



Developing an analytical framework for mapping, monitoring and assessing transnational R&D collaboration in Europe. The case of the ERA-NETs

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EUR 23843 EN - 2009

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JRC 51448

EUR 23843 EN
ISBN 978-92-79-12562-1
ISSN 1018-5593
DOI 10.2791/11940

Luxembourg: Office for Official Publications of the European Communities

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Printed in Spain

Acknowledgements

This report has benefitted from the contributions of both external experts and IPTS colleagues. Particular thanks are due to Ken Guy, Effie Amanatidou and Manfred Horvat for their time, written input and challenging discussions.

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Executive Summary

This Report has been prepared by the Knowledge for Growth Unit at the Institute for Prospective Technological Studies (IPTS). The IPTS is one of the seven institutes of the European Commission Joint Research Centre (JRC). NETWATCH is a platform for information, analysis and learning on transnational cooperation in research and development being developed at the JRC-IPTS.

This Report is the third deliverable of the NETWATCH Preparatory Phase and its main aim is to **present an analytical framework for mapping, monitoring and assessing transnational R&D collaboration programmes in Europe, using in the case of the ERA-NET scheme as a starting point.**

The Report discusses the rationales for the European Research Area (ERA) and Joint Programming Initiatives (JPIs) in order to contextualise the NETWATCH Project, to explain the added value of NETWATCH and to justify the rationale of having an analytical framework for ERA-NETs. The core of the Report describes the proposed analytical framework and the ERA-NETs in the field of energy serve as a preliminary case study. Recommendations for the further implementation of the analytical framework are also highlighted.

The **analytical framework** is a starting point for strategic discussions at national and European level on how to implement more sustainable and efficient trans-national programme cooperation at EU level, and thus, for policy learning towards Joint Programming (JP). Its main **aim** is to collect, analyse and present, via an easily accessible web platform, information on the evolution and impacts of ERA-NETs and other JPIs in line with two main objectives:

- To provide support to Member States in their ongoing efforts to formulate and implement strategies for their participation in ERA-NETs and other JPIs
- To assess impacts of ERA-NETs and, subsequently, other JPIs, relevant to the attainment of the overall goals of the Lisbon Strategy and the ERA.

The **main functions** of the analytical framework are:

- Generating better knowledge about the ERA-NETs and the joint activities implemented.
- Contributing to mutual learning of R&D programme cooperation activities in Europe.
- Capturing evidence of the benefits, both on national and on EU level, of transnational R&D programme collaboration making a case for increasing the efforts towards JP.
- Offering guidance for future collaboration exercises on EU level and between Member States.

In the light of the analysis of the ERA and the JP initiatives, the report indicates that the problems stemming from fragmentation and sub-criticality in combination with the challenges faced today by the research policies and systems inevitably lead to acknowledging the need for more and better coordination and collaboration.

JP is seen as a strategic approach with a long-term horizon, needing the commitment of all Member States and leading to the optimal use of existing instruments at all levels. Within this strategic approach, the ERA-NET scheme is an important vehicle to deal with transnational cooperation issues and it is considered one of the most significant instruments developed and implemented at EU level during the FP6 to transform ERA from a theoretical concept to a more practical policy approach.

Accordingly, there is a need for an information platform on ERA-NETs that facilitates benchmarking, evaluation and the identification of good practices. It should also allow strategic analysis and the development of a battery of indicators to provide a comprehensive view of the transnational collaboration in Europe.

Three main target groups have been identified as the **potential users** of the analytical framework, each of them with different priorities with respect to their information and analytical needs:

- a) **Programme managers and owners** are the core target group of NETWATCH. The analytical framework aims mainly to be useful for policy makers in their decision making processes, for the definition of strategies, future partners and further collaboration.
- b) **Strategic stakeholders.** This group includes policy analysts and policy makers at the European Commission but also at national level whose focus is on keeping an overview of R&D programme activities. This target group will be interested not only in the factual and operational information but also in the benefits or impacts of the transnational collaboration exercises on national programmes and EU policies.
- c) **Research community.** Individual researchers and research groups will be also users of the NETWATCH platform since they are the main beneficiaries of the joint calls and the transnational research collaborations. However, our hypothesis is that this target group will be mainly interested in information on joint-calls and potentially on national research programmes.

Based on the nature of the analysis provided, the analytical framework suggested is broken down into three different types: mapping, monitoring and assessment:

- **Mapping** consists of a descriptive analysis based on factual information. It will provide a static picture of what is happening in the ERA-NET landscape at a given moment. This analysis will be useful for operational purposes.
- **Monitoring.** By analysing ERA-NETs systematically over time, NETWATCH will be able to provide comparative analysis of how the transnational R&D collaboration is evolving in different thematic areas, countries, and organisations and national programmes involved. This type of analysis will be useful for Member States to define clear strategies for their involvement in ERA-NETs and in other transnational collaboration schemes.
- **Assessment.** This final analysis will assess, in the medium and long run, the effects and benefits of the transnational R&D collaboration experiences for national policies and for the realisation of the ERA. It will show the dynamics of the transnational R&D collaboration and, eventually, provide a better understanding of how to define and implement more sustainable and efficient national programme coordination at European level.

For the **mapping and monitoring analysis**, three dimensions for mapping and monitoring ERA-NETs are proposed. This is illustrated by applying them to the case of the ERA-NETs in the field of energy. The three dimensions are the following:

- a) **Thematic dimension**: analysing the range of areas covered by the ERA-NETs.
- b) **Spatial or geographical dimension**: considering the number of ERA-NETs by Member States and regions.
- c) **Participant dimension**: studying the different groups of actors participating in ERA-NETs, differentiating between programme owners and programme managers. This dimension will have to be linked with the different types of research (as presented in the report) and possibly also other qualities as well.

Besides the mentioned dimensions, there are other variables or elements that should be taken into consideration to provide a comprehensive picture of the ERA-NET landscape, such as the **type of research** carried out by the consortium (distinguishing between frontier research, applied research and societal research) and the **funding mode** used by the ERA-NET (virtual pot, common pot or mix-mode) can be considered as two of the most appropriate aspects to characterise and monitor ERA-NETs.

The final step of the analytical framework will **assess**, in the medium and long term, **the dynamics, effects, benefits and impacts of the transnational collaboration efforts on a national level and on the level of the ERA**. The report identifies the types of impacts and a battery of indicators for each of them:

- Impacts on mutual learning
- Impacts on mutual opening up of national and regional programmes
- Impacts on Joint coordination

Finally, the report reflects on the **data requirements** for the implementation of the proposed analytical framework. Substantial coordination with the other related activities mentioned in Section 3.2 of this report – the ERA-NET learning Platform, including ERA-LEARN, and NORDERA – should take place. The data needs of the analytical framework of NETWATCH can be satisfied by four overlapping data sets:

- Data relevant to the formulation of JPIs;
- Data relevant to the implementation of JPIs;
- Data relevant to the evaluation of individual JPIs;
- Data relevant to the collective evaluation and impact assessment of JPIs.

The report ends with an overview of additional research questions that could potentially be conceptualized at a later stage of the operational phase of NETWATCH. The questions are clustered in three blocks: (a) about the dynamics of the transnational collaboration scheme, (b) about the Joint Calls and other joint activities; and (c) about the funding models.

1. Introduction

This report is the third deliverable of the NETWATCH Preparatory Phase and its main aim is to present an analytical framework for mapping, monitoring and assessing transnational R&D collaboration programmes in Europe, using in the case of the ERA-NET scheme as a starting point.

Research collaboration in Europe is not new. Its origins can be traced back to the European Community Treaties of Rome that were signed in 1957 and institutionalised the EURATOM R&D collaboration that to this day continues to be one of the pillars of European research funding. COST - the programme on European Cooperation in the field of Scientific and Technical Research - was launched in 1971 and the first EU Research Framework Programme (FP) was established in 1984. The creation of a European Research Area (ERA), which was introduced at the Lisbon European Council in March 2000, has become the central pillar of EU activities in the field of research and the reference framework for European research policy issues¹. The concept of the ERA was extended into clear objectives for EU Research and Development (R&D) policy making in the same year² and followed up by proposals for additional measures, both for a European policy framework and on the Member States (MS) level, in 2002³.

The rationale for R&D cooperation in Europe in the context of the ERA is to reduce the fragmentation in the research efforts, both at policy and at activity level (ERA Rationales Report, 2008⁴). However, this argument is becoming controversial since there is still little evidence about what fragmentation and critical mass means for different research fields.

The latest measures on the policy level include: the publication in 2007 of the ERA Green Paper⁵ by the European Commission, which, following a public consultation, reviewed the progress made since 2000; the launch of the Ljubljana Process by the European Council in May 2008⁶; and the Commission's Communication on Joint Programming (JP) in Research⁷ in July 2008, which started a process of consultations that is meant to result in an agreement on concrete initiatives by the end of 2009⁸.

Regarding the activity level, it is widely recognised that collaboration in R&D is a key instrument for both knowledge production and diffusion. As argued by Bammer (2008), collaboration across disciplines and between researchers is crucial for addressing major

¹ European Commission (2000b).

² European Commission (2000a).

³ European Commission (2002).

⁴ European Commission (2008a).

⁵ European Commission (2007b).

⁶ European Council (2008).

⁷ European Commission (2008c).

⁸ In the context of the CREST Working Group on Internationalisation (2007/2008), there is an ongoing analysis of S&T cooperation of ERA with Third Countries, particularly for the case of Brazil, India and Russia.

social, environmental and technical research problems. Furthermore, collaboration between practitioners (including policy makers and business) is increasingly being seen as essential for the development of concrete solutions to societal problems.

Numerous studies and investigations have been carried out to better understand scientific collaboration (Heinze and Kuhlmann, 2008; Georghiou, 1998; Glanzel, 2001; Jappe, 2007). In the international ISI journal *Research Policy*, to mention just one example, this issue has been covered from different perspectives: the increase of collaboration and team sizes; the different patterns of collaboration networks; the rationale, motives, choices and strategies for collaboration; collaboration success; or collaboration between university and industry (Bammer, 2008). Other studies have focused on transnational collaboration developed through European programmes such as the FP, EUREKA or COST (Georghiou, 2001).

Furthermore, specialised literature has drawn special attention to understanding the rationale of researchers for engaging in collaborative research activities. The generic motives identified include: curiosity, knowledge advancement, intellectual companionship, access to expertise or particular skills, access to equipment of resources, cross fertilization across disciplines, improved access to funding, learning tacit knowledge, obtaining prestige, or increasing visibility (Katz and Martin, 1997; Beaver, 2001; Bozeman and Corley, 2004; Heinze and Kuhlmann, 2008).

However, while most of the analysis has put emphasis on the micro level (researchers or research groups) or on the collaboration between universities and public research organisations and industry, little attention has been paid to the transnational collaboration at policy and programme level.

Accordingly, in the light of the ERA concept, the analytical framework suggested in this report has been developed to be a first step for an agreed systematic approach to R&D transnational collaboration at programme level. While as a starting point, the framework described here includes only the ERA-NET scheme and it has been defined in such a flexible way that other types of transnational R&D collaboration could be included in due time.

The next section of this introductory chapter describes the objectives of the Report. The rest of the document is structured as follows: Chapter 2 discusses the wider context and the rationales for the ERA and Joint Programming initiatives. Chapter 3 explains the added value of NETWATCH and the rationale of having an analytical framework for ERA-NET. Moreover, the main target groups identified as potential users as well as their information needs are explained. The general landscape of ERA-NET under the 6th Framework Programme (FP6) is described in Chapter 4. Chapter 5 represents the core of the report and describes the proposed analytical framework distinguishing between three types of analysis: mapping, monitoring and assessment. The ERA-NETs in the field of energy serve as a case study for a first brief application of the analytical framework. Finally, Chapter 6 outlines some recommendation about how to implement the analytical framework, highlighting the data to be collected in the future development of the project.

1.1. Objectives of the report

The **main objective** of this report is to present an **analytical framework** for mapping, monitoring and assessing trans-national R&D collaboration programmes in Europe, focusing on the case of the ERA-NET scheme.

The aim of the NETWATCH analytical framework is to collect, analyse and present, via an easily accessible web platform⁹, information on the evolution and impacts of ERA-NETs and other Joint Programming Initiatives (henceforth collectively termed JPIs) in line with two main objectives:

- To provide support to Member States in their ongoing efforts to formulate and implement strategies for their participation in ERA-NETs and other JPIs
- To assess impacts of ERA-NETs and, subsequently, other JPIs, relevant to the attainment of the overall goals of the Lisbon Strategy and the ERA.

As mentioned above, the analytical framework presented in this report focuses on ERA-NETs operating under the 6th Framework Programme (FP6). However, given the dynamic nature of the ERA-NETs, the framework has been designed with a broader approach to enable the incorporation in the analysis of the new ERA-NETs under 7th Framework Programme (FP7) in due course and be able to cover additional 'informal' cooperations among Member States that might result from current ERA-NETs. Furthermore, although the ERA-NET instrument is currently the only instrument targeting the cooperation among R&D programmes, it can not be excluded that new instruments will be implemented in this regard, e.g. out of the SET-Plan¹⁰ or the JPI¹¹. If the strategy for NETWATCH more generally is to monitor, analyse and support R&D cooperation among EU Member States on R&D programme level, NETWATCH should be sufficiently flexible to also include other instruments and initiatives in the mid-term. Accordingly, the analytical framework suggested in this report will be further and more fully developed and applied during the operational phase of the NETWATCH project (2009 to 2011).

The main functions of the analytical framework are:

- Generating better knowledge about the ERA-NETs and the joint activities implemented.
- Contributing to mutual learning of R&D programme cooperation activities in Europe.
- Capturing evidence of the benefits of transnational R&D programme collaboration making a case for increasing the efforts towards JP.
- Offering guidance for future collaboration exercises on EU level and between Member States.

⁹ For more detailed information about the NETWATCH web platform see Deliverable 2.1 and 2.2.

¹⁰ European Commission (2007a).

¹¹ European Commission (2008c).

This framework aspires to be a starting point for strategic discussions at national and European level on how to implement more sustainable and efficient trans-national programme cooperation at EU level, and thus, for policy learning towards Joint Programming (JP).

Finally, an important objective is to identify how the analytical framework will be implemented and what data and information are needed for the future development of the project.

2. Wider context and rationales

2.1. European Research Area Rationales

The EU is committed to the vision of creating a balanced and sustainable development, marrying economic growth and competition with high levels of quality of life and the environment, and ensuring an effective delivery of public services to the citizens in all Member States. In pursuing this vision the significance of not only investing in research but investing in enhancing the common good has long been recognised. Reflecting this belief the Lisbon Strategy (March 2000) set the target of the transition to a "knowledge-based society" with science, technology and innovation at its heart. This aim calls for the renewal of existing efforts and a reconsideration of the way research is organised.¹²

Within the framework of this broader vision the concept of the ERA was born to form one of its major building blocks. The ERA concept first endorsed at the Lisbon European Council in 2000, was mainly based on the rationale to tackle the fragmentation, isolation and compartmentalisation of national research efforts and systems and the disparity of regulatory and administrative systems which were seen to limit the impact of global investment in knowledge¹³. Citing a variety of observed barriers, it combined a European "internal market" for research, where researchers, technology and knowledge freely circulate; effective European-level coordination of national and regional research activities, programmes and policies; and initiatives implemented and funded at European level.

The ERA has become a key reference for research policy in Europe. The "Ljubljana process" launched in May 2008, reaffirmed the role of the ERA as a primary pillar for achieving the Lisbon objectives and as an engine for driving the competitiveness of Europe. However, much is further needed to be done particularly in terms of the fragmentation of research activities, programmes and policies across Europe.

Thus, the recent ERA Green Paper¹⁴ keeps its main focus on overcoming the negative consequences of fragmentation, while also retaining the importance of creating a European internal market for research. Apart from stating the importance of coordinated research programmes and priorities, the recent ERA Green paper also examines and stresses the role of joint programmes involving common priorities, coordinated implementation and joint evaluation.

The perception of fragmentation has been a core part of the initial rationale for ERA and thus, it received significant attention in terms of examining and clarifying what it means and under which conditions it is considered a positive or negative element. The ERA Expert group on "ERA Rationales"¹⁵ concluded that the concept of fragmentation is composed of system failures at the level of governance to the extent that there is a lack of coordination or

¹² European Commission (2008c).

¹³ European Commission (2000b; p.7).

¹⁴ European Commission (2007b).

¹⁵ European Commission (2008a).

cooperation in research support, whereas at the level of execution of research it is better replaced by the notion of sub-criticality. In turn, sub-criticality is more important at the level of a whole institution and the institution in its setting than at the level of research groups. Sub-criticality (rather than fragmentation) at the level of research institutions inhibits their ability to configure themselves to address interdisciplinary problems and opportunities and to work well with business. Sub-criticality may also relate to the demand-side when markets and the regulatory environment are fragmented.

The ERA Expert Group established on the theme of ‘Optimising Research Programmes and Priorities’¹⁶ also examined the concept of fragmentation but under the framework of optimisation. The group cited a number of major challenges and developments that amplify the need to use Europe’s research resources in an optimal manner. These include:

- Increased global economic competition, where knowledge has become a crucial factor to create added value and to remain competitive;
- Increased internationalisation of R&D where, on the one hand, research talent is becoming a scarce resource and at the same time more and more mobile, while on the other hand, globally operating firms are seeking opportunities to work with the most excellent research hubs regardless of their geographical location; and
- Societal problems that run across national borders and which have to be tackled trans-nationally or globally in some cases.

In answering why today’s research policies are not perceived as optimised they noted the fragmentation of public funding for research into many small regional and national programmes and funds for research institutions. This deters appropriate dedicated funding on a European scale of research issues dependent on critical mass. Second, the consequent lack of coordination of research programmes brings duplication of research execution. While a certain degree of diversity, duplication and competition is healthy for a dynamic research system, the scarcity of resources calls for more attention. In similar lines with the ERA Rationales’ Expert Group, they also stressed that the fragmentation of research funding leads to the fragmentation of research performers not being able to reach the scale and scope necessary for achievements of global excellence.

Nevertheless, the Expert Group noted that there is still little empirical evidence as to what fragmentation and critical mass mean for different research domains; which level of fragmentation is counterproductive (being inefficient on a European scale and not providing an adequate level of competition to ensure excellence) and what level of fragmentation is necessary to maintain diversity and competition in the system, ensuring that alternative routes are explored to tackle a problem or to find opportunities. This issue needs to be analysed for different domains, types of research and from a global perspective.

Going beyond the notions of fragmentation and sub-criticality the ‘ERA Rationales’ Expert Group went further to suggest a new rationale. This new rationale still acknowledges the need to improve the effectiveness of the public research system, but it also stresses that the ultimate justification of the resources and commitment needed to achieve this lies in increasing the

¹⁶ European Commission (2008b).

value of the contribution that public and private sector research makes to Europe's economic, social and environmental goals. Thus the notion of responding to Grand Challenges is put forward. These Grand Challenges, which may be rooted in economic, social or scientific goals relevant at the European level, depend upon research but also involve actions to ensure innovation and the development of markets and/or public service environments.¹⁷

2.2. Emerging need for more and better coordination

The problems stemming from fragmentation and sub-criticality in combination with the challenges faced today by the research policies and systems inevitably lead to acknowledging the need for more and better coordination and collaboration. As the ERA Expert Group on 'Optimisation' stated coordinating or joining up now separate programme activities are options that would help increase critical mass, in terms of scale and scope. Critical mass in turn can help support global excellence as well as the economic and societal relevance of European research.

In a similar vein, the ERA Expert Group on 'ERA Rationales' stressed that the need to re-orientate strategic and applied research in Europe in close support of the full range of policies that Member States have agreed, should be articulated at European level. In this respect they suggested that instruments like the FP and national programmes be linked through ERA-NETs and other instruments engaging much more effectively with policy needs in areas of European relevance and added value such as the environment, transport, energy, agriculture and health. They also warned that there is no 'one-size-fits-all' prescription for cooperation and coordination, as each sub-field at different stages of its development has its own needs and should be studied on a case-by-case basis.

Establishing the need for more and improved coordination and collaboration in research programmes and activities calls for the examination of the effectiveness of existing efforts and initiatives. A wide range of such initiatives exist. These include inter-governmental research organisations, inter-governmental schemes like COST and EUREKA, the EU FP for R&D, Bilateral Agreements between Member States or new instruments such as the ERA-NET Scheme, Article 169 initiatives, and the Open Method of Coordination (OMC).

However, as the Expert Group Report on 'Optimising Research Programmes and Priorities' states, there has never been a thorough high-level debate or analysis to show how the portfolio of all these trans-national research mechanisms contributes to the European challenges and the achievement of the Lisbon goals. Nor have they ever been examined in terms of the way they contribute to or hinder the establishment of an optimal framework for intra-European research coordination. In addition, there is still room for improved coordination of existing programmes and initiatives that are currently operated at the national or regional level only.

On the other hand, the impact of the Community initiatives could have been larger if there would have been more overall strategic focus, more high-level political commitment on the part of Member States, more transparency of the national research systems, and less instrument rigidity. As an example of the limited effectiveness, the OMC, while it has allowed a fruitful exchange of ideas, it so far has not resulted in concrete national research

¹⁷ European Commission (2008a).

policy coordination initiatives between Member States or in common agenda setting in areas of strategic importance.¹⁸

In addition, while Member States have set up many mechanisms over the years to enable trans-national R&D cooperation, it is still the case that around 85% of civil public research in Europe is programmed, financed, monitored and evaluated at national level.¹⁹ Less than 6% of total R&D investment and only 15% of European publicly financed civil R&D (of which 10 percent is accounted for by intergovernmental organisations and schemes, and 5 percent by the FP) is financed in a cross-border collaborative manner.²⁰

Apart from the above justification, the time is now ripe for more and better coordination and collaboration for two basic reasons. Firstly, the wider policy context has changed as commonly faced major societal challenges (climate change, energy security, etc.) have moved decisively to the top of the policy agenda in each Member State and at Community level. Secondly, the valuable recent experience with coordination instruments should be exploited by setting up a properly structured policy process working closely with the Member States in a transparent manner; respecting the principles of subsidiary, European added value and proportionality; preparing and launching concrete initiatives on the basis of an extensive, credible evidence-base; and ensuring the accountability and transparency of the process via proper monitoring and evaluations systems.²¹

2.3. A new initiative: Joint Programming

Better coordination and collaboration of science and research in Europe in order to overcome the unfavourable aspects of fragmentation would imply²²:

- A better coordination of research policies and priorities;
- A better coordination of funding of research by public authorities, funding agencies and research councils (programme owners and programme managers);
- More trans-national collaboration between (public and private) research performers, including increased mobility of human resources (partly through better funding mechanisms);
- Greater accessibility to research facilities and funding for all research performers in Europe (partly through better funding mechanisms).

Under the above context, the JP initiative was proposed. JP is the process whereby several Member States, regions and programme owners engage themselves on a voluntary and *à la carte* basis in the definition, development and implementation of a “joint programme” on a specific research topic or in a specific field. This “joint programme” can either be based on

¹⁸ European Commission (2008c).

¹⁹ European Commission (2008d).

²⁰ European Commission (2008c).

²¹ European Commission (2008d).

²² European Commission (2008b).

the coordination and integration of existing national and regional research programmes or on the setting up of an entirely new “joint programme”²³.

JP offers a voluntary process for a revitalised partnership between the Member States based on clear principles and transparent high-level governance. It involves different steps, in line with the life-cycle of research programmes, namely from programme definition via implementation to monitoring and evaluation. It also calls for a number of framework conditions that have to be in place:

- Agreement on a number of shared principles and procedures for peer review;
- Development of common methodologies for foresight activities and for joint evaluation of national or regional programmes or investments in specific areas of research;
- Definition of common principles for cross-border funding of research by national or regional authorities;
- Effective measures to ensure the protection of Intellectual Property Rights as well as to facilitate the dissemination and optimal use of research outputs.

At its most ambitious, JP requires that Member States be prepared to move in the direction of the definition and implementation of common research agendas with multi-annual, commonly decided activities (planning, launching, evaluating) and funding mechanisms. The Commission can act as a facilitator by offering assistance, if requested by Member States involved in JPIs and by ensuring open access to information about initiatives that are planned or underway.²⁴

The JP initiative as well as other existing mechanisms, structures and initiatives for coordination and collaboration in research have to find their place within the wider research landscape. In this respect the ERA Expert Group on ‘Optimising Research Programmes and Priorities’ proposed to base the existing portfolio of trans-national research mechanisms more transparently on four pillars:

1. The European FP for Research, focusing on the main global research challenges, and/or covering cutting edge technologies;
2. An ERA-Frame, encompassing all programme coordination activities such as ERA-NETs, JTIs, Article 169 measures and potentially new joint programmes where cross-border research and innovation activities create added value;
3. The Inter-governmental Agreements for Research, including existing inter-governmental bilateral and multilateral programmes such as COST, EUREKA and EIROForum as well as potential new ones;
4. National and regional programmes, focusing on the development of national and regional research and innovation systems, where research contains logical and strategic national priorities or where research is very close to the market and therefore very competitive. Such programmes could be opened to non-residents on a voluntary basis.

²³ Ibid.

²⁴ European Commission (2008c).

The introduction of the ERA-Frame forms a starting point for strategic discussions, at both the European and national levels, on which research problems should be tackled at which level, which instruments are the most appropriate and how more coordination can be stimulated. Preparing such an ERA-Frame at the European level requires the development of national and regional strategies and criteria for the launching of and participation in joint programmes. Improved JP involving existing and new programmes also asks for clearer frameworks, principles and guidelines to overcome the existing barriers.²⁵

Concluding, the first recommendation of the Expert Group was that the Member States should develop a common vision with priorities for trans-national research, encompassing regional, national, intra-European and Community funding.

Linked to this is the need to define suitable criteria agreed by all parties in order to determine the fields in which JP could most usefully be launched. To make these criteria operational there must be a solid information base. Information on existing national and regional programmes in various areas has to be gathered, including what they cover and where there are gaps, duplication or a lack of scale and scope. An effective process must allow for a graduated response by selecting the most efficient instruments to use in a given field.²⁶

2.4. A differentiated approach

The need for a differentiated approach in designing initiatives for enhanced coordination and collaboration was stressed in several cases. The ERA Expert Group on 'Optimising Research Programmes and Priorities' recommended that the Member States implement more strategic, sustainable and efficient trans-national programming and coordination of national research programmes and between national funding organisations, using differentiated approaches for frontier science, applied research and societal research²⁷.

The ERA Expert Group on ERA Rationales²⁸ noted that there are key differences between basic and applied research in terms of the rationales for performing research at the European level. For basic research these lie in achieving economies of scale and scope, accessing complementary skills and stimulating competition. Because governments principally support research for the spill-over benefits that it induces in terms of training and knowledge accumulation, cross-border funding is likely only in specific conditions. This holds for basic research even more than for applied research. For applied research, on the other hand, where the motive is to purchase an expert solution the rationale for cross-border funding is an increased chance of obtaining that solution and in principle there should be no barriers to a European market for research services.

Most of the stakeholders responding to the ERA Public Consultation²⁹ also suggested a differentiated approach to coordination for different types of research, based also on

²⁵ European Commission (2008b).

²⁶ European Commission (2008d).

²⁷ See Section 5.1.1.

²⁸ European Commission (2008a).

²⁹ European Commission, (2007b).

principles of subsidiarity, variable geometry and European added value. They also preferred opening-up of programmes in the case of basic slightly more than for applied research. In framing collaboration models between research programmes, the TAFTIE eBook³⁰ explicitly states that collaboration is easier between programmes with similar cultural and institutional backgrounds. Therefore collaboration between basic science programmes or between applied technology programmes is easier than collaboration between science and applied technology programmes. The report also notes that the best suited financial, decision and management models to be used in collaboration depend on the circumstances and character of the specific case of collaboration. Although the financing and management of collaboration using a centralised common pot budget is the easiest and the most practical, this model is mainly suitable for collaboration activities in basic research, and particularly for financing continuous (long-term) schemes. A decentralised ('virtual') common pot financing seems to be best suited for industry-related research collaboration and particularly for financing time-limited collaborative actions.

2.5. The added value of the ERA-NET scheme

Joint Programming is seen as a strategic approach with a long-term horizon, needing the commitment of all Member States and leading to the optimal use of existing instruments at all levels. Within this strategic approach, the ERA-NET scheme is an important vehicle to deal with transnational cooperation issues. In this context, and aiming at driving towards the creation of the ERA, the ERA-NET scheme was launched in 2002 as part of FP6.

The ERA-NET scheme was created to improve the coordination among Member States in the design, implementation and evaluation of R&D programmes in areas related to the thematic priorities of FP6. It was conceived as a bottom-up approach to foster transnational collaboration in research in Europe involving programme owners (ministries) and programme managers (mainly research agencies). The main goal of this instrument is to contribute to restructuring the research landscape in Europe by improving the coordination and mutual opening of national and regional research activities and policies. It is aiming at establishing long-term cooperation between national programmes, leading eventually to joint transnational programmes.

It made use of the funding model of Specific Support Actions (SSA) and Coordination Actions (CA) that had already successfully been applied within the Framework Programme and was conceived as a bottom-up approach to foster transnational collaboration in research in Europe involving programme owners (Ministries) and programme managers (mainly Research Agencies and Councils) in "variable geometry". Its main goal was to address the inefficiency and fragmentation of the research activities carried out in Europe that arise from the incoherence and lack of complementarity of R&D policies and programmes in Europe³¹.

A model with four progressive "steps" towards closer cooperation was envisaged:

³⁰ TAFTIE (2005).

³¹ European Commission (200b)

- Step 1. Systematic exchange of information and good practices on existing programmes. The goal was to encourage mutual learning via the exchange of information on national and regional practices.
- Step 2. Identification and analysis of common strategic issues. In terms of exploring the possibilities for cooperation and coordination, participants were encouraged to identify and analyse: research activities of mutual interest; practical networking arrangements; barriers to trans-national activities; and, new opportunities and gaps in research.
- Step 3. Development of joint activities between national and regional programmes, e.g.:
 - Mechanisms for clustering national or regional research projects;
 - Multinational evaluation mechanisms;
 - Schemes for joint training activities;
 - Schemes for the mutual opening of facilities or laboratories;
 - The development of common schemes for programme monitoring and evaluation;
 - Schemes for the exchange of personnel;
 - The development of specific cooperation agreements and arrangements for planned trans-national schemes;
 - The development of full-blown action plans for such schemes.
- Step 4. Implementation of joint trans-national research activities. The objective in this step was to set up and implement joint calls and other types of joint activities, involving common multinational evaluation systems and common plans for the dissemination of results and experiences.

Only the first two steps – exchange of information and analysis of common strategic issues – were mandatory in this first experimental phase of the scheme. However, the ERA-NETs were free to strengthen cooperation beyond these two steps. From a total of 71 ERA-NETs in FP6, all have achieved the first, second and third steps and 53% have reached the last one.

The FP7 will start from the existing ERA-NETs and new ERA-NET actions will be supported. The running ERA-NETs may re-apply to receive Commission support to extend and/or reinforce their integration (e.g. by broadening their partnership or increasing the type of collaborations). New ERA-NETs will be allowed to follow the same ‘four-step’ process as in FP6, but with the expectation that all four steps will be implemented. ERA-NETs based on experiences gained within FP6 will be expected to move straight to the fourth step – the implementation of joint calls and programmes. In contrast to FP6, the ERA-NET scheme is no longer a 'stand-alone' activity in FP7. It is an implementation tool, which will be used mainly in the context of the specific programme on 'Cooperation', but also in some parts of the 'Capacities' programme. In addition, where the actions are of a horizontal nature or are not directly linked to the 'Cooperation' themes, they can be submitted under a specific, bottom-up call for tenders, and will be supported jointly across all of the themes.

Under FP6, the ERA-NET scheme would fund 100% of the coordination costs of the participants together with a 20% flat rate to cover overhead costs. Under FP7 this flat rate was

reduced to 7%. In a new module to complement the current ERA-NET scheme, called "ERA-NET Plus", the Commission will support the organisation of joint calls between national research programmes by contributing with approximately 25-33% of the call budgets. The ERA-NET PLUS modules provide an operational strategy for cooperation. In ERA-NET PLUS initiatives also the individual R&D projects funded through the Joint Call should offer EU value-added and conform to the budgetary principles of the Community.

The ERA-NET scheme is thus considered one of the most significant instruments developed and implemented at EU level during the FP6 to transform the ERA from a theoretical concept to a more practical policy approach. Although there are other RTD programme cooperation schemes in Europe that have been around for many years, the ERA-NET scheme has been trying to set new standards of ambition and of factual integration, aiming at a clear enhancement of the coherence of European national research policies and RTD budget spending.

However, there is still little empirical evidence about how ERA-NETs contribute to decreasing the level of fragmentation and what level of differentiation is necessary to maintain diversity and competition in the research system. Different studies and documents discussing the rationale and further developments of ERA³² have stated the importance of having a tool for ERA monitoring and evaluation, which will be useful for policy-makers at all different levels.

Furthermore, it is imperative to help each prospective ERA-NET consortium avoid 're-inventing the wheel' and gain as much as possible from the exchange of valuable knowledge and experience. The situation today is still characterised by a significant and unwelcome diversity in terms of submission rules, joint call preparation procedures, evaluation criteria and modes of implementation, and by scattered information about ERA-NETs. Some even see an emerging duplication of effort and the evolution of another layer of fragmentation, rather than progress towards the improved coordination of national and regional research activities.³³

In this respect, one of the recommendations made by the ERA-NET Expert Review Group³⁴ to the Commission suggested the creation of a common web site on all ERA-NET activities, capable of collecting and synthesising the experiences and lessons learned. A second recommendation, addressed to programme owners and managers, was to contribute to the evolution of new guidelines for the implementation of ERA-NETs by sharing information on best practices.

³² Horvat et al. (2006).

³³ Amanatidou and Guy (2008).

³⁴ Horvat et al. (2006).

3. Why and for whom?

3.1. Rationale for a service like NETWATCH

The above Chapter indicates that several needs and gaps have been identified at various levels. At the highest level of overcoming the negative consequences of fragmentation and sub-criticality via improved coordination and collaboration, a thorough analysis is needed to show how the portfolio of the existing trans-national research mechanisms contributes to meeting the European challenges and Lisbon goals.

At the level of JP, preparing and launching concrete initiatives needs a basis of extensive and credible evidence, also ensuring the accountability and transparency of the process via proper monitoring and evaluation systems. Agreement on a number of shared principles and procedures for peer review has to be established. Common methodologies for identifying issues and areas of importance and for joint evaluation of programmes should be developed. These should be accompanied by common principles for cross-border funding of research as well as effective measures to ensure the protection of Intellectual Property Rights and to facilitate the dissemination and optimal use of research outputs.

Such initiatives make imperative the development of national and regional strategies and criteria for the launching of and participation in JPIs. This in turn calls for a thorough examination of the synergies and complementarity of existing schemes like the ERA-NET with other available programmes at all levels (regional, national, trans-national, international). In creating an ERA-Frame the need is also evident for common principles and operative guidelines to optimise the implementation of existing and new ERA structuring mechanisms. In this respect it is crucial for all ERA mechanisms to be evaluated individually and systemically. Common guidance and tools for the implementation of each of the different ERA mechanisms should be devised.

Information on existing national and regional programmes in various areas has to be gathered, including what they cover and where there are gaps, duplication or a lack of scale and scope. An effective process must allow for a graduated response by selecting the most efficient instruments to use in a given field. Open access should be provided to information about planned or underway initiatives. Material should be developed to demonstrate and share, inter alia in an interactive mode, good practices and results from trans-national coordination and JP.

The accumulated knowledge should also be exploited via exchange of experiences and identification of best practices on design, implementation, monitoring and evaluation of such initiatives. The numerous types of barriers (legal, financial, administrative, institutional, etc.) have to be studied in detail and solutions should be sought for different contexts.

At the level of specific instruments, like ERA-NETs, requests have repeatedly been made for the creation of a common web site on all ERA-NET activities, capable of collecting and synthesising the experiences and lessons learned. This has been stressed in combination with the need to develop new guidelines for the implementation of ERA-NETs by sharing information on best practices as well as a tool for ERA monitoring and evaluation.

The rationale for services like NETWATCH builds largely upon the needs and gaps identified above. NETWATCH will provide a central information platform for collecting information and evidence as well as exchanging experiences and identifying good practice elements. Such a platform would aim at improved mutual learning among ERA-NETs at the first stage, provide R&D policy makers and programme managers with relevant information for assessing the efficiency and impact of ERA-NETs, and would increase the visibility of ERA-NETs. At a second stage it will expand to address other forms of transnational R&D collaboration and JP mechanisms and initiatives as well. NETWATCH is expected to support:

- European researchers in finding useful information on joint calls and research priorities at European level for transnational collaboration.
- National RTD programme managers and owners in finding best practice documents, factual information and analysis of JP.
- Policy makers on EU and EC level in finding evidence-based assessments of the effects of the monitored JP activities for the ERA.
- European programme owners and managers in creating a "network community".

Participants at the ERA-NET Learning Platform and NETWATCH Launch Event (Brussels, March 2008)³⁵ made clear recommendations about which tasks such services should facilitate. They should facilitate the collection of information, strategic analyses and mutual learning, as well as networking and collaboration between regions and Member States even after the end of ERA-NET projects. A service like NETWATCH should provide a 'space' for discussions on current and future topics of importance to the ERA-NET community and become a champion of the ERA-NET scheme.

At the individual ERA-NET level easy access was deemed necessary to information about the national programmes involved; thematic clusters of ERA-NETs; the geographical scope of individual ERA-NETs; the type of research supported; related joint activities; rules of participation; procedural steps; overall objectives; joint calls; funded projects and expected and achieved outputs. At the aggregate level, consensus was evident regarding the need to regularly monitor and assess the ERA-NET scheme in terms of transaction costs; the nature and type of research supported; the volume of national funds made available for trans-national cooperation; the effectiveness of efforts to coordinate research; and the potential hazard of a new layer of fragmentation.

Participants agreed that there was a need for a set of well established and broadly used tools and helpful guidelines of three types:

³⁵ Amanatidou and Guy (2008).

- Guidelines for the organisation of joint calls, including suggestions for harmonised selection criteria and evaluation protocols;
- Guidelines concerning the operation of different funding modes (common pot, virtual pot, mixed-mode) and examples of models used to date, with some indication of their characteristics and their suitability for the different types of calls; and
- Guidelines for the future elaboration of joint programmes.

Tools and documents that should be developed in collaboration with ERA-NET participants include for example glossaries; national policy and programme portraits including policy and regulatory contexts and overviews of funding rules and regulations; models for position papers and Memorandi of Understanding; self-assessment procedures; advice on how to tackle special problematic cases; check-lists of key points to remember; guidelines, examples and good practice cases for all stages in the process chain leading to the implementation of joint calls.

It was also made clear that any common procedures and practices for the implementation of joint calls should take into account the different types of ERA-NETs, each of which have different objectives and different needs when setting-up joint calls. In particular, information collection on ERA-NETs should be differentiated in terms of:

- The R&D areas they cover;
- Their orientation towards topics specific to particular regions;
- Their orientation towards fundamental or industrial research;
- Their orientation towards policy coordination;
- The processes they adopt (e.g. those adopting one-step or two-step evaluation processes);
- Their strategic objectives (e.g. to coordinate programmes or to launch additional activities such as conferences etc.);
- Their spatial span (e.g. European or world-wide scope);
- Their intention to join existing programmes or parts of programmes or to create new ones.

3.2. Rationale for an analytical framework

As stressed by ERA-NET participants, the central information platform should facilitate benchmarking, evaluation and the identification of good practices. It should also allow strategic analyses of the information collected. This will involve the development of specific performance indicators and analyses of the links between ERA-NETs and national programme portfolios and strategic agendas.

The idea of developing an analytical framework for ERA-NETs responds to this exact request to provide main stakeholders with relevant analysis to assess the efficiency and impact of the ERA-NET scheme. The analytical framework should address the needs not only of the European Commission but also of national/regional stakeholders and main actors in transnational R&D collaboration³⁶.

³⁶ See Section 3.3 of this Report for further information on potential users of the analytical framework.

To date Member States have participated in ERA-NETs without any overarching strategy, following the bottom-up approach that was offered by the EU FP³⁷. As most ERA-NETs started at different moments during the life span of FP6, the need to reflect upon the national participation in ERA-NETs and to make better and more effective use of the ERA-NET Scheme was raised only towards the end of the FP6 and during the transition period towards FP7. Given the bottom-up approach, most of the ERA-NETs, under the FP6 have individually developed and applied their own ways of cooperation. As a result, a very diverse range of tools, submission procedures, evaluation criteria, etc. have emerged, causing - to a greater or lesser degree-, an inefficient implementation of joint activities, lack of transparency and administrative overload for programme managers involved in a large number of ERA-NETs.

In order to develop a comprehensive and meaningful analytical framework, during this preparatory phase of NETWATCH, a survey based on interviews with stakeholders from a sample of 32 ERA-NETs in the fields of environment and industrial technologies was carried out. The objective of the interviews was to get first hand information about the necessity of having such a framework and to identify the main users and, thus, their information needs. The survey included 58 ERA-NET participants and other experts - 16 from Ministries, 40 from research agencies and the like and two experts on transnational collaboration. This entailed 37 face-to-face interviews, 20 telephone interviews and one email response³⁸.

The above-mentioned survey confirmed that NETWATCH should be conceived not only as a website with centralised factual information on ERA-NETs but also a tool for strategic analysis and mutual learning. Programme managers and owners at national and regional level expressed their need of comprehensive information and analysis on ERA-NETs and other transnational collaborations schemes. Accordingly, the analytical framework will provide an enhanced understanding of the ERA-NET landscape and the effects and benefits of the transnational R&D collaboration experiences on national policies and on the realisation of the ERA.

Accordingly, one of the main aims of the NETWATCH project, both in this preparatory stage and in the following operational phase, is to provide an analytical framework to better understand transnational R&D programme collaboration and its contribution to the ERA. As mentioned before, the conceptualisation of the analytical framework developed so far considers the ERA-NETs as its main unit of analysis, but other JPIs will be covered in due course during the NETWATCH operational phase.

NETWATCH aims at providing a comprehensive picture of the R&D collaboration landscape in Europe, highlighting the main characteristics, strengths and weaknesses of each collaboration activity. Thus, the analytical framework will help to:

- Generate better knowledge about the ERA-NETs, the national programmes involved and the joint activities implemented.
- Contribute to mutual learning of R&D programme cooperation activities in Europe
- Capture evidence of the benefits of transnational R&D programme collaboration making a case for increasing the efforts towards JP.
- Offer guidance for future collaboration exercises on EU level and between Member States.

³⁷ FFG Austrian Research Promotion Agency (2007).

³⁸ See Synthesis Report, in Annex 1, Deliverable 2.1 of NETWATCH Preparatory Phase.

A very similar rationale is behind other related activities that are currently being established by the Commission's DG RTD, following a call for proposals under FP7 that ended in August 2008. They include the ERA-LEARN³⁹ project, which is foreseen under ERA-NET Learning Platform⁴⁰ initiative and the NORDERA⁴¹ project:

- The ERA-NET Mutual Learning Platform initiative was launched together with NETWATCH in March 2007 and its main objective is to collect and synthesise the experiences and lessons to be learnt from running ERA-NETs. As part of this Mutual Learning Platform, ERA-LEARN aims to facilitate mutual learning among ERA-NETs by creating a toolbox for the implementation of joint calls. NETWATCH will play an additional role in the implementation of the Mutual Learning Platform by providing the social networking web-tools⁴² that will facilitate the communication and collaboration of the ERA-NET stakeholder community.
- NORDERA aims to support the coordination of national research programmes and encourage JP. By studying the experiences of the Nordic region in this field, the project will seek to identify best practice on research programme coordination and assess how the lessons learnt can be of value for the further development of the ERA as well as the Nordic Research and Innovation Area (NORIA). The JRC-IPTS is one participant in this project

The collaboration and creation of synergies between NETWATCH and the mentioned initiatives will be crucial for the success of the three projects since they share the same goals: to support the coordination of national research programmes, encourage JP and facilitate mutual learning among practitioners. This will be particularly important for the data collection process and the implementation of the analytical framework. NETWATCH is foreseen to be used as the front end for the ERA-NET Learning Platform and thus also ERA-LEARN.

3.3. Target groups and Information needs

Three main target groups have been identified as the potential users of the analytical framework, each of them with different priorities with respect to their information and analytical needs:

- a) **Programme managers and owners.** They are at the core target group of NETWATCH. The analytical framework aims mainly to be useful for policy makers

³⁹ ERA-LEARN: Supporting the ERA-NET Learning Platform by creating a toolbox for the ERA-NET community. This project is foreseen to start in early 2009.

⁴⁰ For more information see : http://cordis.europa.eu/fp7/coordination/era_lp_en.html.

⁴¹ NORDERA: Lessons from Nordic research coordination in the context of the ERA. This project is foreseen to start in early 2009.

⁴² See deliverable D2.2. of the current preparatory phase of NETWATCH.

in their decision making processes, for the definition of strategies, future partners and further collaboration.

However, as the aforementioned survey showed, this target group is not homogeneous and can be split it into two: **programme owners** focus more on policy and strategic issues which are important to define programmes and rationalise the participation in ERA-NETs at national and institutional level, whereas **programme managers** prioritise information on issues related to the implementation of joint activities and joint agendas, more important from the operational point of view and for mutual learning.

- b) **Strategic stakeholders.** This group includes policy analysts and policy makers at the European Commission but also at national level whose focus is on keeping an overview of R&D programme activities. This target group will be interested not only in the factual and operational information but also in the benefits or impacts of the transnational collaboration exercises on national programmes and EU policies.
- c) **Research community.** Individual researchers and research groups will be also users of the NETWATCH platform since they are the main beneficiaries of the joint calls and the transnational research collaborations. However, our hypothesis is that this target group will be mainly interested on information on joint-calls and potentially on national research programmes.

Based on the nature of the analysis provided, the analytical framework could be broken down into three different types: mapping, monitoring and assessment:

- **Mapping** consists of a descriptive analysis based on factual information. It will provide a static picture of what is happening in the ERA-NET landscape at a given moment. This analysis will be useful for operational purposes.
- **Monitoring.** By analysing ERA-NETs systematically over time, NETWATCH will be able to provide comparative analysis of how the transnational R&D collaboration is evolving in different thematic areas, countries, and organisations and national programmes involved. This type of analysis will be useful for Member States to define clear strategies for their involvement in ERA-NETs and in other transnational collaboration schemes.
- **Assessment.** This final analysis will assess, in the medium and long run, the effects and benefits of the transnational R&D collaboration experiences for national policies and for the realisation of the ERA. This analysis will show the dynamics of the transnational R&D collaboration and, eventually, provide a better understanding on how to define and implement more sustainable and efficient national programme coordination at European level.

The matrix below is the result of the combination of the target groups identified and the type of analysis they require (being ●●● = maximum importance and ● = less importance)

Table 1. Users and types of analysis according to degree of importance

	Programme managers	Programme owners	Other strategic stakeholders	Research community
Mapping	●●●	●●	●●	●●●
Monitoring	●●	●●●	●●●	●
Assessment	●●	●●●	●●●	●

4. ERA-NETs under the FP6: background

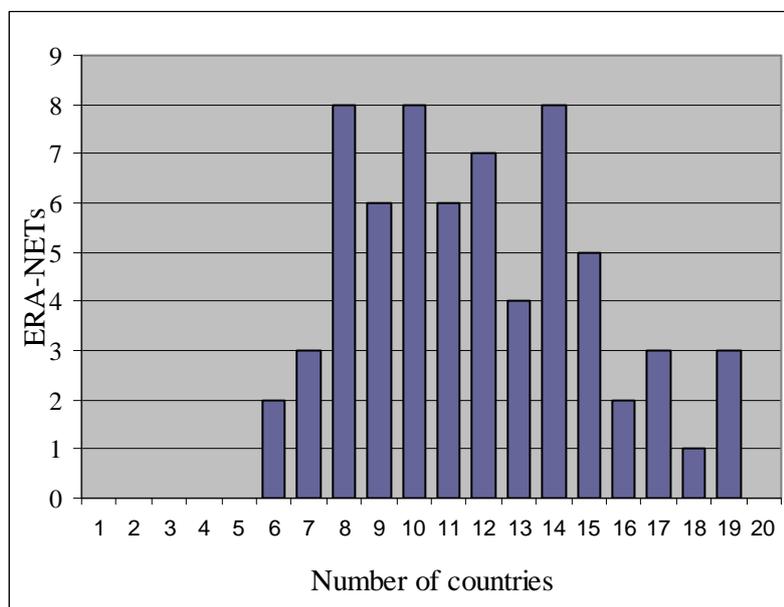
This section describes the general landscape of ERA-NETs under the FP6 by analysing aggregated data. The figures presented clearly demonstrate the enormous potential of the ERA-NET scheme and give an indication of the set of data NETWATCH will need to gather systematically and, thus, the indicators to be analysed to provide an overview of the dynamics of transnational collaboration in Europe through different instruments.

The analysis presented here cannot be more than a preliminary exercise of analysis, as the data used here come from secondary sources and do not allow for comprehensive screening. The figures and graphs presented in this sub-section were collected by DG RTD Directorate B through an extensive survey carried out in winter 2006/2007. It involved all coordinators of the ERA-NETs under FP6 and focused on joint activities.

During FP6 a total of 71 ERA-NET Coordination Actions were developed. The questionnaire addressed all ERA-NETs commissioned under FP6 with the exception of those that only started in 2007, thus achieving a total sample of 67 ERA-NETs. The response rate was 98,5%.

In describing the **size of an ERA-NET** by way of the number of countries involved (see figure 1), the smallest ERA-NETs involved 6 and the largest 19, the average roughly being 11 countries per ERA-NET⁴³.

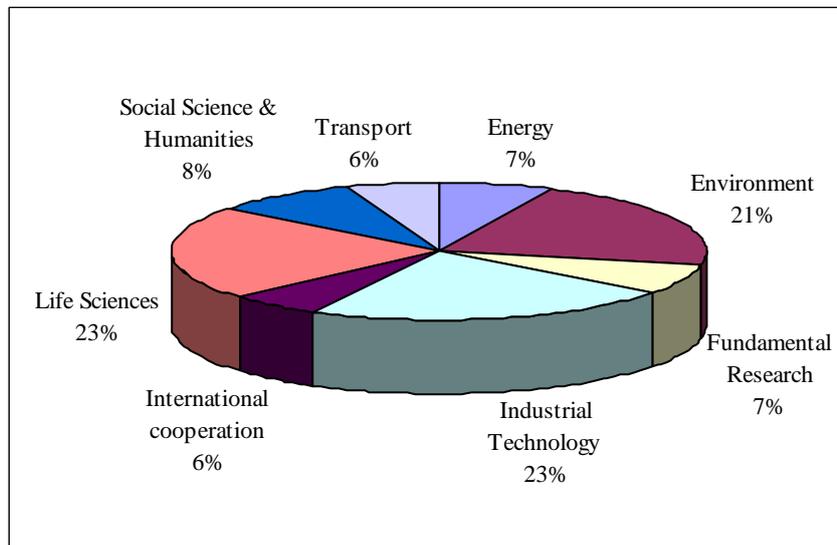
Figure 1. Size of ERA-NETs (Number of countries participating)



The ERA-NETs covered a wide range of research areas (see figure 2), with life sciences (23%), industrial technologies and SMEs (23%) and environment (21%) being the fields with the largest numbers of ERA-NETs.

⁴³ Data over 66 ERA-NETs, 5 blank.

Figure 2. ERA-NETs by thematic areas (%)



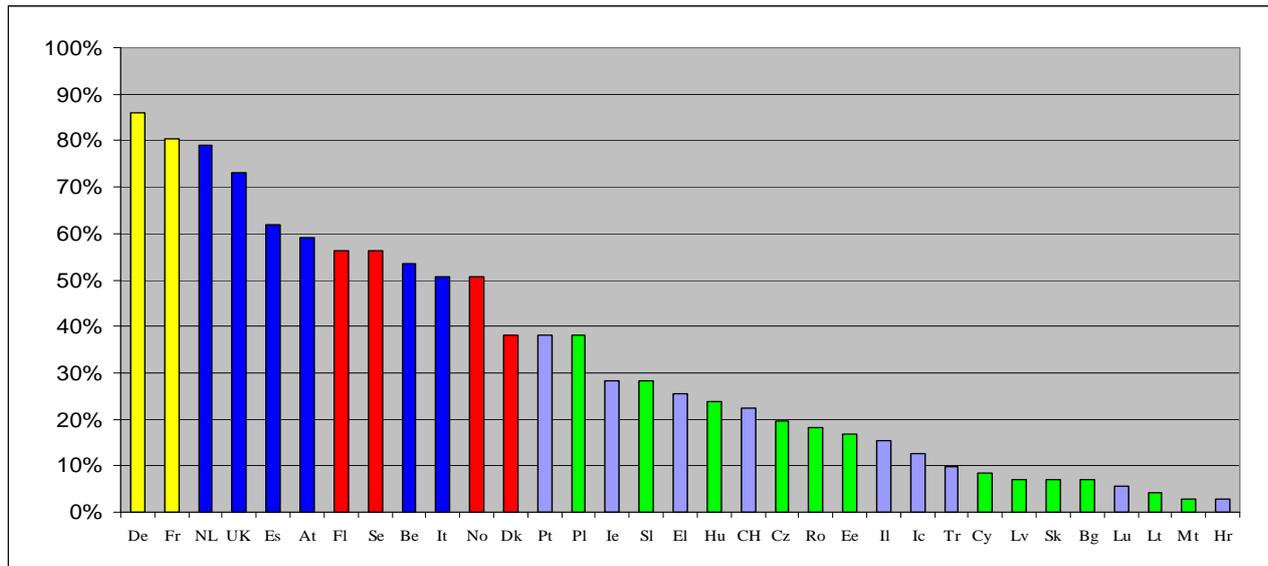
Regarding **country participation** the ERA-NET scheme has been able to attract wide participation by all countries involved in the FP, particularly:

- 27 EU Member States.
- 5 Associated Member States: Switzerland, Iceland, Israel, Lichtenstein and Norway.
- 6 Third countries: Bosnia Herzegovina, FYROM (Former Yugoslavian Republic of Macedonia), Montenegro, Serbia, Canada and Russia.
- From these countries, more than thousand institutions participated, of which 38% were ministries, 23% Research Councils, 28% Agencies 11% other types of institutions (e.g. international organisations such as the JRC-Institute for Reference Materials and Measurements in iMERA; the International Council for The Exploration of The Sea in BONUS; European Agency for Safety and Health at Work in NEW OSH ERA; JRC-IPTS in SUSPRISE).

Figure 3 illustrates the country participation:

- The most active countries are Germany and France, participating in more than 80% of all ERA-NETs.
- The next group of countries with a high level of participation (between 79% and 54%) includes The Netherlands, the United Kingdom, Spain, Austria, and Belgium. Italy is lagging behind a bit (51%).
- The Nordic countries (including Norway as associated country) are well represented.
- All new MS participate in the scheme, not least Poland with a rate of participation of nearly 38%.

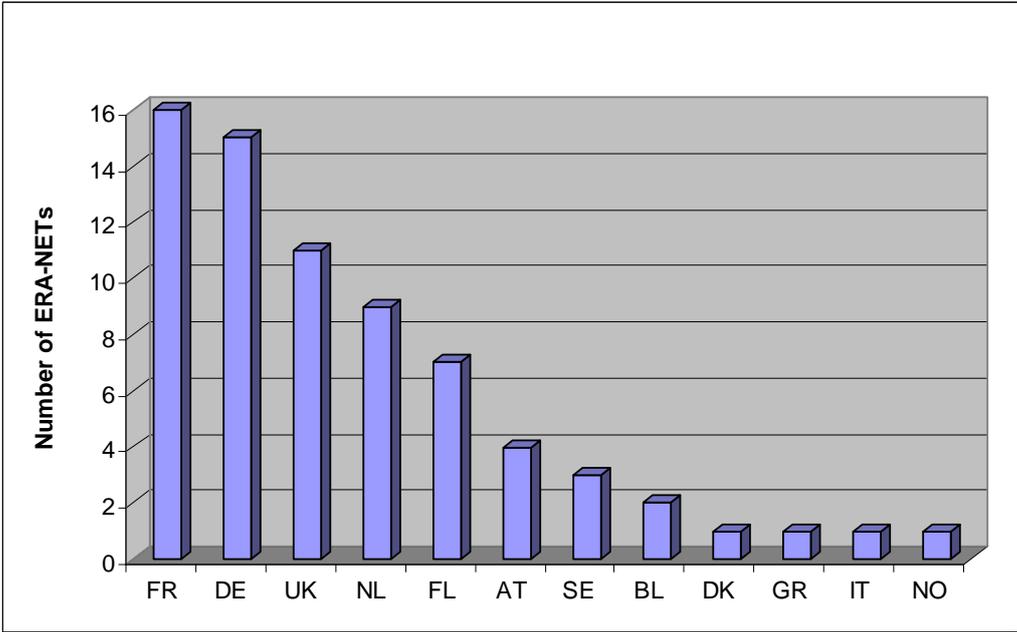
Figure 3. Frequency of country participation in FP6 ERA-NETs



The distribution of the coordinators among the ERA-NET countries follows a pattern similar to the country participation itself. The coordinators of all of the ERA-NETs originate from only 12 countries (see next figure):

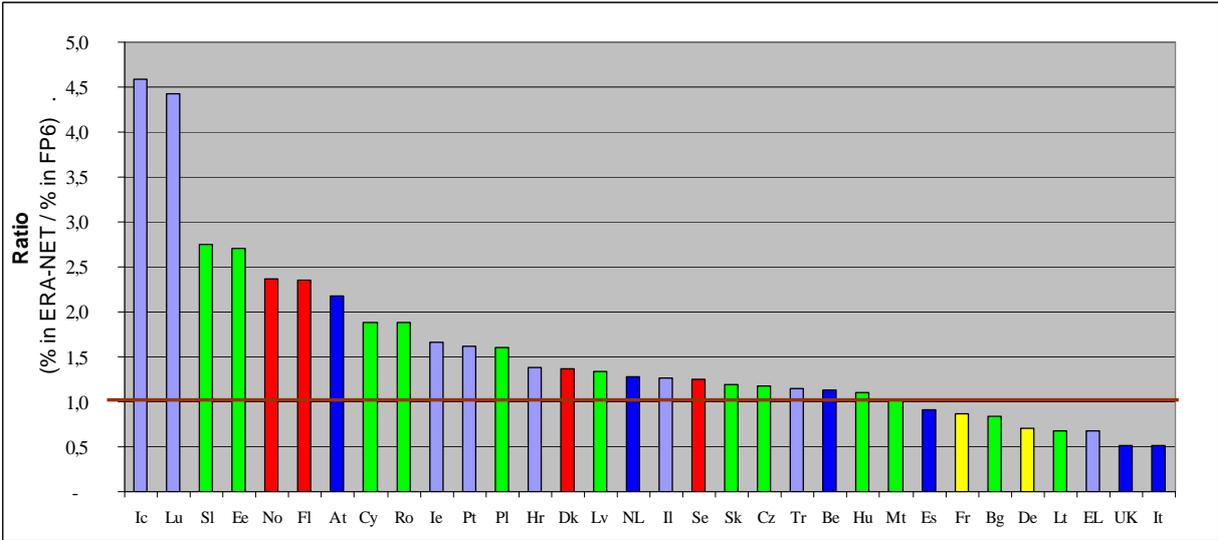
- France and Germany are the most active countries, hosting the coordinating institutions of approximately 22% of all ERA-NETs.
- The cases of funding agencies from The Netherlands (coordinating 13% of the ERA-NETs) and Finland (coordinating 10%) are speciality significant, given the size of their countries.
- There is a intermediate group of countries (Austria, Spain and Belgium), who are the home of the coordinators of 4, 3 and 2 ERA-NETs respectively.
- The last group includes Denmark, Greece, Italy and Norway, which coordinate only 1 ERA-NET each.
- New Member States are not present as coordinators.

Figure 4. FP6 ERA-NET coordinators by countries



In analysing the participation of countries in ERA-NETS in relation to their participation in the Framework Programme (FP) in general, figure 5 shows that Germany's and France's participation in ERA-NETS is not high compared to their overall participation in FP6. In other countries, such as the United Kingdom or Italy, the participation in ERA-NETS is particularly low, while Austria, as well as the Nordic countries (especially Finland and Norway) and most new Member States show a high involvement in ERA-NETS.

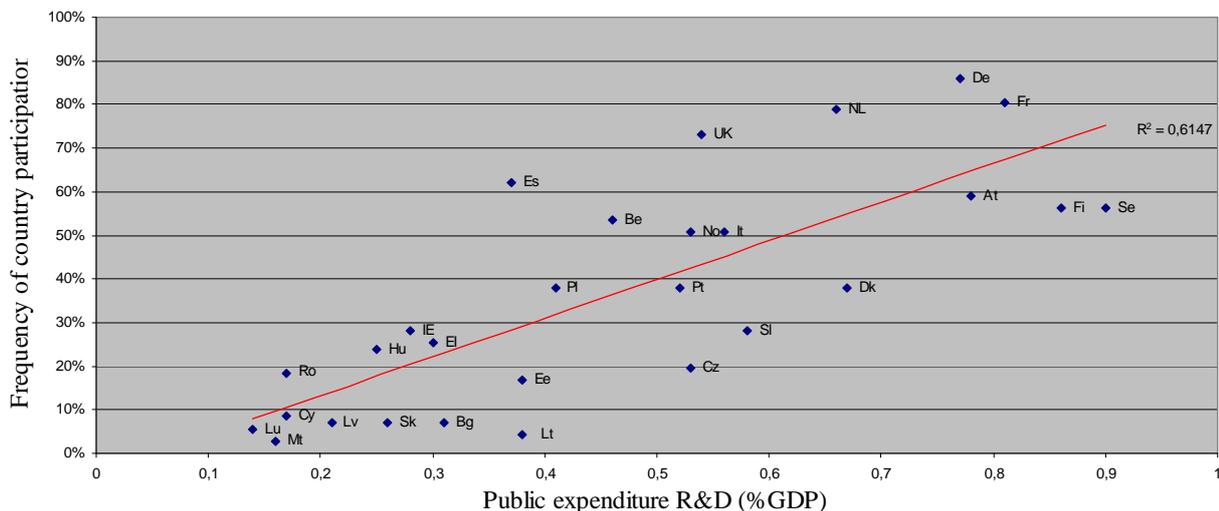
Figure 5. ERA-NET participation relative to overall participation in FP6



When comparing the country participation in ERA-NETS in relation to the intensity of public R&D expenditure (in relation to GDP), some patterns can be highlighted (see figure 6):

- There is a strong correlation between a country's public research expenditure and participation in ERA-NETs.
- The involvement of the larger EU countries, such as Germany, France, United Kingdom and Spain is higher than average.
- The case of The Netherlands is particularly notable given its size.
- The Nordic countries' participation in ERA-NETs is high but still below the level to be expected from their R&D budgets (except for the case of Norway).
- The involvement of new Member States is also below the potential indicated by their R&D expenditures; however Poland, Hungary and Romania rise above this trend.

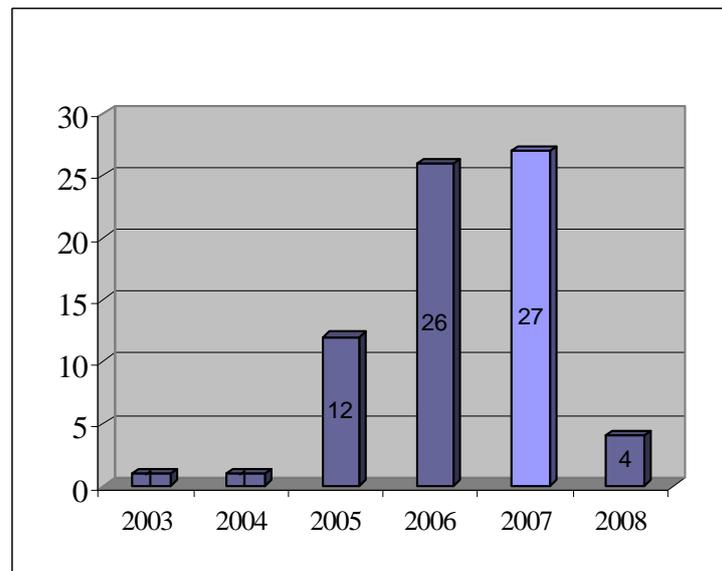
Figure 6. Frequency of country participation vs. public R&D intensity



The aim of the ERA-NET scheme was to encourage national R&D programmes to set up and implement joint calls and joint programmes across borders. Within the 4th step of the evolution described in Section 2.5, 77 joint calls⁴⁴ had been completed, launched or planned by ERA-NETs by Dec 2007 and the majority of them had been launched in the years 2005, 2006 and 2007 (see figure 7). On an average, the time from the start of the contract to the first call has been 2 years. The new ERA-NETs in FP7 can be expected to follow a similar behaviour.

⁴⁴ 2 joint calls (1 planned and 1 done) are calls for tenders.

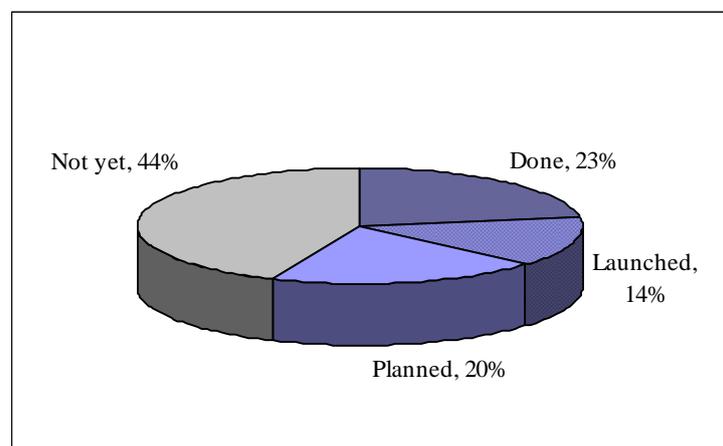
Figure 7. Launch of Joint calls: time line



Analysing the status of the joint calls undertaken by ERA-NETs, the data show that 57% of ERA-NETs have done, launched or were planning joint calls (see figure 8).

Only those ERA-NETs that started in 2007 had not yet planned, launched or done a joint activity when the survey was conducted in 2007.

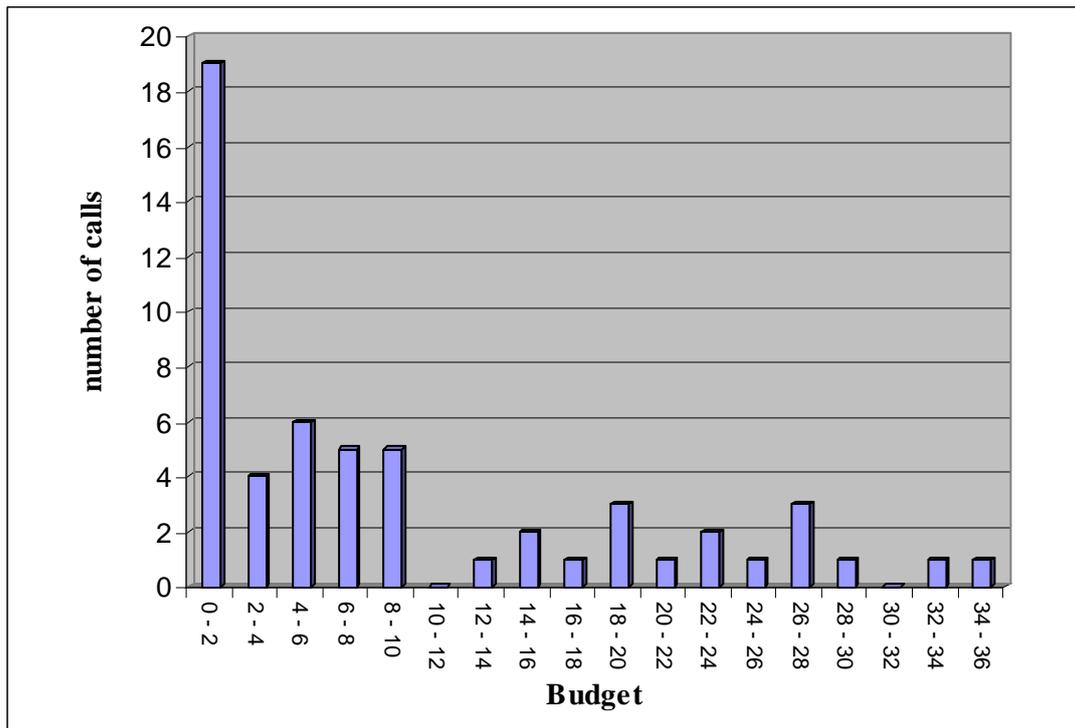
Figure 8. Status of implementation of joint calls (%)



Referring to the **budget** committed to the joint calls (see figure 9), almost 70% of the joint calls were below the size of 10 M€ (approximately 34% were below 2 M€ and roughly 36% between 2 and 10 M€). To conclude that the relatively small size of these budgets shows a structural weakness of the ERA-NET instrument, as has been argued⁴⁵, might be premature as these Joint Call represent the first learning steps or prototypes of what is possible through ERA-NETs.

⁴⁵ European Commission (2008e)

Figure 9. Size of joint calls (in million €)



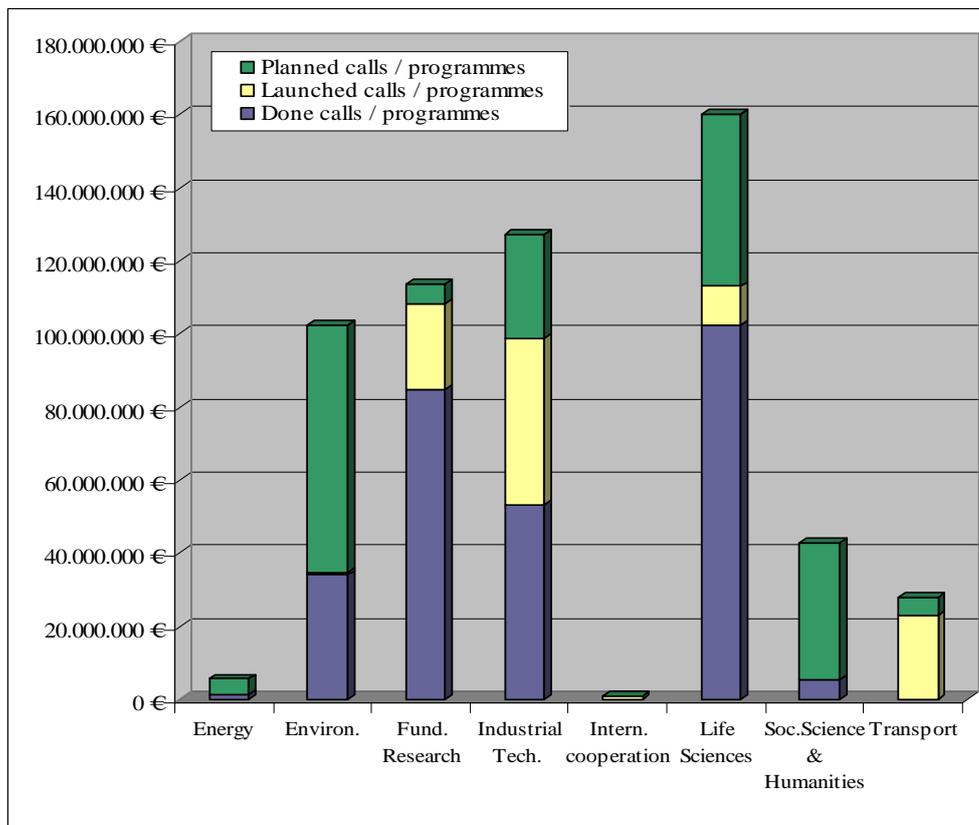
In total almost 600 million € of research funding were coordinated through ERA-NETs, mostly through joint calls. Given, that in FP6 the average funding awarded to an ERA-NET was 2,7 M€ this would compare with approximately 192 M€ on the input side, resulting in a leverage of about three. This estimate will, however, have to be analysed in much more thorough terms in the next stage of NETWATCH.

By the end of 2007, that is, 4 years into the ERA-NET scheme, the status was as follows:

- Planned: 202 million
- Launched: 97 million
- Already implemented: 281 million

Joint calls were launched in all areas, with the majority of the funds being spent in life sciences, industrial technologies, environment and by programmes focusing on fundamental research (see figure 10). Most of the ERA-NET joint calls and funding happened within the fields Industrial Technologies and Life Sciences, and Environment. International cooperation and Energy were of low significance in the ERA-NET landscape in terms of funds committed.

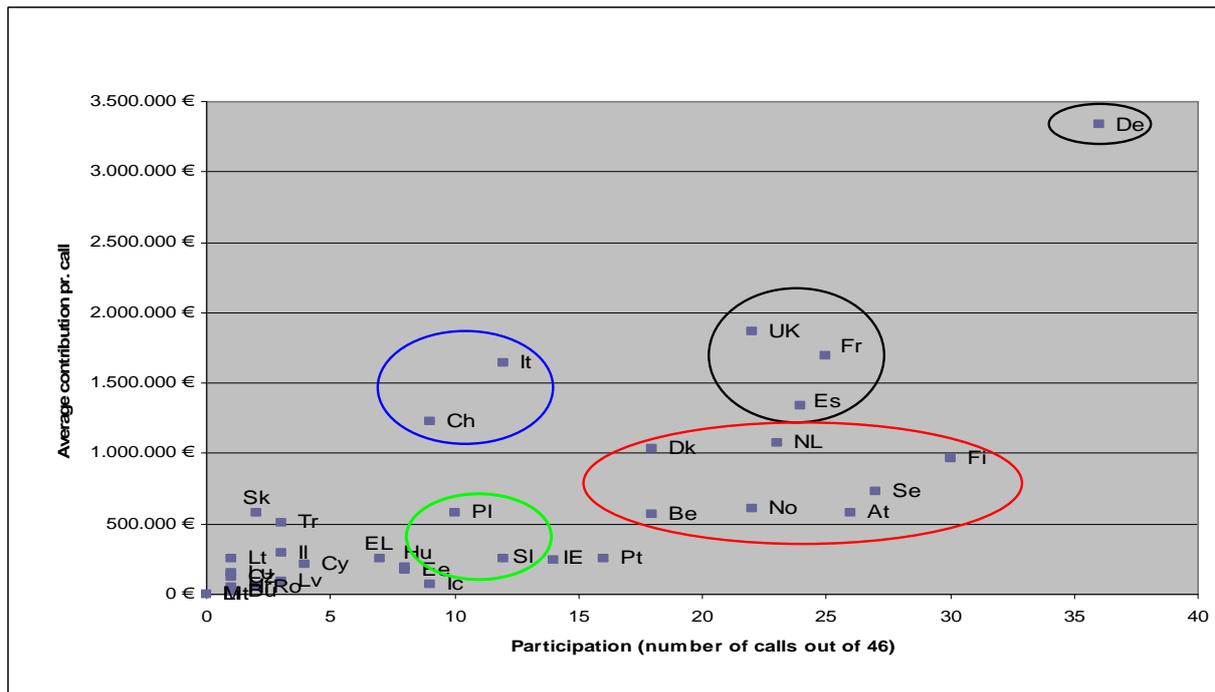
Figure 10. Total funding of joint calls by thematic area (€)



Relating countries' participation in ERA-NETs with their budget contribution to joint calls (see figure 11), it is possible to identify four clusters of countries with different behaviours:

- A group of four large countries (Germany, United Kingdom, France and Spain) which participates extensively (many joint calls and large contributions), with Germany clearly being the leading participant.
- A group of “selective” countries, where Italy and Switzerland are especially significant because they participate in fewer joint calls, but with large contributions.
- A group of smaller countries (Nordic countries, Austria, Belgium and the Netherlands) which participate in a large number of joint calls.
- The new MS. Almost all of them participate in joint calls, Slovenia and Poland being particularly active.

Figure 11. Country participation vs. contribution to joint calls

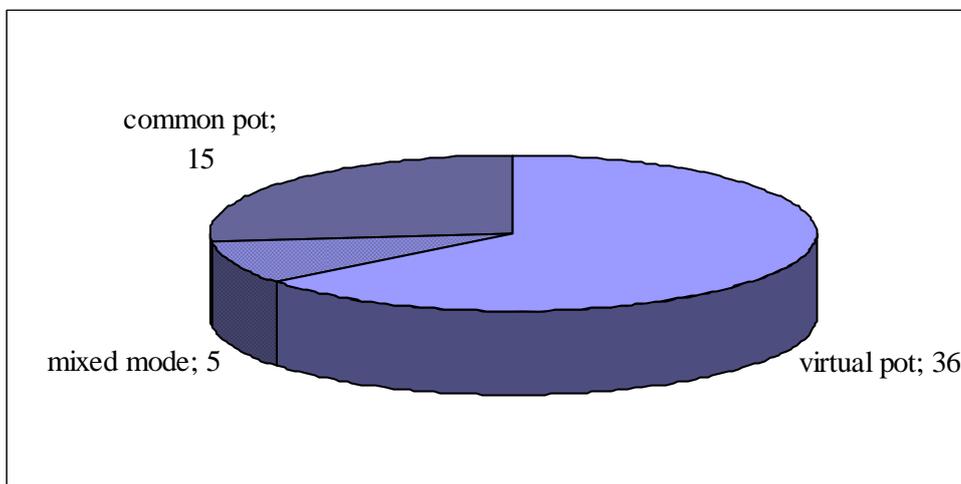


In terms of funding these joint activities, participants developed different funding models. Eventually these funding models can be grouped into the main categories 'virtual common pot', 'mixed mode pot' and 'common pot'. As argued by Horvat et al. (2006), the ability to choose between different funding arrangements for joint actions was much appreciated by participants.

- In the **common pot** model countries pool funds and there are trans-national flows of funds as all researchers are funded only based on their success in the proposal evaluation. This model was mainly applied by programmes and agencies/research councils that have a high degree of budget autonomy. These actors can mainly be found in the field of fundamental or basic research.
- The **virtual common pot** enables countries and regions to pay for their own participants and there are no trans-national flows of national funding. This model carries the risk that some national budgets in the Joint Call might not be enough to cover all of their respective national participants in successful proposals. The advantage, however, is that the national programme managers can simply apply existing national procedures and regulations to transnational Joint Calls.
- To answer occasional challenges arising from the use of the virtual common pot model, some ERA-NETs created **mixed-mode** models of various types, all of which allowed countries to pay for their own researchers and, on occasion, to pay for other countries' researchers. In other words, a part of the budget is handled as a common pot while the rest is virtual.

Figure 12 shows the funding models applied in 56 joint calls, where the majority of the joint calls was implemented with a virtual pot model (64.3%), almost 27% followed a common pot and only 9% implemented a mixed mode funding model.

Figure 12. Funding Models



5. Analytical Framework: Mapping, Monitoring and Assessing ERA-NETs

Against the background of the previous sections, this Chapter sets out the proposed analytical approach of NETWATCH. Firstly, it explains a set of dimensions that constitute the analytical framework considering the three types of analysis described in Section 3.3: mapping, monitoring and assessing for ERA-NETs.

Secondly, a set of dimensions for mapping and monitoring ERA-NETs are proposed and illustrated by applying them to the case of the ERA-NETs in the field of energy. Finally, a framework for assessing the dynamics, benefits and impacts of transnational collaboration instruments at programme level on the definition and implementation of national policies and on the realisation of ERA is suggested.

5.1. Mapping and Monitoring ERA-NETs

5.1.1. Concepts and Dimensions

As proposed in the previous section, there is a need to map and monitor ERA-NETs in order to better understand the scope of the collaboration.

While **mapping** consists of a descriptive analysis based on factual information and provides a static picture of what is happening in the ERA-NET landscape at a given moment, the idea of **monitoring** is based on a more dynamic approach. By analysing ERA-NETs systematically over time, NETWATCH will be able to monitor the ERA-NETs and provide comparative analysis.

In order to characterise the ERA-NETs (and other types of formalised transnational R&D collaboration) in a way that allows for mapping and monitoring their features, they can be classified along the following three dimensions:

Box 1. Dimensions to characterise ERA-NETs and other collaboration schemes

- a) **Thematic dimension:** analysing the range of areas covered by the ERA-NETs.
- b) **Spatial or geographical dimension:** considering the number of ERA-NETs by Member States and regions.
- c) **Participant dimension:** studying the different groups of actors participating in ERA-NETs, differentiating between programme owners and programme managers. This dimension will have to be linked with the different types of research as presented below and possibly also other qualities as well.

This mapping analysis will provide systematic evidence about the areas of knowledge where programme collaboration is more active, and the significant similarities of stakeholders that have been attracted to participate in this collaboration scheme.

Besides the mentioned dimensions, there are other variables or elements that should be taken into consideration to provide a comprehensive picture of the ERA-NET landscape. We have considered the **type of research** carried out by the consortium and the **funding mode** followed by the ERA-NET as two of the most appropriate aspects to characterise and monitor ERA-NETs.

An important distinction related to the different **types of research** has to be addressed here: Basic research and applied research are the terms that have been used traditionally to classify the different types of research. While "basic research" is traditionally seen as driven by a scientist's curiosity or interest in a scientific question and its main motivation is to expand knowledge, not to create or invent something, "applied research" is designed to solve practical problems/needs of society, or create added economic value, rather than to acquire knowledge for knowledge's sake.

However, the European Commission High Expert Group Report (2005) on "Frontier research: the European Challenge" notes that this classical distinction between basic and applied research has lost much of its relevance at a time when many emerging areas of science and technology often embrace substantial elements of both types of research (e.g. biotechnology, ICT, materials and nanotechnology, and cognitive sciences). Therefore it is suggested that the term 'frontier research' is more appropriate than the conventional 'basic research' to reflect this new reality.

Accordingly, and following the distinction made by the ERA Green Paper (and by the ERA Expert Group in the Report on Optimising research programmes and priorities, 2008, p. 31-33), we differentiate between: frontier research, applied research and societal research. These categories are not mutually exclusive, since in many cases the boundaries among them are permeable. Nevertheless, as argued by the mentioned ERA Expert Group (2008a, p.31), "these types of research appear to have different public funding models and varying drivers for internationalisation and coordination":

- **Frontier research.** This concept is preferred to the term "basic research" and is driven by scientists' curiosity or interest in a scientific question. In most frontier research domains, the funding organisations are much based on the principle of self-organisation by the scientific community and have a high degree of independence and autonomy from the national policy. Looking at this distinction from an innovation cycle perspective, one can claim that frontier research themes will mostly carry a much higher risk of not leading to successful technology developments or market implementations, than themes of applied or industrial research. In these areas (e.g. ICT, nano-science or biotechnology, but also all natural sciences) the propensity to collaborate and cooperate with international partners is not new, but has existed for many years through different types of instruments (e.g., FP, COST, ESF). In these fields the policy aim is to create critical mass and support excellence.
- **Applied research** aims at solving practical problems and not just at gaining knowledge. It can be said that applied science has the goal to improve human lives and create added

economic value. For example, applied researchers may investigate ways to improve agricultural crop production, treat or cure a specific disease or improve the energy efficiency modes of transportation. Given its practical dimension, this type of research is usually strongly embedded in regional and national structures. Furthermore, it often involves public-private collaboration and partners from the market side take part actively in the research efforts. An assessment of the engagement of the private sector in the funding of themes can help to explain that themes with a prospective 'time-to-market' of less than two years will mainly be funded by industry while more 'riskier' themes will rather be funded from public money. For this reason, as has already been explained above, applied research is based on a quite large variety of funding sources both public and private.

- **Societal research.** This third category is characterised by the global nature of the issues investigated. Thus, there is quite a strong interest to tackle them beyond the national boundaries in cooperation between countries of research deals with areas such as climate change, ageing population or health care systems. Usually, Member States have public research centres or institutes specialising in these areas. Furthermore, as they address the economic, societal and environmental challenges of our time, this type of research is perceived as creating a value-added for society, and thus, developing a common vision and common research agendas see MS to be less complex than for other areas that might still be seen as vital for national competitiveness.

The mentioned types of research seem to require a different approach for trans-national collaboration and different process of priority setting. This approach could then be applied to other initiatives beyond the ERA-NET scheme to enable comparison. For these reasons, this typology has been considered adequate for classifying ERA-NETs.

Furthermore, the next a two-dimensional framework combines the different types of research and the funding models⁴⁶ available for ERA-NETs.

⁴⁶ See Section 4.

Table 2. Matrix for Mapping and Monitoring ERA-NETs by type of research and funding model

	Frontier research	Applied research	Societal research
Virtual pot			
Common pot			
Mix-mode			

The resulting matrix will provide information about how important the type of research is for defining the funding model or whether this variable is determinant for the way transnational collaboration can be organised in terms of funding. Additional variables to be taken into account are the nature of the funding agencies (structural/industrial settlement funding bodies vs. industrial research agencies/councils vs. scientific research councils etc.) and the characteristics of the organisational mix of the ERA-NETs (number of funding agencies of each kind)⁴⁷. A first application of the matrix on the case of energy can be found in the next chapter.

The framework proposed for mapping and monitoring ERA-NETs will support policy makers in their strategic decisions and will facilitate mutual learning between programme managers and owners. Furthermore, the information provided on joint calls, joint agendas or other joint activities will be useful for the research community to define their research lines and to search for funding opportunities in a more efficient way.

5.1.2. The case of the ERA-NETs in the field of Energy

In order to better understand the dimensions described before, this section illustrates the analysis using the case of the **ERA-NETs** in the **field of energy** operating under FP6.

Energy is fundamental to the quality of our lives and so it is at the heart of national and European policies. As mentioned in the mission statement of DG Energy and Transport "Europe's citizens and companies need a secure supply of energy at affordable prices in order [to] maintain... our standards of living. At the same time, the negative effects of energy use, particularly [of] fossil fuels, on the environment must be reduced. That is why EU policy focuses on creating a competitive internal energy market offering quality service at low prices, on developing renewable energy sources, on reducing dependence on imported fuels, and on doing more with a lower consumption of energy"⁴⁸.

Energy research is essential to support the development of sustainable energy policies. It ranges from new and cleaner production technologies based on different energy sources to the demonstration of innovative energy conservation techniques.

⁴⁷ See also the arguments on knowledge accumulation vs. marketability of research in chapter 2.4.

⁴⁸ http://ec.europa.eu/energy/index_en.htm.

The challenge for energy research is to reconcile conflicting pressures. These consist in a growing energy demand and the need to reduce the environmental impact of energy production and use while, at the same time, seeking to improve security and diversity of supply, economic competitiveness, and social benefit.

Europe has agreed a forward-looking political agenda to achieve its core energy objectives of sustainability, competitiveness and security of supply. This agenda means substantial change in Europe's energy system over the next years, with public authorities, energy regulators, infrastructure operators, the energy industry and citizens all actively involved. It means choices and investments during a time of much change in global energy markets and international relations.

Accordingly, transnational R&D collaboration at programme level in this field seems to be particularly strategic for Europe.

This field represents 7% of the whole ERA-NET activity⁴⁹. The data presented in this example have been collected through the individual online websites of the ERA-NETs and other sources of secondary information.

The three dimensions for mapping and monitoring:

a) **Thematic Dimension.** As described in the table below, in the field of energy there are 5 ERA-NETs with 5 different areas covered.

Table 3. Description of FP6 ERA-NETs in the field of energy

Name	Area	Start date	End date	Number of Countries Involved
BIOENERGY	Bio energy	01/10/2004	31/05/2011	10
FENCO-ERA	Clean energy fossil technologies	01/06/2005	31/05/2009	9 ⁵⁰
HY-CO	Hydrogen and fuel cells technology	01/10/2004	30/09/2009	18
INNER	Innovative energy technologies	01/06/2005	31/05/2009	10
PV-ERA-NET	Photovoltaic solar energy	01/10/2004	31/03/2008	12

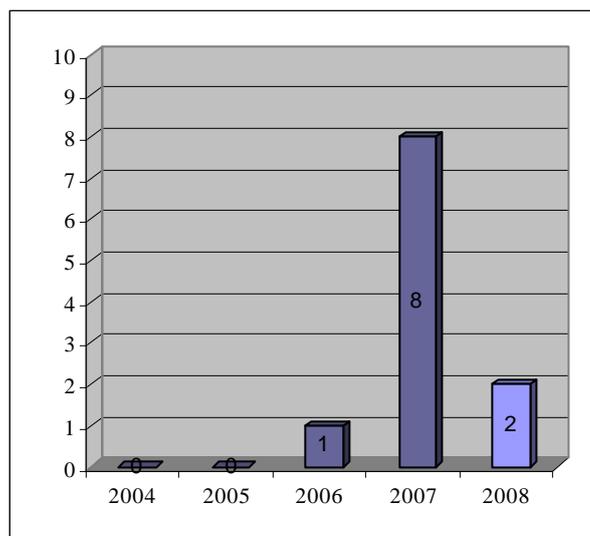
Regarding the size of the ERA-NETs, the minimum number of countries involved is 8 and the maximum 16, the average being 11. The size of the ERA-NETS in the field of energy is completely in line with the average size of the ERA-NETs in general terms (see Section 4).

⁴⁹ Note that for comparison purposes, other energy related ERA-NETs such as ERA-NET Transport or ERA-Build are not included since in earlier surveys of DG-RTD they were not attributed to this thematic field.

⁵⁰ FENCO has 3 more countries participating as Observers (Poland, Latvia and Estonia).

The average duration of the ERA-NETs in this field was originally planned to be around 48 months and the EC funding appropriated for them has been 12,9 million €. As they were not able to spend their budget in the time originally foreseen, most of the ERA-NETs, agreed with the EC on an extension of their duration. Additional amendments were created to incorporate new partners and observers. Table 3 therefore shows the duration and number of countries that were finally agreed. A more detailed analysis of the evolution of the ERA-NETs may be done at a later stage.

Figure 13. Launch of joint calls in the field of energy: time line



11 joint calls have been launched by these five ERA-NETs. As figure 13 and table 5 show, there was no joint call during the first two years of the life of the ERA-NETs, and the most active year was 2007 (when 8 out of 11 joint calls were launched). The ERA-NETs in the field of energy follow the same time line as the rest of the ERA-NETs, where on average the time from the start of the contract to the first call is about 2 years. The budget committed by these five ERA-NETs to the 11 joint calls has been 23,3 Million €(see table 5).

b) **Spatial or geographical dimension:** considering the number of ERA-NETs by Member States and regions. In the ERA-NETs in the field of energy 22 countries have been involved: 19 EU Member States and 3 associated countries (see figure 14 and 15).

Figure 14. EU countries participating in FP6 ERA-NETs in the field of energy

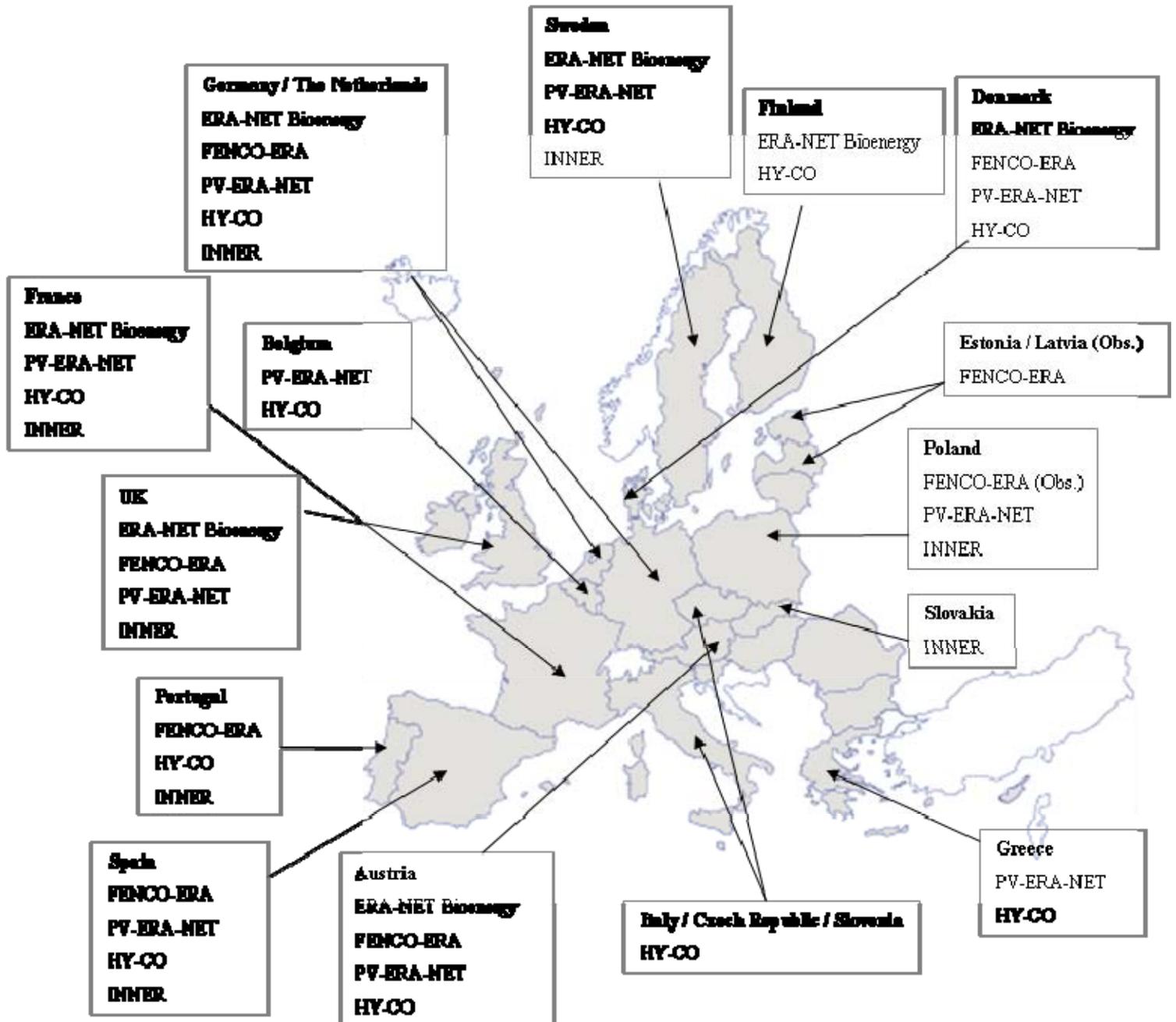
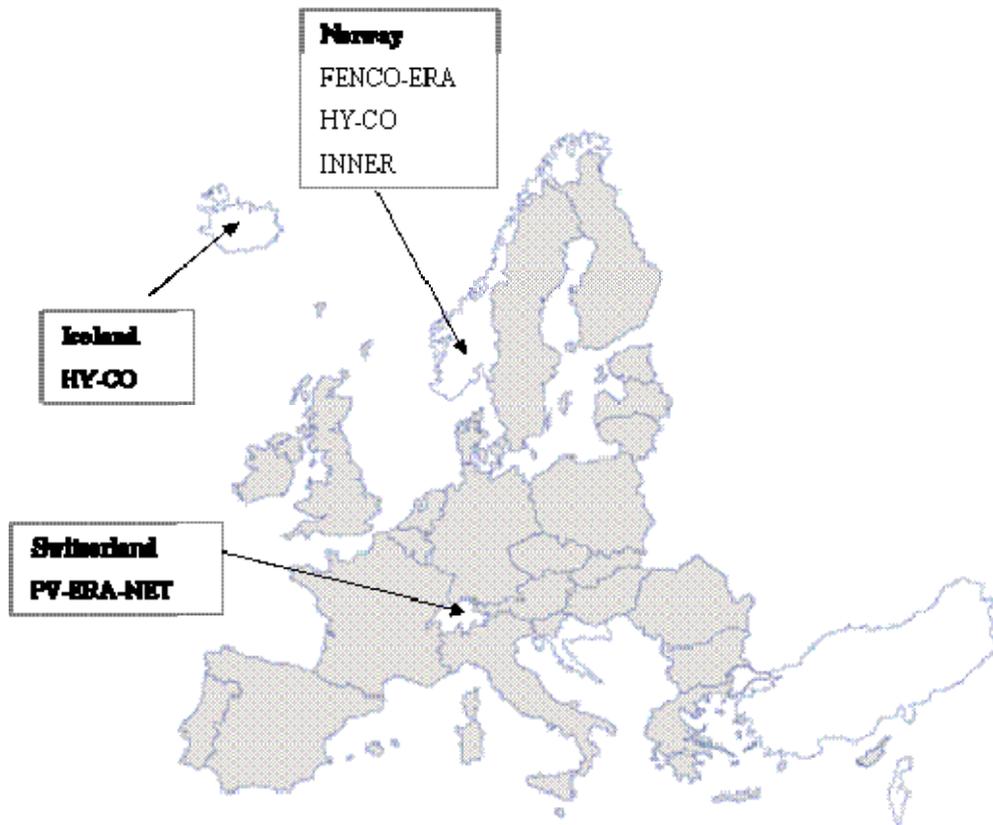


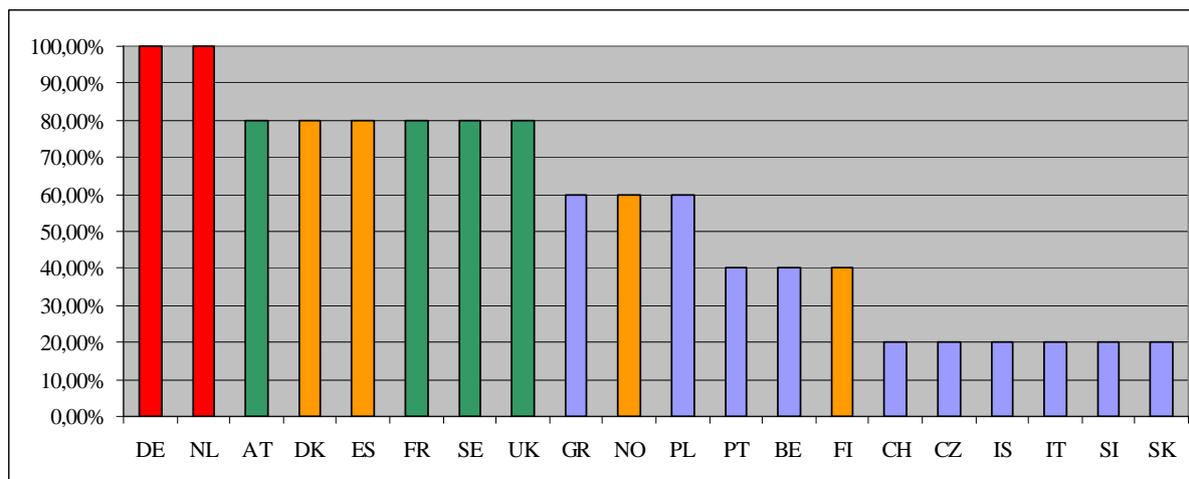
Figure 15. Associated countries participating in FP6 ERA-NETs in the field of energy



When referring to the frequency of participation the figures illustrates that there are clearly different country participation behaviours:

- Germany and The Netherlands were frontrunners in the ERA-NETs in the field of energy, as they were participating in all of them.
- The next group with a very high level of participation (80%) includes Austria, Spain, France and United Kingdom.
- Nordic countries (including Norway as associated country) are very well represented, particularly significant in the case of Denmark and Sweden.
- The new Member States participate in 20% of the ERA-NETs in this field, the participation of Poland being particularly prominent (40% and 1 participation as observer).

Figure 16. Frequency of country participation in FP6 ERA-Nets in the field of energy



c) Participant dimension

The next table shows the number of institutions involved in each of the 5 ERA-NETs of the sample, the average level of participation being 16.

It is important to take into account that in most of the cases (at least in the field of energy) the same institutions participate in different ERA-NETs, and so, double counting should be avoided.

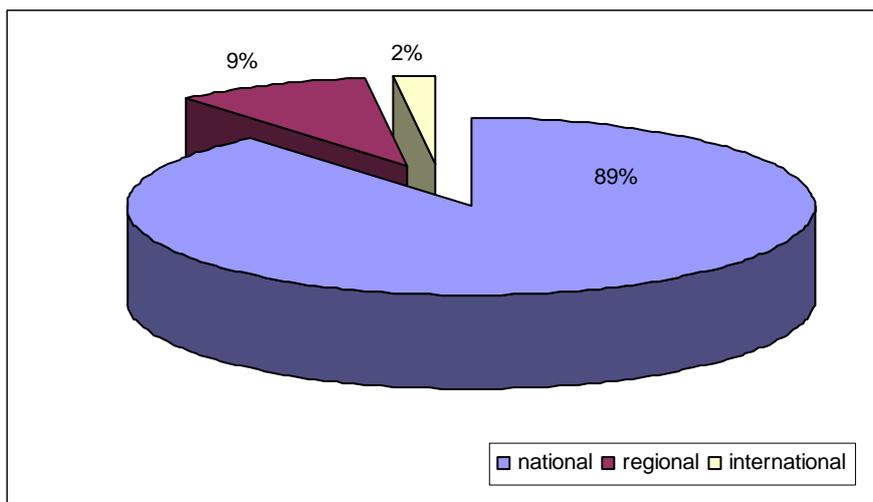
Table 4. Institutions involved in the ERA-NETs in the field of energy

Name	Total number of institutions involved
ERA-NET BIOENERGY	11
FENCO-ERA	16
HY-CO	21
INNER	13
PV-ERA-NET	19

In this particular thematic field, a total number of 48 institutions⁵¹ from 22 different countries (see figure 13) were involved, the great majority of them being organisations at national level while 5 organisations were regional (2 from Belgium and 3 from Germany; all of them countries with a strong regional organisation of the state) and 1 international (see figure 16). Although the regional dimension of the ERA-NETs has been often referred to, in the case of an area of research with a global perspective, as it is the case with energy, the regions do not appear to be significantly important. A comparative analysis of the regional involvement in different other fields would be interesting.

⁵¹ 3 institutions participating as observers.

Figure 17. Types of institutions participating in FP6 ERA-NETs in the field of energy



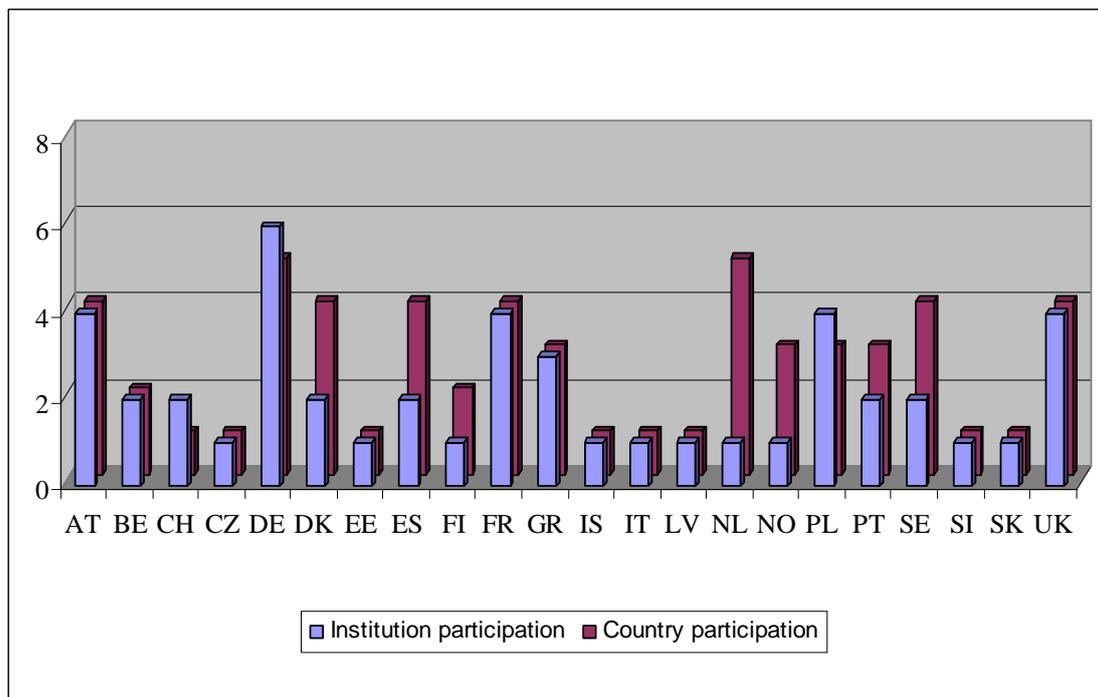
It is also interesting to compare the country participation in ERA-NETs and the institutional participation by country⁵². As figure 18 illustrates, there are paradigmatic examples of countries whose level of participation is very high as a country, but quite low in terms of the number of institutions involved, such being the case for The Netherlands (which, as a country participates in all ERA-NETs in the energy field through only one institution: *SenterNovem*), Denmark, Norway or Spain, while other countries present the opposite behaviour: their participation is higher in relation to the number of institutions involved than as a country, as it is the case with Poland. For the rest of the countries, their country participation is completely in line with their institutional participation.

These figures show that, on one hand, there might be a need for those frequent participants to optimise the use of the ERA-NET instrument, and, on the other hand, for those countries with a high number of institutions involved in different ERA-NETs there might be a need for strong coordination.

In relation to the role of the institutions participating as coordinator of the consortium, the German Research Centre Jülich (programme manager) is the coordinator of 4 out of 5 of the ERA-NETs considered and SenterNovem (The Netherlands) is coordinator of one ERA-NET (ERA-NET Bioenergy).

⁵² Data over 47 institutions (excluding Nordic Energy Research - which as an international organisation –does not belong to any individual country).

Figure 18. Institution participation and country participation in ERA-NETs in energy



Another interesting feature that can be analysed in this dimension is the institution's role, distinguishing between programme owners and programme managers.

Box 2. Definition of the roles of programme owners and managers

- **Programme owners** are those organisations with a strong strategic role in the definition and implementation of programmes, as well as in the allocation of budget. They can be ministries or agencies/research councils/industrial councils.
- **Programme managers** are the institutions that handle and manage the programmes. They also can be ministries or agencies. Two different roles can be distinguished:
 - Financial programme management: typically done by agencies who are responsible for the administration of the programme budgets and thus of the contracts with the individual projects and for delivering the contractual payments to the researchers involved in the projects;
 - Thematic programme management: can be done by all of the above and relates to management functions connected with the administration of the thematic details and results of the programme

When analysing this characteristic for the case of the institutions involved in the ERA-NETs in the field of energy, the institutions involved sometimes cannot be attribute to one role alone.

There is a significant number of institutions (33%)⁵³ that play both roles, and hence are programme managers and owners at the same time, and another 7%, being able to act as both owners or managers, decided to act with a different role in two different ERA-NETs. However, the great majority of institutions have a well defined role, being exclusively either programme managers (36% of the participants) or programme owners (24%) (see Figure 19).

Figure 19. Role of institutions in FP6 ERA-NETs in the field of Energy

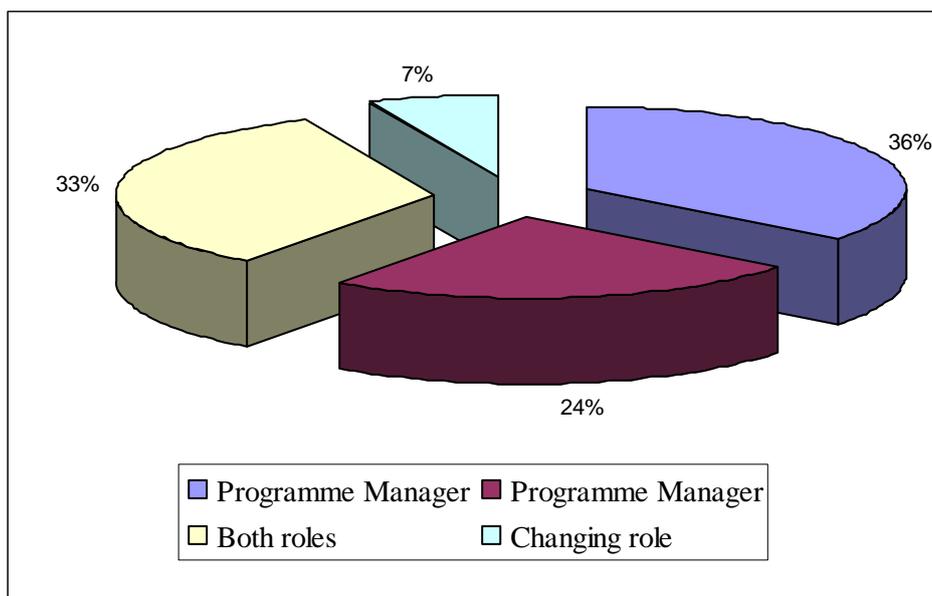


Table 5 gives an overview of all the Joint Calls that were organised by the ERA-NETs in the field of energy. The 11 calls resulted in 34 projects with a funding budget of 23,3 M€ Most of the calls had a clear experimental character and were used by the ERA-NETs to develop and test possible strategies of future cooperation. As has already been stated in chapter 4 it seems premature to draw conclusions on the success or failure from the characteristics of these calls. What can, however, be extracted are the types of research funded in the calls. Table 6 shows the titles of the projects funded and the types of the institutions involved allowing for this analysis.

⁵³ Data from 45 institutions (the 3 observer organisations have not been taken into account).

Table 5. Overview and classification of the Joint Calls conducted in the energy related ERA-NETs

ERA-NET	No. of JC	Theme of Joint Call	Timing of JC	Funding Model applied	Budget of Joint Call (M €)
BIOENERGY	3	Small Scale Combustion	2006	Virtual Pot	1.7
		Gasification	2007	Virtual Pot	3.7
		Short Rotation Coppice	2008	Virtual Pot	2.8
FENCO ERA	1	CCS Implementation Strategies	2008	Virtual Pot	1.0
HY-CO	5	<ul style="list-style-type: none"> ▪ Hydrogen storage ▪ Fuel cells & Hydrogen storage ▪ Deployment Strategies in Hydrogen & Fuel Cells ▪ PEMFC - cells, stacks, systems & manufacturing and production technology ▪ SOFC - cell, stack, BoP development and systems integration1 project per call 	2007	Virtual Pot	6.1
INNER	1	<ul style="list-style-type: none"> ▪ Innovative and visionary research with the potential to open new fields for energy science and technology 	2007	Virtual Pot	6.0
PV ERA-NET	1	<ul style="list-style-type: none"> ▪ POLYMOL 	2007	Virtual Pot	2.0
TOTAL	11				23.3

Table 6a. Analysis of Research Themes and Institutional Participation in Energy Joint Calls (1/2)

ERA-NETs	Themes of Successful Projects	Institutions Involved	Type of Research ⁵⁴
BIOENERGY	<ul style="list-style-type: none"> ▪ Small scale biomass-fired CHP systems ▪ Test methods for non-wood small-scale combustion plants ▪ Particle measurements, sampling and physicochemical and toxicological characterisation for biomass combustion ▪ Combustion characteristics of ash-rich pellets ▪ Control potential of different operating methods in small-scale wood pellet combustion 	<ul style="list-style-type: none"> ▪ Univ. ▪ PRO ▪ Univ. + PRO ▪ Univ. + PRO ▪ Univ. + Ind. 	<ul style="list-style-type: none"> ▪ FR-AR ▪ AR ▪ FR-AR ▪ AR ▪ AR
	<ul style="list-style-type: none"> ▪ Photoionization-detection technique for on-line measurement of biomass tar concentrations ▪ Mop Fan and Electro filter: an innovative approach to cleaning product gases from biomass gasification ▪ Intensification of Syngas Cleaning and Hydrogen Separation (Synclean) ▪ Tar removal from low-temperature gasifiers ▪ Energy efficient selective reforming of hydro carbons ▪ OptiBtLGas - Cleaning and treatment of Product Gas from biomass gasifiers –for 2nd generation biofuels 	<ul style="list-style-type: none"> ▪ Univ. + Ind. 	<ul style="list-style-type: none"> ▪ AR ▪ AR ▪ AR ▪ AR ▪ AR ▪ AR
	<ul style="list-style-type: none"> ▪ Generic improvement of Salix and other woody SRC species ▪ Improving the value chain of SRC ▪ Environmental aspects of SRC 	<ul style="list-style-type: none"> ▪ Univ. + Ind. ▪ Univ. + Ind. ▪ Univ. + Ind. 	<ul style="list-style-type: none"> ▪ AR ▪ AR ▪ AR
	FENCO ERA	<ul style="list-style-type: none"> ▪ Economic modelling and a strategy for roll out of CCS ▪ Public acceptance and development of public communication and outreach on CCS 	<ul style="list-style-type: none"> ▪ Univ. + PRO ▪ Univ. + PRO

⁵⁴ FR: Frontier Research; AR: Applied Research; SR: Societal Research.

Table 6b. Analysis of Research Themes and Institutional Participation in Energy Joint Calls (2/2)

ERA-NETs	Themes of Successful Projects	Institutions Involved	Type of Research ⁵⁵
HY-CO	<ul style="list-style-type: none"> ▪ MDM – MEA Degradation Mechanisms in PEMFC systems for stationary back-up applications: control, understanding and improvements ▪ BTL Diesel Reformer Development and SOFC Test ▪ New light metal hydride systems for hydrogen storage ▪ New metal-organic frameworks (MOF) for hydrogen storage in cryo-adsorption storage systems ▪ Development of cathode contact coatings on interconnect materials and their effect on the SOFC degradation ▪ AccelenT – Accelerated Testing of SOFC Components ▪ SEE-μFC - Socioeconomic and Energy Systems Analysis of Micro Fuel Cells 	<ul style="list-style-type: none"> ▪ PRO + Univ. + Ind. ▪ PRO + Ind. ▪ PRO ▪ Univ. + PRO ▪ PRO ▪ PRO ▪ Univ. + Ind. 	<ul style="list-style-type: none"> ▪ FR-AR ▪ FR-AR ▪ FR ▪ FR ▪ FR ▪ FR ▪ SR
INNER	<ul style="list-style-type: none"> ▪ Synthesis and durability of CNT based MEAs for PEMFC (Nanoduramea) ▪ Optimizing Lipid Production by planktonic Algae – LIPIDO ▪ Solar Hydrogen ▪ Evaluation platform for polymer solar cells – Morphoso ▪ Novel High-Temperature Proton and Mixed Proton Electron Conductors for Fuel Cells and H₂-Separation Membranes 	<ul style="list-style-type: none"> ▪ PRO + Univ. ▪ PRO + Univ. ▪ Univ. ▪ PRO + Univ. ▪ PRO + Univ. 	<ul style="list-style-type: none"> ▪ FR ▪ FR ▪ FR ▪ FR ▪ FR
PV ERA-NET	<ul style="list-style-type: none"> ▪ Polymer and Molecular Solar Photovoltaic Cells (4 projects) 	<ul style="list-style-type: none"> ▪ PRO + Univ. + Ind. 	<ul style="list-style-type: none"> ▪ FR-AR
	TOTAL number of projects: 34		

⁵⁵ FR: Frontier Research; AR: Applied Research; SR: Societal Research.

Finally, table 7 attempts to relate the funding models of the joint calls organised and the types of research. As explained before, the types of research are not rigid categories but rather permeable and in most cases the research carried out by the ERA-NETs does not fit in one individual category alone but might cover two. For the case of energy, with the information available, it can be said that only the virtual pot funding model has been used and that most of the research can be defined as applied and fundamental research.

Table 7. Visualization by type of research and funding model for ERA-NETs in the field of energy

	Frontier Research	Applied Research	Societal Research
Virtual Pot	INNER	BIOENERGY	HY-CO FENCO
Mixed mode		HY-CO	
Common Pot		PV-ERA-NET	

By replicating the exercise done in this section for the rest of the ERA-NETs, NETWATCH will attempt to provide insights about the different behaviour patterns depending on the country/region, areas of knowledge and participants over time. As argued in chapter 4, additional information might have to be looked at in the future to further characterise the behaviour and outcome of the ERA-NETs.

5.2. Impact assessment framework

The final step of the analytical framework will assess, in the medium and long term, the effects, benefits and impacts of the transnational collaboration efforts on a national level and on the level of the ERA. Following the same rationale as for the previous analysis, the main focus will initially be the ERA-NET scheme.

This impact assessment framework will benefit from the systematic analysis of the ERA-NETs (the mapping and monitoring analysis explained before) since as stated by Bammer (2008, p.11), "one benefit of thinking more systematically about research collaboration is that the insights gained can be useful for evaluation".

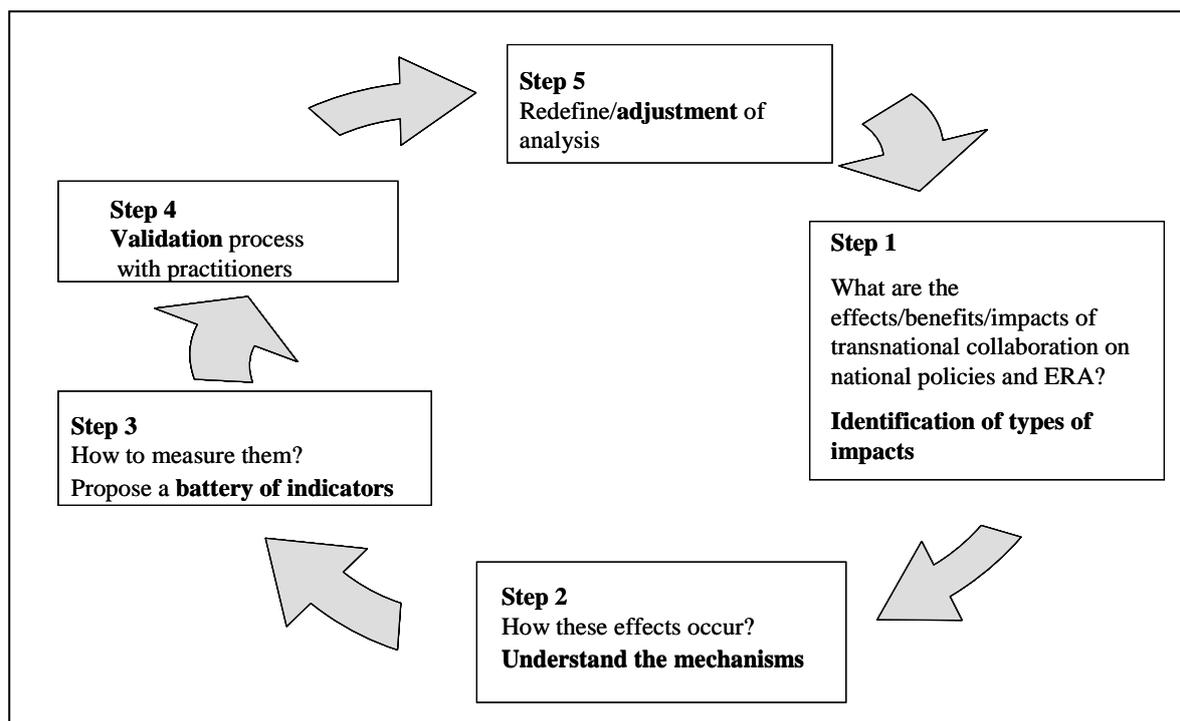
This analysis will be an ex-post exercise⁵⁶, in other words, an evaluation conducted either when the scheme is ongoing or after completion of the collaboration scheme.

The rationale followed in building this analysis is composed of five stages, depicted in the next graph (see figure 20). The first step for building this analytical framework is the identification of the impacts/effects/benefits that the collaboration is producing at both, national and European levels. After that, a better understanding of how these effects occur (second step) will eventually lead to insights for building a set of indicators (third step), which are crucial to monitor and evaluate the transnational collaboration instruments and their impacts. The fourth step will consist of a validation process with programme and policy actors and other stakeholders. The final stage is a refinement of the suggested framework and will be done considering the results of the validation process.

While the first three steps have been developed during the preparatory phase of NETWATCH and are presented in the following pages, the last stages – validation process and refinement of the framework – will be undertaken in the operational phase.

⁵⁶ For more information about evaluation and assessment methods see (Hong and Boden, 2003)

Figure 20. Rationale for developing an impact assessment framework for ERA-NETs



One of the main aims of the impact assessment framework (see next diagram in colour, figure 21), is to assess whether or not ERA-NETs (and eventually other JPIs) are contributing to the overall goals associated with the Lisbon Agenda and the ERA. In essence, the **purpose of the ERA** (see blue area in the diagram) is to resolve a set of issues related to:

- The fragmentation of R&D-related policy initiatives across the EU, leading to problems associated with the duplication of activities and failures to establish critical masses of funding;
- The fragmentation of research activities across the EU and similar problems associated with lack of critical mass and duplication at the research activity level.

The **high level goals** (see blue area in the diagram) of the ERA can thus be identified as:

- The creation of an ‘internal market’ for research, involving the free movement of knowledge, researchers and technology;
- The development of a European research policy, taking into account other EU and national policies;
- The restructuring of the fabric of research in Europe via the improved coordination of national and regional research activities and policies.

Concerning the latter goal, the European Commission launched a number of initiatives during the course of the FP6 that sought to improve coordination and cooperation at three different levels (**intermediate goals**, see blue area in the diagram):

- At the project level (e.g. Integrated Projects, Networks of Excellence);
- At the programme level (e.g. ERA-NETs, Article 169s);
- At the policy level (e.g. the Open Method of Coordination (OMC)).

The **ERA-NET** scheme, as one of the main **instruments** (see orange area in the diagram) under FP6 to achieve these goals, was intended primarily to improve cooperation and coordination among Member States in the design, implementation and evaluation of R&D programmes. This was to be achieved via:

- The transnational networking of the bodies responsible for national and regional research activities in order to encourage mutual learning about the potential for cooperation and coordination at the programme level;
- Support for joint coordination via the development and implementation of joint initiatives such as joint calls, joint programmes and other activities performed jointly;
- The mutual opening of national and regional research programmes.

As explained in Section 1.1, the ERA-NET scheme initiated different types of networking. Specifically, participants were encouraged to pursue a **four-step process (activities)**, (see pink area in the diagram), with the expectation that participants would become involved in at least the first two steps and, hopefully, the latter two steps.

Finally, each type of impact will be analysed through a different set of indicators (see green area in the diagram).

Summing up, Figure 21 shows how these high-level and intermediate goals and their translation into mechanisms (e.g. ERA-NETs) and activities (the four ERA-Net steps) can be used to help identify potential outputs, outcomes and resultant impacts. Activities undertaken in Step 1, for example, are likely to have outputs, outcomes and impacts relevant to the goal of mutual learning, while the activities in Stages 3 and 4 are more likely to have outputs, outcomes and impacts related to the goals of mutual opening and the joint coordination of programmes, calls and related activities.

The next tables (see tables 8, 9 and 10) further show how the scheme can be used to identify and classify impact indicators relevant to the three intermediate goals of mutual learning, mutual opening and joint coordination. Joint workshops, conferences, papers and policy statements all provide some indication that there have been impacts on mutual learning. Similarly, an annual monitoring of the changes in the numbers of new and existing national and regional programmes, facilities and laboratories that allow mutual access is needed to track progress towards the goal of mutual opening. Likewise, the existence or not of development plans or actual implementations of the activities expected in Stages 3 and 4 provide evidence of progress towards the goal of the joint coordination.

When the impacts on mutual learning, mutual opening and joint coordination are aggregated and synthesised, statements can be made concerning overall impacts on some of the higher

level goals, e.g. improved cooperation and coordination at the programme level as a whole and the contribution of changes at this level to the restructuring of research in Europe and the development of the ERA.

It is also necessary to consider an additional set of impact indicators associated with the attainment of higher-level goals (also depicted and described in Figure 21 and in tables 8, 9 and 10). Involvement in ERA-NETs *per se* can have a range of secondary impacts other than those directly associated with specific ERA-Net activities and their outputs. Involvement, for example, can lead to overall reviews of national and regional strategies for the joint coordination of research activities, including strategies for cooperation and coordination with non-EU countries and regions. It can also lead to a range of regulatory, legislative, institutional and procedural changes, all designed to reduce many of the barriers to international cooperation and coordination identified during the course of ERA-NETs.

Figure 21. General Framework for Goals, Instruments, Activities, Impacts and Indicators

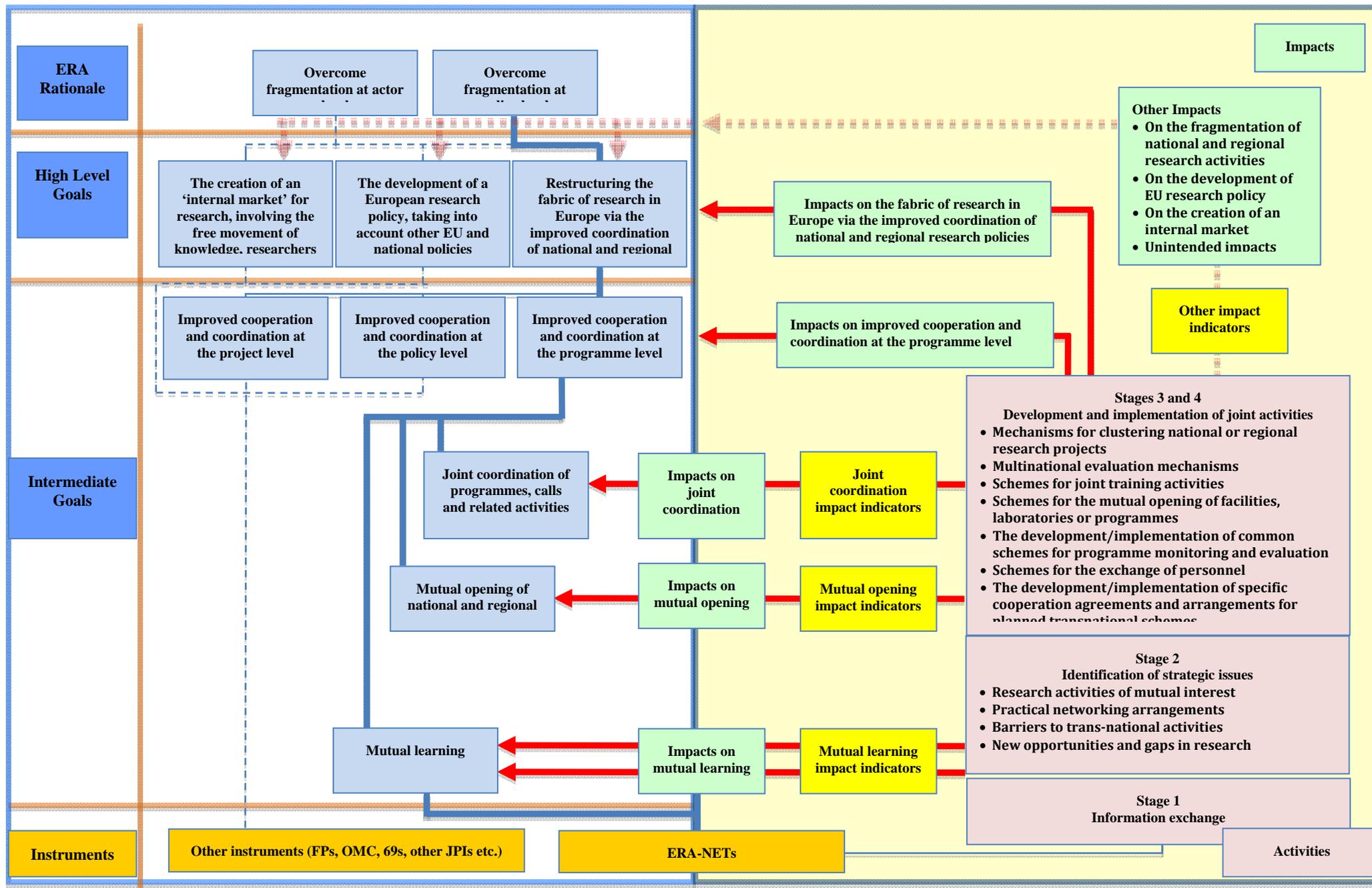


Table 8. Battery of qualitative indicators for mutual learning by type of activity

Type of Activity	Indicators	Data Type
Information Exchange	Number of joint workshops/conferences held	Number
	Number of joint reports prepared	Number
	Number of joint papers published	Number
Identification of Strategic Issues	Evidence that research activities of mutual interest are identified	Yes/No
	Description of research areas of mutual interest	List/Qualitative description
	Evidence that practical networking arrangements is established	Yes/No
	Description of networking arrangements in place	List/Qualitative description
	Evidence that barriers to joint activities are identified	Yes/No
	Description of barriers to joint activities	List/Qualitative description/High-low estimates
	Evidence that SWOT analyses are performed	Yes/No
Description of strengths, weaknesses etc.	List/Qualitative description/High-low estimates	

Table 9. Battery of qualitative indicators for mutual opening up of regional and national programmes by type of activity

Activity	Indicators	Data Type
Development of Joint Activities	Evidence of the development of schemes for the mutual opening of facilities or laboratories	Yes/No
	Description of proposed schemes for the opening of facilities or laboratories	List/Qualitative description
	Evidence of the development of schemes for the mutual opening of programmes	Yes/No
	Description of proposed schemes for the opening of programmes	List/Qualitative description
Implementation of Joint Activities	Evidence of the implementation of schemes for the mutual opening of facilities or laboratories	Yes/No
	Description of implemented schemes involving the opening of facilities or laboratories	List/Qualitative description
	Evidence of the implementation of schemes for the mutual opening of programmes	Yes/No
	Description of implemented schemes involving the opening of programmes	List/Qualitative description

Table 10a. Battery of qualitative indicators for joint coordination by type of activity (1/2)

Activity	Indicators	Data Type
Development of Joint Activities	Evidence of development of schemes for clustering national or regional research projects	Yes/No
	Description of proposed clustering schemes	List/Qualitative description
	Evidence of the development of multinational evaluation schemes	Yes/No
	Description of proposed multinational evaluation schemes	List/Qualitative description
	Evidence of the development of common programme monitoring and evaluation schemes	Yes/No
	Description of proposed common programme monitoring and evaluation schemes	List/Qualitative description
	Evidence of the development of schemes for joint training activities	Yes/No
	Description of proposed schemes for joint training activities	List/Qualitative description
	Evidence of the development of schemes for the exchange of personnel	Yes/No
	Description of proposed schemes for the exchange of personnel	List/Qualitative description
	Evidence of the development of specific cooperation agreements	Yes/No
	Description of proposed cooperation agreements	List/Qualitative description
	Evidence of the development of full blown action plans for joint calls	Yes/No
	Description of proposed action plans for joint calls	List/Qualitative description
Evidence of the development of full blown action plans for joint programmes	Yes/No	
Description of proposed action plans for joint programmes	List/Qualitative description	

Table 10b. Battery of qualitative indicators for joint coordination by type of activity (2/2)

Activity	Indicators	Data Type
Implementation of Joint Activities	Evidence of implementation of schemes for clustering national or regional research projects	Yes/No
	Description of implemented clustering schemes	List/Qualitative description
	Evidence of the implementation of multinational evaluation schemes	Yes/No
	Description of implemented multinational evaluation schemes	List/Qualitative description
	Evidence of the implementation of common programme monitoring and evaluation schemes	Yes/No
	Description of implemented common programme monitoring and evaluation schemes	List/Qualitative description
	Evidence of the implementation of schemes for joint training activities	Yes/No
	Description of implemented schemes for joint training activities	List/Qualitative description
	Evidence of the implementation of schemes for the exchange of personnel	Yes/No
	Description of implemented schemes for the exchange of personnel	List/Qualitative description
	Evidence of the implementation of specific cooperation agreements	Yes/No
	Description of implemented cooperation agreements	List/Qualitative description
	Evidence of the implementation of specific cooperation agreements	Yes/No
	Description of implemented cooperation agreements	List/Qualitative description
	Evidence of the implementation of action plans for joint calls	Yes/No
	Description of implemented action plans for joint calls	List/Qualitative description
Evidence of the implementation of action plans for joint programmes	Yes/No	
Description of implemented action plans for joint programmes	List/Qualitative description	

6. Recommendations for the implementation of the analytical framework

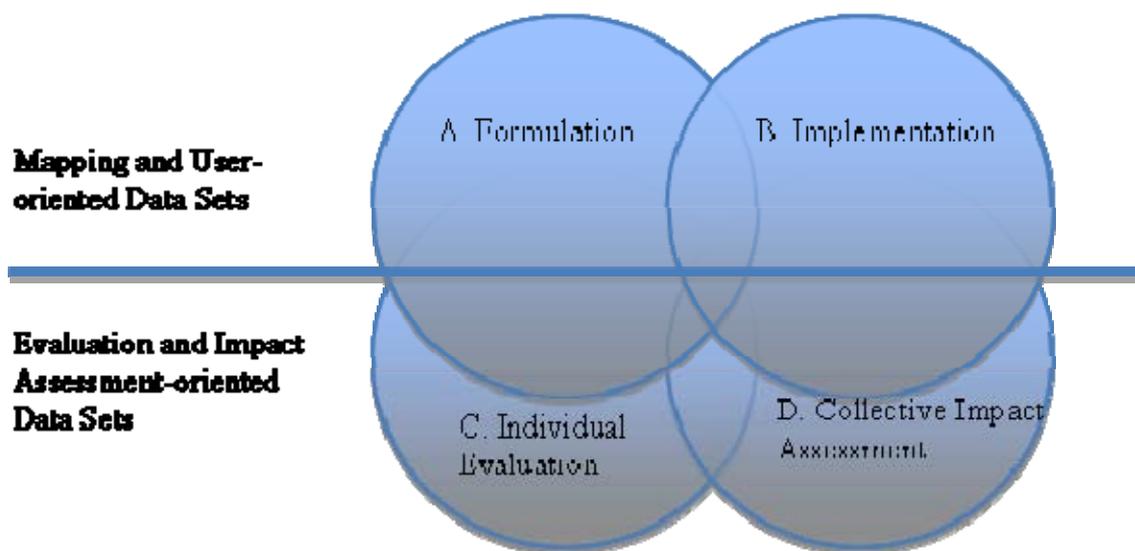
6.1. Data requirements

This final section of the report reflects on the data requirements for the implementation of the proposed analytical framework. Substantial coordination with the other related activities mentioned in Section 2 of this report – the ERA-NET learning Platform, including ERA-LEARN, and NORDERA – should take place.

The **data needs** of the analytical framework of NETWATCH can thus be satisfied by four overlapping data sets (see figure 22):

- A. Data relevant to the formulation of JPIs;
- B. Data relevant to the implementation of JPIs;
- C. Data relevant to the evaluation of individual JPIs;
- D. Data relevant to the collective evaluation and impact assessment of JPIs.

Figure 22. Data sets underpinning NETWATCH



A. Data Relevant to the Formulation of JPIs

Data in this set include data mapping of the range of existing JPIs in Europe (and possibly elsewhere if broader international cooperations are considered) broken down by country, region, research area, budget, etc. Data should also be collected on research areas of strength and weakness in different countries and centres of excellence. In essence, all data likely to inform the identification and choice of different options when contemplating joint activities should be collected. This should also include details of JPI contact points in order to facilitate initial contacts likely to lead to joint activities.

B. Data relevant to the implementation of JPIs

Data supporting implementation that are of use to programme managers when implementing the various stages of setting up and running JPIs. This includes examples and case studies of best practice, guidelines covering the various stages involved in the implementation of JPIs etc.

C. Data relevant to the evaluation of individual JPIs

Data on the efficiency, effectiveness and impact of individual JPIs, so that programme owners and managers can learn from previous experience and improve future performance (both their own and, via sharing on mutual learning platforms, the performance of others). These data should preferably be collected by programme managers and owners via standardised routines facilitating the benchmarking of JPIs across the EU and elsewhere (as suggested by the Mutual Learning Platform). In terms of an analytical framework, this should correspond to an **endogenous** evaluation framework, i.e. one in which data are collected on:

- The attainment of the goals (expected impacts) of the individual JPIs in order to assess the **effectiveness** of these policy interventions;
- The **efficiency** of implementation of individual JPIs.

D. Data relevant to the collective evaluation and impact assessment of JPIs

Data collected on the impact of JPIs require an exogenous evaluation framework, i.e. one whereby the goal attainments of JPIs are assessed not in terms of the goals and expected impacts of individual JPIs, but in terms of the higher level goals of the Lisbon Agenda. The aim here is to assess whether or not JPIs have collectively contributed to the realisation of the Lisbon goals.

The analytical approach suggested relies heavily on Logic Models and their application in both planning and evaluation activities. These require the (*ex ante* or *ex post*) articulation of a hierarchy of goals and expected impacts and the identification of the routes traversed (or necessary to traverse) to attain these impacts, together with the elaboration of the various activities, milestones and outcomes associated with the process of goal attainment.

When used as a planning aid, these routes dictate the mechanisms necessary to attain specific goals. When used retrospectively for evaluation and impact assessment purposes, they help to define hypotheses concerning the ways in which different types of impact may or may not have been achieved.

Concerning Data Set D, the main aim is to assess whether or not JPIs stimulated by EU and Member States policy initiatives are helping to realise the overall goals associated with the Lisbon Agenda and the realisation of the European Research Agenda. In essence, these are:

- To overcome the fragmentation of R&D-related policy initiatives across the EU, and erase the problems associated with the duplication of activities and failures to establish critical masses of funding;
- To reduce the fragmentation of research activities across the EU and similar problems associated with lack of critical mass and duplication at the research activity level.

6.2. Final recommendations for the operational phase

This report has proposed a systematic approach to drawing up an analytic framework that could help in mapping, evaluating and assessing the impacts of transnational R&D programme collaboration. Such an approach has yielded a first set of requirements for the information collection which will be undertaken as part of the NETWATCH Operational Phase.

Naturally, this will not answer all questions that might be asked. Therefore some possible additional analytical questions will be listed here, without attempting to be systematic or comprehensive at this stage. The intention is to use such questions as an inspiration for further inquiry and for a review of the data and information requirements resulting from the present analytical frame. The questions can be clustered in the following three groups:

1. Questions about the dynamics of the transnational collaboration scheme:

- What were the typical evolution patterns of the ERA-NETs? Which are the most notable developments and why?
- Would correlating frequency of participation with the absolute level of public expenditure yield a different pattern than correlating it with public expenditure as a % of GDP (i.e. 'funding intensity' as shown in Figure 6)? Would this be more appropriate if one wants to conclude that "there is a strong correlation between a country's public expenditure and participation in ERANETs"?
- Small countries may need to have more research priorities and therefore may be more focused on the choice of areas for transnational cooperation. How can this be analysed?

2. Questions about Joint Calls:

- What kind of analysis was the basis for the thematic orientation of the ERA-NET Joint Calls? Would the experiences of the ERA-NETs suggest a need for rigorous analysis of research needs to support joint calls?
- What can be said about the transaction costs of ERA-NETs with regard to their Joint Calls? Is there an indication of an evolution of these costs when more experience had been gained?

3. Questions about the funding models:

- In the discussions on JP the Commission has generally emphasized the benefits of a common pot versus a virtual pot. The experience (advantages and disadvantages) from the Joint Calls using a common pot approach versus the virtual pot should be analysed.

Relevant current policy initiatives on EU level that NETWATCH will relate to:

The publication of the Joint Programming Communication by the EC in July 2008⁵⁷ has added new timeliness to the objectives of the NETWATCH project. As already foreseen in the Description of Work of the upcoming operational phase of NETWATCH there will be good reasons for timely input to the debate emerging on this issue and to prioritise data collection and analysis in order to deliver first evidence and insights on ERA-NETs in the thematic areas of the first Joint Programming related

⁵⁷ European Commission (2008c)

initiatives that are being discussed. As the scope of these initiatives goes beyond the area covered by the Framework Programme, NETWATCH will probably have to include instruments like the INCO-NETs in the analysis.

These initiatives include:

- Initiative on Alzheimer disease.
- Nordic Top-Level Research Initiative (link to NORDERA project).
- Strategic Energy Technology (SET) Plan (including 'Financing Low Carbon Technologies' Communication).
- European Strategy for Marine and Maritime Research.
- Strategic Framework for International S&T cooperation.
- Strategy for a European Agriculture Research Agenda.
- Strategy for ICT R&D and Innovation in Europe.

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European Commission

EUR 23843 EN – Joint Research Centre – Institute for Prospective Technological Studies

Title: Developing an analytical framework for mapping, monitoring and assessing transnational R&D collaboration in Europe. The Case of the ERA-NETs

Authors: Susana Elena Pérez and Hans-Günther Schwarz

Luxembourg: Office for Official Publications of the European Communities

2009

EUR – Scientific and Technical Research series – ISSN 1018-5593

ISBN 978-92-79-12562-1

DOI 10.2791/11940

Abstract

This Report has been developed within the NETWATCH Project (Preparatory Phase) and presents an analytical framework for mapping, monitoring and assessing trans-national R&D collaboration programmes in Europe, using in the case of the ERA-NET scheme as a starting point.

The Report discusses the rationales for the European Research Area (ERA) and Joint Programming Initiatives (JPIs) in order to contextualise the NETWATCH Project, to explain the added value of NETWATCH and to justify the rationale of having an analytical framework for ERA-NETs. The core of the Report describes the proposed analytical framework and the ERA-NETs in the field of energy serve as a preliminary case study. Recommendations for the further implementation of the analytical framework are also highlighted

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