

“Monitoring the FP7 contribution towards the transition to a low-carbon economy”

FP7-4-SD.eu policy brief No. 2 from April 2011

Summary

FP7 and research for a low-carbon economy

As outlined in the Europe 2020 Strategy, the EU strives to become a low-carbon economy by 2050. To this end, the EU has set itself the target of cutting EU greenhouse gas emissions by 80-95 % by 2050. This will be mainly achieved through the Strategy’s flagship initiatives “A resource-efficient Europe” and “An industrial policy for the globalisation era”. A roadmap for a low-carbon economy, focusing on development and innovations of low-carbon technologies, will be one of the key deliverables under the “Resource efficiency” flagship initiative.

EU policy context: moving towards a low-carbon economy

How does FP7 contribute to the transition towards a low-carbon economy?

The monitoring system FP7-4-SD shows that, overall, 38 % of the research carried out under the Specific Programme (SP) ‘Cooperation’ within the Seventh Framework Programme (FP7) contributes to the transition towards a low-carbon economy. The share of funding provided by the SP ‘Cooperation’ for research projects addressing low-carbon economy objectives accounts for 41 % (i.e. € 4.3 billion out of € 10.5 billion)¹.

How do the ten ‘Cooperation’ themes contribute to a low-carbon economy?

How big is the EU financial contribution to low-carbon economy research across the FP7 themes?

Of the ten themes of the SP ‘Cooperation’, the themes ENERGY (88 %), ENVIRONMENT (69 %) and Materials (NMP) (67 %) comprise the largest share of research topics relevant for a low-carbon economy. The total amount of EC contribution is highest in the theme ICT (€1 billion). However, due to the large number of other projects funded within ICT, the share of EC contribution dedicated to low-carbon economy research in ICT is relatively low (28 %) compared to other themes.

What aspects of a low-carbon economy are addressed by FP7 research?

How did FP7 research relevant for a low-carbon economy develop over time?

Objectives from the areas “climate change and clean energy” and “conservation and management of natural resources” are most prominently addressed. Time series data show that throughout the Work Programmes 2007 to 2011 the share of topics contributing to a low-carbon economy has remained rather constant at about 43 %.

Where are the centres of excellence of FP7 research relevant for a low-carbon economy?

With 219 coordinated projects, Germany can be regarded as leading country in low-carbon economy research, followed by the United Kingdom, France and Italy with about 120 coordinated projects each.

¹ In this policy brief, terms such as “addressing low-carbon economy objectives” or “contributing to the transition towards a low-carbon economy” are used synonymously for “contributing to at least one of the 31 objectives within the low-carbon economy referential framework”.

EU policy context: moving towards a low-carbon economy

Achieving a low-carbon economy is one of the main challenges outlined in the EU 2020 Strategy

As outlined in the Europe 2020 Strategy² under its “sustainable growth” priority, the European Union is fostering the transition towards a low-carbon economy. The notion of a low-carbon economy is based on the view that investment in low carbon technologies (e.g. renewable energy) helps the environment by fighting climate change and at the same time creates new business and employment opportunities, which will ultimately foster growth and competitiveness.

More specifically, the flagship initiatives “A resource efficient Europe”³ and “An industrial policy for the globalisation era”⁴ are the EU’s main instruments for moving towards a low-carbon economy by 2050, by cutting EU greenhouse gas (GHG) emissions by 80-95 %. Under the former, the roadmap for a low-carbon economy⁵ has been drafted in order to support development and innovation in the area of low-carbon technologies. The latter aims to reduce emissions that are produced throughout the supply chain and in the use and disposal of products.

Issues addressing low-carbon economy research are ranging from improving public transport systems to the development of environmentally friendly products

The issue of a low-carbon economy is cross-cutting and covers a wide range of societal aspects, from energy production and transport to the conservation of renewable natural resources. A shift towards low-carbon energy production (e.g. through renewable energies) and improving energy efficiency both contribute to a reduction in GHG emissions. Transport is regarded as one of the main sources of GHG emissions. It is therefore essential to improve public transport, promote low-carbon passenger cars (e.g. hybrid cars) and achieve sustainable levels of transport energy use.

In order to set the foundations of a low-carbon economy, the development of eco-innovations and environmentally friendly technologies (inter alia low-carbon technologies) which ensure the production of environmentally friendly products as well as their uptake by consumers are necessary preconditions. Improving management and avoiding overexploitation of natural resources (also in order to mitigate impacts from climate change) can be achieved through improving resource efficiency, and through enhancing re-use and recycling of waste.

A wide range of EU policies are supporting the

Apart from the Europe 2020 Strategy, the issue of a low-carbon economy has also been taken up by other EU policies. In order to foster the implementation of carbon capture and storage (CCS) technology, the

² [European Commission \(2011\). Europe 2020 - A European strategy for smart, sustainable and inclusive growth. COM\(2010\) 2020.](#)

³ [European Commission \(2011\). A resource-efficient Europe – Flagship initiative under the Europe 2020 Strategy. COM\(2011\) 21 final.](#)

⁴ [European Commission \(2010\). An Integrated Industrial Policy for the Globalisation Era. COM\(2010\) 614.](#)

⁵ [European Commission \(2011\). A Roadmap for moving to a competitive low-carbon economy in 2050. COM\(2011\) 112 final.](#)

introduction of low-carbon technologies

European Commission has set up a legal framework⁶ for safe geological storage of carbon dioxide and to ensure that the adverse effects on human health and the environment are minimised. Along with renewable energy and energy efficiency technologies CCS is another option to reduce GHG emissions into the atmosphere.

The EU's "NER 300" programme⁷ aims at supporting commercialisation of low-carbon technologies. It provides substantial funding for large-scale demonstration of low-carbon technologies in Europe. The total available budget comes from the sale of 300 million emission allowances accounting for € 4.5 billion held in the New Entrants Reserve (NER) of the EU Emissions Trading System (ETS).

Other EU initiatives engaging in low-carbon technology development and demonstration are the European Energy Programme for Recovery⁸ and the Strategic Energy Technology Plan⁹.

A framework for analysing 'low-carbon economy' research

Identifying research contributing to the transition towards a low-carbon economy

This policy brief focuses on research contributing to the transition towards a low-carbon economy by analysing the structure of the FP7 Specific Programme 'Cooperation', funding and the geographical spread of centres of excellence within the EU. Therefore, experts from DG Research and Innovation together with experts from WU Vienna extracted a set of operational objectives as outlined in the renewed EU Sustainable Development Strategy (EU SDS)¹⁰. The rationale behind the selection of operational objectives was based on a text analysis of the Europe 2020 Strategy, the flagship initiative "A resource efficient Europe"¹¹, the roadmap for a low carbon economy¹² and other sources such as the IPCC Fourth Assessment Report¹³. The resulting framework can be regarded as important aspects of a low-carbon economy and has been used as a basis for analysing low-carbon economy research. Overall, operational objectives related to "climate change and clean energy", "sustainable transport", "sustainable consumption and production" and "conservation and management of natural resources" comprise fundamental aspects of a low-carbon economy. The list

⁶ [Directive 2009/31/EC on the geological storage of carbon dioxide.](#)

⁷ See http://ec.europa.eu/clima/policies/lowcarbon/ner300_en.htm.

⁸ [Regulation \(EU\) No 1233/2010 of the European Parliament and of the Council of 15 December 2010 amending Regulation \(EC\) No 663/2009 establishing a programme to aid economic recovery by granting Community financial assistance to projects in the field of energy.](#)

⁹ See http://ec.europa.eu/energy/technology/set_plan/set_plan_en.htm.

¹⁰ The extract used for this policy brief is based on the referential framework of 78 operational objectives outlined in the EU SDS that is used for the FP7-4-SD.eu monitoring system; see <https://www.fp7-4-sd.eu/index.php?request=public:page:default&page=about#sds>.

¹¹ [European Commission \(2011\). A resource-efficient Europe – Flagship initiative under the Europe 2020 Strategy. COM\(2011\) 21 final.](#)

¹² [European Commission \(2011\). A Roadmap for moving to a competitive low carbon economy in 2050. COM\(2011\) 112 final.](#)

¹³ [IPCC Fourth Assessment Report: Climate Change 2007 \(AR4\)](#)

of objectives selected for the low-carbon economy framework can be found in the Annex to this policy brief (see page 13).

How does FP7 contribute to the transition towards a low-carbon economy?

More than one third of FP7-funded research contributes to a low-carbon economy

The FP7-4-SD monitoring system shows that, overall, about **38 % of the projects** (i.e. 1125 out of 2987) that have been funded so far by FP7 under the SP 'Cooperation' Work Programmes 2007 to 2010¹⁴ **contribute to at least one of the 31 operational objectives within the low-carbon economy framework**. The share is even higher when looking at the number of topics (called for in annual Work Programmes) and the amount of funding provided by the SP 'Cooperation' (total EC contribution), accounting for 43 % (i.e. 1032 out of 2409 topics) and 41 % (i.e. € 4.3 billion out of € 10.5 billion), respectively. This variation is due to differences in the number and size of projects funded by the individual 'Cooperation' themes (see box 1 below for a brief description of the FP7's 'Cooperation' programme and its ten thematic areas).

Box 1: The FP7 'Cooperation' Specific Programme

The Specific Programme (SP) 'Cooperation' is at the core of FP7, representing about two thirds of the overall FP7 budget (i.e. € 32 billion out of € 50 billion) over the period 2007-2013. It fosters collaborative research across Europe and other partner countries, through projects by transnational consortia of industry and academia, in ten thematic areas¹⁵. Since the start of FP7 in 2007, a total of 2409 topics have been called for so far in the annual Work Programmes (WPs). Under these topics, 2987 projects¹⁶ have been or are being carried out with a total EC contribution (that is, the co-financing provided by FP7) of € 10.5 billion. The EC contribution accounts for more than two thirds of the total project costs (i.e. the co-financing provided by FP7 plus other funding sources) of € 15.1 billion. For further information, please visit http://cordis.europa.eu/fp7/cooperation/home_en.html.

How do the ten 'Cooperation' themes contribute to a low-carbon economy?

The themes TRANSPORT, ENERGY and ENVIRONMENT comprise the largest number of topics with impacts on objectives

Among the ten 'Cooperation' themes, TRANSPORT accounts for the largest number of topics (232 topics) with positive expected impacts on low-carbon economy objectives, followed by ENERGY and ENVIRONMENT with 203 and 201 topics respectively. However, in relative terms ENERGY (88 %), followed by ENVIRONMENT (69 %) and Materials (NMP) (67 %), covers the largest

¹⁴ Data on the number of projects stemming the Work Programme 2010 are not yet complete, and projects from the Work Programme 2011 are not included as they are still under negotiation.

¹⁵ The ten themes are: (1) Health, (2) Food, Agriculture and Fisheries, Biotechnology, (3) Information & communication technologies, (4) Nanosciences, nanotechnologies, materials & new production technologies, (5) Energy, (6) Environment (including Climate Change), (7) Transport (including aeronautics), (8) Socio-economic Sciences and the Humanities, (9) Space and (10) Security.

¹⁶ It is important to note that not all topics called for are being translated into action by funding of projects: in the Work Programmes 2007-2009, projects are being funded under some 1126 topics only (76 % of all topics called for). However, more than one project may be funded under one topic.

relevant for a low-carbon economy

share of topics relevant for a low-carbon economy. Themes with rather small shares are SECURITY (4 %) and HEALTH (1 %).

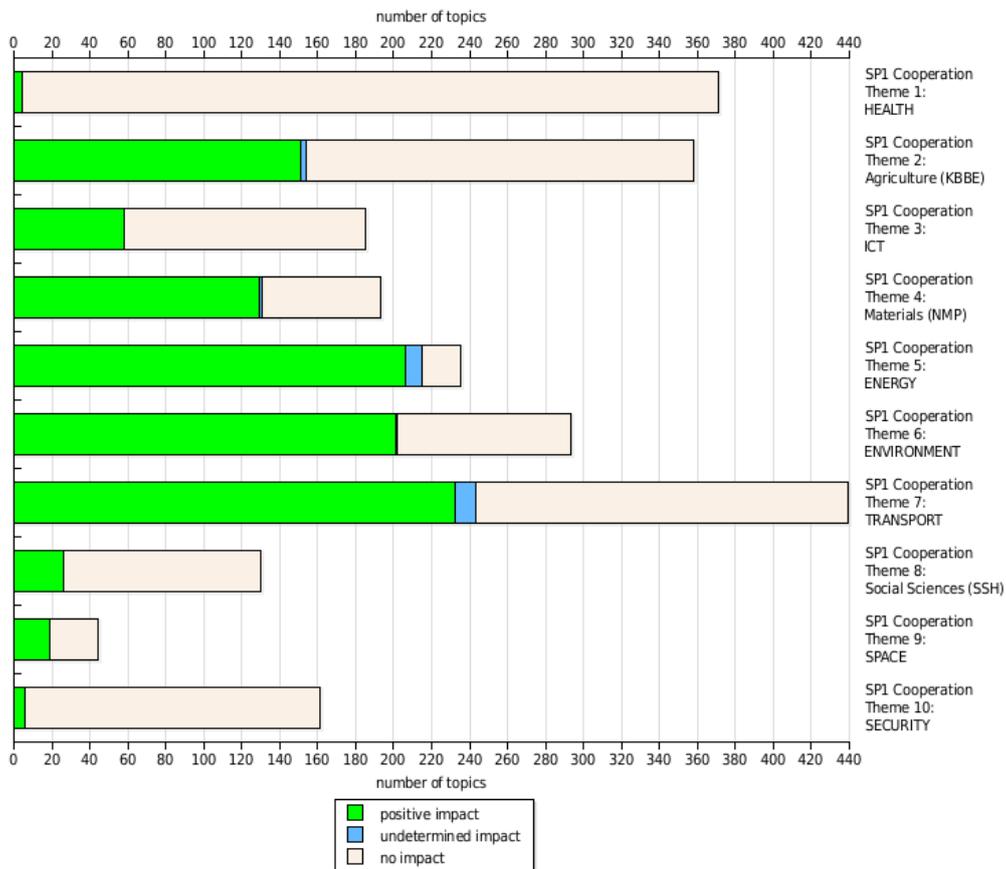


Figure 1: Number of topics with expected impacts on low-carbon economy objectives in the ten ‘Cooperation’ themes¹⁷

How big is the EU financial contribution to low-carbon economy research across the FP7 themes?

The themes ICT, NMP and ENERGY provide the highest amount of EC contribution (€) to research relevant for a low-carbon economy

The pattern of the themes being prominent in terms of expected impacts (see Figure 1) changes when looking at the amount of co-financing (“total EC contribution”) provided by SP ‘Cooperation’ (see Figure 2 below). An outstanding result of the analysis is that the theme ICT exceeds all other ‘Cooperation’ themes in terms of total EC contribution addressing low-carbon economy aspects (€ 1 billion). Other themes with a considerable amount of EC contribution are NMP (€ 922 million), ENERGY (€ 696 million), TRANSPORT (€ 656 million) and ENVIRONMENT (€ 501 million). However, due to the large number of topics within ICT the share of EC contribution to research relevant for a low-carbon economy (28 %) is rather low when compared to the themes ENERGY (93 %), ENVIRONMENT (80 %) and NMP (72 %). This picture is similar to the one presented above for the number of topics. Themes ranging at the lower end of the scale are HEALTH (1 %) and SECURITY (9 %).

¹⁷ Typology of impacts: “positive”: supporting the EU SDS objectives; “undetermined”: impacts that due to a lack of scientific evidence cannot yet be categorized as positive, negative or neutral; “no impact”: no expected impacts on EU SDS objectives.

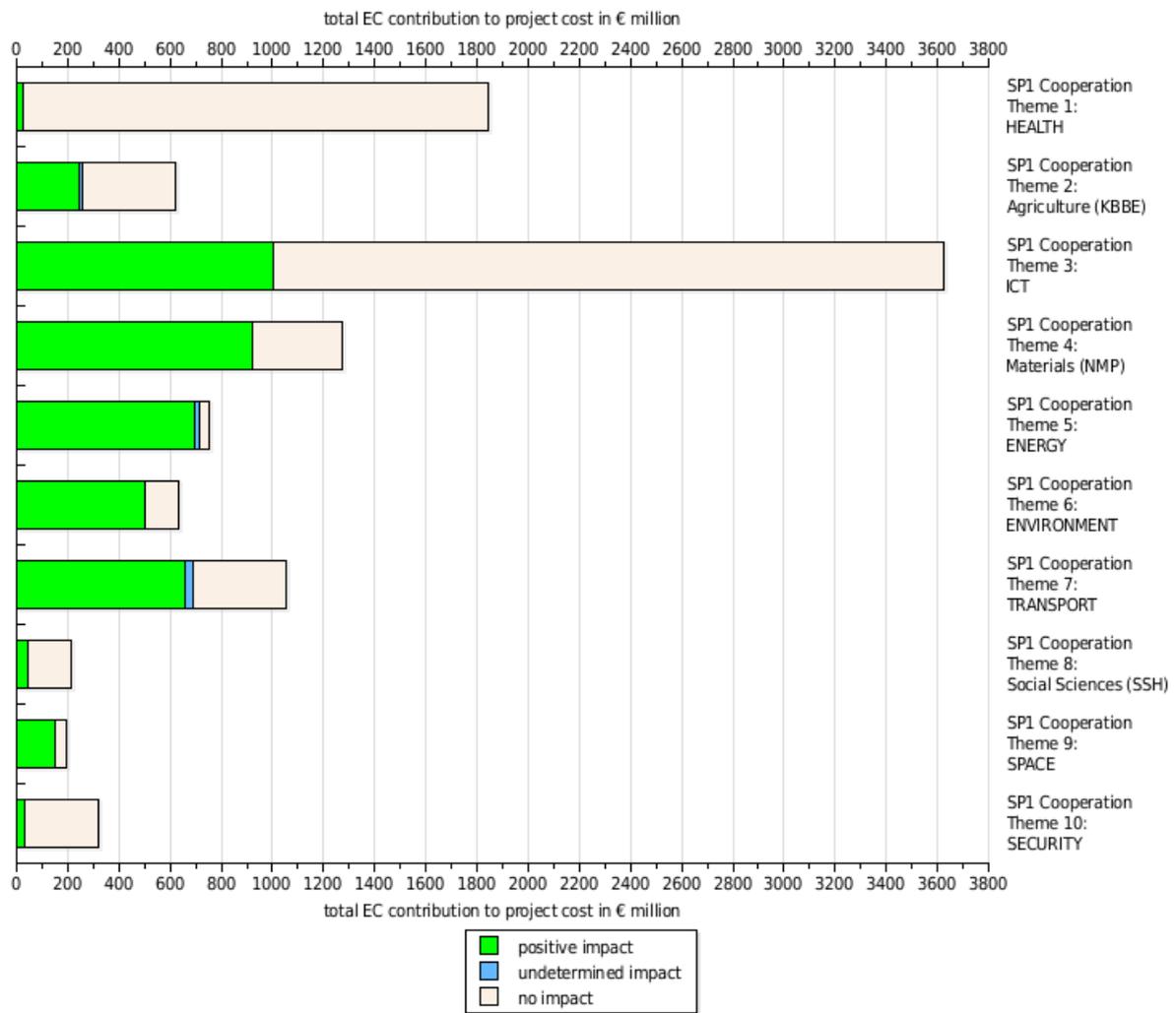


Figure 2: Total EC contribution to projects with expected impacts in the ten 'Cooperation' themes

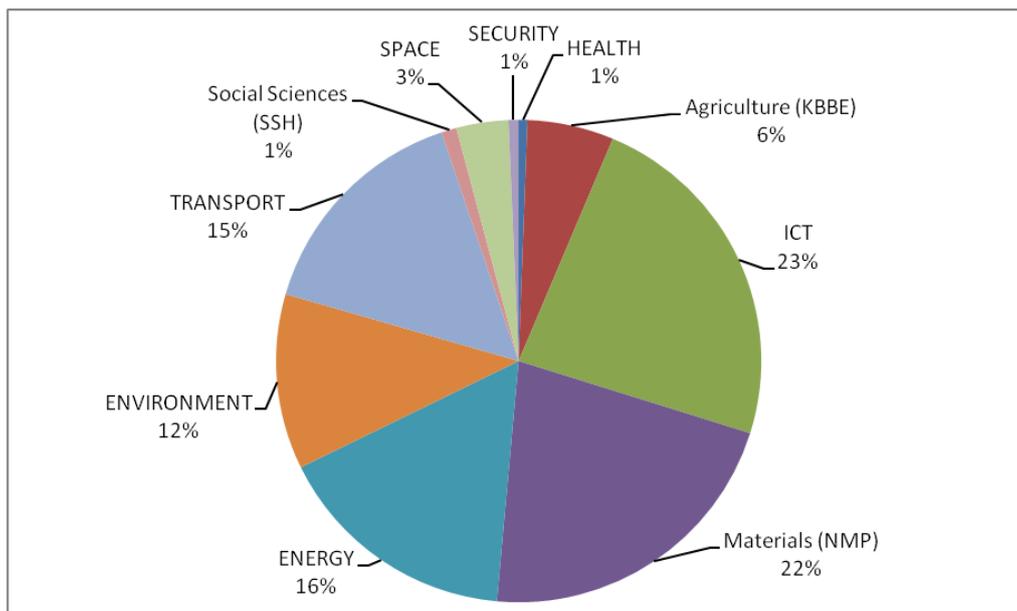


Figure 3: Share of total EC contribution (€) to projects with positive impacts on low-carbon economy objectives across the ten 'Cooperation' themes

What aspects of a low-carbon economy are addressed by FP7 research?

SP 'Cooperation'-funded research contributes considerably to the challenges "climate change and clean energy" and "conservation and management of natural resources"

So far, only the extent – in terms of topics, projects and funding – to which SP 'Cooperation' research contributes to the transition towards a low-carbon economy has been investigated. In this section, the angle of view is changed by concentrating more on what aspects of a low-carbon economy are covered by SP 'Cooperation' research (see Figure 4).

Within the low-carbon economy framework, objectives related to "climate change and clean energy" (540 topics) and "conservation and management of natural resources" (488 topics) comprise the largest number of topics with positive expected impacts. A similar picture is shown when looking at the EC contribution: objectives related to "climate change and clean energy" and "conservation and management of natural resources" account for the highest EC contribution with € 2.7 billion and € 1.9 billion respectively.

Aspects like reduction of GHG emissions and management and efficiency of resources within the low-carbon economy framework are most prominent

By investigating the operational objectives within the low-carbon economy referential framework (see Annex), the main aspects of a low-carbon economy covered by SP 'Cooperation' research can be identified. Concerning individual operational objectives, "improving management and avoiding overexploitation of renewable natural resources" (211 topics) accounts for the largest number of topics with positive impacts. Concerning broader issues, reducing GHG emissions (addressing the operational objectives "reducing GHG emissions", "reducing transport greenhouse gas emissions" and "reducing CO₂ emissions from new car fleets") can be considered as one of the main pillars of a low-carbon economy, and is most prominently addressed (by about 300 topics). Within the key challenges "climate change and clean energy" and "sustainable transport", 181 and 123 topics respectively are contributing to this issue. Increasing efficiency in production and consumption is considered as a high priority within the low-carbon economy framework. Both the key challenges "climate change and clean energy" and "conservation and management of natural resources" are covering aspects of energy and resource efficiency, the former being addressed by 155 topics and the latter by 105 topics.

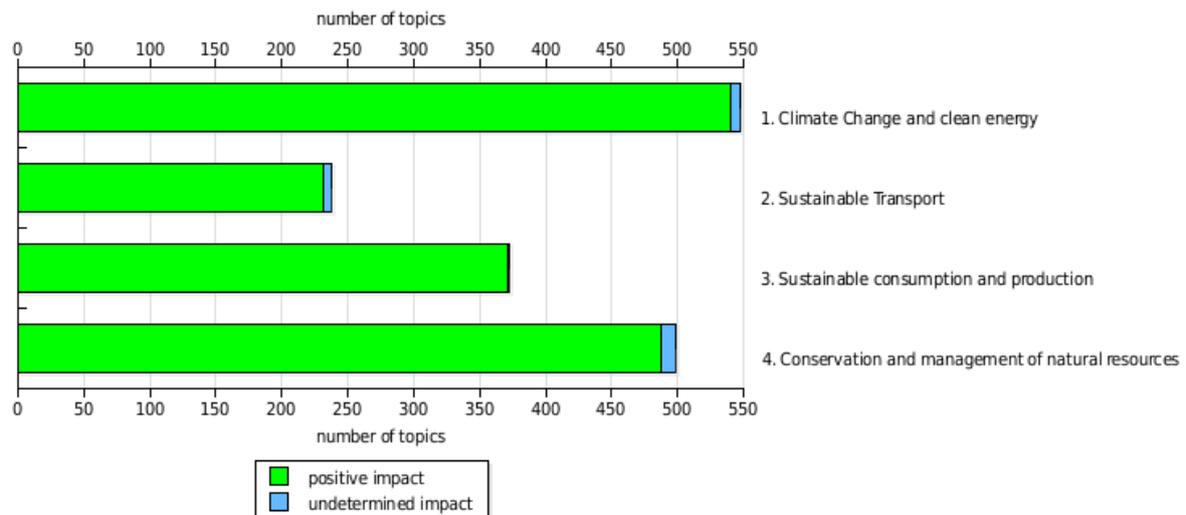


Figure 4: Number of topics with expected impacts on low-carbon economy objectives in the corresponding challenges

How did FP7 research relevant for a low-carbon economy develop over time?

The share of topics with positive impacts on low-carbon economy objectives remained stable from 2007 to 2011

As displayed in Figure 5 the share of low-carbon economy relevant research within the SP ‘Cooperation’ showed a relatively stable development over time. The number of topics with positive expected impacts on objectives related to a low-carbon economy varied between 42 % and 44 % over the Work Programmes 2007 to 2011, although the total number of topics decreased from 280 to 203. Notably, the share of topics with undetermined impacts declined almost steadily from 1.1 % (7 topics) in 2007 to 0.9 % (4 topics) in 2011.

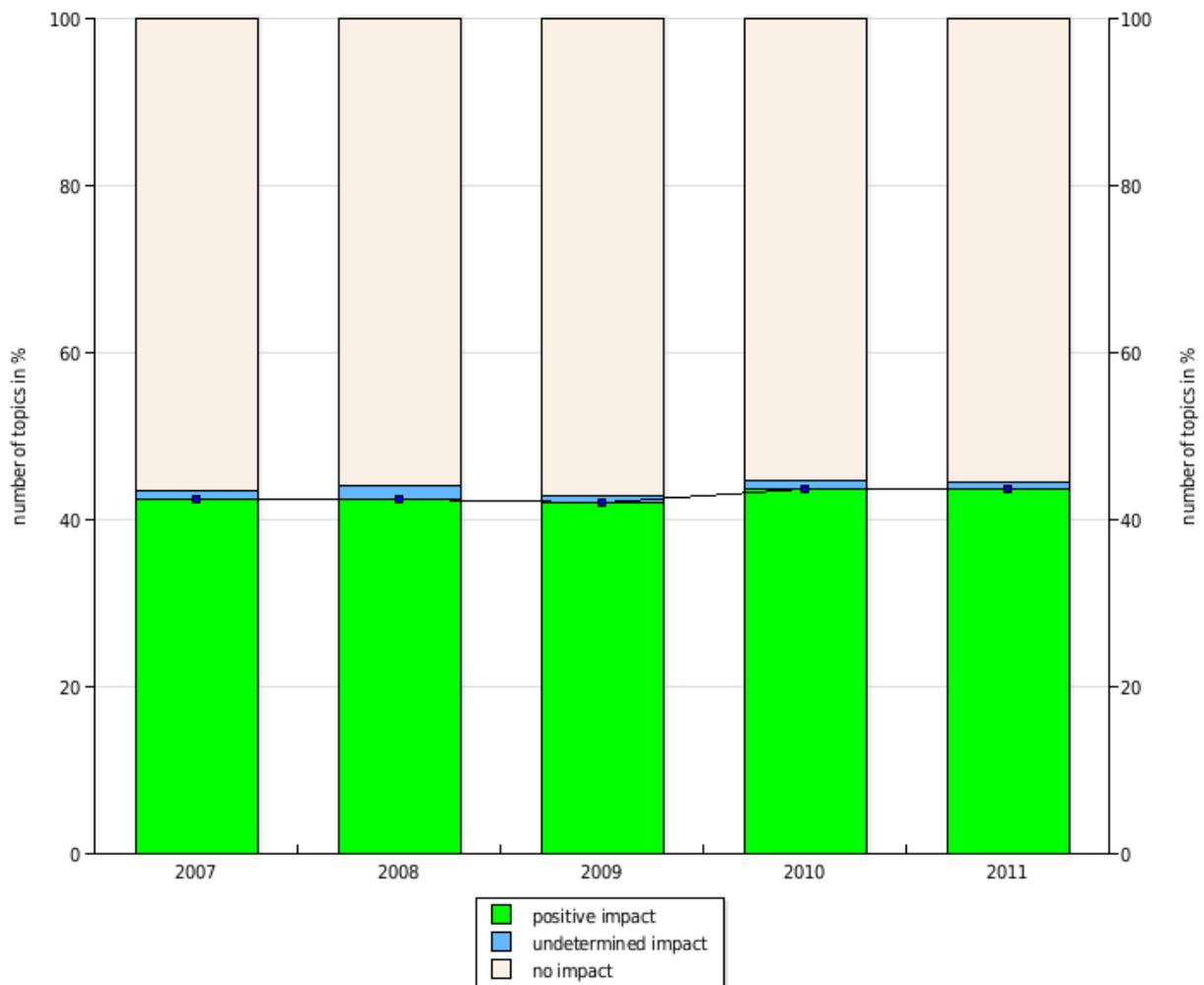


Figure 5: Share of topics with expected impacts on low-carbon economy objectives during the Work Programmes 2007 to 2011

The share of EC contribution addressing projects with positive impacts on low-carbon economy aspects increased continuously

The patterns of impacts over time changes when looking at the amount of EC contribution dedicated to projects with positive impacts (see Figure 6). Despite an overall decline of EC contribution to projects from € 4.4 to € 2.7 billion in 2009¹⁸, the share of EC contribution to projects with positive impacts continuously increased from 33 % to 47 % over the Work Programmes 2007 to 2009. In parallel, the share of EC contribution to projects with undetermined impacts slightly declined from 0.5 % to 0.4 %.

Among the ten SP ‘Cooperation’ themes, almost all increased their share of EC contribution to projects with positive impacts, except for the themes HEALTH and SPACE which decreased from 2.9 % to 0.6 % and 98.1 % to 80.3 % between 2007 and 2009, respectively.

¹⁸ Data on the number of projects stemming the Work Programme 2010 are still not yet complete, and projects from the Work Programme 2011 are not included as they are still under negotiation.

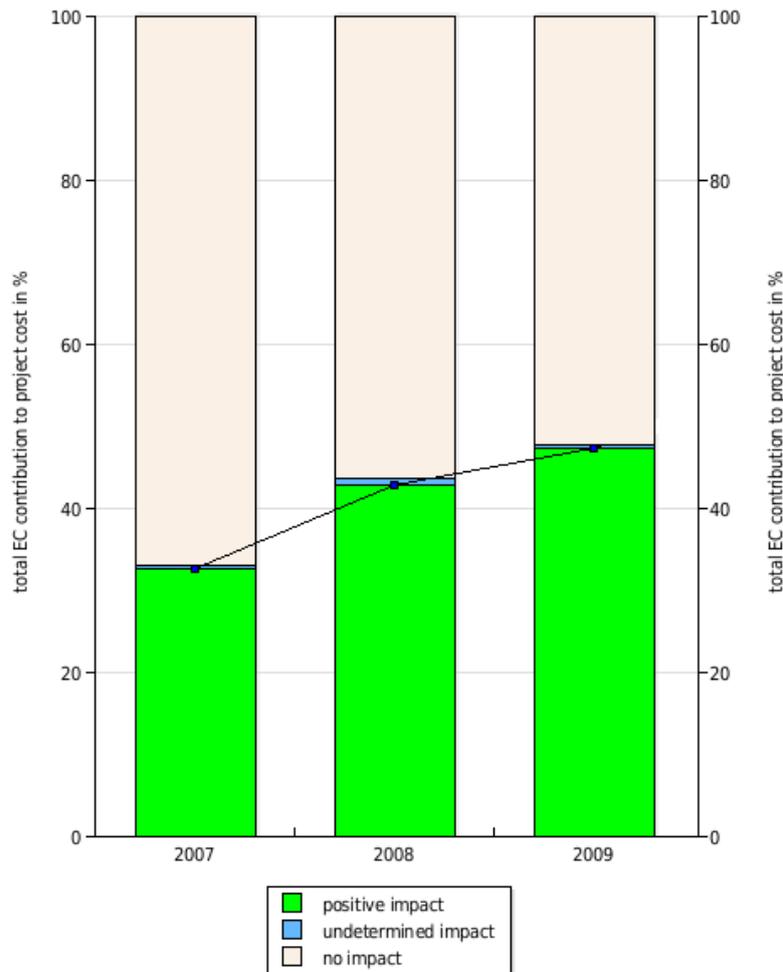


Figure 6: Total EC contribution to projects with expected impacts during the Work Programmes 2007 to 2009

Where are the centres of excellence of FP7 research relevant for a low-carbon economy?

Germany, the United Kingdom, France and Italy are leading the research for a transition towards a low-carbon economy

As displayed in Figure 7 below, the EU Member States which are leading the SP ‘Cooperation’ research for a transition towards a low-carbon economy¹⁹ are Germany, the United Kingdom, France and Italy. Germany by far exceeds the other EU Member States with a total of 219 coordinated projects, followed by the United Kingdom, France and Italy, which account for 129, 121 and 120 coordinated projects respectively.

¹⁹ The assumption has been made that institutions from countries which are responsible for the coordinating a project are characterized by an exceptional scientific knowledge base and the essential coordination skills to implement the respective project. Therefore countries with a high number of coordinated projects can be seen as "centres of excellence" in the respective field of research.

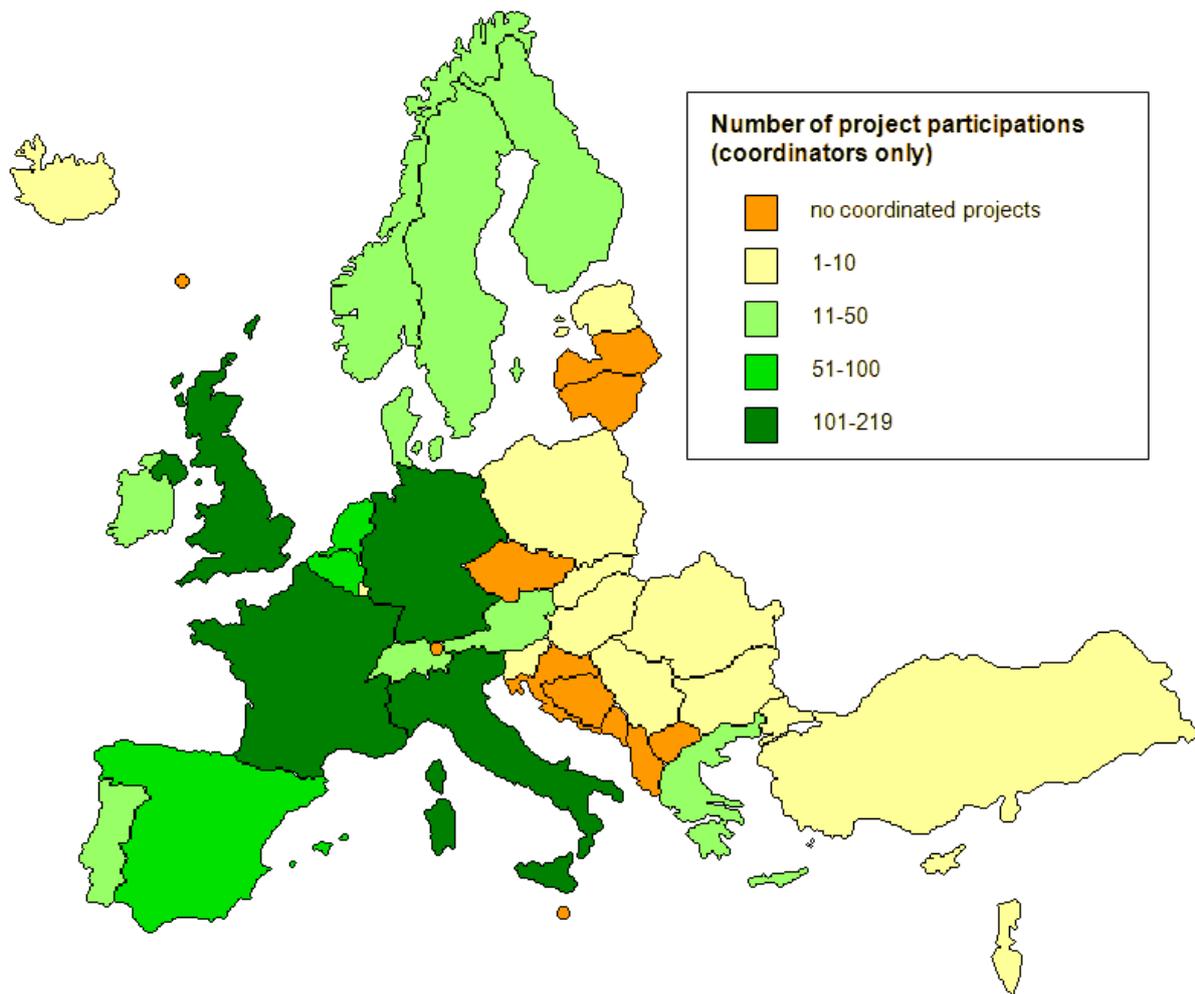


Figure 7: Geographical representation of coordinated SP ‘Cooperation’ projects impacting on objectives related to a low-carbon economy in the EU Member States and associated countries

For Cyprus, Greece, Malta and Bulgaria the ratio of EC contribution addressing research for a low-carbon economy to national R&D expenditure in million € is highest

As indicated in Figure 8 below, countries with a relatively high ratio of EC contribution to national R&D expenditures are Cyprus (€ 84.4 million), Greece (€ 81.1 million), Malta (€ 59.9 million) and Bulgaria (€ 36.4 million). Also countries like Belgium and the Netherlands score rather high on the ratio of EC contribution to national R&D expenditure with about € 32.8 million and € 27.3 million, respectively. The underlying reason for a rather high ratio of total EC contribution per € million national R&D expenditure is either a relatively low national R&D expenditure and/or a high number of projects contributing to a low-carbon economy.

Eastern European countries are integrated in FP7 funded research contributing to a low-carbon economy

When comparing Figures 7 and 8 it becomes obvious that especially Eastern European countries are not among the centres of excellence driving research and development. However, Eastern European countries are well integrated in European research within SP ‘Cooperation’ with a focus on low-carbon economy aspects, which is in line with the aim of the European Union to establish a European-wide research area.

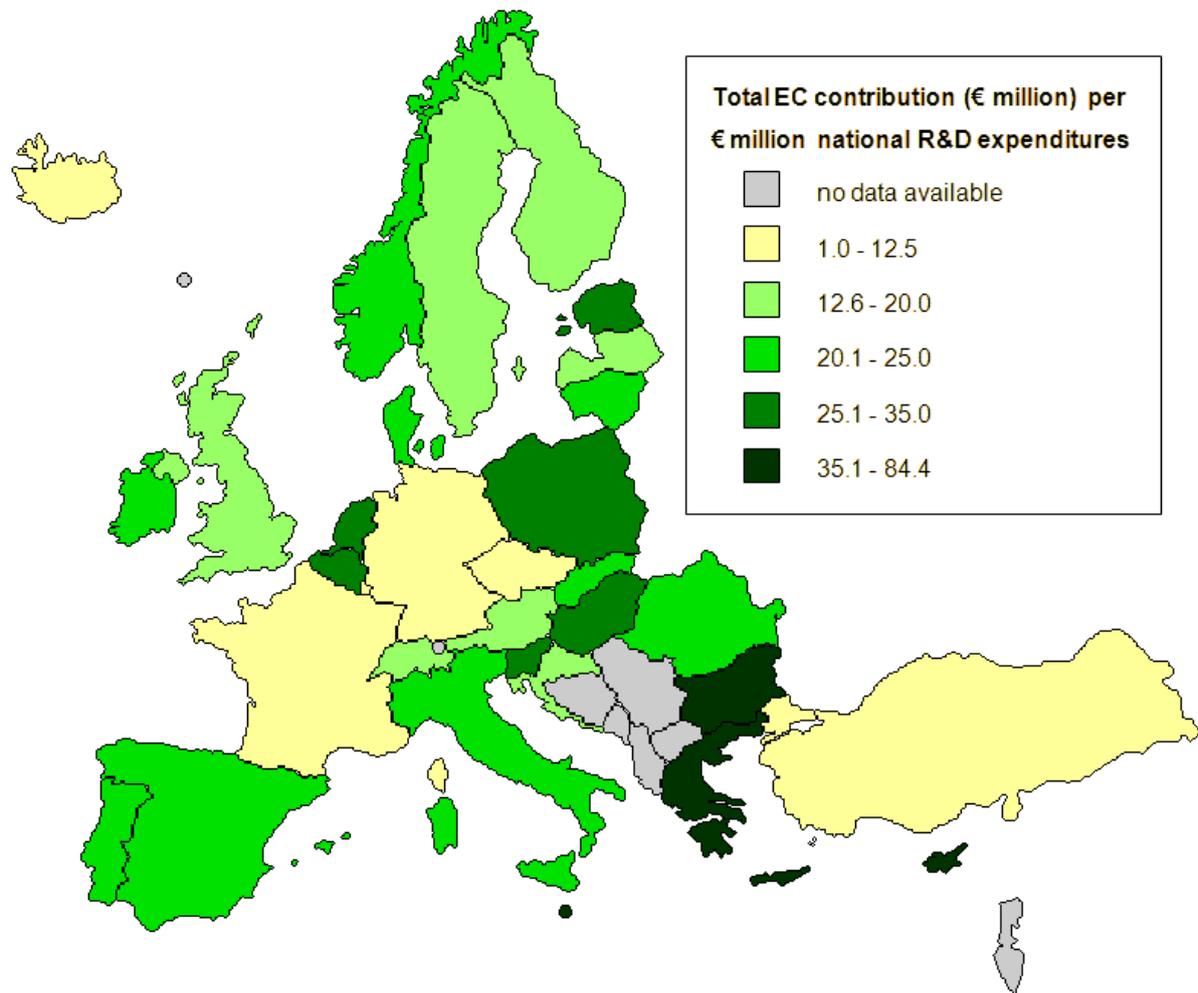


Figure 8: Geographical representation of total EC contribution (€ million) per € million national R&D expenditure to projects with positive expected impacts on low-carbon economy objectives among the ten 'Cooperation' themes



Annex: List of objectives selected for the low-carbon economy framework

The following EU SDS objectives have been selected for the low-carbon economy framework used for the analyses presented in this policy brief. The list of objectives is based on the referential framework of 78 EU SDS operational objectives that is used for the FP7-4-SD monitoring system. The complete framework including the original formulation of the EU SDS objectives can be accessed at https://www.fp7-4-sd.eu/tpl/static/EUSDS_referential_framework.pdf. "Low carbon economy" is also available as so-called public filter setting in the monitoring system's interactive database²⁰.

EU SDS key challenge "Climate Change and clean energy":

- Reducing GHG emissions
- Promoting environmental sustainability of energy
- Enhancing adaptation and mitigation of Climate Change
- Raising the share of renewables
- Raising the share of biofuels
- Reducing energy consumption (increasing energy efficiency and/or decreasing energy demand)
- Other expected impacts on Climate Change and clean energy

EU SDS key challenge "Sustainable Transport":

- Decoupling economic growth and demand for transport
- Achieving sustainable levels of transport energy use
- Reducing transport greenhouse gas emissions
- Achieving environment friendly transport modes
- Modernising the EU framework for public passenger transport
- Encouraging better efficiency of public passenger transport
- Encouraging better performance of public passenger transport
- Reducing CO2 emissions from new car fleets

EU SDS key challenge "Sustainable consumption and production":

- Addressing social and economic development within the carrying capacity of ecosystems
- Decoupling economic growth from environmental degradation
- Improving the environmental performance for products and processes
- Encouraging the uptake of environmentally/socially better performing products and processes by businesses and consumers
- Raising the level of Green Public Procurement (GPP)
- Increasing the global market share of the EU in environmental technologies
- Increasing the global market share of the EU in eco-innovations
- Other expected impacts on Sustainable consumption and production

²⁰ The interactive database of the FP7-4-SD monitoring system allows for more detailed and customised analyses of the FP7's contribution to EU SDS objectives. It can be accessed at <https://www.fp7-4-sd.eu/index.php?request=public:page:default&page=database>.

EU SDS key challenge “Conservation and management of natural resources”:

- Reduce the overall use of non renewable natural resources
- Reduce environmental impacts of raw materials use
- Improving resource efficiency
- Promotion of eco-efficient innovations
- Improving management and avoiding overexploitation of renewable natural resources
- Contributing effectively to achieving the four United Nations global objectives on forests
- Avoid generation of waste by applying the concept of life-cycle thinking
- Avoid generation of waste by promoting reuse and recycling