobility Package that calls for establishing procedures and financial support mechanisms at the European level for preparing Urban Mobility Plans, foresees the development of a package for urban road user charging and access restriction schemes and envisages to produce best practice guidelines for better monitoring and managing urban freight flows.

Sources: European Parliament, Directorate General for Research (1991); European Parliament (2014); ESPON (2004a), pp.102-110; European Commission (1993b); European Commission, Directorate General for Regional Policy (2001); http://ec.europa.eu/transport/themes/infrastructure/ten-t-policy/index_en.htm; http://europa.eu/legislation_summaries/transport/index_en.htm

[322] COM(2001) 370
[323] i.e. through the Green Paper "Towards a new culture for urban mobility" of 25 September 2007.
[324] COM(2011) 0144
[325] Key goals to be reached by 2050 include: (1) No more conventionally-fuelled cars in cities; (2) 40% use of sustainable low carbon fuels in aviation; at least 40% cut in shipping emissions; (3) a 50% shift of medium distance intercity passenger and freight journeys from road to rail and waterborne transport.

ANNEX 3:
Accessibility – a short overview on main concepts and indicators

Accessibility is usually understood as the degree to which a product, device, service, or environment is available to as many people as possible (i.e. the "ability to access" and benefit from some system or entity). However, as rightly pointed out in a recent ESPON study, accessibility (…) *is not a goal by itself but a derived demand. Accessibility is important because it provides access to opportunities at distant locations or makes it possible to receive goods and services or visitors from distant locations. For policy making, the maximisation of accessibility is therefore an objective only as far as it helps to improve the quality of life by facilitating access to opportunities, goods and services and so participation in social and cultural life* (ESPON, 2012a, p.17).

In transportation, accessibility refers to the ease of reaching destinations and is considered to be the "main product" of a transport system. Although there are scientific disputes about how the term "ease" should be defined and measured, indicators of accessibility usually (…) *measure the benefits households and firms in a region enjoy from the existence and use of the transport infrastructure relevant for their region. Accessibility indicators can be defined to reflect both within-region transport infrastructure and infrastructure outside the region which affect the region* (Schürmann/Talaat, 2000, p.6). Overall, however, accessibility indicators can differ as regards the specification of the destination and the impedance functions (**see: Annex 3 - Table A**) and also with respect to their complexity:

- ***Simple accessibility indicators*** *consider only intraregional transport infrastructure expressed by such measures as total length of motorways, number of railway stations* (…) *or travel time to the nearest nodes of interregional networks* (…). *While this kind of indicator may contain valuable information about the region itself, they fail to recognise the network character of transport infrastructure linking parts of the region with each other and the region with other regions* (Schürmann/Talaat, 2000, p.6).
- ***More complex accessibility indicators*** *take account of the connectivity of transport networks by distinguishing between the network itself, i.e. its nodes and links, and the 'activities' (such as work, shop or leisure) or 'opportunities' (such as markets or jobs) that can be reached by it (…). In general terms, accessibility then is a construct of two functions, one representing the activities or opportunities to be reached and one representing the effort, time, distance or cost needed to reach them* (Schürmann/Talaat, 2000, p.6).

A more recent ESPON-study (ESPON, 2012a, pp.9-13) highlights also that accessibility indicators may be sensitive to various dimensions such as origins, destinations, impedance, constraints, barriers, type of transport, modes, spatial scale, equity and dynamics (**see: Annex 3 - Table B**).

When **accessibility is considered from a territorial development point of view,** it is usually understood to determine the locational advantage of a region relative to all regions (including itself). This is because (…) *the quality of transport infrastructure in terms of capacity, connectivity, travel speeds etc. determines the quality of locations relative to other locations.* (…) *Investment in transport infrastructure leads to changing location qualities and may induce changes in spatial development patterns* (Spiekermann/Wegener, 2006, p.17).

A more sophisticated way of classifying regions by accessibility is to take also their economic performance into account. Economic theory suggests that regions that have better access to raw materials, suppliers and markets are, ceteris paribus, economically more successful than regions in remote, peripheral locations. As transport infrastructure is an important policy instrument to promote regional economic development, it is highly policy-relevant to know which regions have been able to take advantage of their location and which regions have not (Spiekermann/Wegener, 2006, p.21).

Annex 3 - Table A: Overview on basic accessibility indicators and on further accessibility indicators that can be derived from them

Basic Indicators	Specification	Advantages (+) and disadvantages (-)	Indicators that can be derived from the three basic indicators
Travel cost	The indicator is based on the assumption that not all possible destinations are relevant for the accessibility of a region but only a specified set. This set may, for instance, consist of all cities over a certain size or attraction. In the simplest case no distinction is made between larger and smaller destinations.	**+** easy to understand and to communicate (esp. if expressed in familiar units such as average travel cost or travel time). **-** generally lack a behavioural foundation because they ignore that more distant destinations are visited less frequently and that therefore their values depend heavily on the selected set of destination.	**Modal accessibility indicators:** Indicators may be presented separately e.g. for road, rail and air in order to demonstrate differences in accessibility between modes. **Multimodal accessibility indicators:** Different modes can be integrated into one indicator, expressing the combined effect of alternative modes for a location. There are essentially two ways of integration. One is to select the fastest mode to each destination, which in general will be air for distant destinations and road or rail for short- or medium-distance destinations, and to ignore the remaining modes. Another way is to calculate an aggregate accessibility measure combining the information contained in the three modal accessibility indicators **Intermodal accessibility indicators:** They take account of trips involving two or more modes and are most relevant for logistic chains in freight traffic such as rail freight with feeder transport by lorry at either end. Intermodal accessibility indicators in passenger travel involve mode combinations such as Rail-and-Fly or car rentals at railway stations and airports. **Regional accessibility indicators:** They measure the restrictions and opportunities for daily life provided by the transport infrastructure in the regions to the population and economic actors. There is a huge variety of approaches at this scale and in most of them travel cost type indicators in the form of travel time to a few selected destinations and the trend towards high spatial resolution dominate. **Global accessibility indicators:** They describe the linkages of European regions to the world and show how regions are embedded in the global context (i.e. their linkages to global hotspots outside Europe or to European gateways to the world). Only a few studies on global accessibility exist and in most cases travel time indicators for selected points in Europe, usually airports, are used. The recent ESPON study "TRACC" examined access to global cities, global travel connectivity and global potential accessibility travel.
Daily accessi-bility	Indicator is based on the notion of a fixed budget for travel in which a destination has to be reached to be of interest. The indicator is derived from the example of a business traveller who wishes to travel to a certain place in order to conduct business there and wants to be back-home in the evening. Maximum travel times of between three and five hours one-way are commonly used for this indicator type.	**+** easy to understand and to communicate (e.g. if expressed in familiar units such as the number of people one can reach in a given number of hours). **-** generally lack a behavioural foundation because they heavily depend on the arbitrarily selected maximum travel time beyond which destinations are no more considered.	
Potential accessi-bility	Indicator is based on the assumption that the attraction of a destination increases with size, and declines with distance, travel time or cost. Destination size is usually represented by population or economic indicators such as GDP or income. Accessibility to population is seen as an indicator for the size of market areas for suppliers of goods and services; accessibility to GDP an indicator of the size of market areas for suppliers of high-level business services.	**+** are superior to travel cost & daily accessibility indicators in that they are founded on sound behavioural principles of stochastic utility maximisation. **-** contain parameters that need to be calibrated and their values cannot be expressed in familiar units.	

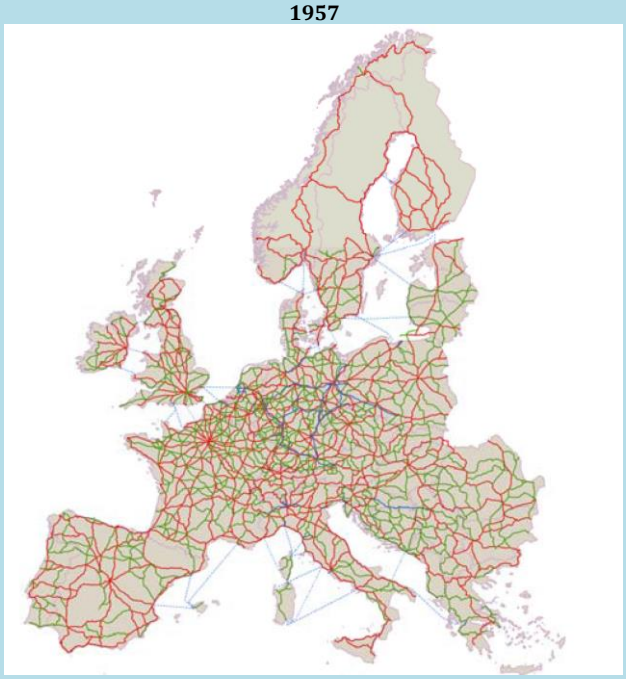
Source: Schürmann/Talaat, 2000, pp.6-11; Spiekermann/Wegener, 2006, p.18; ESPON (2012a), p.10

Annex 3- Table B: Dimensions of accessibility (Source: ESPON, 2012a, p.10)

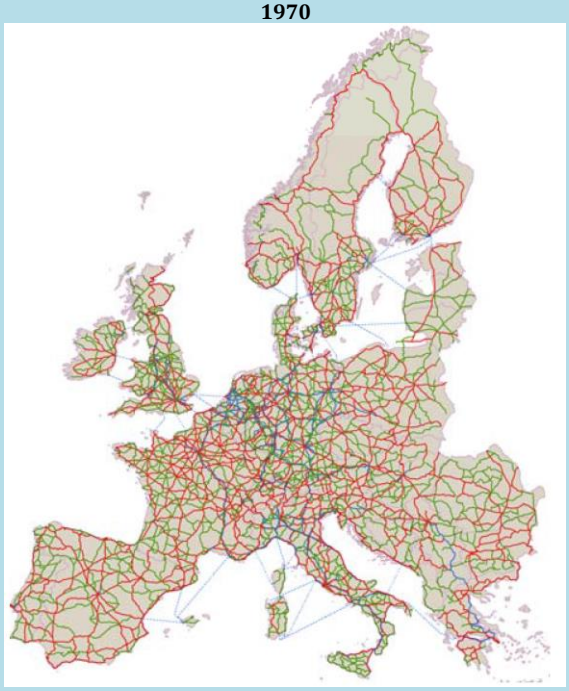
Dimension	Comments
Origins	Accessibility indicators may be calculated from the point of view of different population groups such as social or age groups, different occupations such as business travellers or tourists or different economic actors such as industries or firms.
Destinations	Accessibility indicators may measure the location of an area with respect to opportunities, activities and assets such as population, economic activities, universities or tourist attractions. The activity function may be rectangular (all activities beyond a certain size), linear (of size) or non-linear (to express agglomeration effects).
Impedance	The spatial impedance term may be a function of one or more attributes of the links between areas such as distance (Euclidean or network distance), travel time, travel cost, convenience, reliability or safety. The impedance function applied may be linear (mean impedance), rectangular (all destinations within a given impedance) or non-linear (e.g. negative exponential).
Constraints	The use of the links between areas may be constrained by regulations (speed limits, access restrictions for certain vehicle types of maximum driving hours) or by capacity constraints (road gradients or congestion).
Barriers	In addition to spatial impedance also non-spatial, e.g. political, economic, legal, cultural or linguistic barriers between areas may be considered. In addition, non-spatial linkages between areas such as complementary industrial composition may be considered.
Types of transport	Only travel or only freight transport, or both, may be considered in the analysis.
Modes	Accessibility indicators may be calculated for road, rail, inland waterways or air. Multimodal accessibility indicators combine several modal accessibility indicators. Intermodal accessibility indicators include trips by more than one mode.
Spatial scale	Accessibility indicators at the continental, transnational or regional scale may require data of different spatial resolution both with respect to area size and network representation, intra-area access and intra-node terminal and transfer time.
Equity	Accessibility indicators may be calculated for specific groups of areas in order to identify inequalities in accessibility between rich and poor, central and peripheral, urban and rural, nodal and interstitial areas.
Dynamics	Accessibility indicators may be calculated for different points in time in order to show changes in accessibility induced by TEN projects or other transport policies, including their impacts on convergence or divergence in accessibility between areas.

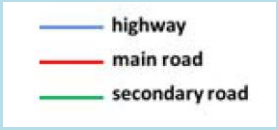
ANNEX 4:
Densification of the European road network 1957-2012

1957

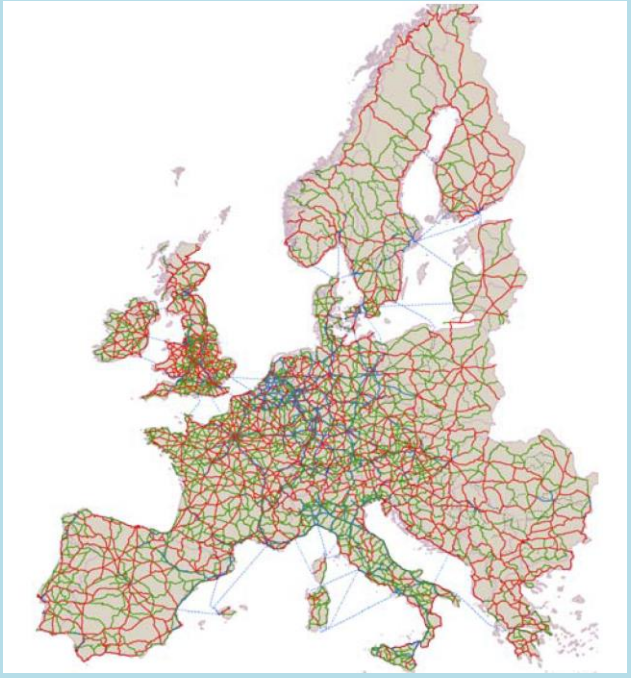


1970





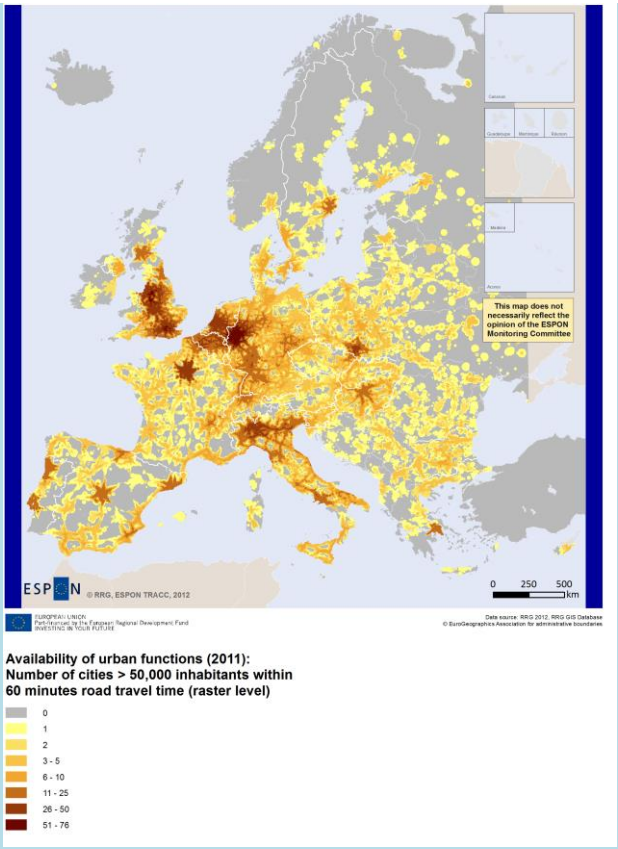
1980

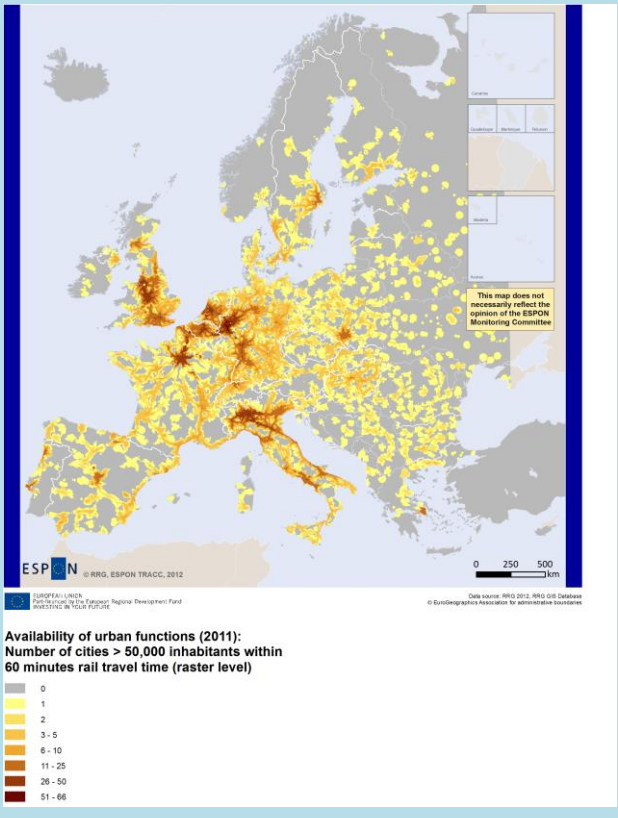


2012

Source: Stelder (2013), pp.24-25

ANNEX 5:
Availability of urban functions by road and rail compared





Source: ESPON (2012b), pp.112,113

ANNEX 6:
Performance of different modes of passenger transport (1990-2012)

Passenger Cars

billion pkm

	1990	1995	2000	2005	2010	2011	2012	% CHANGE '11/'12
EU-28		*3 936.6*	*4 358.4*	*4 597.0*	*4 720.7*	*4 703.2*	*4 613.0*	*– 1.9*
BE	90.2	98.2	105.5	108.3	114.2	115.5	115.9	*0.3*
BG		*25.0*	*26.9*	*35.1*	*46.9*	*48.1*	*49.7*	*3.4*
CZ		54.5	63.9	68.6	63.6	65.5	64.6	– 1.3
DK	47.2	48.4	50.6	50.0	51.0	52.5	53.4	1.9
DE	683.1	815.3	831.3	856.9	887.0	894.4	895.0	0.1
EE		*5.1*	*6.7*	*9.9*	*10.1*	*10.4*	*10.8*	*4.1*
IE	*28.5*	*31.6*	*34.6*	*44.4*	*48.1*	*47.5*	*46.6*	*– 1.8*
EL	*35.0*	*44.0*	*63.0*	*85.0*	*99.6*	*98.3*	*96.9*	*– 1.4*
ES	174.4	250.4	302.6	337.8	341.6	334.0	321.0	– 3.9
FR	611.1	671.7	744.5	788.1	796.9	798.7	801.1	0.3
HR		*12.5*	*20.0*	*24.0*	*25.7*	25.2	26.1	3.6
IT	522.6	614.7	713.9	677.0	698.4	665.8	578.7	– 13.1
CY		*3.4*	*3.9*	*4.8*	*5.9*	*5.9*	*6.0*	*0.3*
LV		*7.5*	*11.5*	12.1	12.3	11.3	11.5	1.6
LT		*16.0*	*26.0*	34.8	32.6	29.9	*30.4*	*1.6*
LU	*4.0*	*4.7*	*5.6*	*6.3*	*6.5*	*6.6*	*6.7*	*2.1*
HU	47.0	45.4	46.2	49.4	52.6	52.3	*52.2*	*– 0.1*
MT		*1.7*	*1.8*	*2.0*	*2.2*	*2.2*	*2.2*	*0.5*
NL	137.3	131.4	141.1	148.8	135.1	140.1	136.4	*– 2.6*
AT	55.7	62.2	66.7	70.6	73.5	74.5	74.2	– 0.4
PL		110.7	130.1	152.3	188.8	197.8	204.6	3.4
PT	*40.0*	*52.5*	*71.0*	*85.0*	*83.7*	*83.2*	*82.1*	*– 1.3*
RO		*40.0*	*51.0*	*61.0*	*75.5*	*75.0*	*77.0*	*2.8*
SI	13.3	16.3	20.3	22.5	25.6	*25.5*	*25.3*	*– 0.7*
SK		18.0	23.9	25.8	26.9	26.9	26.9	0.2
FI	51.2	50.0	55.7	61.9	64.7	65.5	65.3	– 0.3
SE	85.9	87.6	101.4	107.4	108.0	109.2	109.6	0.4
UK	588.0	617.9	638.6	667.1	643.9	641.5	642.7	0.2

Notes: Data are not harmonised and therefore not fully comparable. Many data for 2012 are provisional. BE: includes pkm by vehicles registered as light goods vehicles but used as personal cars. FR: passenger-km by cars obtained by removing v-km of motorcycles. UK: data refer to Great Britain only; include pkm by vans. PL: 2012 is a preliminary estimate.

Buses & Coaches

billion pkm

	1990	1995	2000	2005	2010	2011	2012	% CHANGE '11/'12
EU-28		*503.5*	*548.8*	*540.5*	*527.5*	*529.1*	*525.7*	*– 0.6*
BE	11.4	13.1	13.3	17.5	17.4	17.7	17.9	*1.4*
BG	26.0	11.6	14.6	13.7	10.6	10.8	10.5	– 3.3
CZ		18.6	16.2	15.6	17.0	15.8	15.3	– 3.2
DK	6.4	7.3	7.4	7.2	6.9	6.8	6.5	– 5.2
DE	73.1	68.5	69.0	67.1	61.8	61.4	59.5	– 3.1
EE	4.5	2.0	2.6	2.7	2.1	2.1	2.2	7.9
IE	3.9	5.2	*7.0*	*7.9*	*8.5*	*8.4*	*8.1*	*– 3.2*
EL	17.7	20.2	21.7	*21.7*	*21.1*	*21.2*	*21.1*	*– 0.3*
ES	33.4	39.6	50.3	53.2	50.9	55.7	54.5	– 2.2
FR	40.7	41.2	42.0	42.5	49.9	51.1	51.6	1.0
HR	7.0	4.1	3.3	3.4	3.2	3.1	3.2	3.3
IT	84.0	87.1	93.4	101.0	102.2	102.4	102.8	0.4
CY		*1.0*	*1.1*	*1.3*	*1.3*	*1.3*	*1.4*	*3.1*
LV	5.9	1.8	2.3	2.9	2.3	2.4	2.4	– 2.2
LT	7.9	4.2	2.8	3.7	2.7	2.7	2.7	– 0.5
LU	*0.5*	*0.5*	*0.6*	*0.8*	*0.9*	*1.0*	*1.0*	*1.7*
HU	19.3	16.6	18.7	17.8	16.5	16.5	17.1	3.8
MT		*0.4*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.2*
NL	13.0	*12.0*	*11.3*	*11.8*	*12.1*	*11.9*	*11.4*	*– 4.5*
AT	8.0	8.7	9.2	9.3	9.6	9.5	9.5	– 0.4
PL	46.3	34.0	59.2	49.2	41.7	40.1	40.0	– 0.2
PT	10.3	11.3	11.8	*6.4*	*6.1*	*6.1*	6.1	*– 0.3*
RO	24.0	12.3	*12.0*	11.8	12.0	11.8	*12.1*	*3.0*
SI	6.5	4.1	3.5	3.1	3.2	*3.2*	*3.2*	– 0.2
SK		*14.4*	*9.3*	*8.5*	*5.3*	*5.5*	*5.4*	*– 0.8*
FI	8.5	8.0	7.7	7.5	7.5	7.5	7.5	0.0
SE	9.7	9.7	9.5	8.8	8.6	8.7	8.7	– 0.9
UK	*47.7*	*45.8*	*48.5*	*43.8*	*45.9*	*43.7*	*43.4*	*– 0.7*

Notes: Data are not harmonised and therefore not fully comparable. Many data for 2012 are provisional. CS: 1990 = 43.4 (included in EU-28). UK: GB data + 1.5 bn pkm throughout to account for Northern Ireland. PL: 2012 is a preliminary estimate.

Tram & Metro

billion pkm

	1990	1995	2000	2005	2010	2011	2012	% CHANGE '11/'12
EU-28		*71.9*	*78.4*	*83.9*	*92.2*	*93.4*	*94.1*	*0.8*
BE	0.7	0.8	0.9	*0.9*	*1.1*	*1.1*	*1.2*	*7.6*
BG	0.6	0.3	0.4	0.4	0.9	0.9	1.0	17.0
CZ		7.7	8.1	7.9	9.0	8.7	9.5	9.0
DK	-	-	-	0.2	0.2	0.3	0.3	– 1.4
DE	*15.1*	*14.4*	*14.6*	15.5	16.3	16.6	15.6	– 6.0
EE		*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*42.5*
IE	-	-	-	*0.1*	0.1	0.1	0.1	4.3
EL	*0.8*	*0.7*	*1.2*	*1.5*	*1.7*	*1.7*	*1.7*	*– 0.3*
ES	4.4	4.3	*5.2*	*6.0*	*6.3*	*6.3*	*6.0*	*– 4.7*
FR	10.5	9.3	11.6	13.3	14.7	15.0	15.2	1.2
HR		*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	0.6
IT	4.2	5.2	5.6	6.0	7.1	7.1	7.2	1.0
CY	-	-	-	-	-	-	-	-
LV	*0.7*	*0.3*	*0.3*	*0.3*	*0.1*	*0.1*	*0.1*	*– 2.4*
LT	-	-	-	-	-	-	-	-
LU	-	-	-	-	-	-	-	-
HU		*2.5*	2.6	2.4	2.5	2.5	2.5	– 0.2
MT	-	-	-	-	-	-	-	-
NL	1.3	1.4	*1.4*	*1.5*	*1.6*	*1.6*	*1.5*	*– 4.5*
AT	2.8	3.3	3.6	3.8	4.1	4.1	4.1	0.0
PL		*5.0*	*4.7*	*4.4*	*4.3*	*4.4*	*4.4*	*– 0.3*
PT	0.7	0.5	0.5	0.8	1.1	1.1	1.0	– 10.4
RO		*6.0*	*6.0*	*6.6*	*7.1*	*7.1*	*7.3*	*3.0*
SI	-	-	-	-	-	-	-	-
SK		*0.4*	*0.4*	*0.4*	*0.3*	*0.3*	*0.3*	*– 5.7*
FI	0.4	0.4	0.5	0.5	0.5	0.5	0.5	2.1
SE	2.0	1.9	2.0	2.0	2.3	2.3	2.4	1.4
UK	6.5	6.8	8.3	8.7	10.2	10.9	11.6	6.2

Notes: Data are not harmonised and therefore not fully comparable across countries. FR: data refer to the Paris Metro and RER (Réseau Express Régional) systems and to metros in other French cities. PT: data only refer to Lisbon and Porto Metro.

Railways

billion pkm

	1990	1995	2000	2005	2010	2011	2012	% UNDER PSO (*) 2012	% CHANGE '11/'12
EU-28	404.1	351.7	372.0	379.9	406.8	415.3	418.4	*65.2*	*0.7*
BE	6.5	6.8	7.7	9.2	10.6	10.4	10.3	87.7	– 1.3
BG	7.8	4.7	3.5	2.4	2.1	2.1	1.9	84.0	– 9.2
CZ	13.3	8.0	7.3	6.7	6.6	6.7	7.3	98.3	8.2
DK	5.1	4.9	5.5	6.0	6.3	6.6	6.8	96.1	2.1
DE	61.0	71.0	75.4	76.8	83.9	85.1	88.4	58.9	3.9
EE	1.5	0.4	0.3	0.2	0.2	0.2	0.2	92.8	– 3.3
IE	1.2	1.3	1.4	1.8	1.7	1.6	1.6	100.0	– 3.7
EL	2.0	1.6	1.9	1.9	1.3	1.0	0.8	100.0	– 13.2
ES	15.5	16.6	20.1	21.6	22.4	22.8	22.5	50.7	– 1.4
FR	63.7	55.6	69.9	76.2	85.9	89.0	89.1	38.5	0.1
HR	3.4	1.1	1.3	1.3	1.7	1.5	1.1		– 25.7
IT	44.7	46.7	49.6	50.1	47.2	46.8	44.6	*52.6*	– 4.8
CY	-	-	-	-	-	-	-	-	-
LV	5.4	1.4	0.7	0.9	0.7	0.7	0.7	88.3	– 1.6
LT	3.6	1.1	0.6	0.4	0.4	0.4	0.4	63.0	3.6
LU	0.2	0.3	0.3	0.3	0.3	0.3	0.4	*100.0*	7.2
HU	11.4	8.4	9.7	9.9	7.7	7.8	7.8	94.7	0.0
MT	-	-	-	-	-	-	-	-	-
NL	11.1	16.4	14.7	15.2	15.4	16.8	17.1	94.8	1.7
AT	8.9	10.1	8.7	9.5	10.7	10.9	11.3	*66.0*	4.1
PL	50.4	26.6	24.1	18.2	17.9	18.2	17.8	84.7	– 1.9
PT	5.7	4.8	*4.0*	3.8	4.1	4.1	3.8	78.4	– 8.2
RO	30.6	18.9	11.6	8.0	5.4	5.1	4.6	94.6	– 10.1
SI	1.4	0.6	0.7	0.8	0.8	0.8	0.7	98.2	– 4.0
SK	6.4	4.2	2.9	2.2	2.3	2.4	2.5	92.3	1.2
FI	3.3	3.2	3.4	3.5	4.0	3.9	4.0	43.8	3.9
SE	6.6	6.8	8.2	8.9	11.2	11.4	11.8	46.5	3.6
UK	33.4	30.3	38.4	44.4	55.8	58.6	61.0	96.2	4.0

Notes: BE, EL, LU 2012 pkm values based on quarterly data from Eurostat. These figures may exclude some railway undertakings not obliged to produce detailed quarterly reporting. UK share of PSO excludes Northern Ireland.

Source: European Commission, Eurostat (2014c), pp.48-51

ANNEX 7:
Survey data on public transport use (Eurobarometer) and satisfaction with urban public transport services (urban audit)

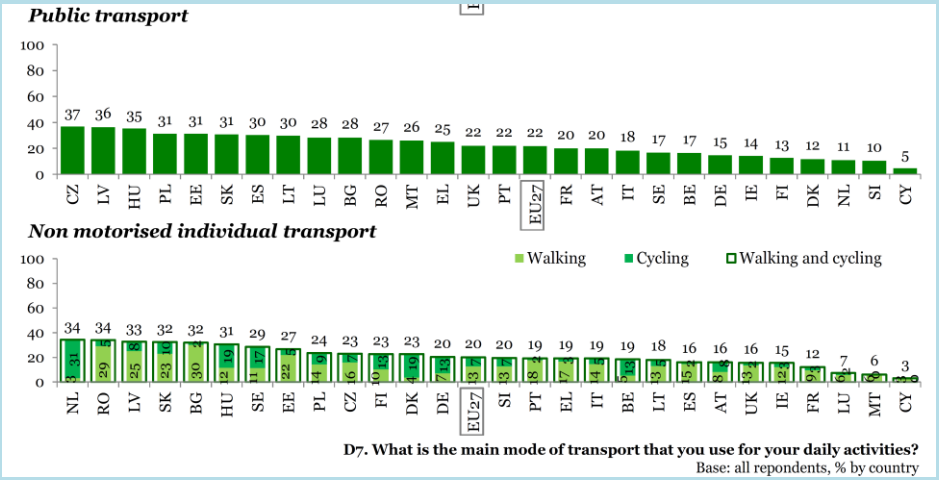


Figure 1:
Main mode of transport used for daily activities (2010).

Source :
European Commission, Eurobarometer (2011), p.8

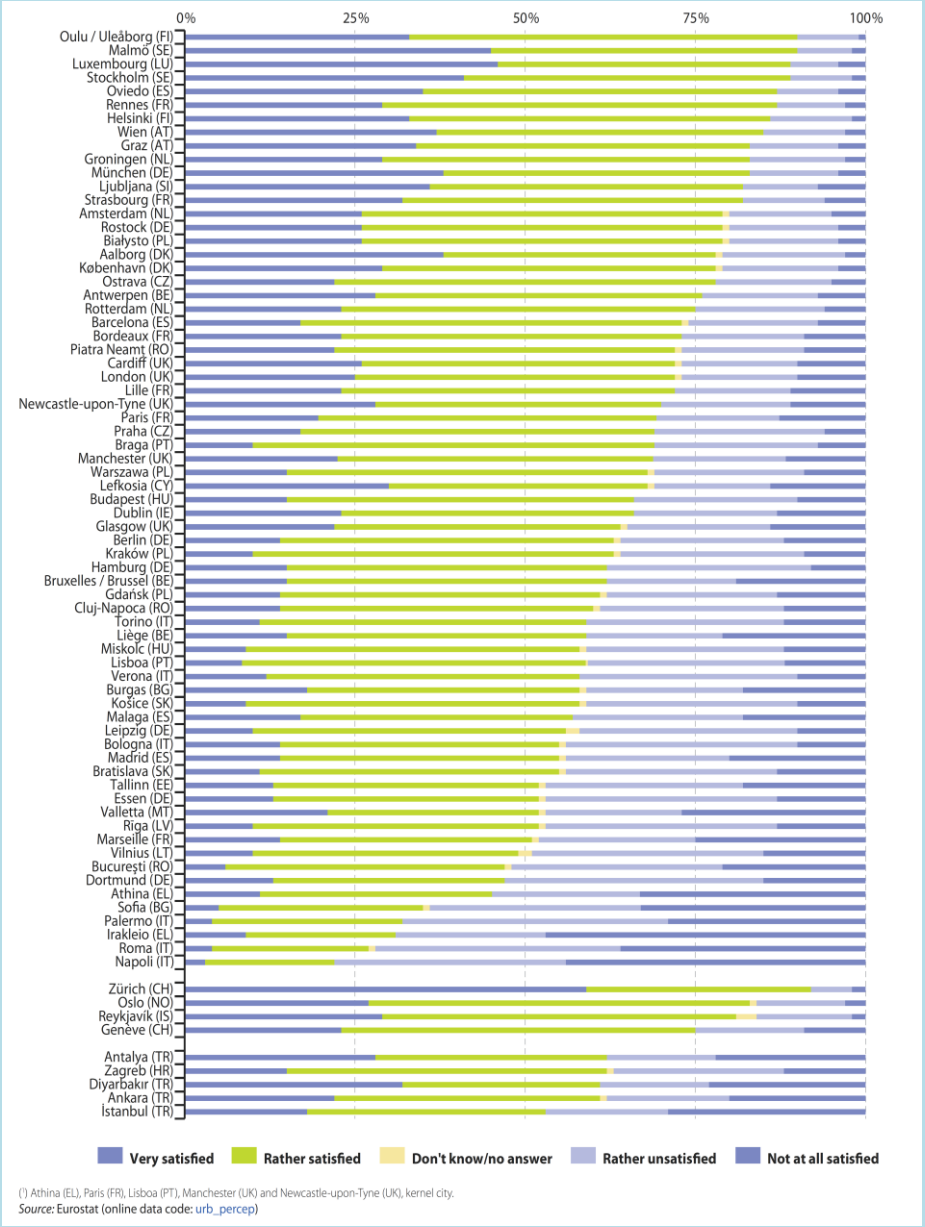
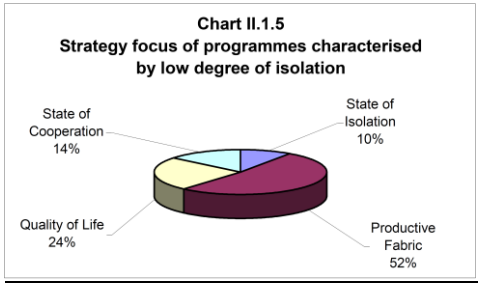


Figure 2:
Satisfaction with public transport services in selected Urban Audit cities, 2012.

Source :
European Commission, Eurostat (2013c), p.209

ANNEX 8:
General and theme-specific funding profile of the 20 INTERREG IIA programmes characterised by a "low degree of isolation"

INTERREG IIA Programmes (according to size of SFC)	Type of border covered (*)		General and theme-specific funding profile (**) SFC MEURO	CSFC MEURO	CR %	Initial thematic spread of SFC and assumptions for calculating estimated total CSFC 1994-1999 (***)	Reducing Isolation: Status at the outset, strategy focus, typical interventions & CSFC 1994-99 (****)	Improving Quality of Life: Status at the outset, strategy focus, typical interventions & CSFC 1994-99 (****)
10 BE-FR (PACTE)	IB	LB	74	29	40	**(1) Thematic spread of SFC (initial programming):**	**General status, observed needs / challenges:** Sufficient links were in general available and day-to-day contact was feasible at levels of convenience and cost comparable to transport communications within the same country. Partly still weak transport and communication links (bottlenecks, lack of connection between intra-regional & inter-regional networks). Physical obstacles (river Rhine, Lake Constance). **Strategy focus:** A reduction of isolation was not a strategy focus in any of these programmes. No considerable differences exist between programmes with regard to the absolute amount of EU funds devoted to this aspect. **Typical interventions:** Measures on local transport infrastructure, public transport and communication systems or spatial structuring.	**General status, observed needs / challenges:** Environment: pollution, negative effects of traffic congestion, shortage of natural resources, lack of common standards, no cross-border tackling of environmental problems. Lack of cross-border access to health services. **Strategy focus:** An improvement of quality of life was a strategy focus in "BE-NL (Middengebied)", "DE-AT-CH (Bodensee / Hochrhein / Alpenrhein)" with over 40% of EU funds). No considerable differences in absolute terms between programmes. **Typical interventions:** Measures on protection of natural resources and the environment, waste water management, fight against pollution, energy and environment, town and country planning, landscape protection, social cohesion, culture and education, health cooperation.
15 BE-DE-NL (Maas-Rhein)	IB	LB	37	37	100			
17 BE-NL (Middengebied)	IB	LB	34	36	106			
19 BE-FR-LU (PED)	IB	LB	31	31	100			
20 DE-FR-CH (Oberrhein Mitte-Süd)	IB	LB	26	24	93			
21 DE-AT (Bavaria-Austria)	IB	LB	25	26	103			
22 DE-FR (Saar-Lor-Westpfalz)	IB	LB	25	25	100			
23 DE-NL (EUROREGIO)	IB	LB	23	23	102			
24 DE-NL (Ems-Dollart)	IB	LB	23	23	100			
27 BE-FR (West Flanders)	IB	LB	18	19	105			
32 BE-FR (Ardennes)	IB	LB	13	13	100			
33 DE-NL (Rhein-Waal)	IB	LB	12	12	101			
34 DE-FR (PAMINA)	IB	LB	12	12	104			
36 BE-NL (Scheldemond)	IB	LB	12	12	99			
39 DK-DE (Sønderjylland/Schleswig)	IB	LB	11	11	100			
43 DE-LU	IB	LB	8	8	100			
46 DE-NL (Rhein-Maas-Nord)	IB	LB	6	6	100			
52 DK-DE (Storstrøm/Ostholstein)	IB	MB	5	5	100			
53 DE-AT-CH	IB	LB	5	5	100			
57 DK-DE (Fyn/KERN)	IB	MB	2	2	91			
Total, all programmes	**all IBs 18 LBs 2 MBs**		**402**	**359**	**89.3**		**Estimated total CSFC for 1994-1999: € 33 million**	**Estimated total CSFC for 1994-1999: € 86.2 million**

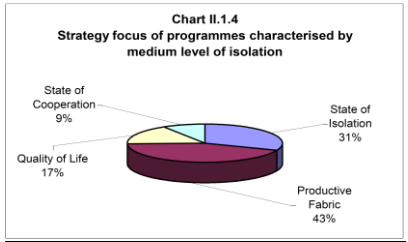


(2) Assumptions for calculating the estimated total CSFC 1994-1999: The average CR of all programmes was strongly distorted by the low CR of "BE-FR (PACTE)".
- For calculating the total CSFC on reducing isolation, the programme was excluded. This is because it did not implement major transport actions. Only some bus-line projects were realised under a very small measure (total measure share: 1.3% of ERDF). The total SFC considered is thus € 328 million with a new average CR of 100.6%.
- For calculating the total CSFC on improving quality of life, the programme was included for the following reasons. It is the largest programme in terms of SFC and re-programming has also led to an increase of ERDF-funding for environmental actions. Considered are therefore the total SFC of € 402 million and the average CR of 89.3%.

(*) **IB** = internal EU-border; **EB** = external EU-border; **LB** = land border; **MB** = maritime border;
(**) **SFC =** Structural Funds Contribution ERDF/ESF/EAGGF/FIFG (as decided in year of approval 1995/96); **CSFC =** Committed Structural Funds Contribution (1994-1999); **CR =** Commitment Rate (1994-1999)
(***) **General calculation:** SFC (of 1995/1996) x thematic spread according to initial planning (in %) x average CR for the period 1994-1999 (in %) = estimated total CSFC for 1994-1999.
(****) **Overall status, general needs/challenges & typical interventions** = observed across all programmes of this category. **Strategy focus** = the largest share of the SFC was allocated to that theme in the initial programme strategy.

Sources: Own elaboration on ground of information and data from the 11th report on the Structural Funds 1999 (European Commission, Directorate General for Regional Policy, 2000: pp.213-214) and the ex-post evaluation of INTERRG II (LRDP, 2003, pp.24-50).

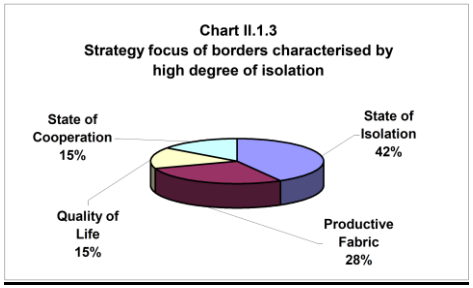
ANNEX 9:
General and theme-specific funding profile of the 24 INTERREG IIA programmes characterised by a "medium degree of isolation"

INTERREG IIA Programmes (according to size of SFC)	Type of border covered (*)		General and theme-specific funding profile (**) SFC MEURO	CSFC MEURO	CR %	Initial thematic spread of SFC and assumptions for calculating estimated total CSFC 1994-1999 (***)	Reducing Isolation: Status at the outset, strategy focus, typical interventions & CSFC 1994-99 (****)	Improving Quality of Life: Status at the outset, strategy focus, typical interventions & CSFC 1994-99 (****)
1 ES-PT	IB	LB	569	550	97	**(1) Thematic spread of SFC (initial programming):**  **(2) Assumptions for calculating the estimated total CSFC 1994-1999:** The average CR of all programmes was strongly distorted by the low CR of "FR-UK (Nord Pas-de-Calais/Kent)". - For calculating the total CSFC on reducing isolation, the programme was excluded. This is because reprogramming led to a significant reduction of ERDF-support for transport-related measures (i.e. from arr. 8% to 0.6%). Considered are therefore a reduced SFC of € 1,238 million and a new average CR of 98.5%. - For calculating the total CSFC on improving quality of life, the programme was included. This is because environmental measures still had an important share in the final SFC (24% of ERDF). Considered are therefore the total SFC of € 1,283 million and the average CR of 95.6%.	**General status, observed needs / challenges:** Communication links are available, but day-to-day contact is not feasible due to time, distance, frequency of services or cost. Maritime borders: lack of territorial continuity & insufficient access links. Peripheral location: isolation from & long distances to main decision-making centres and European markets (Scandinavian borders). Mountain borders: lack of transport links & communication lines (e.g. FR-ES in Central Pyrenean) or congestions (FR-IT, FR-CH, IT-CH). **Strategy focus:** A reduction of isolation was a clear strategy focus in "FR-IT (Corsica / Tuscany)" and "IE-UK (Wales)", but above 30% of funding (majority of funds) was also observed in "FR-IT (Corsica/Sardinia)", "FI-SE-NO", "FR-CH (Jura)" and "IE-UK (Northern Ireland)". In absolute terms "ES-PT" spent the largest amount of EU funds (> € 190 million), but also the "IE-UK (Northern Ireland)" and "IE-UK (Wales)" programme budgets were considerable. **Typical interventions:** Measures on coordinated cross-border planning, cross-border transport organisation, improvement of cross-border links, infrastructure investments (roads, port, rail, airport), energy and telecommunication infrastructure, coordination of communication, rural and island development.	**General status, observed needs / challenges:** Environment: pressure on marine or alpine ecosystems & natural resources, coastal erosion, water pollution, lack of awareness & of proper management and monitoring systems. Social problems: unemployment, migratory flows (ES-Morocco), low population density, ageing & outward migration of young people (ES-FR). Social infrastructures and services: Lack of higher education institutions, low level of education and training (ES-FR), weak health and sanitary standards (ES-FR), lack of joint emergency services (SE-FI-NO). Cultural and language differences. **Strategy focus:** An improvement of quality of life was not a strategy focus in any of the programmes. In absolute terms the largest budget was allocated in the "ES-PT" programme (app. € 100 million), but support was also relatively high in "IE-UK (Northern Ireland)" with > € 30 million. **Typical interventions:** Measures on conservation of natural resources, protection of marine & coastal environment, water quality, prevention of pollution, support of common historical, natural and cultural heritage, media and culture, health care systems, employment and rehabilitation or measures specific for sparsely populated areas.
3 IE-UK (Northern Ireland)	IB	LB	165	163	99			
6 ES-Morocco	EB	MB	104	104	100			
7 IE-UK (Wales)	IB	MB	85	84	98			
12 ES-FR (Pyrénées)	IB	LB	63	60	95			
13 FR-IT (Alpes)	IB	LB	58	56	97			
14 FR-UK (Nord Pas-de-Calais/Kent)	IB	MB	45	8	17			
16 FR-UK (Rives Manche)	IB	MB	34	37	109			
18 FR-IT (Corsica/Sardinia)	IB	MB	35	35	101			
25 IT-CH	EB	LB	20	20	100			
26 FR-IT (Corsical/Tuscany)	IB	MB	19	19	101			
30 DK-SE (Øresund)	IB	MB	14	14	100			
35 IT-AT	IB	LB	12	14	113			
37 FI-SE-NO (North Calotte)	IB	LB	11	11	99			
44 FR-CH (Jura)	EB	LB	7	7	100			
45 FI-SE-NO (Kvarken&MittSkandia)	IB	LB	7	7	100			
48 SE-NO (Ett Gränslöst Samarbete)	EB	LB	6	6	101			
49 FI-EE	EB	MB	6	6	98			
50 SE-NO (Nordens Gröna Bälte)	EB	LB	6	6	99			
51 FR-CH (Rhône-Alpes)	EB	LB	5	7	121			
55 SE-NO (Inre Skandinavia)	EB	LB	5	5	100			
56 FI-SE (Island)	IB	MB	4	5	100			
58 DK (Bornholm)-Baltic	EB	MB	2	2	100			
59 UK-Morocco (Gibraltar)	EB	MB	1	1	97			
Total, all programmes	**14 IBs 10 EBs 13 LBs 11MBs**		**1,283**	**1,227**	**95.6**		**Estimated total CSFC for 1994-1999: € 378.0 million**	**Estimated total CSFC for 1994-1999: € 208.5 million**

(*) **IB** = internal EU-border; **EB** = external EU-border; **LB** = land border; **MB** = maritime border;
(**) **SFC =** Structural Funds Contribution ERDF/ESF/EAGGF/FIFG (as decided in year of approval 1995/96); **CSFC =** Committed Structural Funds Contribution (1994-1999); **CR =** Commitment Rate (1994-1999)
(***) **General calculation:** SFC (of 1995/1996) x thematic spread according to initial planning (in %) x average CR for the period 1994-1999 (in %) = estimated total CSFC for 1994-1999.
(****) **Overall status, general needs/challenges & typical interventions** = observed across all programmes of this category. **Strategy focus** = the largest share of the SFC was allocated to that theme in the initial programme strategy.

Sources: Own elaboration on ground of information and data from the 11th report on the Structural Funds 1999 (European Commission, Directorate General for Regional Policy, 2000: pp.213-214) and the ex-post evaluation of INTERRG II (LRDP, 2003, pp.24-50).

ANNEX 10:
General and theme-specific funding profile of the 15 INTERREG IIA programmes characterised by a "high degree of isolation"

INTERREG IIA Programmes (according to size of SFC)	Type of border covered (*)		General and theme-specific funding profile (**) SFC MEURO	CSFC MEURO	CR %	Initial thematic spread of SFC and assumptions for calculating estimated total CSFC 1994-1999 (***)	Reducing Isolation: Status at the outset, strategy focus, typical interventions & CSFC 1994-99 (****)	Improving Quality of Life: Status at the outset, strategy focus, typical interventions & CSFC 1994-99 (****)
2 EL (external borders)	EB	LB	344	320	93	**(1) Thematic spread of SFC (initial programming):**  **(2) Assumptions for calculating the estimated total CSFC 1994-1999:** The average CR of all programmes was strongly distorted by the low CRs of "Greece-Italy", "Italy-Albania" and DE-PL (Brandenburg). - For calculating the CSFC on reducing isolation, all programmes were included due to the following reasons: they are among the largest programmes in terms of SFC and transport-related measures still had a very significant share in the CSFC (i.e. EL-IT: 30% of ERDF; IT-AL: 59% of ERDF) or further increased due to re-programming (DE-PL: from 4% to 7%). Considered are therefore the total SFC of € 975 million and the average CR of 89%. - For calculating the CSFC on improving quality of life, all programmes were included due to the following reasons: they are among the largest programmes in terms of SFC and the CSFC for environmental measures either remained stable or decreased only slightly (i.e. EL-IT from 11% to 7% of ERDF; DE-PL from 14% to 11% of ERDF). Considered are therefore the total SFC of € 975 million and the average CR of 89%.	**General status, observed needs / challenges:** Long distances & peripheral or remote location. Insufficient transport communication links (lack of or no significant border crossings, tunnels, ferry services etc.). Insufficient or low quality of cross-border infrastructure (in particular at external borders). Weak telecommunication links. Neglected infrastructural needs, lack of political willingness to change and lack of planning. **Strategy focus:** A reduction of isolation was a strategy focus in "EL-IT", "EL (External)", DE-PL (Pomerania) and "IT-AL". In absolute terms, the largest amount of money has been spent in the "EL (External)" and "EL-IT" programmes (above € 80 million in each). **Typical interventions:** Measures on general infrastructure, transport infrastructure (border crossing points & transport links), telecommunication and other communication facilities.	**General status, observed needs / challenges:** Labour: High levels of unemployment, highly differentiated income levels (at borders with RU). Environmental problems: pollution in urban areas; hydrological problems; problems caused by intensive agriculture; ecological problems in coastal regions & lack of surveillance (IT-EL). Lack of cross-border cultural links & cultural differences (at borders with RU). Lack of basic facilities/services (EL external borders). **Strategy focus:** An improvement of quality of life was a strategy focus in the "DE-PL (Brandenburg)" "DE-CZ" and "DE-CZ-PL programmes. In absolute terms the largest amount of money has been spent in the programmes "EL-external borders", "DE-PL-CZ", "DE-PL (Brandenburg)" and "GR-IT", with above € 20 million in each programme. **Typical interventions:** Measures on environmental protection (sewage and waste disposal), improvement of cross-border natural parks, labour market (training & employment).
4 EL-IT	IB	MB	158	92	58			
5 DE-PL-CZ (Saxony)	EB	LB	152	152	100			
8 IT-Albania	EB	MB	82	73	89			
9 DE-PL (Brandenburg)	EB	LB	75	67	90			
11 DE-PL (POMERANIA)	EB	LB	65	63	96			
28 DE-CZ (Bavaria)	EB	LB	17	17	100			
29 IT-SI	EB	LB	16	16	100			
31 FI-RU (Karelia)	EB	LB	14	14	100			
38 AT-HU	EB	LB	11	12	101			
40 FI-SE-NO-RU (Barents)	EB	LB	11	11	99			
41 FI-RU (South East Finland)	EB	LB	10	10	100			
42 AT-SI	EB	LB	9	9	105			
47 AT-SK	EB	LB	6	6	101			
54 AT-CZ	EB	LB	5	5	100			
Total, all programmes	**1 IB 14 EBs 13 LBs 2 MBs**		**975**	**867**	**89**		**Estimated total CSFC for 1994-1999: € 364.5 million**	**Estimated total CSFC for 1994-1999: € 130.2 million**

(*) **IB** = internal EU-border; **EB** = external EU-border; **LB** = land border; **MB** = maritime border;
(**) **SFC =** Structural Funds Contribution ERDF/ESF/EAGGF/FIFG (as decided in year of approval 1995/96); **CSFC =** Committed Structural Funds Contribution (1994-1999); **CR =** Commitment Rate (1994-1999)
(***) **General calculation:** SFC (of 1995/1996) x thematic spread according to initial planning (in %) x average CR for the period 1994-1999 (in %) = estimated total CSFC for 1994-1999.
(****) **Overall status, general needs/challenges & typical interventions** = observed across all programmes of this category. **Strategy focus** = the largest share of the SFC was allocated to that theme in the initial programme strategy.

Sources: Own elaboration on ground of information and data from the 11th report on the Structural Funds 1999 (European Commission, Directorate General for Regional Policy, 2000: pp.213-214) and the ex-post evaluation of INTERRG II (LRDP, 2003, pp.24-50).

ANNEX 11:
General and theme-specific funding profile of INTERREG IIC programmes promoting cooperation in the field of spatial planning

Programme	Total cost (in € million)	SFC (in € million)	Rate of Community Assistance (in %)	Theme-specific project-level funding and aggregation				
				Relevant priority or measure	Number of projects supported	Average project size, total eligible expenditure (in € million)	Total eligible expenditure all projects (in € million)	Estimated total CSFS (*) all projects (in € million)
Investments the field of transport/communication & sustainable mobility								
Western Mediterranean and Latin Alps	25.7	14.9	57.8	Sub-Programme 2	5	0.913	4.57	2.64
South-West Europe	9.7	5.5	56.7	Measure 3	1	2.186	2.186	1.24
North West Metropolitan Area	59.5	32.9	55.3	Priority 2, Measures 1 & 3	12	1.297	15.564	8.61
North Sea Region	31.1	14.8	47.6	Priority 2	12	0.448	5.376	2.56
Baltic Sea Region	47.9	25.6	53.4	Measure 1.2.	12	0.989	11.868	6.34
CADSES	38.3	21.7	56.7	Measure C	9	1.319	11.871	6.73
Atlantic Area	24.0	13.4	55.8	Priority 1	4	0.311	1.244	0.69
							Subtotal	**28.81**
Investments in the field of environment & climate change								
Western Mediterranean and Latin Alps	25.7	14.9	57.8	Sub-Programme 4	11	1.017	11.187	6.47
North West Metropolitan Area	59.5	32.9	55.3	Priorities 3 & 4	8	1.177	9.416	5.21
North Sea Region	31.1	14.8	47.6	Priority 3	11	0.730	8.03	3.82
Baltic Sea Region	47.9	25.6	53.4	Measure 2.2.	4	1.159	4.636	2.48
CADSES	38.3	21.7	56.7	Measure E	10	0.710	7.100	4.03
Atlantic Area	24.0	13.4	55.8	Priority 4	13	0.350	4.55	2.54
							Subtotal	**24.55**

(*) Estimated total CSFS = total eligible expenditure of all projects (in € million) x rate of Community assistance (in %)

Sources: Own elaboration on ground of information and data from the 11th report on the Structural Funds 1999 (European Commission, Directorate General for Regional Policy, 2000: pp.213-214) and from the ex-post evaluation of INTERRG II (LRDP, 2003, pp.168-169).

ANNEX 12:
Use of the ERDF categorisation system for the purpose of the financial analysis of the programming periods 2000-2006 and 2007-2013

In order to carry out the financial analysis of the programming periods 2000-2006 and 2007-2013 focusing on the environment and accessibility themes (with related sub-themes), it has been necessary to study the **evolution of the categorisation system** allowing monitoring the financial commitments by the programmes.

(A) In the period 2000-2006, following the requirements indicated by the Regulation (EC) 438/2001, committed expenses were classified by the Managing Authorities according to *areas of intervention*. The system is hinged on four one-digit codes (Productive environment, Human resources, Basic infrastructure, Miscellaneous). The available dataset for the period 2000-2006 (in the present study usable only in relation to INTERREG IIIA) allowed analysing the commitments at two-digit code level, basing therefore on twenty fields of intervention.

For the analysis of the environment theme, seven of these fields of intervention were considered[326]. No financial data were available at three-digit code level, and this **did not allow investigating the climate change sub-theme**.

Table… : 2000-2006 fields of intervention related to the environment theme

Codes	Environment
11 Agriculture	√
12 Forestry	√
13 Promoting the adaptation and the development of rural areas	√
14 Fisheries	√
33 Energy infrastructures	√
34 Environmental infrastructure (including water)	√
35 Spatial planning and rehabilitation	√

Source: Own elaboration on the ground of the Structural Funds 2000-2006 Categorisation system

Regarding the analysis of the accessibility theme, one field of intervention was considered, i.e. 31 on transport infrastructure. No financial data were available at three-digit code level, and this **did not allow investigating sustainable mobility sub-theme**.

(B) In the period 2007-2013, the Regulation (EC) 1828/2006 imposed a structured monitoring system, requiring to encode the commitments by Priority theme dimension form of finance dimension, territorial dimension, economic activity dimension and location dimension. **The following analysis is based on the priority theme dimension.**

Sixteen priority themes are associated to the environment, and the sub-theme of climate change is analysed considering eight priority codes related to energy, climate change adaptation and climate change mitigation. Furthermore, environment is also analysed in its broad meaning, including priority themes related to tourism, culture and urban and rural regeneration.

Seventeen priority themes are clearly linked to accessibility. Furthermore, the sub-theme of sustainable mobility is linked to five priority themes related to cycle tracks, multimodal

[326] Differently from the following period, where tourism was included in the broad concept of environment, it was noted that the content of this field of intervention in the 2000-2006 period did not have any clear link with environmental issues. So, the field of intervention 17 Tourism was mentioned but not grouped with the 'environmental' codes.

solutions and intelligent transport systems.

Table : 2007-2013 priority themes related to environment

Codes	Environment	Climate change	Broad meaning of environment
39 Renewable energy: wind	√	√	√
40 Renewable energy: solar	√	√	√
41 Renewable energy: biomass	√	√	√
42 Renewable energy: hydroelectric, geothermal and other	√	√	√
43 Energy efficiency, co-generation, energy management	√	√	√
44 Management of household and industrial waste	√		√
45 Management and distribution of water (drinking water)	√		√
46 Water treatment (waste water)	√		√
47 Air quality	√		√
48 Integrated prevention and pollution control	√		√
49 Mitigation and adaptation to climate change	√	√	√
50 Rehabilitation of industrial sites and contaminated land	√		√
51 Promotion of biodiversity and nature protection *(including Natura 2000)*	√		√
52 Promotion of clean urban transport	√		√
53 Risk prevention *(including the drafting and implementation of plans and measures to prevent and manage natural and technological risks)*	√	√	√
54 Other measures to preserve the environment and prevent risks	√	√	√
55 Promotion of natural assets			√
56 Protection and development of natural heritage			√
58 Protection and preservation of the cultural heritage			√
61 Integrated projects for urban and rural regeneration			√

Source: Own elaboration on the ground of the Structural Funds 2007-2013 Categorisation system

Table : 2007-2013 priority themes related to accessibility theme

Codes	Accessibility	Sustainable mobility
16 Railways	√	
17 Railways (TEN-T)	√	
18 Mobile rail assets	√	
19 Mobile rail assets (TEN-T)	√	
20 Motorways	√	
21 Motorways (TEN-T)	√	
22 National roads	√	
23 Regional/local roads	√	
24 Cycle tracks	√	√
25 Urban transport	√	√
26 Multimodal transport	√	√
27 Multimodal transport (TEN-T)	√	√
28 Intelligent transport systems	√	√
29 Airports	√	
30 Ports	√	
31 Inland waterways (regional and local)	√	
32 Inland waterways (TEN-T)	√	

Source: Own elaboration on the ground of the Structural Funds 2007-2013 Categorisation system

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