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**Research Report**

## Mapping the regional embeddedness of the NMP programme: Final report of the project "RTD-NMP-2014-Mapping"

ZEW-Gutachten und Forschungsberichte

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# Mapping the regional embeddedness of the NMP programme

Final report of the project  
"RTD-NMP-2014-Mapping"

Written by INNOVA+ - TNO - ZEW



**EUROPEAN COMMISSION**

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# **Mapping the regional embeddedness of the NMP programme**

Final report of the project  
“RTD-NMP-2014-Mapping”

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## EXECUTIVE SUMMARY

The aim of this study was to analyse how research and innovation activities funded by FP7 NMBP<sup>1</sup> programme (former FP7 NMP programme and the Industrial Biotechnology portfolio within the FP7 thematic area KBBE<sup>2</sup>) were embedded at a regional and local level and how the activities funded under these programmes linked with local networks and clusters actions, and to what extent and in what way these activities had impacts at the regional level. The project implementation consisted of five main tasks:

**Task 1: Mapping and regression analyses.** This part of the research, based on the database of all FP7 NMBP projects made available by the European Commission, was conducted involving descriptive and multivariate analysis of the level of participation in FP7 NMBP projects for each region in Europe.

**Task 2: A network analysis.** This part of the study aimed at analysing patterns of collaboration both in geographic terms and in terms of type and composition of consortia in the projects funded under FP7 NMBP.

**Task 3: Case studies.** The case studies were conducted for six regions in order to get in-depth evidence regarding the factors that drive a region's participation performance in the FP7 NMBP programme and how projects and project participants were embedded in each region. The six regions initially selected for case study analysis were: *Cologne Region (DE)*, *Central Hungary (HU)*, *Walloon Brabant (BE)*, *South Sweden (SE)*, *Basque Country (ES)*, *Lodz region (PL)*. Following discussions with the European Commission a seventh case study has been added for the *Bucharest-Ilfov region (RO)*. The development of case studies was based on desk research, interviews and the results of a survey amongst FP7 NMBP projects participants.

**Task 4: Regional workshops.** Workshops were conducted in each of the six initially selected regions to validate the case studies and to extend their analyses. Participants included project managers from enterprises, project managers from research centres and regional actors.

**Task 5: Conclusions and recommendations.** The recommendations were based on the outcomes of the previous tasks, providing answers to the key questions of the study, with a view on strategic inputs for future programming under Horizon 2020 and beyond.

This study refers to the notion of '*regional embeddedness*'. Embeddedness relates to the question how knowledge organisations and firms themselves are embedded within their context at regional, but also at national, European and global level. In this case embeddedness also touches upon closely related issues, such as how distinct regional factors affect the FP7 NMBP participation rate and potential participation, and how regions are positioned in European and global research, development and innovation networks.

Even though separated in FP7, the fields of NMP - Nanosciences and nanotechnologies (N), Materials (M), New Production Technologies (P) and of Biotechnologies (B) are merged for the purpose of this study, as to ensure alignment with the creation of the NMBP programme within Horizon 2020.

The **mapping part of this study** concluded that at regional level (NUTS-2 level), each EU region participated on average in 29 FP7 NMBP projects, and received €11.67 million in funding over the period 2007-2014. The 5,168 distinct organisations that took part in the FP7 NMBP projects were spread throughout Europe (and the world), but most of the participants came from existing industrial hubs, especially in more central parts of Western Europe. This pattern of participation is very similar across the different fields of technology and participant organisation types. The regions which are in the top ten in all four NMBP fields include Catalonia (Spain), Lombardy (Italy) and Rhône-Alpes (France). Other regions with high participation are the Community of Madrid (Spain), Oberbayern (Germany), Basque Country (Spain), Piedmont (Italy), Île de France (France) and Cologne (Germany).

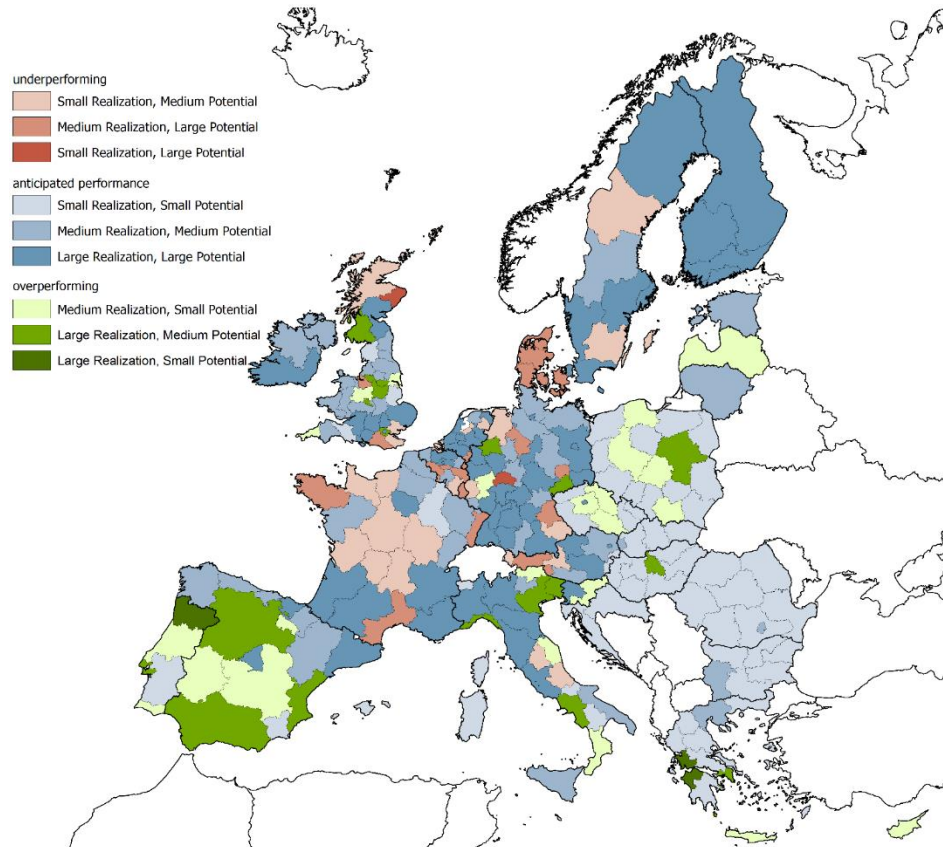
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<sup>1</sup> Nanotechnologies, Advanced Materials, Biotechnology and Advanced Manufacturing and Processing

<sup>2</sup> The "Knowledge-Based Bio-Economy", including Food, Agriculture and Fishery, and Biotechnology

In terms of type of organisations, the largest group among the participants were small and medium-sized enterprises (43.6%), followed by large enterprises (24.4%) and higher education providers (13.5%). Additionally, 551 research institutes were involved (11.1%) and 368 'other organisations', which did not fall in any of the categories mentioned above.

Further analysis compared the actual participation rate with the 'potentially expected participation rate' based on a set of criteria such as the technological strength of the region, the R&D intensity, the wealth of GDP, the population density and other national and regional characteristics. It aimed to determine whether each region was performing according to the expectations and resulted in a classification of all the regions. The nine 'typologies' of project participation performance are presented in the Figure 1 below.



**Figure 1: Realised vs. Potential participation in FP7 NMBP projects**

At the **network analysis** level, this study verified how intra- or inter-regional collaboration has taken shape and concluded that a strong inter-regional collaboration is correlated with strong intra-regional collaboration. It should be noted, however, that according to our findings, intra-regional collaboration is weak in comparison to the overall share of inter-regional collaborations (i.e. projects-partner combinations). Although intra-regional collaboration exists, other collaborations at national, European and even international level are much more common in NMBP.

Another main conclusion was that the European capital regions like Paris, Helsinki, Copenhagen, Stockholm, Berlin, Madrid, Athens and The Hague are strong NMBP hubs, which act as real magnets in NMBP collaboration. The capital regions are joined in this effect by typical R&D hubs like North-Brabant (Eindhoven), the Basque Country (Bilbao), Rhône-Alpes (Grenoble), Stuttgart and Oberbayern (Munich).

Participants that took part in the studies considered FP7 funding as an opportunity to cooperate with partners identified as "excellent" and with organisations from other regions in Europe. Case studies showed that participants rather avoid regional (or national) partnerships so as to increase their perceived chances of success when applying to EU funds and that these funds are perceived as opportunities to go beyond their borders.

**Case studies** show that regions with a higher than expected participation can profit from the presence of organisations that are particularly well connected with their research



peers across Europe. 69% of all project participants take part in only one project even though in average each participant took part in around 2.3 projects, which points out to the existence of “large” participators and indicates great differences between participants with limited participation and those with more extensive experience.

Interesting to note is the role of supporting organisations. The role of consultants in project applications were often referred to as a facilitating factor to access EU funds, especially in project applications led by organisations with limited knowledge and experience in applications. National Contact Points (NCPs) and Enterprise Europe Network (EEN) members were also seen as positive by participants in the case-studies but with important varying factors depending on the regions (NCP being sometimes seen as a structure from the “capital city”) and depending on the experience of the applicant.

Another interesting outcome of the case studies is the complementarity and competition with scientific funds provided at national or regional level. As observed in some cases, the national or regional funds have similar objectives as the EU ones, and in particular those to support scientific excellence and access to the market even, though they were perceived quite differently depending on the region. Regional or national funding was perceived as more flexible than their European equivalents in some regions (Walloon Brabant, Basque Country) but also as less flexible in others (Lodz). The non-European funds were also generally perceived as complementary when it comes to the initial level of Technology Readiness Level (TRL) of the supported project, being preferred in cases of higher TRL (closer to market) as resource to local funds reduces the number of partners with whom to share the information (especially noted in Walloon Brabant and Basque Country).

Following our analysis, the following **key recommendations** were developed, per stakeholder type:

*a) Recommendations for the European Commission:*

- 1- Regions are key actors for the NMBP actions. Not as such to foster the actions but to create the necessary infrastructure for research and industry to thrive. The main success factors for high performing regions derive from the track record of these regions and its level of specialisation, but also the level of regional expertise. Some analysed regions took active stands in the 80’s and 90’s to create and strengthen research centres, to diversify incentives to innovation, which now appear to payoff. In this context, further increased cooperation between the EU research funds, currently Horizon 2020, and the regional funds, is suggested.
- 2- The European Commission should also lead the process to organise closer cooperation and links between European Research Framework Programme funds and Research & Innovation funds that are organised at national or regional level. Indeed, these funds can be complementary when it comes to TRL and when it comes to bringing the product closer to the market.
- 3- Europe should continue to support strategic investments that focus on technologies on low or medium TRL. Parallel to this, the European Union should further support the transformation of its leading R&D into marketable products and services through complementary measures and actions, including networks such as the Enterprise Europe Network (EEN).

*b) Recommendations for the regions:*

- 4- In the framework of the study, it is perceived how regional research centres are a catalyser for mobilising and promoting industrial participation. In this context, and in order to enhance regional participation, regional authorities from low performing regions should facilitate and actively support the establishment and co-organising capacities at research centres able to participate in the extremely competitive market of EU funded projects.
- 5- Increase networking among regional actors. Knowing partners, knowing experts is of tremendous importance in accessing to EU funds. On this respect, brokerage events are often preferred to info-days as stated in various interviews and workshops, as they allow for more intense collaborations to emerge. Decentralised events in the

regions should be organised in collaboration between regional authorities and the main regional participants.

c) *Recommendations for all actors*

- 6- Make a better use of the EEN structure, including increasing synergy and complementarity with NCPs. A possible service to be implemented, as suggested by several interviewees, is a 'H2020 project hotline' that project applicants, and in particular those with less experience, could contact in their own language to ask administrative and practical questions. Another idea could be to provide further thematic orientation of the EEN.

d) *Further Suggestions to maximise the impact of projects:*

The impact of FP7 NMBP projects is difficult to assess. One reason for this relates to the logic of FP7 and/or H2020 projects that target "excellent R&D&I" (which is often intangible) rather than "excellent end-products" whose success can be assessed by traditional market systems. By definition, FP7 NMBP targets more medium- and long-term projects with more indirect impacts and higher spill-over effects. On this, we would suggest:

- 1- Consider the use of regional funding instruments for funding collaboration projects between local actors (especially SMEs) and organisations involved in on-going or recently terminated EU-funded projects. The availability of follow-up funding from regional funds could take the results of EC funded projects to a stage closer to commercialisation.
- 2- Increase the match-making between EU funded instruments with national and regional funding instruments, using the new legal possibilities in the H2020 and ESIF<sup>3</sup> regulations that allow complementary funding of the same project by different financial instruments.
- 3- NMBP projects and regional development projects could be streamlined along the innovation chain. On the one hand, regional policies often invest into building up and strengthening regional research infrastructures which would be a natural partner in NMBP projects. On the other hand, regional projects often target more applied-oriented, close-to-market innovation activities. Such activities could build upon results from NMBP projects.
- 4- Regional funding sources, both from Structural Funds and from regional authorities in the Member States, could be used to finance follow-up research to increase the TRL of the research conducted in NMBP projects. The more technologically demanding this research is, the more likely it is that NMBP projects stop at TRLs below a prototype level. Interviews and regional workshops conducted within this study suggest that follow-up financing could significantly increase the economic impact of NMBP projects. If such follow-up financing is linked to regional initiatives, this could substantially increase the regional impact of the projects and, at the same time, contribute to the objectives of regional policy measures.
- 5- A main challenge for a successful embeddedness of organisations in the NMBP fields lies in the different focus of NMBP projects and regional policies. While FP7 (as well as Horizon 2020) projects aim at pushing further the technological frontier at a global level, regional specialisation rests on comparative advantages of regions. Comparative advantages imply that the respective activities promise the highest returns for a region given that region's specific endowment with knowledge and production factors. However, it does not imply that these activities are world- or Europe-leading ones in the respective field. As such, a project not retained by EU funds may still be valid within a regional policy, and regions may decide to accept H2020 evaluation results as a basis for complementary regional funding e.g. to fund to regional players when EU funding could not be obtained due to strong European competition or otherwise.

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<sup>3</sup> European Structural and Investment Funds

## 1. INTRODUCTION AND CONCEPTUAL CLARIFICATIONS

This report summarises the results of the study "Mapping the regional embeddedness of the NMP programme". It was commissioned by the Directorate-General RTD, Directorate for Industrial Technologies, to better understand the research landscape in Key Enabling Technologies (KETs) in European regions and the impact of the Seventh Framework Programme (FP7) and Horizon 2020 funding in this area.

The aim of this study was to analyse how research and innovation activities funded by the NMBP programme (former FP7 thematic area NMP and Industrial Biotechnology portfolio in FP7 KBBE), were embedded at a regional and local level and how the funded activities under these programmes linked with local networks and clusters actions, and to what extent and in which way these activities had impacts at a regional level.

The report is the summary of a project that aimed to answer the following eight key questions:

1. Which are the regions of relatively high participation and which are the regions of relatively low participation?
2. What regional or local factors can explain the participation of a certain region in the NMBP research programme?
3. Are there regions that according to these and other relevant factors should have had a higher participation in FP7 NMBP?
4. How are the research and innovation activities embedded locally and in particular, what are the spill-over effects and how could they be quantified (jobs, turnover, access to markets, increased knowledge or skills base...)?
5. What are the regional success factors (institutional, policy, programme, financing, skill base, infrastructure frameworks, among others) for research and innovation for different kinds of NMBP areas?
6. How is the active participation in the NMBP programme ensured at a regional or local level? Are the EU support systems (i.e. European Enterprise Network or the NMP National Contact Points) adequate?
7. How is the NMBP research and innovation activity networked at inter-regional level?
8. What are the recommendations for European, national and regional or local policy makers for creating maximum added value from European research funding, such as Horizon 2020 NMBP?

The project implementation, aimed at providing answers to these questions, consisted of the five following main tasks:

- Task 1: Mapping and regression analyses. This part of the research, based on the database of all FP7 NMBP projects was conducted involving descriptive and multivariate analysis of the level of participation in FP7 NMBP projects for each region in Europe.
- Task 2: A network analysis. This part of the study aimed at analysing patterns of collaboration both in geographic terms and in terms of type and composition of consortia in the projects funded under FP7 NMBP.
- Task 3: Case studies. The case studies were conducted for six regions in order to get in-depth evidence regarding the factors that drive a region's participation performance in the FP7 NMBP programme and how projects and project participants were embedded in each region. These regions selected for case study analysis were: Cologne Region (DE), Central-Hungary (HU), Walloon Brabant (BE), South Sweden (SE), Basque Country (ES), Lodz region (PL). On top of these six regions, the Bucharest-Ilfov region (RO) was also analysed. The development

of case studies was based on desk-research, interviews and the results of a survey amongst FP7 NMBP projects participants<sup>4</sup>.

- Task 4: Regional workshops. Workshops were conducted in each of the selected regions to validate the case studies and to extend their analysis. Participants included project managers from enterprises, project managers from research centres and regional actors.
- Task 5: Conclusions and recommendations. The recommendations were based on the outcomes of the previous tasks, providing answers to the key questions of the study, with a view on strategic inputs for future programming under Horizon 2020 and beyond.

In the next five chapters, the report presents the obtained results following the main tasks: Mapping and regression analysis (Chapter 2), Network analysis (Chapter 3), Case studies (Chapter 4), Synthesis (Chapter 5). This study closes with Conclusions and recommendations (Chapter 6).

### **1.1. NMP and NMBP in the European Research Framework Programmes**

This study focuses on the field of Nanoscience and Nanotechnologies (N), Materials (M), New Production Technologies (P), and Biotechnology (B), as defined as "NMBP" under the Horizon 2020 within the 'Leadership in Emerging and Industrial Technologies' (LEIT) programme.

The various subsets of NMBP existed since the first years of the European Framework Programmes. At first, NMP was merged within a thematic priority in the Sixth Framework Programme (FP6) as "Nanotechnologies and nanosciences, knowledge-based multifunctional materials, and new production processes and devices". The overall budget for NMP within FP6 was €1,429 million out of the €12 billion of the whole FP6 for a period of five years. Afterwards, FP7 saw the continuation of NMP with an extended budget of €3,475 million, which represented an increase of almost 150% compared to FP6-NMP, but for a duration of seven years (in fact an increase of 73% in the budget per year).

The integration of the fourth element of Biotechnology in NMP to NMBP only took place with the creation of Horizon 2020 that merged these four fields, labelled as "Key Enabling Technologies" (KETs) under the heading "Leadership in enabling and industrial technologies" with an estimated budget of €13,781 million<sup>5</sup> (again for seven years).

In order to be in line with the content of NMBP as mentioned in Horizon 2020, this study projects analysis integrates also industrial biotechnology projects funded under FP7 KBBE<sup>6</sup>, programme. For the purpose of simplification, the present study refers to the FP7 NMBP programme as a representation of the collective of projects under analysis, although this programme did not exist in this configuration in FP7.

### **1.2. The notion of regional embeddedness in NMBP**

The notion of embeddedness used in the realm of this study is strongly related to the question of how knowledge organisations and firms themselves are embedded, not only at local or regional level, but also at national, European and global level. Embeddedness also touches upon closely related issues, such as how distinct regional factors affect the FP7 NMBP participation rate and potential (future) participation, and how regions are positioned in European and global research, development and innovation (RD&I) networks. As the constituent elements of the NMBP programme contribute to an R&D agenda that is globally driven to a large extent, and with European firms in the NMBP-based industry domains being more and more part of what are *de facto* global industries, all levels of project participation and connectedness, from the local up to the global level, are taken into consideration. In other words, whereas regional embeddedness is an

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<sup>4</sup> A large-scale survey of all participants in the 822 NMBP projects was conducted in May 2015. The response rate was 25% of all project participants contacted with a total of more than 2,300 responses.

<sup>5</sup> [http://ec.europa.eu/research/horizon2020/pdf/press/horizon\\_2020\\_budget\\_constant\\_2011.pdf](http://ec.europa.eu/research/horizon2020/pdf/press/horizon_2020_budget_constant_2011.pdf)

<sup>6</sup> The thematic area KBBE refers to the "knowledge-based bio-economy" and includes food, agriculture and fishery, and biotechnology.

important focus, it will not be analysed in isolation but rather in close connection to other important levels of embeddedness.

In the existing literature, a distinction can be made between territorial, social and network embeddedness. The territorial notion focuses on how firm location decisions are made, a key and an already longstanding question in regional economics and economic geography.

While *territorial embeddedness* puts the 'firm-place' relationship at the centre of attention, the notion of *social embeddedness* highlights the importance of institutions, and the cultural and the social structure of organisations. Rooted in organisation sociology, its central tenet is that social relations are shaped by economic behaviour (Polanyi, 1978; Granovetter, 1985). As a result, specific firm or industry cultures may emerge but not necessarily tied to or influenced by their territorial contexts, but rather by interdependencies between the actions of the firm and its social and inter-organisational relationships. The way social relations shape and are shaped may consequently have fundamental implications on resource mobilisation and on evolution of organisational environments and economic institutions (DiMaggio and Powell, 1983; Granovetter, 1985; Stinchcombe, 1965).

The literature on social capital also deals with important aspects of regional embeddedness, arguing that social capital is an important ingredient for innovation, regional growth and development (e.g. Putnam 1993; Cooke, Clifton, and Oleaga 2005; Doh and Acs, 2010). Social capital, however, remains difficult to measure, with "shared values and rules for social conduct including trust and civic responsibility" as its central notion (Iyer, Kitson, and Toh, 2005: 1016). As such, it relies on horizontal and associative networks, which generate trust and strengthen the productivity of a community.

The third notion is *network embeddedness*, which is rooted in network theory and social network analysis. The higher the network embeddedness of a region is (i.e. of organisations located in that region), the more this will increase the information and knowledge access and exchange potential within the network, which in turn may create competitive advantages when it comes to the formation and conditioning of new collaborations and alliances (Wanzenböck et al., 2014; see also Gilsing et al., 2008; Maggioni and Uberti, 2005). Network embeddedness refers to the notion of centrality in social network analysis (SNA) literature. With vertices having a more prominent and central position in the network, it is more likely to benefit from network advantages than actors who have a more distant, peripheral position in the network (Wanzenböck et al. 2014; see also Wasserman and Faust, 1994).

## 2. MAPPING AND REGRESSION ANALYSES

### 2.1. Introduction

The goals of the mapping and regression analyses were to assess to which extent regions have participated in the FP7 NMBP programme, in comparison to regional endowments, and to discover any patterns of regional under- or over-participation. Table 1 presents the total number of funded projects in the NMBP areas of FP7. The observed participation in the FP7 NMBP programme was later compared to an expected participation rate, which was calculated with the help of a regression analysis based on the strength of NMBP technologies, as well as on other determinants of the region.

**Table 1: Number of projects per field of technology<sup>7</sup> in the NMBP area of FP7**

Field	Projects	Share
Nanoscience and Nanotechnologies	203	23.0 %
Materials	196	22.2 %
New Production Technologies	251	28.5 %
Integration	101	11.5 %
Biotechnology	131	14.9 %
<b>Total</b>	<b>882</b>	<b>100.0 %</b>

The mapping and regression analyses allow to understand how NMBP participants are embedded at regional level (mapping analysis) and how the actual realisation rate of participating in EU funding contrasts with the level of expected participation, based on a set of indicators that were selected for this project (regression analysis). The same methods of analysis were applied for each of the four NMBP areas.

### 2.2. Mapping analysis: Spatial distribution of FP7 NMBP project participation

A first set of findings pertains to the basic structure of the funding programme. On average, each of the 276 regions of the EU-28 Member States at NUTS-2 level have participated in 31 FP7 NMBP projects, and received €12.72 million in funding over the period 2007-2014 (this is the arithmetical average per region, meaning that each project can be counted several times depending on the number of regions where the partners are located)<sup>8</sup>.

The top ten most participating countries in terms of representation in projects were as follows: 85% of the projects had at least one participant from Germany, followed by the United Kingdom (62%) and Italy (60%). Participants from Spain and France were represented in 56% and 52% of NMBP projects, respectively. They are followed by the Netherlands (38%), Belgium (34%), Sweden (26%) and Denmark (21%).

The location distribution of total project participants follows a similar pattern to that of project participation. The country which delivered most participants is Germany (17%). Spain, Italy and the UK, all at the same level, delivered the second highest share of participants (each with 9%). 8% of participants were located in France and 5% in the Netherlands. Belgium and Switzerland each housed 4% of participants, and Sweden rounded off the top 10 with 3%. The remaining 32% of participants were spread across a wide range of European and extra-European countries.

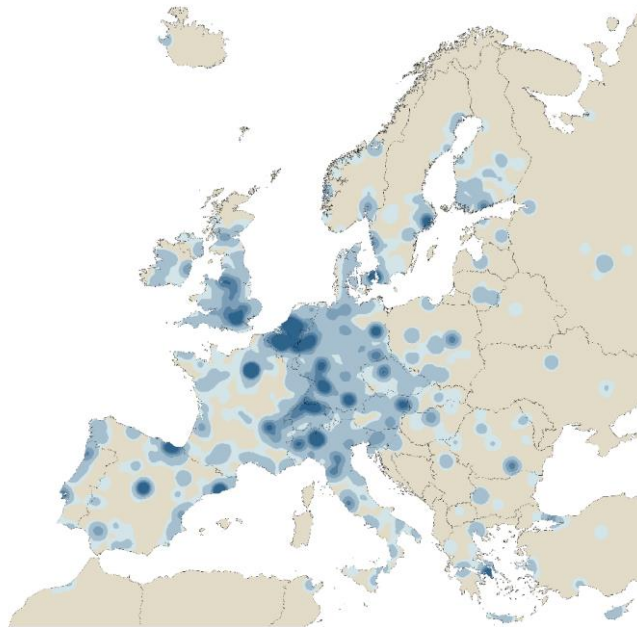
Figure 22 visualises how the projects participants are distributed geographically. While project participants are spread across Europe – and, while not displayed in the figure, also the rest of the world – they are especially clustered in the United Kingdom, Belgium, the Netherlands, France, Germany, Northern Italy, and Northern Spain. Other ‘hotspots’ can be observed in capital regions (mainly Île de France, Madrid, London, etc.).

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<sup>7</sup> In the rest of this report, Integration projects have been distributed to the other fields according to project content. New Production Technologies include Public-Private Partnership projects.

<sup>8</sup> This calculation only considers NUTS-2 regions in the EU-28. The average has been calculated as the mean of total project involvement and total funding received between 2007 and 2014 over all EU-28 NUTS-2 regions





**Figure 2: 'Heat map' of FP7 NMBP project participants**

**Table 2: Number of project participants by region and technology**

Nanoscience and Nanotechnologies				Materials			
	Region	Name	# projects	Region	Name	# projects	
1	FR10	Île de France	43	FR10	Île de France	46	
2	ES51	Catalonia	35	ITC4	Lombardy	42	
3	FR71	Rhône-Alpes	29	ES51	Catalonia	37	
4	ES30	Community of Madrid	25	ITC1	Piedmont	32	
5	DE30	Berlin	25	ES30	Madrid	28	
6	SE11	Stockholm	24	DE21	Oberbayern	27	
7	ITC4	Lombardy	23	FR71	Rhône-Alpes	27	
8	ITC1	Piedmont	22	ES21	Basque Country	25	
9	DE21	Oberbayern	19	DEA2	Cologne	25	
10	ES21	Basque Country	19	DEA1	Düsseldorf	24	
New Production Technologies				Biotechnology			
	Region	Name	# projects	Region	Name	# projects	
1	ES21	Basque Country	80	FR10	Île de France	32	
2	ITC4	Lombardy	67	ES51	Catalonia	22	
3	FR71	Rhône-Alpes	60	UKH1	East Anglia	20	
4	FR10	Île de France	52	ITC4	Lombardy	19	
5	ITC1	Piedmont	51	FR71	Rhône-Alpes	19	
6	EL30	Attica	49	NL33	South-Holland	19	
7	ES51	Catalonia	45	ES30	Community of Madrid	18	
8	DE11	Stuttgart	44	DK01	Hovedstaden	17	
9	DEA2	Cologne	37	AT13	Vienna	17	
10	DE21	Oberbayern	36	BE23	East Flanders	17	

Note: Calculation based on EU-28 countries

Table 2 provides a field-specific view of project participants' distribution, through a list of the ten regions which housed the majority of project participants for each technology<sup>9</sup>. The top ten regions in each field are all in Western European regions, mainly France, Germany, Spain, and Italy. The regions which are in the top ten in all four fields include Catalonia (Spain), Lombardy (Italy), and Rhône-Alpes (France). Other regions which return multiple times are the Community of Madrid (Spain), Oberbayern (Germany), Basque Country (Spain), Piedmont (Italy), Île de France (France), and Cologne (Germany).

Another aspect of interest concerns the nature of the participating organisations. Table 33 reports each relevant share of organisation types, among participants of FP7 NMBP projects. The largest group includes Small and Medium-sized Enterprises (SMEs), which comprised 41.9% of participants, immediately followed by large enterprises. 673 higher education institutes were also involved (13%), as well as 551 research institutes and 368 organisations, which did not fall into any of the categories mentioned above.

**Table 3: Organisation types of project participants**

Organisation Type	Count	Share
Small and Medium Enterprises	2,167	41.9%
Large Enterprises	1,212	23.5%
Higher Education Institutes	673	13.0%
Research Institutes	551	10.7%
Others	368	7.1%
N/A	197	3.8%
Total	5,168	100.0%

Note: Calculation based on EU-28 countries

Table presents the top ten regions in terms of number of project participants of each type. Some marked differences exist. First, the number of higher education institutes is much less dispersed than in the other categories: the most intense region with higher education institutes has ten organisations which have participated in projects (Southern and Eastern Ireland), while the most intense region in terms of large enterprises (Île de France) hosted 55 project participants. Second, French, Spanish, Italian, and German regions are listed most often. This is strongly the case for large enterprises, which are only located in regions from these countries, but not as much for higher education institutes, which are also located in Irish and British regions. Regions which host the most participating SMEs are also located in Greece and in the Netherlands. For research institutes, regions in Romania and Czech Republic are among the top 10.

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<sup>9</sup> The information provided in tables 2-6 is focused only at EU-28 regions, as the focus of the project as per the specifications was at EU-28 only and the input database didn't include sufficient data for projects partners from outside the EU on NUTS 2 level.



**Table 4: Project participants by region and organisation type**

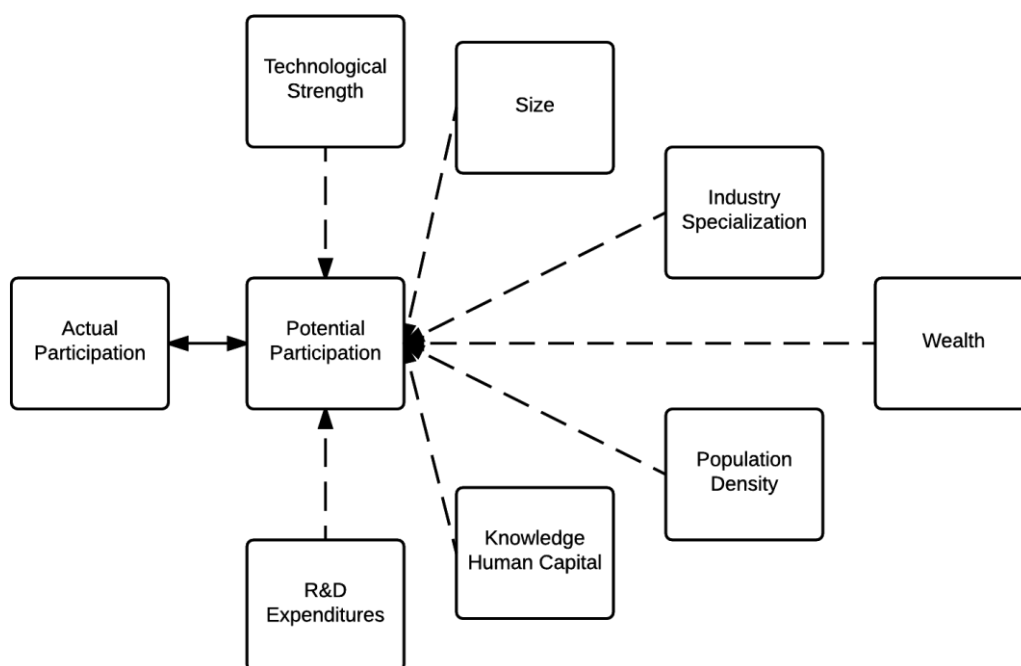
Higher Education				Small and Medium Enterprise		
	Region	Name	# projects	Region	Name	# projects
1	IE02	Southern and Eastern Ireland	10	ITC4	Lombardy	56
2	UKI1	Inner London	10	FR71	Rhône-Alpes	52
3	ES61	Andalusia	9	ES21	Basque Country	48
4	FR71	Rhône-Alpes	9	ES51	Catalonia	56
5	DEA2	Cologne	8	ITC1	Piedmont	42
6	FR10	Île de France	8	EL30	Attica	39
7	ES51	Catalonia	7	DE21	Oberbayern	36
8	ES30	Community of Madrid	7	DEA2	Cologne	33
9	ITC4	Lombardy	7	FR10	Île de France	32
10	DE21	Oberbayern	6	NL33	South Holland	30
Large Enterprise				Research Institute		
	Region	Name	# projects	Region	Name	# projects
1	FR10	Île de France	55	ES51	Catalonia	21
2	ES21	Basque Country	37	FR10	Île de France	20
3	ITC4	Lombardy	32	ITC4	Lombardy	16
4	ITC1	Piedmont	31	FR71	Rhône-Alpes	15
5	ES30	Community of Madrid	28	ES21	Basque Region	14
6	DEA1	Düsseldorf	27	ES30	Community of Madrid	12
7	DE11	Stuttgart	25	CZ01	Prague	12
8	ES51	Catalonia	22	RO32	Bucharest - Ilfov	10
9	DE21	Oberbayern	22	ITI4	Lazio	10
10	DE71	Darmstadt	21	DE30	Berlin	10
Other						
	Region	Name	# projects			
1	BE10	Brussels-Capital Region	22			
2	FR10	Île de France	11			
3	ES30	Community of Madrid	8			
4	ITC4	Lombardy	7			
5	DE30	Berlin	6			
6	SE11	Stockholm	6			
7	ITH5	Emilia-Romagna	6			
8	SI02	Western Slovenia	6			
9	DE71	Darmstadt	6			
10	FI1B	Helsinki-Uusimaa	6			

Note: Calculation based on EU-28 countries

### 2.3. Regression analysis: Realised versus expected performance

Having mapped the origin and type of participants of the FP7 NMBP projects, the question arising is whether regions realise their potential. That is, do participants from a given region attract as much funding as it would be expected considering the characteristics of the region (wealth, size, and technological and scientific strength)? For this purpose, we compared in this section the participation rate of a region – how much funding was received by project participants in that region – with an expected participation rate.

We estimated the latter through a statistical model which relates the actual funding received to a set of regional characteristics. The results of this estimation procedure were then used to calculate a potential participation rate for each region. The comparison of expected and actual participation rates provides an indication of which regions have participated more, and which less in the FP7 NMBP programmes, as compared to their regional endowments. Figure 3 summarises the factors taken into account in the analysis.



**Figure 3: Overview of factors that determine the potential participation**

The analysis was based on the notion that project participation is, in part, determined by regional endowments in terms of wealth, human capital, R&D capabilities, and other factors. This was based on the following set of assumptions:

1. Technological strength: regions which house actors that have more prior experience in the NMBP fields are more likely to receive funding, as a result of more applications or a higher success rate of applications;
2. R&D expenditures: regions with higher degrees of R&D spending are more likely to be home to firms and organisations, which are active in R&D in general, and in the knowledge-intensive NMBP fields in particular, which results in more applications;
3. Regions associated with a great knowledge capital and that have a large supply of highly educated human capital, have more capacity to host actors in knowledge-intensive fields like NMBP.

Beyond the main three factors outlined above, also broader differences in wealth and population were taken into consideration, as they might influence the participation

through various direct and indirect channels. For example, national differences in wealth, which accounts for any skewness in the distribution of funds towards wealthier or less wealthy nations, were taken into account. National differences in experience with European funding were estimated from the time the country has entered the European Union: countries which have been Member States for a longer time might have more developed national support structures, which could lead to higher success rates for applicants. The year effects were included to account for any systematic fluctuation in grant rates. The variables used in the recession analysis are presented in Table 5.

**Table 5: Variables used in regression analysis**

Concept	Measure
<b>Technological strength</b>	
	NMBP patent applications per million employees
	Nanoscience and Nanotechnologies patent applications per million employees
	Materials patent applications per million employees
	New Production Technologies patent applications per million employees
	Industrial Biotechnology patent applications per million employees
<b>R&amp;D Intensity</b>	
	Business R&D expenditures (share of GDP)
	Government R&D expenditures (share of GDP)
	Higher Education R&D expenditures (share of GDP)
<b>Knowledge capital</b>	
	Share of population with tertiary degree
	Share of labour population employed in science and technology
<b>Wealth</b>	
	Regional GDP (million EUR)
	Regional GDP per capita (EUR)
<b>Size</b>	
	Population density (inhabitants / km <sup>2</sup> )
<b>National Characteristics</b>	
	National GDP (million EUR)
	Time since entry into the European Union

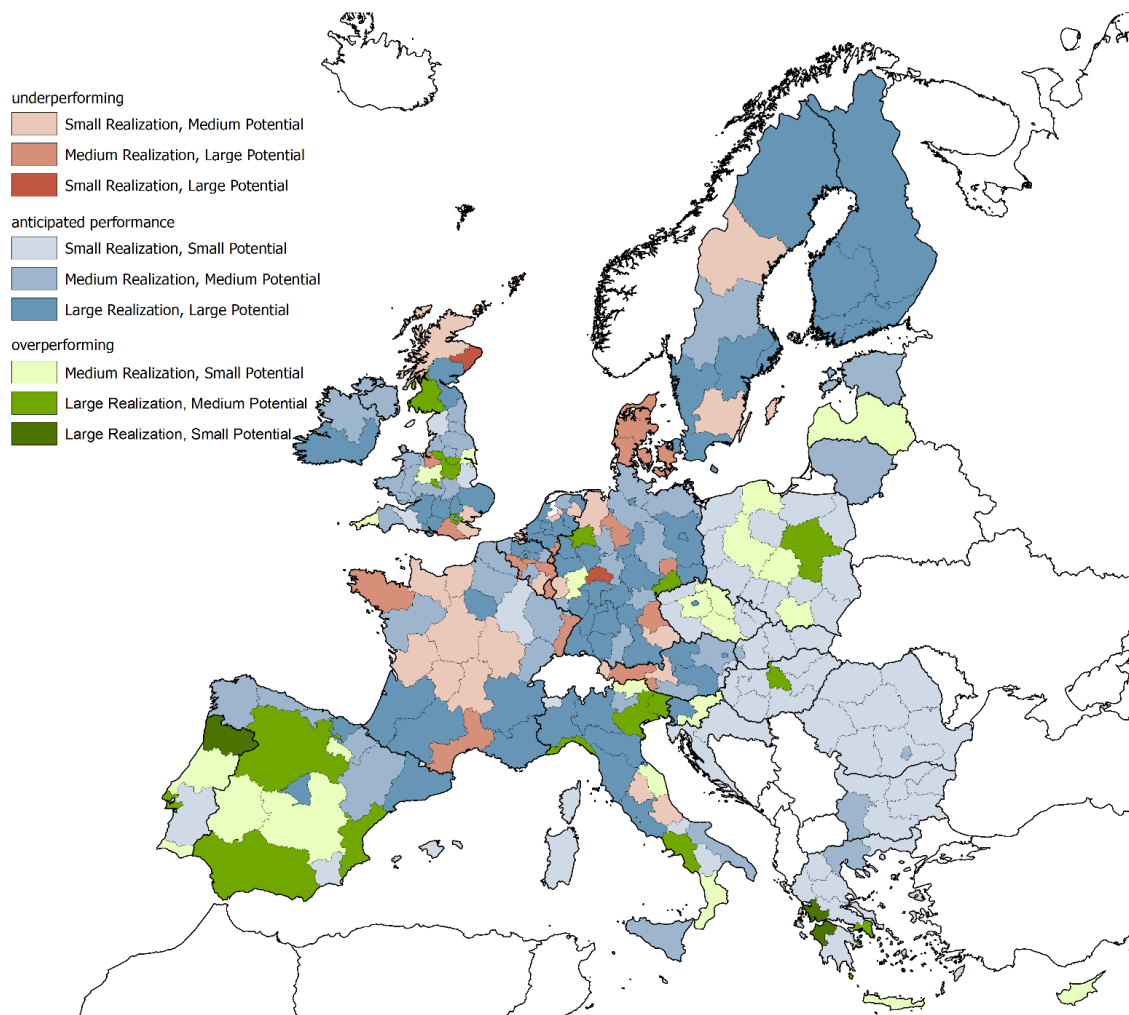
**Notes:** Information from Eurostat, unless stated otherwise. Technological strength indicators based on internal calculations by ZEW. NMBP patent applications: EPO and PCT priority applications. General model takes all NMBP patent applications into consideration, model by field with only patent applications relevant for that field. Industry specialisation index: sum of squared deviations from EU-28 averages of employment intensities along NACE sectors. All variables are of a period of three years, except from the time of entry into European Union.

The results of the regression analysis confirmed that factors such as patenting in NMBP fields, regional GDP, Business, Government, Higher Education, and R&D intensities positively relate to the participation in NMBP funds. However, there is a weak and negative relation between participation and national GDP, conditioning another variable; less wealthy or smaller countries are more likely to receive funding. These results are coherent across the various NMBP areas.

The main results of this exercise can be visualised in the form of maps, which present for each region whether its potential and realisation is small, medium, or large<sup>10</sup>. Figure 4 displays the results taking into account projects from all NMPB fields. It can be observed that the vast majority of regions confirmed the expectations: realisations tend to be small when potential is estimated to be small, and so on. Nevertheless, some regions deviate from the expected. For instance, the Portuguese Northern region and the Western Greek region showed large realisations even though their potential was estimated to be small.

Figure 4 presents the comparison between the actual realisation rates and the expected realisation rates of the EU-28 NUTS 2 regions.

<sup>10</sup> Regions whose realised participation was below the 33th percentile were labelled as "small". From the 33th up to the 66th percentile was labelled as "medium", and above the 66th percentile as "large". The labels are analogous for potential participation.



**Figure 4: Realised vs. Potential participation in FP7 NMBP projects**

Table 3 provides more information on regional performance by technology through the top 10 regions which received most EC contribution for NMBP projects in each field.

**Table 3: Top 10 regions in terms of EC contribution by technology field (million €)**

Nanoscience and Nanotechnologies				Materials			
Region Name		EC Contrib.	Region Name		EC Contrib.		
1	FR71 Rhône-Alpes	21.6	ES51 Catalonia	22.3			
2	SE11 Stockholm	21.3	FR71 Rhône-Alpes	22.0			
3	FR10 Île de France	21.0	FR10 Île de France	20.0			
4	IE02 Southern and Eastern Ireland	20.3	ES21 Basque Region	18.6			
5	FI1B Helsinki-Uusimaa	18.4	ITC1 Piedmont	18.1			
6	ES51 Catalonia	17.2	DEA2 Cologne	17.8			
7	DK01 Hovedstaden	17.0	NL41 North-Brabant	16.9			
8	ES30 Community of Madrid	16.2	ITH5 Emilia-Romagna	15.6			
9	NL41 North Brabant	15.8	NL33 South-Holland	15.2			
10	DE21 Oberbayern	15.7	DE21 Oberbayern	15.2			
Biotechnology				New Production Technologies			
Region Name		EC Contrib.	Region Name		EC Contrib.		
1	NL22 Gelderland	28.3	ES21 Basque Country	65.6			
2	DK01 Hovedstaden	27.8	DE11 Stuttgart	55.5			
3	BE23 East Flanders	19.9	ITC4 Lombardy	49.3			
4	ES30 Community of Madrid	18.0	DEA2 Cologne	40.8			
5	FR10 Île de France	17.0	FR71 Rhône-Alpes	39.3			
6	FI1B Helsinki-Uusimaa	12.1	ITC1 Piedmont	36.6			
7	IE02 Southern and Eastern Ireland	11.8	ES30 Community of Madrid	29.8			
8	NL33 South-Holland	11.2	EL30 Attica	24.6			
9	UKH1 East Anglia	10.8	NL33 South-Holland	24.2			
10	DEA2 Cologne	10.1	DE21 Oberbayern	22.4			

Note: Calculation based on EU-28 countries

## 2.4. Summary

The mapping of participants in FP7 NMBP projects revealed some generic findings on the regional dimension of the NMBP programmes:

- Analyses demonstrated that participants in FP7 NMBP projects were spread throughout Europe (and the world), but most of the participants came from existing industrial hubs, especially in western Europe. This pattern of participation is very similar across the different fields of technology and participant organisation types.
- Further analysis revealed that most regions have participated in the NMBP programmes as much as what would be expected according to their participation potential: regions with more R&D resources tend to participate more. However, significant over-participation and under-participation is still an issue. There are over-participating and under-participating regions in all parts of Europe and on top of this, there are examples of regions over-participating in one NMBP discipline, while under-participating in another.
- Participants from larger EU Member States are found in most NMBP projects consortia. Participants from Germany were represented in 85% of projects, followed by the participants from the United Kingdom, Italy, France and Spain. Among medium-sized EU Member States, participants from the Netherlands, Belgium, Sweden and Denmark were represented in a significant share of projects.
- The regional pattern of participation is very similar across the four fields of technology. There are also no significant differences in the regional pattern by type of organisation.
- This regional participation pattern follows largely the regional resources that support the participation in the NMBP programmes. Regions with high potential in terms of R&D capacities and specialisation on NMBP fields have participated more intensively in the NMBP programmes than regions that lack such resources.
- Nevertheless, there are several regions in Europe that have participated either to a larger or to a smaller extent than one would expect given their regional potential. However, we cannot establish a clear rule explaining the over- or under-participation of a specific region. Each regional situation depends on its own specificities that are analysed in the following chapter.

### 3. NETWORK ANALYSIS

#### 3.1. Introduction

The network analysis conducted focused on the question how FP7 NMBP project participation and collaboration have taken shape, measured by their overall totals and by their distinct constituent fields: Nanosciences and Nanotechnologies (N), Materials (M), New Production Technologies (P), and Biotechnology (B). It specifically addressed the patterns of collaboration that can be distinguished, both in geographic terms as in terms of type and composition. Project collaborations can take place at regional level – pointing at a certain degree of regional embeddedness – but in many cases they go much beyond the regional level, reaching national, European and even global level. The resulting analysis of network relationships has been done both at overall programme and sub-programme levels.

This chapter addresses the main network analysis results in terms of revealed mapping patterns and quantitative bearing, using social network analysis (SNA). The results of the overall network analysis show how NMBP actors are connected to other partners inside and outside their regions, highlighting different characteristics.

#### 3.2. Project collaboration and networking in NMBP

Network analysis provides us with a broad picture on how NMBP participants are connected, at regional, national, European and global level, and allows us to compare the number and relative size of project collaborations in the FP7 NMBP programme within and between European regions at NUTS-2 level. For each of the four NMBP areas an analysis was performed of both inter-regional (between NUTS-2 regions) and intra-regional (within a NUTS-2 region) collaborations between project participants. Furthermore, for each NMPB area, a top-10 of regions with the highest number of project-partner combinations was compiled, both for inter-regional and intra-regional collaborations.

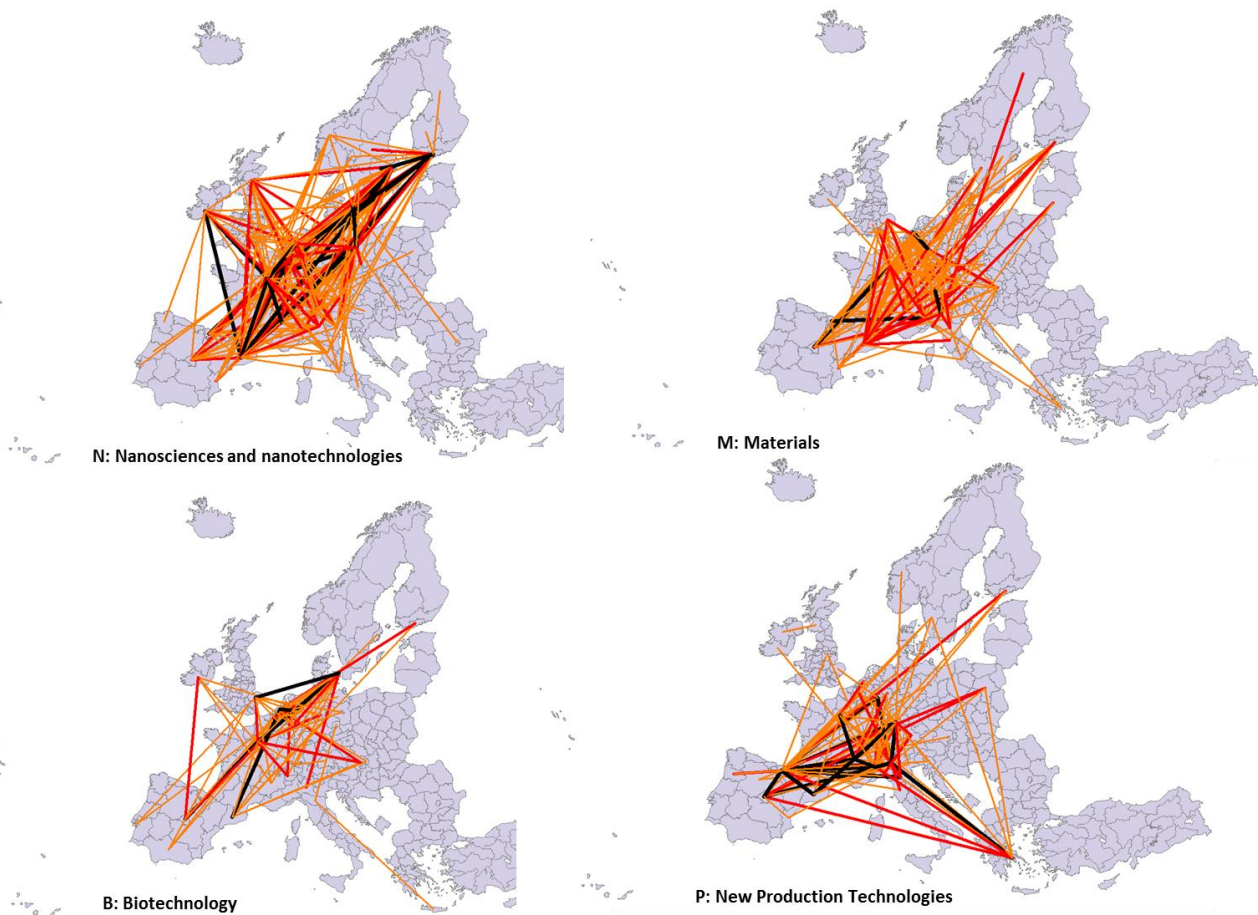
##### Inter-regional collaboration

When looking all inter-regional FP7 project collaborations in each of the NMBP domains in Europe what first strikes the eye in all four cases is a very dense pattern of collaboration. Project collaboration in Nanosciences and Nanotechnologies appears well-spread across Europe, with different hot spots of collaborative activity throughout Europe, both in the Western EU-15 countries (the United Kingdom and Ireland, France, Italy, Germany and Scandinavian countries) and in the Eastern “new Member States” (Hungary, Czech Republic). For Materials, most collaborations appear to take place in EU-15 (France, Belgium, Netherlands, Germany, Italy, Spain, United Kingdom and Scandinavian countries). For New Production Technologies topic, a slightly different pattern emerges, overall similar to the Materials one, but also with Greece playing an important role. And last, for Biotechnology, collaboration patterns appear to be concentrated in EU-15 (France, Germany and Northern Spain), tilting towards the United Kingdom and Ireland and the Netherlands, Belgium, Denmark, Sweden and Finland.

The core of activity is shown in Figure 5, representing *core pair regions*, i.e., those regions that have ten or more project collaborations with each other. The density of collaboration in the Nanosciences and Nanotechnologies domain is higher: Although most of the European regions can claim at least one project, the core pair regions representing the highest density of project collaborations can be found on an axis that starts from Northern Spain and goes all the way up to Finland and Sweden, covering France, Belgium, the Netherlands and Germany, with sizeable collaborations stretching westward (in particular Ireland, but also the United Kingdom) and eastward (Austria, Italy, and Eastern European countries). Whereas the density of collaborations in Materials is high - like in Nanosciences and Nanotechnologies - the outer regions are relatively more involved in Materials projects. The core pair regions for Materials topic are found on axes that start from Northern Spain going up to Finland and Sweden, and from the United Kingdom to Germany and Italy. In Biotechnology, the collaboration density between pairs of regions with more than ten projects is mostly concentrated in EU-15 countries. Inter-



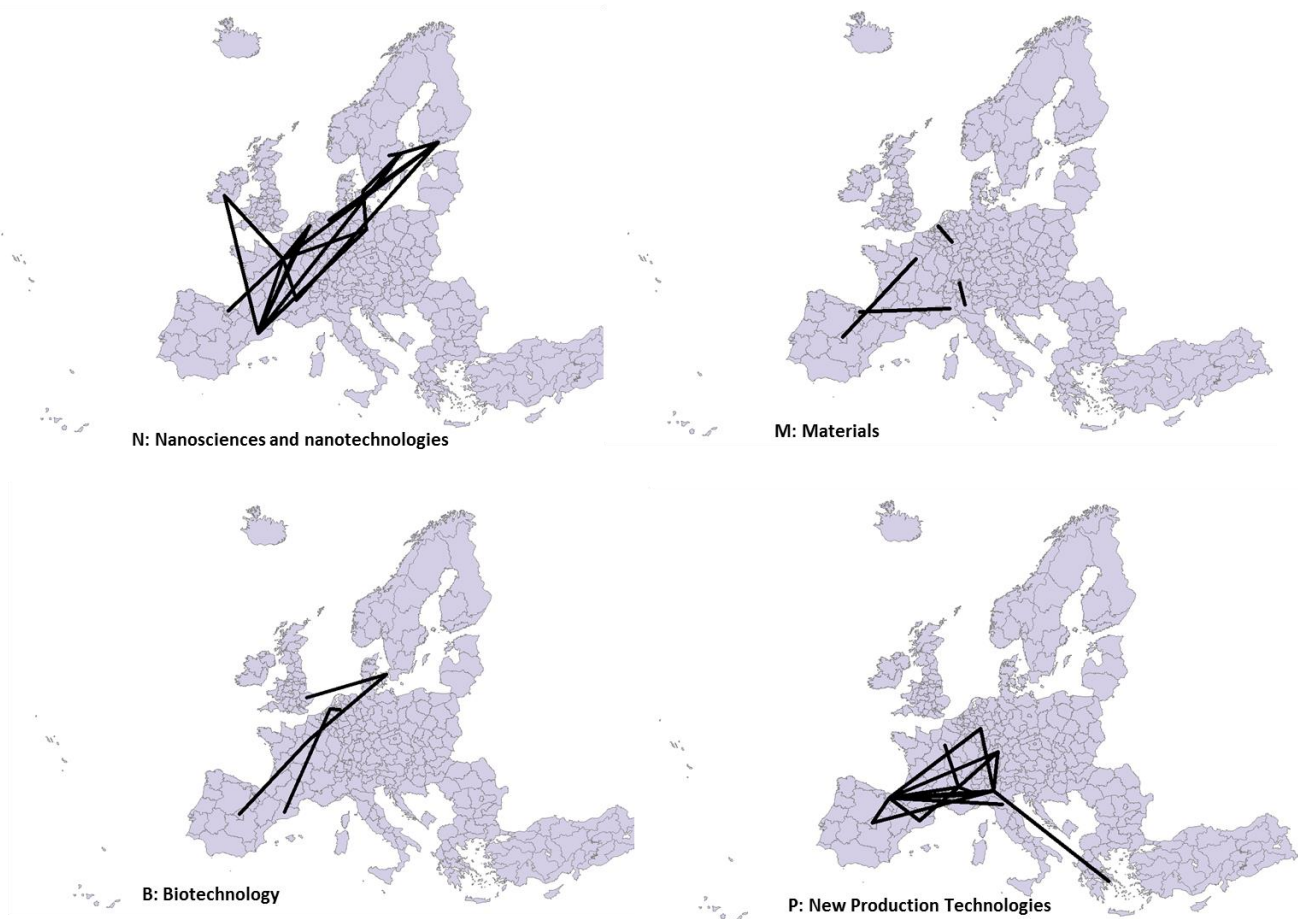
regional collaborations in the New Production Technologies area are densest, even if Figure 5 at first sight might signal something different. Note that the density in the New Production Technologies graph is at least a factor of two bigger than in the other three NMBP areas.



**Figure 5: Network graphs representing  $\geq 10$  project collaborations in NMBP\***

\*Caption: collaboration density by NMBP area. Please note that the lines in the New Production Technologies case, represent different collaboration densities (orange: 10-19; red: 19-30; black:  $\geq 40$  collaborations).

Figure 6 shows the core pair regions with the highest density of project collaborations. For Nanosciences and Nanotechnologies, twenty or more collaborations can be found on the axes that start from Northern Spain and go all the way up to Finland and Sweden, covering France, Belgium, the Netherlands, and Germany, with sizeable collaborations stretching westward (in particular Ireland, but also the United Kingdom) and eastward (Austria, Italy, and Eastern European countries). For Materials, the most intensive project collaboration of twenty or more collaborations can be found only between four pair regions on the axis Northern Spain – Paris, Northern Spain – Northern Italy, Northern Italy/Belgium – the Netherlands. In Biotechnology, the number of pair regions with more than twenty project collaborations is also very low and confined to the axes Northern Spain via France to the Netherlands, the United Kingdom and Denmark. Last but not least, Figure 6 shows that for New Production Technologies pair regions with more than forty project collaborations, are predominantly found in Western Europe (EU-15 countries), with axes that go from Northern Spain and France to Germany, Northern Italy and Greece.



**Figure 6: Network graphs representing  $\geq 20$  project collaborations in NMBP\***

\*Caption: Collaboration density by NMBP area. Please note that the lines in the New Production Technologies case represent a collaboration density of  $\geq 40$ .

When we analyse which NUTS-2 regions have most inter-regional project collaborations in each of the NMBP areas, a certain number of regions qualifies on more than one top 10 lists. As Table 6 shows, this stands for the region of Paris (Île de France), the Basque Country, Rhône-Alpes, Lombardy, South and Eastern Ireland, and the regions of Copenhagen (Hovedstaden), Madrid, Catalonia, Cologne, Vienna, and Helsinki. This not only points at a concentration of collaborative activity around a limited number of NMBP European hubs, but also suggests similar patterns of specialisation in these hubs – at least at high aggregate level – which attracts substantial collaboration with other regions. It is clear that these NMBP hubs act as magnets for collaboration and as the ‘glue’ for innovative activities in NMBP. This does not intend to state that the other regions listed in Table 6 have not a similar function.

The difference in project-partner combinations between the number one region in New Production Technologies (the Basque Country) and the number one region in each of the remaining three domains is striking, with the first having almost three times as many project-partner combinations than the number one in Materials (Île de France) and in Biotechnology (Copenhagen region). This also holds for the *spread*<sup>11</sup> between the number one and ten on each of the rankings. In Nanoscience and Nanotechnologies, and in Materials this is relatively limited. In Biotechnology, but especially in New Production Technologies, the spread is more pronounced.

<sup>11</sup> Spread is a measure of how far the numbers in a data set are away from the mean or median.



**Table 6: Top 10 regions with most interregional project-partner combinations**

Region	Number of project-partner combinations	Percentage of collaborations with outside the EEA	HEI	SME	Enterprise (not SME)	Research institute	Other	Missing	Total
<b>Nanosciences and nanotechnologies</b>									
Île de France	981	9.90%	4	6	11	9	13	0	43
Catalonia	872	11.20%	7	0	13	11	4	0	35
Helsinki-U	865	10.20%	1	2	4	5	6	0	18
Berlin	852	14.40%	2	2	5	14	1	1	25
Utrecht	805	8.30%	1	3	4	1	1	1	11
Stockholm	792	13.90%	3	2	3	11	5	0	24
Hovedstaden	749	7.50%	2	0	4	5	4	1	16
East Scotland	666	15.20%	3	0	0	4	0	0	7
S&E Ireland	658	10.60%	7	2	0	4	2	1	16
Rhône-Alpes	654	9.30%	5	3	9	7	5	0	29
<b>Materials</b>									
Île de France	730	10.40%	5	8	21	9	3	0	46
Piedmont	716	9.80%	3	12	10	3	2	2	32
Catalonia	714	11.20%	2	15	7	13	0	0	37
Cologne	590	16.40%	4	11	5	3	2	0	25
Madrid	578	15.60%	6	3	8	7	2	2	28
Rhône-Alpes	576	11.80%	3	16	2	4	2	0	27
Lombardy	572	18.40%	4	21	8	8	0	1	42
Helsinki-U.	559	9.30%	1	5	2	5	2	0	15
Basque Country	549	13.50%	1	8	8	6	2	0	25
Vienna	531	9.40%	3	5	4	3	3	0	18
<b>Biotechnology</b>									
Hovedstaden	751	15.30%	3	3	4	1	4	2	17
Gelderland	712	18.30%	2	0	9	2	2	0	15
Île de France	670	11.50%	10	1	9	0	4	8	32
O-Vlaanderen	555	13.90%	1	2	7	3	1	3	17
South-Holland	542	15.90%	4	2	9	0	2	2	19
Madrid	530	12.10%	5	2	6	1	1	3	18
Cologne	449	16.90%	3	1	3	1	4	2	14
East Anglia	436	17.20%	2	1	9	2	2	4	20
Vienna	405	9.40%	3	2	6	0	4	2	17
Lombardy	387	11.10%	4	0	5	2	5	3	19
<b>New Production Technologies</b>									
Basque Country	2423	8.90%	2	29	9	23	1	3	67
Lombardy	1926	7.50%	3	28	4	14	5	2	56
Stuttgart	1759	5.30%	2	14	6	13	3	2	40
Piedmont	1600	6.40%	2	24	2	18	2	2	50
Rhône-Alpes	1525	6.60%	5	27	9	10	1	0	52
Madrid	1342	4.60%	3	9	2	16	3	0	33
Île de France	1263	4.50%	0	8	7	27	3	2	47
Attica	1256	5.50%	1	30	2	11	1	1	46
Cologne	1128	4.20%	4	17	4	6	1	4	36
Oberbayern	906	5.70%	3	12	5	14	0	1	35

Source: NMBP mapping project 2015

What is also interesting to observe is that in all NMBP areas, collaboration with project partners from outside the European Economic Area (EEA – the EU-28 countries plus Iceland, Norway and Liechtenstein) is intensive, being higher in Biotechnology and lower in New Production Technologies, the last markedly lower than in the other three NMBP areas. Strong international project involvement points at the global character of the NMBP field as a whole. When we compare the four NMBP areas, there is a striking

difference on the presence of firms (both SMEs and other) in NMBP projects and, hence, also in collaboration with a relatively large number of firms in New Production Technologies and Materials, but far less so in Biotechnology, and Nanoscience and Nanotechnologies. In Nanoscience and Nanotechnologies, company involvement is predominant from larger enterprises and large research institutes. Involvement from research institutes is especially high in New Production Technologies. Research institutes, predominantly the leading European research and technology organisations (RTOs), and universities tend to coordinate the NMBP projects, whereas companies, whether small, medium-size or large, follow in partnership. Biotechnology is the only one of the four NMBP domains where the involvement of research institutes is limited and where universities dominate.

### Intra-regional collaboration

Intra-regional collaboration is, from the point of view of regional embeddedness, even more important than inter-regional collaboration. Table 7 provides an overview of the top NMBP regions in terms of intra-regional collaboration.

**Table 7: Top regions with most intra-regional project-partner combinations**

Region	project-partner combinations	HEI	SME	Enterprise (not SME)	Research institute	Other	Missing	Total
<b>Nanosciences and Nanotechnologies</b>								
Stockholm	43	3	8	5	2	1	0	19
Île de France	32	3	4	6	9	5	0	27
Helsinki-Uusimaa	28	1	2	5	4	1	0	13
Catalonia	22	3	5	3	8	0	0	19
North Brabant	16	2	2	7	2	0	0	13
Berlin	14	2	7	0	4	1	1	15
Hovedstaden	14	2	3	2	3	0	0	10
<b>Materials</b>								
Lombardy	46	2	15	4	5	0	1	27
Catalonia	32	2	9	6	12	0	0	29
Rhône-Alpes	28	2	9	1	3	1	0	16
Piedmont	26	3	11	8	1	1	1	25
Île de France	18	3	4	12	4	2	0	25
Emilia-Romagna	18	2	6	2	3	1	0	14
Tuscany	18	1	7	0	1	0	0	9
Madrid	17	3	2	3	6	1	2	17
<b>New Production Technologies</b>								
Basque Country	119	1	32	24	9	2	3	71
Lombardy	68	2	20	16	3	2	2	45
Rhône-Alpes	67	5	15	9	7	1	0	37
Piedmont	54	2	17	16	1	2	3	41
Attica	45	2	24	10	2	1	1	40
Stuttgart	31	2	10	8	4	1	2	27
Île de France	27	0	4	18	5	3	0	30
Catalonia	26	1	5	5	4	1	1	17
Madrid	22	3	6	10	1	1	0	21
Cologne	21	1	9	5	3	0	4	22
<b>Biotechnology</b>								
Île de France	21	2	5	2	9	1	0	19
Hovedstaden	19	3	3	2	3	3	0	14
South Holland	19	2	8	2	2	1	0	15
Gelderland	18	2	8	0	2	0	2	14
Madrid	15	0	2	2	4	2	1	11

Source: NMBP mapping project 2015

In Nanosciences and Nanotechnologies, intra-regional collaboration is especially strong in the regions of Stockholm, Île de France, Helsinki-Uusimaa, Catalonia and North Brabant, all of which, with exception of North Brabant also appear in the overall collaboration top ten, albeit in a different order. Intra-regional collaboration in Materials is especially strong in the regions of Lombardy, Catalonia, Rhône-Alpes, Piedmont and Île de France. The Basque Country and Lombardy are the number 1 and 2, both in inter-regional and intra-regional collaboration in Materials. Intra-regional collaboration in Biotechnology is especially strong in the regions of Île de France, Copenhagen (Hovedstaden), South-Holland and Gelderland (both Dutch regions), Madrid, and Southern and Eastern Ireland, again all of which also appear in the overall top ten collaboration. Intra-regional collaboration in New Production Technologies is especially strong in the Basque Country, Lombardy, Rhône-Alpes, Piedmont and Attica.

The general conclusion and message is that a strong inter-regional collaboration goes together with strong intra-regional collaboration. It should also be noted, however, that intra-regional collaboration is weak in comparison to the overall share of intra-regional collaborations (i.e. projects-partner combinations) never exceeding the five percent threshold in terms of the total number of collaborations, and in most cases far below this. Although intra-regional collaboration exists, other collaborations at national, European and even international level are more frequent in NMBP.

Another main conclusion is that the European capitals like Paris, Helsinki, Copenhagen, Stockholm, Berlin, Madrid and Athens are strong NMBP hubs, which act as magnets in NMBP collaboration. The capital regions are joined by typical R&D hubs like North-Brabant (Eindhoven), the Basque Country (Bilbao), Rhône-Alpes (Grenoble), Stuttgart and Oberbayern (Munich).

## **4. REGIONAL CASE STUDIES**

### **4.1. Introduction**

The purpose of the regional case studies was to go beyond the overall mapping and regression and network analysis, and to expand analyses of specific cases to reveal patterns and structures of regional cooperation and embeddedness of the FP7 NMBP programme. It aims to show, on the one hand, how regional and local factors have (co)determined project content, the chances of winning projects and eventual success rates within the FP7 NMBP programme, and, on the other hand, how the results of NMBP projects impact the regional and local economy and society, in terms of innovation and improved competitiveness.

An important topic of the case studies is related to the patterns of collaboration, within and beyond the region, both geographically and in terms of type and composition. Do project participants predominantly collaborate with their peers or are project collaborations rather determined by triple helix-type considerations?

Those case studies were developed based on the results obtained from three data collection methods. This chapter builds on earlier project outputs, notably revealed mapping patterns based on social network analysis, the results of a multivariate regression analysis and a survey. Other data sources, like Eurostat, national statistical institutes or EC reports were also widely used. Additionally, partners conducted interviews with participants in EU projects, as well as civil servants working in the promotion of FP7 funds. Last but not least, six regional workshops were organised throughout the project.

Seven regions were selected for case-studies. These were: Walloon Brabant (Belgium), Cologne (Germany), South Sweden (Sweden), Lodz region (Poland), Basque Country (Spain), Central Hungary (Hungary) and Bucharest-Ilfov (Romania). The seventh case study from Romania was added to the initial plan of six case studies, as it was considered that the region represented an interesting case-study as a strong hub in an Eastern European country (or as they are often still referred to, a "new Member State"), with a strong track record of industrial presence and a relative high number of participations in FP7 NMP. However, in this case it has been proved difficult to access all the necessary information and no workshop could be organised within the time constraints of the project.

### **4.2. Criteria for the selection of these case studies**

Each case study focuses on a specific NUTS-2 region, being that the selection of which was based on the results of the Task 1 (mapping analysis) and 2 (network analysis and regression analysis), and a number of specific additional criteria.

The case studies focus on the regional level and aim to analyse and reveal patterns and structures of regional cooperation and embeddedness of NMBP projects and partner organisations, including universities, RTOs selected regional/local industry sectors, bearing in mind the overall project objective.

Based on an initial proposal and further discussion with the Steering Group created within the European Commission to support the study, the following criteria were chosen for the selection of region:

- NMBP participation of a region, in terms of the number of projects acquired and implemented, the size of FP7 funding, and the number of organisations in the region involved in FP7 NMBP projects.
- Participation performance of a region in NMBP as measured by the calculated difference between a region's estimated NMBP project potential and its actual NMBP project realisation, based on a given number of characteristics. Participation is measured for NMBP jointly and by single KET (N, M, B, P).
- Intra-regional and inter-regional patterns and intensity of NMBP partnering and collaboration, focusing on the patterns of NMBP project collaboration.

- Intrinsic regional NMBP characteristics, including technological capacity and presence of NMBP RD&I capacity in the region, the presence of NMP(+B)-based or related industries, and NMBP excellence in terms of being known as innovative and/or industrial leadership in the NMBP domain.
- Regional economic endowments including the degree of economic development of the region, the share of high-skilled labour, and the sector structure and composition of that region.
- NMBP strategy and ambition of the region, in terms of a regional strategy and actions to further developing NMBP potential or existing strengths, as revealed in the Smart Specialisation Strategy (S3) documented and/or cluster strategy; and, related, specific attention for emerging regions active in NMBP, especially in countries that have joined the European Union since 2004. This criterion is specifically intended to identify regions with ambition but (still) with relatively low levels of realisation.
- Overall (meta-)criterion: Adequate balance between the case studies in terms of NMBP specialisation and country coverage, *in concreto*, no more than one case study per country and an equal and balanced spread between the 4 NMBP domains.

From the regions that met the criteria above, the final decision was taken into account the factor of “realised vs. potential EC contribution to FP7 NMBP projects”, in line with Table 8.

**Table 8: List of regional case studies and rational for selection**

Front-running Multi-KETs region High realisation, High potential	Overachieving Multi-KETs Region High realisation, Low or medium potential	Underperforming Multi-KETs Region Medium realisation, High potential	Performing as expected Medium realisation Medium potential
Basque Country (ES21)	Lodz (PL11)	Walloon Brabant (BE31)	Bucharest-Ilfov (RO32)
Cologne (DEA2)	Central Hungary (HU10)		
South Sweden (SE22)			

On this list, three regions were considered as front-runners with both very high realisation rates and very high potentials. These are the Basque Country, the Cologne region and South Sweden. The Lodz region and Central Hungary were selected as they were overachieving: Despite medium or low potentials, these two regions achieved large participation rates. As opposed to the two previous regions, Walloon Brabant was selected as it was an underperforming region despite a high potential and innovative industries in this field - Walloon Brabant “only” achieved a medium realisation rate. Last but not least, Bucharest-Ilfov was added as it was achieving the medium level we could expect.

These regions were selected at NUTS-2 level. Nevertheless, in the analysis of the situation in which the regions operate, information that came from the Member States was also analysed, and, for the federal states, also policies and work of the corresponding political regions that have impact on the analysed NUTS-2 level. This was the case of Walloon Brabant or Cologne where policies or instruments from the Walloon region and North Rhine-Westphalia played a role.

For each region, the first step was a more detailed analysis of the results of the mapping, regression and network analysis developed under this project. The information was then complemented by a further qualitative analysis based on some economic and political information from the region to know the policy structure, the key economic strengths and the supporting structures (NCP and EENs mainly). Then the research data was complemented by 54 interviews, a survey with 2300 respondents and six regional workshops with the participation of 45 local and regional actors.

### **4.3. Typology**

FP7 projects were mainly located around important industrial, economic and cultural hubs where scientific excellence can thrive, but the situation is more complex and diverse than this first assumption. This section will further explore this situation.

Several typologies could be drawn from the case studies:

- Typology of project participation
- Typology of participation level
- Typology of intra-regional participation
- Typology of impact

#### **Typology of project participation**

Based on the conducted study, it can be concluded that the most typical project participant is a one-timer from EU-15 who is participating without partners from the same region.

Most project participants are one-timers but most projects involve very experienced project partners. On average, each of the 5,336 participants mapped for this study participated in 2.3 projects. Indeed, 69% of project participants have been involved in only one FP7 NMBP project, but 11% of the most active participants have been involved in almost half of projects.

#### **Typology of participation level**

To draw the typology of participation level in FP7 NMBP programme, we could rank each region in three categories: the low performers, the medium performers and the high performers.

As demonstrated by the mapping analysis, the great majority of project participations are located around big hubs that are often strong industrial hubs, important economic and/or research hubs. Those hubs are mainly from capital regions or large urban centres. But what differentiates a medium performing region from a high performing region?

The main reason can be found in the high performing participants. The regions with a very high participation rate (Basque Country, Stockholm, several regions of the Netherlands and Germany, etc.) are regions that are not only important industrial and research hubs but that also have important organisations with reputation, quality and capabilities that allow them to participate in several projects, being this what brings the success rate of the region at a higher level.

The other key reason for the high performance of a specific region relates to the high specialisation of actors in that region. This is, for example, the case of Basque Country, a region with high specialisation, particularly in the area of New Production Technologies, or South Sweden, specialised in Nanosciences, Nanotechnology and Biotechnology.

#### **Typology of intra-regional participation**

The main rationale to create EU consortia for projects relates to the quest for excellence and high quality collaborations from all over Europe. Regarding the question "*What are the reasons for cooperating with partners in FP7 NMBP projects?*", the most quoted answers by far are "scientific excellence" (76%), "partner complements our capabilities and competences" (73%) and "Networking and exchange of ideas" (70%).

Important intra-regional cooperation can be mainly seen in regions with a large number of lead actors in the field, such as Île de France, Madrid, Stockholm or in regions that have a networking tradition for a long time. This can be seen hereafter with the case of the Basque Country.

#### **4.4. Main results from the case study on Basque Country**

The Basque Country (País Vasco, NUTS-2-ES21) is an important economic centre and one of the most important industrial hubs in Spain. The Basque region is the third largest participant in FP7 NMBP projects in Europe, and the first in Spain. This positive situation can be mainly explained with the specialisation of the region in NMP related fields, in particular the new production technologies, and with the important role of research centres and enterprises.

The main industrial sectors in the Basque economy are machinery, aeronautics and energy. New technologies and other sectors related to research and development (R&D) are growing in size, and the R&D expenditure in the region represented 2.12% of the Basque GDP in 2012, slightly higher than the EU-27 average of 2.06%, and higher than the Spanish average of 1.30%.

The region is very successful when it comes to attract FP7 NMBP projects. According to our regression analysis, this is a region with "large potential and large realisation rate" for the whole NMBP. The same applies to the Nanosciences and Nanotechnologies, and Materials areas. In Biotechnology, the Basque Country is a region with medium potential, but large realisation rate, and in New Production Technology it has a large potential, but a medium realisation rate.

The Basque Country was one of the most active regions in FP7 NMBP programme, being involved in 186 projects. 70% of the funding obtained by Basque organisations in FP7 was in the NMP area<sup>12</sup>. This distribution of results also explains the focus on Nanosciences and advanced manufacturing mentioned in the Basque Smart Specialisation Strategy.

A total of 114 project participants took part in the 186 projects, to which 48 reported as being SMEs, corresponding to a little bit more than 40%. 85 project participants were private companies. From the 186 projects, 48 were coordinated by enterprises headquartered in the Basque Country, the second most important region in Europe regarding coordination, right after Oberbayern and at the same level as Île de France.

The specialisation of the region in industries operating in the NMBP related sectors, is one key factor explaining the high participation of the Basque Country in FP7 NMBP projects. The region managed to gather producers, as well as innovators and research centres, in several sectors including in fields of NMP.

Another reason for the success of the Basque Country in FP7 is related to the presence of large actors, mainly research centres. On average, each participant organisation was involved in 2.6 projects, but this involves important disparities. Indeed, 70% of the project participants were involved in one project, but seven partners participated in more than 50% of FP7 NMBP projects listed in this region. When participating in a European project, more than 43% of the Basque organisations are in consortium with another participant from the same region, making the Basque Country one of the top regions in Europe with intra-regional cooperation.

Excellence and complementarity appears clearly on top of all considerations for creating a consortium for a project. This interest in excellence is mainly related with searching for opportunities to gain insight from other operators, and research centres in Europe. Complementarity is mainly seen as a way to smooth cooperation during the lifetime of a project.

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<sup>12</sup> Official answer from the Basque Region in the written interview.



Despite the quest for European excellence and complementarity, involving companies from the same region is seen by some operators, mainly RTOs, as a key strategy of their organisation since their creation. Several RTOs in the region are private organisations under management of regional public authorities. Some of them reported that intra-regional cooperation is part of their key performing indicators.

The regional authorities play a rather active role in terms of promotion of cooperation through the creation of clusters, and in the creation of the necessary infrastructure to develop research and foster the networking of local players. The Basque Region provides funding support to organisations before they apply to EU funds and provides administrative and counselling support through a dedicated regional support structure similar to a National Contact Point (NCP) set up by the EC<sup>13</sup>.

In addition to the support provided in applying to EU funds, the Basque Country authorities provide funding opportunities for regional operators. This was reported by several interviewees as providing a complementarity source of funding with different technology readiness level (TRL) targets. Interviewees often see European funds as more important at economic level, and as an important possibility to access excellence wherever its location in Europe but with lower TRL. On the other side, regional funds from the Basque government are perceived as funds to manage research with a higher TRL that are closer to the market.

When it comes to the impact of the projects, most interviewees were very positive even though they could not quantify the impact directly, once such projects have impacts that cannot be seen directly after the end of the project, but sometimes just a few years after. Several participants in the study mentioned the creation of spin-offs and the creation of new expertise in the region as the most relevant and visible impacts.

#### **4.5. Main results from the case study on Lodz**

The Lodz region (Łódzkie Voivodeship, NUTS-2-PL11) is located in the centre of Poland. It is the sixth region in Poland in terms of population and share of national GDP (6.1%). Almost 64% of the population lives in urban areas. The Lodz region is one of the European regions with the lowest economic development level on GDP per capita, but the annual growth rate of 4.6% in the period 2001-2011 was stronger than the average for EU28 (1%). The main industries of the region include textiles and clothing (30% of Polish companies are located here), chemical industry, construction materials industry (ceramic tiles – 70% of Polish production), electromechanical, agricultural-food industry, energy, pharmaceutical, and furniture.

According to the Regional Innovation Scoreboard (RIS) 2014, the Lodz region is ranked as a modest innovator, with an overall innovation performance 50% below the EU average. The region (all sectors) spends about 0.77% of its GDP on R&D, which is below the national average of 0.89% in 2012. The business sector has a share of 24.3% in the total R&D expenditure, accounting for 0.19% of GDP, which is substantially lower than the national average (0.33%) and EU28 average (1.27%). The Lodz region has a relatively high level of well-educated people.

Despite the relatively weak innovation conditions in the region, with 22 projects, the Lodz region has been more successful in attracting NMBP funding than what would have been expected. This is especially true in the domain of New Production Technologies. The majority of the projects focus on construction and textiles, which are also two of the major industries in the region. Partners from the Lodz region were involved in 22 projects, out of 142 for Poland, and 822 for Europe. Of these 22 projects, twelve of them were in New Production Technologies, four in Materials and three in Nanosciences and Nanotechnologies, one in Biotechnology.

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<sup>13</sup> National Contact Points (NCPs) are national structures created and financed by governments of the 28 EU Member States and the states associated to the Framework Programme. The role of the NCPs is to give personalised support on the spot and in applicants' own languages. The NCP systems can vary from one country to another from highly centralised to decentralised networks, and a number of very different actors, from ministries to universities, research centres and special agencies to private consulting companies.



In total, 11 organisations from the Lodz region participated in the 22 projects, including: three higher education institutes, three public research institutes, four SMEs and one large company. Only one project was coordinated by an organisation based in the Lodz region. Three organisations, two SMEs and one higher education institute, are strongly involved, as each one participated in five projects (15 of the 22 in total).

Intra-regional collaboration does not play a key role in this region. Two organisations from the Lodz region have collaborated in only one project. Collaborations with partners from other Polish regions are also limited. There is a preference for collaborating EU-wide, as these collaborations offer opportunities to gain insight in what is happening in Europe, to get access to complementary and better expertise, to have a broader exchange of knowledge and ideas, and to have a better connection to application oriented R&D and well-developed industry. Administrative procedures are considered as time consuming, complex and cumbersome, but also as inevitable. This was also considered as the main reason why a partner from the Lodz region was coordinating only one project.

Involving companies, both SMEs and large firms, is seen as of major relevance as this is needed to develop solutions and potential applications that can be brought to the market after the project ends. However, this can be difficult as there is often a gap between the needs from a business perspective and the needs from a scientific perspective. Moreover, the Polish enterprise sector was considered as less developed and therefore less attractive to collaborate with.

The role of the regional authorities is rather moderate, both in active administrative support and in a co-funding capacity. Although Lodz project partners are in general aware of the support services available in the region and at a national level, this support isn't used very often and was not considered as substantial for the proposal phase in finding partners or obtaining projects. One exception is an SME participating in five NMBP projects and which has an EU project coordinator and is also part of a regional network supporting others when applying for Horizon 2020 proposals. There is a need for more and better support, which should also include reviewing the draft proposal by experts and advice on financial aspects. Moreover, there is a need for more brokerage events, especially in Poland and within the region to get to know each other and to build up some trust.

Although the impact of the EU-funded projects could not be quantified in concrete value or numbers, the participants are positive about the impact of the EU projects where they were involved. In general, the projects supported participating organisations in getting active at the European level, exploring new (application and R&D) domains, and building curriculum. Moreover, the projects supported academic partners to get access to industry and get involved into R&D oriented application. The expertise built up in the NMBP projects is used in new projects, both at European and national or regional level. Also the SMEs involved were able to use the results in new projects to further develop new products and services. The Lodz project participants called for the establishment of a professional technology transfer institute and technology transfer programmes to support the transfer of research results from the (EU-funded) projects into regional initiatives to further develop the results and bringing new products and services to the market.

#### **4.6. Main results from the case study on Cologne**

The Cologne region (Köln, NUTS-2-DEA2) is an administrative district ('Regierungsbezirk') of the German Federal State of North Rhine-Westphalia. It is one of the industrial hubs of Europe. According to the Eye@RIS3 Specialisation Mapping, the region is especially active in the areas of Machine and Plant Engineering, Life Science, Health, Media and Creative Industry, Energy and Environmental Industry, ICT, and Mobility and Logistics (European Commission, 2015). The region of Cologne hosts important companies with large R&D capabilities, and is also home to internationally renowned research facilities (including, but not limited to, Institutes of the Fraunhofer Society, the Leibniz Association, and the Helmholtz Association) and some of Germany's most highly ranked universities.

The region is further characterised by a high GDP per capita and a high level of R&D expenditure. The Regional Innovation Scoreboard lists the broader region of North Rhine-Westphalia as an innovation leader (European Commission, 2014). The region spent more than one billion EUR of ERDF funds on innovation and the knowledge-based economy in the 2007-2013 programme (European Commission, 2006). Research and innovation are strongly supported by the Federal as well as Regional Government policy initiatives.

The Cologne region has strongly participated in the NMBP programme with 149 projects. 59 of these were in New Production Technologies, 36 in Materials, 25 in Nanosciences and Nanotechnologies, and 29 in Biotechnology. From all projects, 47 projects involved universities from the region (mainly the RWTH Aachen, which specialises in applied engineering), 43 involved SMEs, and 39 involved large enterprises (examples of participants include Bayer, Aixtron, and Philips). Research centres in the region took part in 52 projects, notably taking the lead in two thirds of the projects coordinated by organisations of the region. The Juelich Research Centre partook in most projects, followed by Fraunhofer Institutes.

The high participation rate of the region can be related to the presence of large actors, mainly the RWTH Aachen, a technical university that provides a rich knowledge based, especially in the fields pertinent to NMBP. The university has spawned a multitude of spinoffs through the years, resulting in highly specialised knowledge clusters. Moreover, the historical roots of the university highlight the engineering competences of the region. As a centre of excellence in many science and technology areas, RWTH Aachen is a globally leading research centre in several areas related to NMBP.

The high participation rate can also be explained by the presence of several high-level research organisations which have the experience, capacity, and competences required for successfully leading (European) research projects.

Last but not least, the level of participation can be explained by the Active national and regional government policy of engagement in European funding projects have led to multiple organisations which aim to increase regional participation. This is achieved by spreading information about funding opportunities, but also by bringing together potential partners, and providing administrative aid in proposal generation.

Concerning the regional embeddedness of FP7 NMBP projects, the main findings of the case study are as follows:

- Having regional collaborators is not important for building a consortium. Rather, excellence is the main factor that drives the composition of a consortium.
- The nationality of participants is a strategic factor in a consortium formation for two reasons; i) consortium members feel a need to balance participants across Member States to demonstrate European impact and hence increase the probability of success of project application; ii) having a broad international network of participants increases the potential economic impact of the project and helps the industrial partners to reach out the innovations developed in the project to a wider range of geographic markets.
- Consortia tend not to create new critical network connections. Networks follow excellence, and the excellent players are already known to industry leaders if existing networks are extended to new partners, it is rather for reasons of European balancing.
- Partners feel a need to collaborate in FP7 NMBP projects when invited by institutes or enterprises they already do business with, even when they feel the project is less than optimal.

The direct impact of projects is highly heterogeneous and project specific. The European impact of the projects depends mainly on spill-overs, but these are hard to quantify. A higher impact of projects could be achieved through more follow-up funding. Many projects end before the innovations to be developed are ready for market introduction.

#### 4.7. Main results from the case study on South Sweden

The South Sweden region (Sydsverige, NUTS-2-SE22) consists of the larger Skåne and the smaller Blekinge county. South Sweden has over 1.4 million inhabitants, with the majority (88%) living in Skåne, with Malmö, Lund and Helsingborg as the three main cities. South Sweden is well connected with the wider region. This in particular holds for the trans-border Öresund region, also called the Copenhagen-Malmö Metropolitan Area, with a population of 3.9 million. It has a diversified economic structure, with key strengths in life sciences (in particular pharma), medical technology, ICT and telecoms, food production, cleantech and packaging. Apart from universities, the region has no RTOs, which often act more as the 'natural' partners for technology development in business, and only a limited number of large research companies, making the region vulnerable to relocation of decisions (shown by recent downsizing of Sony Ericsson research, closure of Astra Zeneca). Especially Malmö and Lund are characterised by a large share of higher educated employees. In other parts of South Sweden, education levels are well below the national average, mirrored by a high share of labour-intensive low knowledge-intensive industries.

Its geographical location, as part of a larger metropolitan area, its research and knowledge infrastructure with renowned universities, and an active business community as shown by various cluster initiatives, among others, make South Sweden an attractive region for NMBP activities. This also holds for the region's specialisation pattern. The total number of FP7 NMBP projects coordinated by organisations in South Sweden was 43, out of 223 for Sweden as a whole, and 822 project participations. Of these 43 projects, 15 projects were in Nanosciences and Nanotechnologies, 12 in Biotechnology, eight in Materials and eight in New Production Technologies.

All project participants were based in the region of Skåne; no projects were granted to an organisation in Blekinge. Five out of the 43 projects, or almost 12%, were coordinated by an organisation based in South Sweden. Another six of the 43 projects were coordinated by an organisation based in another Swedish region. Higher education institutes were strongly involved in NMBP. The University of Lund, the largest Nordic university, participated in 23 projects (53%). The Swedish University of Agricultural Sciences participated in two, and Malmö University and Kristianstad University College each in one project. In total, 19 different companies based in the region participated, ranging from large enterprises (9), SMEs to start-ups (10). Only three companies participated in more than one project. The fact that South Sweden has no RTOs and that the reformed national research institute SWEREA has moved towards shorter research projects, might be an explanation of what type of projects are mostly sought for and acquired. This might explain a relative emphasis on fundamental research. It could also be part of the explanation of why large multinational companies have a rather company-internal R&D focus.

The majority of project collaborations take place outside the region. What is striking, is that in new production technologies and biotechnology domains, intra-regional collaboration played no role whatsoever as no more than one participant from the same region took part in the projects. In most of the NMBP domains, non-EEA collaborations play a sizeable role, except in projects in the new production technologies domain.

Most project participants perceive their success in winning projects to be related to scientific excellence, having a strong network and operating on the knowledge frontier, more than anything else. Most interviewees had earlier project experiences, in EU but also in Swedish and Nordic projects. Excellence is considered as the prime factor in building consortia and in drafting successful proposals. As one interviewee put it: "scientific excellence is number one". For another: "very solid consortium building is extremely important". Complementarities in knowledge and expertise as well as well-considered coverage of different roles in the innovation value chain (from idea generation to prototyping, from scientific development to production or process capabilities) are important assets to have on board in a consortium.

In some of the projects, consortia included both a university partner from the region and a young start-up, and in some cases even the spin-off or spin-out of earlier projects.

Apart from these examples, regional proximity is, however, not perceived as important in forming consortia. However, proximity is a factor that is appreciated when it comes to implementing the project, e.g. to testing or evaluating project results involving special machinery or equipment, or enabling the exchange of PhD students. But proximity is for several of the interviewees, a concept related to being able to travel and meet another actor in (maximum) a few hours driving distance rather than being within a nearby radius of a few kilometres. In the case of South Sweden proximity goes as far as the Danish Greater Copenhagen area, but equally so for Gothenburg or Stockholm.

The region has been very active since 2008 in creating an apt and conducive innovation environment, by producing a joint future vision and strategy and by developing the right framework conditions. In terms of active involvement in support of the preparation of FP7 proposals, the role of the region is negligent, both in active administrative support and in a co-funding capacity. None of the interviewees indicated that the region or regional authorities had played a substantial role in finding partners or in obtaining the project(s). For the most of interviewees, the region was not important, even to the extent that regional embeddedness as something valuable was not easily recognised. What is recognised is the region's strategy of innovating by seeking 'white spaces', cross-overs and cross fertilisation, which is starting to pay off.

The NMP National Contact Point (NCP) was contacted by participants only to a very limited extent and in those cases where some minor administrative or financial details needed to be checked or verified. The NCPs only seem to play a marginal role as a support structure in South Sweden. It was pointed out that the relevant NCP contact persons are with VINNOVA and other central organisations all based in Stockholm, which is perceived as "far away in the capital". A far more effective support structure in drafting proposals and getting a sound consortium together, could be the European Enterprise Network (EEN), one that is currently underused but also very effective as every region has an EEN regional contact point and it can tap into the European-wide EEN contact network database for active matchmaking.

The importance of regional factors in NMBP projects, in responding to regional issues and challenges or in searching solutions addressing existing regional industrial needs, is limited to non-existent. This is not to say that the projects implemented in NMBP have no link with the region. First, most of the projects are built on already existing academic and industrial strengths in the region. Second, a number of NMBP projects address one of the Grand Challenges, in the area of energy, health, the bio-based economy and the environment, which also serve regional challenges. Where 'smart cities' is one of the central topics, at least two projects relate to energy-efficient buildings. In other cases, the relationship between project content and the region lies in the creation of a start-up, with a growth of direct employment and multiplier effects.

Despite the region's successful performance there are still challenges, such as i) the scaling up of start-ups and finding the financial resources to do so, ii) finding the appropriate in-cash and/or in-kind contributions, especially for academic partners, iii) the handling of IP in the Swedish university context, with ownership of new IP - inventions - lying with individual staff rather than by universities or university faculties, iv) IP-sharing contracts and dissemination practices in FP context, especially for companies and especially where process innovations are concerned: "if you want economic impact, you don't publish"; v) the absence of RTOs in the region which may have had a downward impact both on the success of NMBP proposals and their spin-off compared to other EU successful NMBP regions.

#### **4.8. Main results from the case study on Central Hungary**

The region of Central Hungary (Közép-Magyarország, NUTS-2-HU10) is located in the centre of Hungary consisting of Budapest and Pest County (NUTS-3 regions) and is the economic, commercial, financial, administrative and cultural capital of Hungary.

The region covers an area of 6,916.1 km<sup>2</sup>, with a population of 2.9 million, representing 29% of the country's population. Although it is the most populated, it is also the smallest region, being the population density the highest of Hungary. It is also Hungary's most

developed and wealthiest region. In 2013, its gross regional product amounted to € 48.6 billion, which is 48.3% of Hungary's GDP. In 2013, the GDP per capita in Central Hungary was € 16,500, which is 62% of the nominal EU-28 average, but 108% in purchasing power parity terms.

In 2013, 41.4% of all enterprises in Hungary had their head office in Central Hungary. 40% of all SMEs and 71% of enterprises with Foreign Direct Investment (FDI) in Hungary are located in Central Hungary. The region has good accessibility and a well-developed infrastructure. Main drivers of regional economic performance are high-value knowledge intensive services (77% share in GRP), with tourism, financial and real estate, creative industry, education and health being prime and manufacturing production (19% GRP share) in electronics, pharmaceuticals, chemicals, printing and sustainable construction. In 2014, 77.4% of those employed were in services, 21.6% in manufacturing and 1.2% in agriculture. In 2014, the region's unemployment rate stood at 6.2%.

Central Hungary is the leading innovation and R&D hub in Hungary. In 2011, the total R&D expenditure in Central Hungary amounted to €784.8 million, or 1.62% of the GRP, the highest percentage of all regions in Hungary. Two-thirds of total R&D expenditure in the region comes from the business sector. Central Hungary was home to over half of all R&D units in the country, accounting for more than 68% of all researchers and 64% of total R&D expenditure in Hungary. Collaboration between the science and the business community in Central Hungary is much more intensive than elsewhere in Hungary, with well-developed knowledge and innovation clusters and a dense network of industry-university linkages. From an international comparative perspective, however, the innovation performance of Central Hungary is modest. The OECD qualifies the region as a *medium-tech manufacturing and service provider*, rather than a (international) knowledge hub. The Regional Innovation Scoreboard (RIS) ranks Central Hungary as a *moderate innovator*, with an overall performance between 50% and 90% of the EU average.

Beneficiaries from Central Hungary received € 219.9 million of FP7 funding from the European Commission, which represents 78.4% of total FP7 funding received by Hungary, making the region the principal beneficiary by far of FP7 funding in Hungary. In addition, beneficiaries in Central Hungary received € 561.8 million in Structural Funds dedicated to RTDI projects, representing 12.5% of the Hungarian total.

The total number of NMBP FP7 projects granted to an organisation in Central Hungary was of 52, out of 64 for Hungary (i.e. 81%). Of these 52 projects, 14 projects were in materials, 22 in New Production Technologies, 12 in Nanosciences and Nanotechnologies and four in Biotechnology. Three out of the 52 projects were coordinated by an organisation based in Central Hungary. There were no other projects coordinated by a Hungarian organisation. In total, 28 organisations from Central Hungary participated in the 52 projects, involving five higher education institutes, four public research institutes, 17 SMEs and two large companies. It must be noticed that 12 partners have participated in more than one project with the Technical University of Budapest leading (9 projects), closely followed by the Research Centre for Natural Sciences of the Hungarian Academy of Sciences (6 projects).

Several factors are important in building a successful proposal and project. Scientific excellence is a prime factor in R&D projects. Building a strong consortium including partners with complementary capabilities and competences, good coverage of different roles in the value chain and a sufficient geographic distribution are all considered to be important. Trust is important, which is reflected in how IPR are perceived and treated.

Asked for the main reason for the relatively limited number of other Hungarian project participants, there is the perception that too many participants from the same country will limit the success rate of project applications. Some point at the prevailing culture of cooperation between research centres and industries in Hungary, which is seen as difficult and limited. As one workshop participant put it: *"the problem is when I have to figure out what the industry actually needs"*. Moreover, many SMEs are too small and large firms are often international firms without R&D facilities in the region. Participating in EU-funded projects helps to become active in an international playing field where



geographical proximity does not play a role: “we have to travel anyway, so it does not matter where to”. Asked for reasons for the relatively low level of FP participation in Hungary, interviewees highlight complex application procedures, low perceived probability of success and low salaries of researchers (also to Hungarian standards) which makes more difficult to attract, hire and keep researchers.

The role of the region in support of NMBP participation is rather moderate. Several project participants mentioned that they never use regional support and others used it for information and advice on application procedures. European networks are seen as important elements to develop connections and build up informal networks. Both the Enterprise Europe Network (EEN) and the NMP NCP are used, even though their use was not that frequent among the workshop participants and the interviewees. Getting informed is not a problem at all, with several good and easy access sources of information on EU projects and funding. Interviewees acknowledged that the Participant Portal is an improvement compared to CORDIS, although it could be further improved. Brokerage events or scientific events tailored to a specific field or topic are by far preferred to the Information Days that are described as too generic and offering nothing new, compared to what is already available on the Internet. Project participants mentioned that support in identifying industry needs and related research topics would be useful.

The importance of regional factors in formulating NMBP proposals could not be identified. This is not to say that the projects implemented in NMBP have no link to the region. Many projects build on the specific, complementary knowledge, expertise and experience held by organisations in the region. 12 of the 52 projects target flexible manufacturing, plug and produce, rapid design prototyping, the virtual factory and other factory of the future themes. This matches with the strong focus on manufacturing production in Central Hungary’s economy. Moreover, six projects focus on health and five on energy, which are also two specialisation areas in the regional smart specialisation strategy.

The 52 NMBP projects add up to an overall total €13.6 million in EC contribution and an overall amount of €18.7 million over the period 2007-2017/8 (only counting the regional share). As highlighted by project participants, an important and clear aspect of NMBP projects is their importance as an enabler of EU-wide collaboration, exchange of knowledge and views, being active at the European stage, application oriented R&D, getting access to industry, exploring new (application and R&D) domains, attracting young researchers, and building curriculum. Interviewees are positive about what they gained from the EU-projects and they were able to indicate what they achieved. Apart from scientific publications, it is, however, difficult to quantify the value added in concrete money or number terms. Most projects do not translate into ‘market-ready’ innovations, but rather deliver intermediate results. But there are exceptions. Some projects originate concrete results, such as software tools, and are further developed and commercialised in valorisation projects. The expertise built up in the NMBP projects is used in new projects both at European and national or regional level and allow participants to further develop the topics.

#### **4.9. Main results from the case study on Walloon Brabant**

Walloon Brabant (Wallon-Brabant, NUTS-2-BE31) is one of the ten provinces of Belgium and one of the five located in the Walloon region. With 394,000 inhabitants it is one of the smallest provinces in Belgium, and the smallest in the study, but it is the third richest Belgian province after Flemish Brabant and the Province of Antwerp (and after the Brussels-region, which is not officially part of any province but a region in itself). It is part of the 20 percent richest NUTS-2 regions in Europe regarding GDP per inhabitant.

Out of the 25 projects, 12 were in New Materials, seven in Biotechnology, five in Nanosciences and Nanotechnologies and one in New Production Technologies. In total, these projects sum up to €8.659 million of EC contribution.

According to our study, the Walloon Brabant region was considered as an underperforming region with high potential, but only medium realisation rate in all fields except in the fields of Materials and Biotechnology. None of the project participants was

as coordinator. Several elements can explain this limited performance: the limited size of the province, the limited specialisation of the province in the fields of Nanosciences and Nanotechnologies and Materials, and the fact that the large research centres related to the Biopharma industry are not using the European funds. Another element may come from the availability of relatively important regional funds from the Walloon region for industrial research.

Another striking factor for Wallonia as a whole (including Walloon Brabant) is the limited level of intra-regional cooperation. As for the other regions we studied, the main reason is related to the understanding of EC rules for which participants perceived that intra-regional cooperation is a negative point in the evaluation. Another element comes from the limited existence of research structures with international outreach in this field. Another reason could be the limited knowledge the different actors have of each other in this field, but this later situation was tackled politically with the creation of support structures.

At policy level, the Walloon region started two types of structures for the development of research and innovation in specialised sectors: the clusters and the "*poles de compétitivité*". Since 2001 the region is committed to support the development of clusters of enterprises. Currently seven clusters are being supported by the regional government in the fields of sustainable construction, eco-construction, environmental technology, energy and sustainable development, photonics, plastic, audio-visual technologies and ICT. Each of these clusters benefits from a funding of €160,000 per year to support its functioning.

Based on the experience of the clustering policy, conducted since 2001, the Walloon region launched the "competitiveness centres" (*pôles de compétitivité*) in 2005. The main objective of this policy is to develop key sectors for regional growth, based on strong partnership projects between companies, universities/research centres and training centres, according to the triple-helix approach. The 2015 budget for the six "*pôles de compétitivité*" is € 121 million.

Due to the regionalisation processes that took place in Belgium, the Walloon region benefits from organisations that provide support on accessing EU funds dedicated to its territories, and also to the proximity to Brussels. The National Contact Point (NCP) is one of the key structures (unlike most other countries that have only one NCP, Belgium has 3 NCPs for each FP7 programme, one for each region), along with the 12 members of the European Enterprise Network (EEN) while the region is also location to some of the European Technology Platforms (ETPs).

Additionally, the *Université Catholique de Louvain* adds a dedicated structure centralising the support and some administrative back-up for the university researchers. The structure is efficient in informing researchers about potential funding, and it supports their applications to EU funds.

#### **4.10. Main results from the case study on Bucharest-Ilfov**

Bucharest-Ilfov (Bucharesti-Ilfov, NUTS-2-RO32) is a region located in Romania that includes its capital, Bucharest (12.5% of the Region's territory) and the Ilfov county (87.5% of the territory).

Its regional GDP is the highest of the country, representing 24.5% of the national GDP. Its economic structure is based on services, processing industries, retail and commerce, real estate and public administration. Regarding the regional human resources employed in high-tech industries and knowledge-intensive services (5.7% of the active population) contrasts with Romania's average (1.8%), albeit lagging that of EU28. Of the regional enterprises, 7.4% are active in the industry sector. The region presents relevant growth drivers, concentrated in the city of Bucharest, that set it apart from other Romanian regions: higher capacity for regional growth, job creation and workforce attraction, better development of the local service economy and industry base, higher density of highly innovative enterprises and R&D, more educated workforce, higher availability of public utilities and telecom infrastructure.

The region concentrated 58.3% of the Romanian annual expenditure in R&D on average, between 2007 and 2012, employing 51.3% of Romanian R&D personnel in 2012. Gross Expenditure in R&D (GERD) and Business Expenditure in R&D (BERD) were relatively low compared with the EU27 average (1.2% and 0.4% compared with 1.9% and 1.2% respectively, as measured by averaging values for the period 2008-2011), while the proportion of Human Resources working on Science and Technology (as measured by the percentage of active population) was 44.4% higher than the EU27 average (38.9%) during the period 2008-2011.

The region of Bucharest-Ilfov was involved in 61 FP7 NMBP projects, which is a relatively small number, especially in view of the total population of the region (more than two million inhabitants) and the central place of this region in Romania, both economically and intellectually. More important to mention, none of these 61 projects were coordinated by an organisation of this region.

The largest share of projects was in New Production Technologies with 22 projects, followed by Nanosciences and Nanotechnologies with 18 projects, Materials with 14 projects and Biotechnology with 6 projects. In total, the 67 project participants in Bucharest-Ilfov received more than €9 million in EC contributions. On average, each project participant in the region received € 284,000, but with large disparities between organisations from €15,000 for one organisation to one million Euro for another.

Looking at the participation of organisations of the region, 33 organisations located in Bucharest-Ilfov were identified as partners with an average participation of four projects each. The largest contributors are the Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI) with the participation in 13 projects followed by the Ministry of National Education (MEN) with involvement in five different projects.

A total of 67 organisations of the region were identified as participants in projects, including 39 public bodies, 18 as SMEs and 35 research organisations (33 of these being also a public body). This high share of participation by public bodies linked with ministries is something relatively unique compared to the other six regions analysed in this project.

According to the regression analysis performed under this project, the Bucharest-Ilfov region reached a medium success rate in attracting NMBP funds in line with her expected rate. This medium realisation rate in line with the medium potential can be seen in all fields of NMBP, except in Nanoscience and Nanotechnologies where a large realisation rate was reached by the region.

The importance of regional factors in formulating NMBP proposals could not be identified. Interviewees could not mention any regional factor that might play a role in formulating and winning proposals. Many projects were built on the specific, complementary knowledge, expertise and experience held by organisations in the region.

It is interesting to note that around a quarter of all projects related to FP7 NMBP in this region have as partners either the Romanian National Ministry of Education (MEN) or the executive agency UEFISCDI subordinated to the MEN. The UEFISCDI performs several functions<sup>14</sup>, such as the distribution of public funds, coordination of strategic higher education projects funded by the European Social Fund, consultancy and technical assistance in innovation programmes, and coordination of the executive activities of national councils. Based on a (written) interview, the main sources of funding for this organisation are related to FP7.

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<sup>14</sup> European Commission, Regional Innovation Monitor, retrieved 15/09/2015; <https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/organisation/executive-unit-financing-higher-education-research-development-and-innovation-uefiscdi>



## 5. SYNTHESIS

This chapter summarises the main outcomes of the study based on three key perspectives pertinent for the concept of regional embeddedness. The regional embeddedness is related to three aspects: the degree of participation of regional actors in the FP7 NMBP programmes, the linkages of these actors with the region, and the regional impacts of FP7 NMBP programmes.

### 5.1. Regional participation

Participation of regions in the FP7 NMBP programmes is largely driven by the available regional resources for high-level R&D in the fields of technology addressed by the programmes. As capacities and research capabilities in the NMBP fields vary greatly across Europe, so do participation rates in the NMBP programme. In certain subfields of technology within NMBP, the most capable researchers and most innovative industrial companies are concentrated on a few regions, limiting the geographical spread of participation in calls related to such subfields. From the study conducted, the main type of project participant from the analysed regions is a one-timer participant that has a strong previous experience and expertise in NMBP and who is participating without another partner from the same region. Most project participants are one-timers, but most projects are assigned to very experienced project partners. On average, each of the 5,336 participants mapped for this study participated in 2.2 projects. Indeed, 70% of project participants are involved in only one FP7 NMBP project, but the 12% most active participants account for half of all project participations and the top 4% account for a third.

Case studies show that regions with a higher than expected participation can profit from the presence of organisations that are particularly well connected within the European Research Area or show outstanding scientific and research excellence. In general, case study interviewees reported that participation in FP7 programmes (which also holds for H2020) requires well-established networks with potential project partners in order to react rapidly on calls and provide high-quality proposals in the short term. Taking on new participants without a track record of European research projects and without knowing the researchers personally is often perceived as a risk which may jeopardise successful proposals.

From several interviews and workshops, it seems that the most difficult step is the first participation in an EU project. Despite the fact that some experienced participants may refrain from integrating newcomers, case studies revealed, however, that participants from well-established networks are highly willing to take up a new member that they never worked with provided they can demonstrate a high research excellence and an ability to actively participate in all parts of a research project, from preparing proposals to documenting project progress. Participating in FP7 projects is demanding in terms of the organisational capabilities required and the administrative procedures to follow, particularly when compared to regional and national programmes. Participants in FP7 NMBP projects consider European funding superior over regional/national funding in terms of financial attractiveness and innovative ambition and results, but clearly less favourable in terms of administrative procedures, project requirements and the burden associated with setting up a consortium. This holds for all four areas of NMBP. As a consequence, inexperienced participants face high barriers for successfully applying to FP7. Reducing the administrative burden, as has been done in Horizon 2020, is hence also a way to increase participation from many regions by offering lower entry barriers to new or less experienced applicants.

The participation is even more demanding if organisations are willing to assume coordination. The coordination role is more complex as it needs, in practice, previous experience, a high recognition in the scientific or industrial field and the necessary supporting structure. Not surprisingly, 45% of all FP7 NMBP participants are research centres and 35% of coordinators are universities. 17% of coordinators are private companies, compared to the 44% of participants from private companies. The expressed reasons for the limited participation from enterprises are the lack of interest on taking on the responsibilities and burden that come with the job, the limited administrative support

structure or even in some cases the fear of enterprises of being considered too research focussed. As one participant mentioned: "I would like to coordinate a project, but this would disclose a wrong priority to my market".

**Table 9: Comparison of European and regional/national funding of NMBP projects as scored by FP7 NMBP project participants, by field of technology**

	<b>Total</b>	Nanosciences and Nano- technologies	Materials	Bio- technology	New Production Technologies
Participated in national or regional funded projects in same field, 2007-2013 (share in %)	<b>57.3</b>	61	57	60	54
<i>Characteristics<sup>1)</sup></i>					
Financial attractiveness	<b>+1.5</b>	+1.4	+1.6	+1.4	+1.6
Generating new ideas and solutions	<b>+1.2</b>	+1.4	+1.2	+1.3	+1.2
Generating innovation	<b>+0.9</b>	+1.1	+1.1	+0.9	+0.8
Higher success rate	<b>-1.3</b>	-1.2	-1.4	-1.1	-1.5
Lower risk of IP issues	<b>-0.8</b>	-0.9	-0.9	-0.6	-0.7
Easier to meet project requirements	<b>-0.9</b>	-0.9	-1.1	-0.7	-0.8
Easier administrative procedures	<b>-1.1</b>	-1.5	-1.2	-0.9	-0.9
Shorter time between application and grant date	<b>-0.6</b>	-0.7	-0.7	-0.7	-0.5
Easier setting up of a consortium	<b>-1.2</b>	-1.1	-1.2	-1.0	-1.4

<sup>1)</sup> Values are derived from a 9 point Likert scale with 1 for preferred regional/national funding and 9 for preferred European funding. Likert scale values have been subtracted by the mean (5) to produce positive and negative values. Positive values indicate that European funding is perceived superior over regional/national funding while negative values indicate superiority of regional/national over European funding. Source: Survey of participants in FP7 NMBP projects (n=2,356)

Regional support also seems to play a role for the level of regional participation. Participants from regions with a low participation rate more often report that no regional support is available. While regional support in regions with a low level of support focus on providing information on application procedure, support in regions that strongly participate in the NMBP programme more often provide technical and administrative as well as financial support for preparing proposals.

**Table 10: Importance of support from regional authorities and agencies or regional knowledge transfer offices for FP7 NMBP projects, by level of regional participation**

<i>Share of all responses, %</i>	<b>Total<sup>1)</sup></b>	Low participation rate	Medium participation rate	High participation rate
<i>Importance of support</i>				
No support available	<b>16.5</b>	23	12	17
Not relevant	<b>46.4</b>	40	49	48
Somewhat relevant	<b>21.2</b>	17	25	21
Important	<b>12.1</b>	17	12	11
Very important	<b>3.8</b>	3	2	4
<i>Type of report received</i>				
Information on potential regional partners	<b>32.9</b>	29	32	33
Information on application procedures	<b>54.8</b>	75	58	54
Technical or administrative support for preparing proposal	<b>42.0</b>	25	38	43
Financial support for preparing proposal	<b>17.7</b>	8	20	15

<sup>1)</sup> Figures for "Total" are based on the responses of all participants (including participants from non-Member States) whereas only participants from EU Member States have been assigned to regions by the level of regional participation. Source: Survey of participants in FP7 NMBP projects (n=2,356)

## 5.2. Regional linkages

In general, participants find FP7 funding as an opportunity to cooperate with partners from other regions in Europe. Case studies showed that participants rather avoid too strong regional (or even national) links in FP7 projects, but rely on national or regional funding for leveraging regional or national networks in publicly funded research projects. The main reasons pointed out for cooperating with partners in FP7 NMBP projects are the scientific excellence of the partners, the possibility of complementing its own capabilities and competences, and extending networks and exchanging ideas with others. A large proportion of the participants (70% to 75%) rank these reasons among the top-5 reasons for cooperating in FP7 NMBP projects. Geographical proximity and political reasons are of marginal relevance only. It must also be noticed that prior positive experience with the partner is no special reason for cooperation. In fact, it can be concluded that consortia in FP7 NMBP projects were not “closed clubs”, involving partners that have been collaborating with each other for a long time, but were instead rather open to new partners.

Comparing regions with higher and lower participation rates, low-participation regions are more likely to select partners based on opportunities for networking (83% in low participation regions versus 70% on average) or to gain access to relevant stakeholders (57% in low participation regions versus 41% on average), indicating that FP7 NMBP projects are a way to gain access to existing networks and knowledge for low-participation regions.

**Table 11: Reasons for cooperating with partners in FP7 NMBP projects, by field of technology**

<i>Share of responses that chose the reason as one of five most important ones, %</i>	<b>Total</b>	<b>Number of respondents per NMBP topic</b>			
		<b>and Nanotechnology</b>	<b>Materials</b>	<b>Biotechnology</b>	<b>New Production Technologies</b>
Scientific excellence	<b>76.3</b>	84	81	79	67
Partner complements our capabilities and competences	<b>73.6</b>	77	72	74	72
Networking and exchange of ideas	<b>70.3</b>	70	70	71	70
Partner has well-identified innovation needs/goals	<b>44.7</b>	42	43	41	50
Partner is well-experienced in the execution of European projects	<b>42.9</b>	45	41	41	44
Partner provides access to relevant stakeholders	<b>40.6</b>	36	39	45	42
Strategic reasons	<b>35.7</b>	33	35	32	40
Maximise the probability to obtain funding	<b>30.0</b>	31	33	29	27
Partner is part of the same supply or value chain	<b>16.2</b>	13	16	17	18
Partner provides access to specific facilities or infrastructures	<b>16.1</b>	14	14	15	20
Political reasons	<b>5.0</b>	4	6	6	5
Geographical proximity of the partner	<b>4.4</b>	4	3	4	6
Good previous experiences with the partner	<b>3.6</b>	3	3	5	4
Scanning and recruiting talent	<b>2.8</b>	4	2	3	2

*Source: survey of participants in FP7 NMBP projects (n=2,356)*

If participants cooperate with regional partners in FP7 NMBP projects, the mission and role of the organisation, as well as the continuation of successful collaborations in the past, are the main reasons. Again, geographical proximity as such (by easing communication) is of minor importance, as well as political motives. Regional clusters seem to be of limited relevance for establishing consortia in FP7 NMBP projects as only a small share of participants (19%) reported that cooperating with regional partners is driven by their organisation’s position in the regional economy. Regional clusters seem

slightly more relevant for low participation regions, as almost a third (27%) of respondents selected this option there.

**Table 12: Reasons for cooperating with regional partners in FP7 NMBP projects, by level of regional participation**

<i>Share of respondents that cooperated with regional partners in FP7 NMBP projects, %</i>	<b>Total<sup>1)</sup></b>	Low participation rate	Medium participation rate	High participation rate
Our mission and role	<b>46</b>	48	47	45
A continuation of successful existing / previous collaboration	<b>42.3</b>	47	39	43
Funding / cofunding requirements	<b>28.5</b>	32	29	28
Our position in the regional economy / region	<b>19</b>	27	20	18
Ease of communication through geographical proximity	<b>13.9</b>	12	12	14
Regional political motives	<b>5</b>	11	5	5
There are no specific reasons	<b>16.3</b>	11	16	17

<sup>1)</sup> Figures for "Total" are based on the responses of all participants (including participants from non-Member States) whereas only participants from EU Member States have been assigned to regions by the level of regional participation. Source: survey of participants in FP7 NMBP projects (n=2,356)

The strongest role of regional linkages for FP7 NMBP projects is perhaps related to support infrastructures available in the region. These infrastructures include European or EU supported (e.g. European Enterprise Network – EEN, National Contact Points - NCPs), national and regional support organisations or structures (e.g., information service providers, technology transfer offices at research institutions and universities, services of industry associations). The regional offices of these organisations act as important intermediaries between potential participants in the region, the FP7 and often other European or national/regional programmes. An effective support infrastructure in a region will bring together regional actors and funding opportunities, and will hence contribute to mobilising regional potentials for (European) funding programmes.

**Table 13: Comparison of European and regional/national funding of NMBP projects as scored by FP7 NMBP project participants, by level of regional participation**

	<b>Total<sup>1)</sup></b>	Low participation rate	Medium participation rate	High participation rate
Participated in nationally or regionally funded projects in same field, 2007-2013 (share in %)	<b>57.3</b>	52	60	57
<i>Characteristics<sup>2)</sup></i>				
Financial attractiveness	<b>+1.5</b>	+1.8	+1.7	+1.6
Generating new ideas and solutions	<b>+1.2</b>	+1.5	+1.5	+1.2
Generating innovation	<b>+0.9</b>	+1.0	+1.4	+0.9
Higher success rate	<b>-1.3</b>	-1.2	-1.3	-1.3
Lower risk of IP issues	<b>-0.8</b>	-0.6	-1.0	-0.8
Easier to meet project requirements	<b>-0.9</b>	-0.7	-0.8	-0.9
Easier administrative procedures	<b>-1.1</b>	-0.3	-0.7	-1.1
Shorter time between application and grant date	<b>-0.6</b>	+0.2	-0.5	-0.5
Easier setting up of a consortium	<b>-1.2</b>	-1.1	-1.0	-1.2

<sup>1)</sup> Figures for "Total" are based on the responses of all participants (including participants from non-Member States), whereas only participants from EU Member States have been assigned to regions by the level of regional participation.

<sup>2)</sup> Values are derived from a 9 point Likert scale with 1 for preferred regional/national funding and 9 for preferred European funding. Likert scale values have been subtracted by the mean (5) to produce positive and negative values. Positive values indicate that European funding is perceived superior over regional/national funding while negative values indicate superiority of regional/national over European funding  
Source: survey of participants in FP7 NMBP projects (n=2,356)

Regional or national funding programmes could also contribute to strengthen regional linkages of FP7 NMBP project participants. More than half of the participants (57%)

reported national or regional funded projects in the same field as the FP7 project they have been involved in. This means that these participants can act as a link between the target groups of regional and national programmes in the NMBP area, and European networks. These links tend to be stronger in regions with a medium or high level of participation in the FP7 NMBP programmes, since participants from these regions receive regional or national funding more frequently.

Nevertheless, important intra-regional cooperation was highlighted in the Networking Analysis for some regions, as follows:

- Stockholm, Île de France, Helsinki-Uusimaa, Catalonia and North Brabant (N)
- Lombardy, Catalonia, Rhône-Alpes, Piedmont and Île de France (M)
- Basque Country, Lombardy, Rhône-Alpes, Piedmont and Attica (P)
- Île de France, Hovedstaden, South-Holland, Gelderland, Madrid and Southern & Eastern Ireland (B)

The high intra-regional cooperation of actors within the same region can be understood by the following factors:

- As mentioned previously in the report, the main reason for selecting partners in projects is their recognised excellence in their respective field. The intra-regional cooperation, for reasons of excellence, operates even better where there are structures to facilitate cooperation (through local brokerage events, organisations of conferences, joint activities, etc.) and where there is an important culture to bridge the gap between enterprises and research centre/universities.
- Other reasons for high intra-regional cooperation derive from the presence of large organisations, mainly research centres which steer regional promotion. This can be seen from research centres such as Tecnalia or Tekniker in the Basque Region, VTT for Finland or TNO for the Netherlands. These research centres aim to achieve excellence and, through different means, to involve other regional players.

### **5.3. Regional impacts**

As FP7 NMBP projects are designed on a European level and mostly target European-wide markets, participants reported that impacts in their regions are not a focus of FP7 NMBP projects. Even if participants are part of strong regional clusters - as we have seen in some case studies, e.g. Basque Country, South Sweden and Cologne - generating a regional impact is not a priority of their participation. They rather use FP7 projects (and other European projects) to reach out beyond the borders of their regions.

Significant regional impact can be observed in case FP7 NMBP projects generate or strengthen localised knowledge assets such as spin-off companies emerging out of projects, or laboratory infrastructures that were established or extended in the course of FP7 projects. These are considered tangible results with impacts for the regions where participants came from.

Case study results suggest that there is a significant potential to increase the impact of FP7 NMBP projects, and hence also the regional impact. However, it was also stressed out that FP7 NMBP project results need to be strengthened with a set of suitable follow-up activities to fully leverage their economic impact. In many cases, technology readiness levels of FP7 NMBP project results are not close enough for market introduction which allows an immediate commercialisation after the project ends. If follow-up funding would be at least partially based on regional funding resources, this could also help to improve the link of FP7 NMBP project results with regional development and hence maximise regional impact.

## 6. POLICY RECOMMENDATIONS

### 6.1. Introduction

This chapter presents policy recommendations for three aspects of regional embeddedness that have been studied in the project: i) the degree of participation of organisations from the different regions in the FP7 NMBP programme, ii) the linkages of actors within the region and iii) the regional impacts of these programmes. Recommendations for each of these aspects are presented in separate subsections, below.

The recommendations are based on the findings of the quantitative analysis, the interviews conducted in the case studies, the survey of participants and the regional workshops implemented, as well as on further information acquired during the project, including desk research. The policy recommendations have a medium and long-term view, basically related to activities that could be implemented by the end of the Horizon 2020 Programme and during the following programming period.

The recommendations are oriented towards regional (or national) policy makers, industrial participants, as well as to the European Commission. Some recommendations can also be used by other European policy-makers, including the European Parliament and the European Council.

### 6.2. Towards a more effective involvement of organisations in NMBP funding

Manufacturing is a strategic sector for Europe once it provides 66% of private R&D investment and represents 2.1 million enterprises providing direct employment for 33 million persons. Nevertheless, as mentioned in the Final report of the High-Level Group on KETs, *"Europe is confronted with a structural erosion of its manufacturing base and risks losing its competitive manufacturing capacity (...) Europe is experiencing a significant de-industrialisation and a progressive dismantling of its manufacturing sector, both in terms of contribution to Gross Domestic Product (GDP) and employment (with a total loss of 3.8 million jobs over the period 2008-2012. Symptoms include relatively high manufacturing costs as well as a lack of a coordinated innovation and industrial policies across the European Union."*

Europe is leading the development of KETs and is an import key market of products using KETs. Nevertheless, Europe should strengthen its leading position by investing on new technologies across the scope of the technological readiness level (TRL), and in order to do and further increase participation of regional actors. The following actions are recommended on this regard:

- The European Commission should lead the process to organise closer cooperation and links between European Framework Programme funds, cohesion funds, and regional/national funds for research & innovation, in order to improve complementarity amongst them. This complementarity can be promoted following either a research topic logic ('horizontally') or an innovation-chain long ('vertically').

By 'horizontal' complementary, we understand the logic of creating transversal funding opportunities addressing key research areas or gaps, that would be followed by other types of funds. For example, FP7 or H2020 funds could be used to identify some industrial or research gap in some group of regions whose development could then be followed-up by the Cohesion funds. The regional funds could then support the development of research centres. This same logic is starting to be used in Horizon 2020 under the Widespread programme, and in particular the 'Teaming' action<sup>15</sup>.

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<sup>15</sup> For further info see: <https://ec.europa.eu/programmes/horizon2020/en/h2020-section/spreading-excellence-and-widening-participation>



Complementarity could also follow an innovation-chain, or TRL-based criteria. Higher TRL tend to be preferred within projects that require a more limited number of participants (around 3 – 4 maximum) and on a limited geographical scope which tends to be the case for funds provided at regional / national level. Not all regions and countries have similar funds and those who do have national counterparts of Horizon 2020 have not always ensured the complementarity in the sense mentioned above. This complementarity should be push forward in the upcoming programmes.

In both cases it would be useful to assure that rules between national and regional and EU programmes are harmonised and in particular that regional funding authorities adopt the same cost definitions as centrally managed EU funding programmes.

- The match-making between EU funded instruments with national and regional funding instruments could be partly covered through the use the new legal possibilities in the Horizon 2020 and ESIF regulations that allow complementary funding of the same project by different financial instruments. The availability of follow-up funding from regional funds, which takes the results of EC funded projects to the commercial stage (e.g. by funding demonstration or pilot actions, or internationalisation of results, for concluded or close to end EC funded projects), might be critical especially in scaling up business (commercial production).

A recommendation is to consider the use of regional funding instruments for funding collaboration projects between local actors (especially SMEs) and organisations involved in on-going or recently terminated EU-funded projects (either Research and Technological Organisations or Industrial companies) either from the same region or country, or even from different countries, with the purpose of transferring knowledge and technology. At a smaller scale, also a national/ regional supported programme of mobility/internships from SME research/technical staff into frequent NMBP participants (again from the region or from other regions/countries) could be relevant for enhancing impact and fostering future participation.

- Based on our analysis and the feedback gathered during this project, especially from industrial participants and most particularly from SMEs interviewed, it is recommended that NMBP Innovation support strategies put more emphasis on “innovators” and less on technologies and projects. Many SMEs have asked for a more direct relation with funding providers. Projects come to an end as soon as funding expires, while companies carry on, evolve, change, grow, and adapt while making a name themselves. In order to better support companies, a “partnership model”, centred on the user, could be implemented (e.g. valid for multiple contracts), as opposed to the current Grant Donor – Beneficiary approach. To do so, and to develop real partnership links with final clients, support is better provided through a capillary model of intermediary organisations, that should share the risk and be made accountable for the results of the innovation support they provide, either in terms of finance, or services, or both. Again, this process has been started within Horizon 2020 with ‘cascade funding’ type of projects, and can surely be reinforced.

It is also relevant to highlight that the main source of innovation lies in the hand of the actors that are the centre piece for future creations. On this respect, it is of high importance to support, probably with regional funding or through fellowship grants, individuals who, after the end of their NMBP project could be the “torch bearers” for the results of their project and to further promote their activities at regional level.

### **6.3. Regional participation**

Our analyses of participation in the FP7 NMBP programmes have shown that high success rates are driven by a number of regional features. Regions participate to a higher degree in NMBP projects if they are specialised on Key Enabling Technologies (KETs), if they



have strong scientific, economic and industrial hubs, if a regional support infrastructure is in place that provides both information about funding opportunities and procedures, help research organisations and enterprises in setting up, and administering research projects, and if the present actors have the capacity to coordinate large pan-European projects.

Before moving into concrete recommendations that emerged from this study on how to increase the participation from low performing regions, it is worthwhile to point out that if NMBP actions are driven mostly as they have been until now, by criteria of excellence without "positive discrimination", then a performance division amongst regions is always to be expected. Even taking into account a certain 'headquarter' effect (that statistically concentrates all funding obtained by the branches of an organisation on the regions where the management of the organisation is based - something that is particularly relevant for large European research organisations), the study demonstrated that participation in the programme is partly dominated by a relatively limited number of top-performing actors that combine previous experience, knowledge and reputation and that can build on this to reinforce and deepen their dominant position (oligopoly effect). The only effective way to counter this would be by introducing stricter regulatory measures that could, e.g., limit the number of participations per organisations, which are not in line with the current principles of EU funding.

Taking this obvious fact into account, we provide below a set of recommendations extracted from the analysis, interviews and meetings held in this project, on how regions with a low participation in NMBP programmes could get more involved in this type of funding schemes in order to reduce the gap to most performing regions:

- This study has highlighted the role of regional research centres as a catalyser for mobilising and promoting industrial participation. The difference between large and medium realisation rates in a region is often related to the participation of a few but important actors, able to carry out not only some of the research activities, but, even more importantly, to coordinate and lead projects. As such, and in order to enhance regional participation, regional authorities from low performing regions should facilitate and actively support the establishment and co-ordinate capacities at research centres able to participate in the extremely competitive market of EU funded projects. Focus should be made on research excellence, but also on industrial interface and international links. There is a number of funding instruments available to regions for this purpose, at both European level (e.g. the WIDESPREAD programme) and regional level, through the use of European Structural and Investment Funds (ESIF). The model of the TEAMING programme, including a partnership between a university or research organisation with international reputation in research and innovation excellence, and a national or regional authority or research funding agency or a university or a research organisation in a low performing region, is particularly relevant in terms of the leverage it can offer to regional organisations, and can be replicated also with use of ESIF.
- Ensure efficient networking among regional actors. Knowing partners before applying for a project greatly facilitates future project participation and speed up the process. In this respect, policy-makers could support the organisation of more decentralised brokerage events. Brokerage events are preferred to info-days as various project interviewees have stated. Decentralised events in the regions should be ideally organised in collaboration between regional authorities and the main regional participants (including research centres or large industrial actors) in order to reinforce the catalyst role of these, and should be organised quite in advance before the targeted call deadline, as it may facilitate the integration of newcomers in consortia.
- Make better use of the Enterprise Europe Network (EEN) structure, including increasing synergy and complementarity with NCPs. EEN nodes are largely funded by regional authorities as part of the compulsory co-funding. But, with few exceptions, these structures are not used by regions as instruments to promote EU funds to potential regional participants and support them in their first steps,

including in proposal development and submission. The same applies to NCPs in some regions. Regional authorities should take a further involvement in the steering and monitoring of EEN activities in their areas, ensuring that they provide complementary services to those offered by NCPs, with the latter being more focused on information dissemination and EEN concentrating on service provision to potential (and actual) participants. A possible service to be implemented (requested by several organisations interviewed in this study) is a project and proposal hotline at national or regional level that project applicants could contact in their own language to ask administrative and practical questions and that could help participants, including those with less experience, in applying (including suggestions for partner search) and managing EU projects. Such decentralised hotline could be managed through existing structures such as EENs or NCPs.

- Also the thematic orientation of the EEN should be better explored, in order to enhance support to NMBP participants or applicants – the thematic group structure of the EEN could be replicated at regional level, with the local EEN node acting as interface between a local thematic group, and the network of the EEN through the NMBP thematic group(s), and from there to potential partners in other regions.
- Furthermore, regions could decide to accept H2020 evaluation results as a basis for complementary regional ESIF funding e.g. to support regional stakeholders if EU funding could not be obtained due to strong European competition – as in the newly EU promoted action Seal of Excellence<sup>16</sup>, already adopted by some regions – or in supporting management costs of SMEs in complex European projects or providing financing for covering costs of application processes.

#### **6.4. Regional linkages and regional impact**

The direct regional impacts of EU funded projects are always difficult to assess, especially in the short and medium term. This happens because some innovations, especially in NMBP area, have long take-up stages and also because of the indirect impacts generated by projects aimed at support the development of RD&I, but not directly the creation of products that will reach immediately the market. Also, at the level of the impact, it is important also to consider the spill-over effects, i.e., impact within the region of projects where the region is not a direct participant, but from which it may benefit.

This last aspect is of particular importance for many regions with low participation levels, considering also that most project consortia tend to include only one partner per country, and this usually comes from a capital region or from a region with a strong participation.

Intra-regional (e.g. through research-industry collaborations within organisations in the same region) or even intra-national cooperation within a project is therefore less frequent than expected (with the notable exception of some regions such as Basque Country, where technological centres have a clear orientation to include local industrial participants in their projects), and this can limit the short term impact of some projects. The regional impact depends also in big part on the presence in the region of necessary support infrastructure, such as incubators and accelerators, private and public venture capital mechanisms, legal possibilities to create spin-offs, presence of talent and human capital in general, mobility of researchers, strong business ecosystem, etc. It is obvious that investments in any area of the general innovation infrastructure will most certainly improve the impact of EC funded projects in the region.

#### **6.5. Regional impact of NMBP projects and smart specialisation strategies**

European policy has been strongly moving towards fostering innovation at a regional level. Smart specialisation is a main strategy in this context. Regions attempt to take advantage of their specific strengths through cluster and network building while developing their knowledge and innovative capacities. Key Enabling Technologies are one important focus of such strategies. Linking regional development strategies and research

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<sup>16</sup> For more info see: <https://ec.europa.eu/research/regions/index.cfm?pg=soe>

funding in NMBP is hence a promising approach for fruitful cooperation between regional and research policies.

There are several areas for such linkages:

- First, a stronger focus of smart specialisation strategies of regions in the field of NMBP could be used as an entry point for (higher) participation in NMBP programmes. Through regional networks, potential partners in the region could be mobilised. Regional clusters could also act as a focus point that attracts international partners to form new consortia. This could take the shape of favoured funding by regional funds on the activities that are included within their Smart Specialisation Strategy.
- Secondly, NMBP projects and regional development projects could be streamlined along the innovation chain. On the one hand, regional policies often invest into building up and strengthening regional research infrastructures which would be a natural partner in NMBP projects. On the other hand, regional projects often target more applied-oriented, close-to-market innovation activities. Such activities could build upon results from NMBP projects.
- Thirdly, regional funding sources, both from Structural Funds and from regional authorities in the Member States, could be used to finance follow-up research to increase the TRL of the research conducted in NMBP projects. The more technologically demanding this research is, the more likely it is that NMBP projects stop at TRLs below a prototype level. Interviews and regional workshops conducted within this study suggest that follow-up financing could significantly increase the economic impact of NMBP projects. If such follow-up financing is linked to regional initiatives, this could substantially increase the regional impact of the projects and, at the same time, contribute to the objectives of regional policy measures.
- A main challenge for a successful regional embeddedness of organisations in the NMBP fields lies in the different focus of NMBP projects and regional policies. While FP7 (as well as Horizon 2020) projects aim at pushing further the technological frontier at a global level, regional specialisation rests on comparative advantages of regions. Comparative advantages imply that the respective activities promise the highest returns for a region given that region's specific endowment with knowledge and production factors. However, it does not imply that these activities are world- or Europe-leading ones in the respective field. As such, a project not retained by EU funds may still be valid within a regional policy, and regions may decide to accept H2020 evaluation results as a basis for complementary regional funding e.g. to fund to regional players when EU funding could not be obtained.

## 7. REFERENCES

- Beise, M (2001) Lead Markets, Country-Specific Success Factors of the Global Diffusion of Innovations, *ZEW Economic Studies 14*, Heidelberg/New York: Physica; and the *Lead Market Initiative of the European Commission*.
- Cohen, S.S., Fields, G. (1999) Social capital and capital gains in Silicon Valley. *California Management Review* 41 (2) 108–130
- Cooke, P., N. Clifton, and M. Oleaga (2005) Social capital, firm embeddedness and regional development. *Regional Studies* 39 (8):1065-1077
- Cooke, P., M. Gomez Uranga, and G. Etxebarria (1997) Regional Innovation Systems: Institutional and Organisations Dimensions. *Research Policy* 26: 475-491.
- DiMaggio, P.J. and W.W. Powell (1983) The iron cage revisited: Institutional isomorphism and collective rationality in organisational fields. *American Sociological Review* 48: 147-60
- Doh, S., and Z. Acs (2010) Innovation and Social Capital: A Cross-Country Investigation. *Industry & Innovation* 17 (3):241-262
- European Commission (2006) ERDF Operational programme under the competitiveness and employment objective, North Rhine-Westphalia 2007-2013
- European Commission (2014) Regional Innovation Scoreboard
- European Commission (2015) Smart specialisation platform: Nordrhein-Westfalen. Available at: <http://s3platform.jrc.ec.europa.eu/regions/DEA/tags/DEA>
- Gilsing, V., B. Noteboom, W. Vanhaverbeke, G. Duysters and A.S. van den Oord (2008) Network embeddedness and the exploration of novel technologies: technological distance, betweenness centrality and density. *Research Policy* 37: 1717–1731
- Granovetter, M., (1973) The strength of weak ties. *American Journal of Sociology* 78 (6): 1360–1380
- Granovetter, M., (1985) Economic action and social structure: the problem of embeddedness. *American Journal of Sociology* 91 (3): 481–510
- Iyer, S., M. Kitson, and B. Toh (2005) Social capital, economic growth and regional development. *Regional Studies* 39 (8):1015-1040
- Lengauer, L. and F. Tödling (2010) Regional Embeddedness and Corporate Regional Engagement: Evidence from three industries in the Austrian region of Styria. Conference paper for the 8th European Urban & Regional Studies Conference 15th to 17th September in Vienna
- Maggioni, M. A. and T.E. Uberti (2005) Knowledge flows and regional disparities in Europe: geographic, functional and sectoral distance. Paper presented at the Final Open Conference on Knowledge and Regional Economic Development, Barcelona, Spain, 2005.
- Navarro M. and Gibaja J.J. (2009) Typologies of innovation based on statistical analysis for European and Spanish Regions. Working Paper, Innova, 2009-04.
- OECD (1997) National Innovation Systems. Organisation for Economic Co-operation and Development. Paris
- Polanyi, K. (1978) The Great Transformation. Politische und ökonomische Ursprünge von Gesellschaften und Wirtschaftssystemen. Frankfurt: Suhrkamp

Porter, K., K. Bunker Whittington and W.W. Powell (2005) The Institutional Embeddedness of High-Tech Regions: Relational Foundations of the Boston Biotechnology Community. In: Breschi, S. and F. Malerba (eds.) Clusters, Networks, and Innovation. Oxford: Oxford University Press

Putnam, R.D (1993) Making Democracy Work. Civic Traditions in Modern Italy. Princeton: Princeton University Press

Soha, P.-H. and E.B. Roberts (2003) Networks of innovators: a longitudinal perspective. *Research Policy* 32: 1569–1588

Stinchcombe, A.L. (1965) Organisations and Social Structure. In: March, J. (ed.) Handbook of Organisations. Chicago: Rand McNally, pp. 153–193

Wasserman, S. and K. Faust (1994) Social Network Analysis: Methods and Applications. Cambridge University Press, Cambridge

Wanzenböck, I., T. Scherngell and T. Brenner (2013) Embeddedness of regions in European knowledge networks. A comparative analysis of inter-regional R&D collaborations, co-patents and co-publications. Working Papers on Innovation and Space Philipps-Universität Marburg 07.13

Wanzenböck, I., T. Scherngell and R. Lata (2014) Embeddedness of European Union-funded Research and Development (R&D) Networks: A Spatial Econometric Perspective. *Regional Studies* 0(0): 1-21

Wooldridge, J. M. (2002) Econometric Analysis of Cross Section and Panel Data. MIT Press, Cambridge, MA.

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The aim of this study is to analyse how research and innovation activities, funded by the Nanosciences and Nanotechnologies, Materials, New Production Technologies (NMP) and the Industrial Biotechnology (B) themes in the Seventh Framework Programme for Research (FP7) (together: FP7 NMBP), are embedded at a regional level, how the activities linked to local and regional networks and clusters, and to what extent and in what way these activities impacted at the regional level.

This final report presents the summary of the main elements of the study: Mapping and Regression analysis, Network analysis, Case studies of seven regions and the Synthesis. This report closes with Conclusions and Policy recommendations for European as well as regional policy-makers.

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