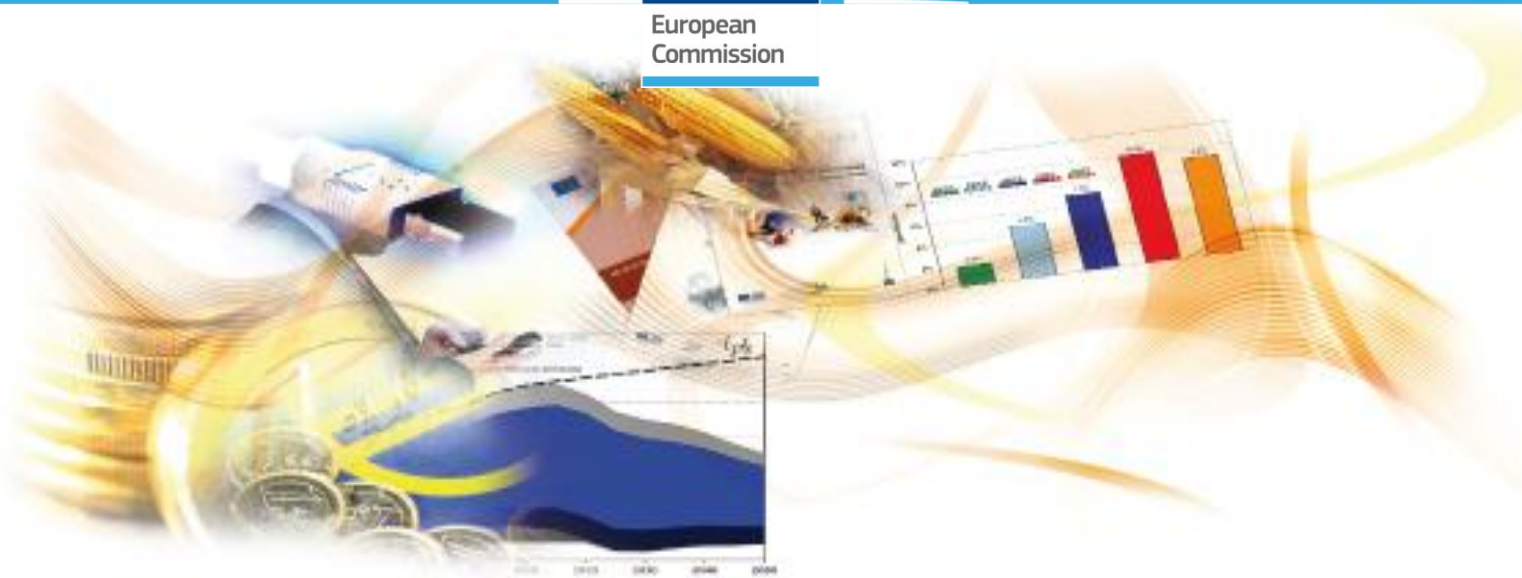




European
Commission



J R C T E C H N I C A L R E P O R T S

Preliminary report on KETs priorities declared by regions in the context of their work on Research and Innovation Strategies for Smart Specialisation (RIS3)

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1. Introduction

The European Commission has noted the capacity to develop and industrially deploy Key Enabling Technologies (KETs) as vital for sustaining competitiveness and growth. In order to move out of the current crisis, fiscal consolidation is not enough; there is a need for further efforts to boost growth, competitiveness and job creation. In this respect, European leaders have specifically advocated the strengthening of Key Enabling Technologies (KETs).¹

For this purpose, the Commission has outlined a European strategy for Key Enabling Technologies² with the ambition to create synergies between EU policies and instruments and ensure coordination of EU and national activities, between both public and private actors. The strategy builds upon three pillars: technological research, product demonstration, and competitive manufacturing activities. The Commission shows its willingness to take on high risk and costly innovation projects, which are closer to the market and of key relevance to the competitiveness of the EU. At the same time, the Commission expects other actors to take on their roles to enable these possibilities, in particular the industry.

The Commission defines KETs as 'knowledge intensive and associated with high R&D intensity, rapid innovation cycles, high capital expenditure and highly skilled employment. They enable process, goods and service innovation throughout the economy and are of systemic relevance. They are multidisciplinary, cutting across many technology areas with a trend towards convergence and integration. KETs can assist technology leaders in other fields to capitalise on their research efforts'³. They address six technology areas that are of particular importance: micro/nano-electronics, nanotechnology, photonics, advanced materials, industrial biotechnology, and advanced manufacturing technologies.

This report, prepared by the European Commission's Joint Research Centre (JRC) Institute for Prospective Technologies Studies (IPTS), presents preliminary information on Key Enabling Technologies (KETs) priorities declared by regions in the context of their work with the S3 Platform⁴ on their research and innovation strategies for smart specialisation (RIS3). As of the end of June 2013, 130 regions and 9 Member States have registered as members of the platform to contribute to and benefit from all its activities.

¹ See European Council Conclusions of 2 March 2012, which requested stepped-up efforts in "strengthening key enabling technologies which are of a systemic importance for the innovativeness of industry and the whole economy".

² COM(2012) 341 Final Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee Of The Regions 'A European strategy for Key Enabling Technologies – A bridge to growth and jobs'

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2012:0341:FIN:EN:PDF>

This strategy takes into account the first KETs Communication from 2009 (Current situation of key enabling technologies in Europe, SEC(2009) 1257) and the recommendations of the High-Level Expert Group on Key Enabling Technologies (HLG KETs). The Commission established the HLG KETs as an external advisory body in accordance with COM(2009) 512. Its mandate was to (1) assess the competitive situation of the relevant technologies in the EU with particular focus on industrial deployment and their contribution in addressing major societal challenges; (2) analyse in depth the available public and private R&D capacities for KETs in the EU (on all levels); and (3) propose specific policy recommendations for a more effective industrial deployment of KETs in the EU.

³ Current situation of key enabling technologies in Europe, SEC(2009) 1257.

⁴ A platform established by the European Commission (DGs JRC and REGIO) to provide professional advice to EU Member States and regions on the design of their innovation strategies for smart specialisation, see <http://s3platform.jrc.ec.europa.eu>.

This report consists of information on KETs and Smart specialisation that the S3 Platform has developed and diffused in different forms, as well as relevant information that has been identified by participation in different kinds of events.

The first part focuses briefly on the role of KETs in smart specialisation as a means of regional development, i.e. the policy rationale for regions to invest in KETs as part of the policy mix related to their research and innovation strategies for smart specialisation (RIS3).

The second part summarises policy recommendations and tools with regard to Smart Specialisation and KETs, as have been identified in different events on the topic. The S3 Platform has arranged a number of peer reviews, where regions share their draft RIS3 to get feedback and improve them. In these peer reviews, some regions have shared how they intend to work with KETs. Furthermore the S3 Platform has participated in events on KETs, and also arranged a specific thematic workshop on KETs and Agro-Food. These and other available sources have been used in order to find more in-depth qualitative information on how regions work and intend to work with KETs.

The third part provides maps on regional priorities related to KETs. The data for this section come from the new web-based priority mapping tool called "Eye@RIS3."⁵ This tool displays a range of priorities identified and declared by regions for their RIS3 and includes:

- the names of the regions that are in the Eye@RIS3 database (69 in total)
- the names of those that have indicated a priority with relation to KETs (48 in total)
- a list of the priorities related to KETs (96), around 20% of the total number of listed priorities

The third part also contains an analysis connecting the data to the regional innovation scoreboard and to patent data and/or indicators on other regional capabilities.

2. The development of Smart Specialisation

The term “smart specialisation” was launched by the Knowledge for Growth Expert Group in the framework of the European Research Area (ERA).⁶ The potential of the concept as a driver of innovation and general economic policy was developed by the European Commission's JRC IPTS.⁷ Smart specialisation refers to the concentration of resources by developing distinctive and original areas of specialisation, which will allow regions/countries to particularize themselves. Until recently research and innovation investments in Europe have been overly fragmented, lacked critical mass and been plagued with a clear "me too" syndrome, in that regions have made investments in too similar and fashionable areas like ICT, nano- and biotech. Furthermore, these areas have often lacked any connection to existing local capabilities and been based more on hopes

⁵ There is a short description of the tool in the annex, see also <http://s3platform.jrc.ec.europa.eu/eye-ris3>.

⁶ Foray, D.; P. David and B. Hall (2009) “Smart Specialisation – The Concept” Knowledge Economists Policy Brief No 9, June 2009.

⁷ Pontikakis D., Kyriakou D. and R. van Bavel (2009) The Question of R&D specialisation: perspectives and policy implications, JRC Scientific and Technical Reports, June 2009.

for future industries. This challenge had also been identified by DG REGIO in the context of the work with past Regional Innovation Strategies. The lack of any connection to existing capabilities was probably the greatest limitation, as recent research⁸ indicates that most regional innovation originates from some set of current capabilities.

For the upcoming programming period 2014-2020 of the European Union, the need to have research and innovation strategies for smart specialisation (RIS3) was introduced as an ex ante conditionality for the awarding of structural funds. A RIS3 is an agenda for knowledge-driven and knowledge-oriented economic and societal change hinging upon the identification of a limited set of regions on which to focus public intervention and leverage private investment. This will imply choosing economic activities and corresponding market niches where a region is most likely to develop and achieve sustainable competitive advantages, based on distinctive capabilities. These activities may correspond to particular kinds of technology, knowledge fields, disciplines, and sub-systems, within an industrial sector or at the interstices of different sectors.⁹

The RIS3 Guide to Smart Specialisation, edited by the JRC.IPTS, advises concentrating resources in a limited number of domains identified in consultation with 'the entrepreneurs', in order to generate critical mass effects (e.g. scale, scope and spillovers), where potential is greatest. It is clear that these effects may not occur if the choices of the activities are rather conservative and duplicated. In such a case, regions would compete for the same resources, with no one making any impact.¹⁰ In short, regions should practise resource concentration and focus by developing distinctive and original areas of specialisation.

But to implement this in practice is a challenge, especially to avoid the government failures usually associated with the top-down and centralised bureaucratic process of technology choices and selection, and not to dissipate the extraordinary power of market-driven resource allocation in boosting decentralised entrepreneurial experiments. Therefore, regions implementing RIS3 also need to have the necessary institutional capacity to analyse their relative positions and opportunities, manage the entrepreneurial process of discovery, develop a shared vision, and implement effective policy mixes, as well as to monitor and evaluate the impact of their policies.

With regard to the use of structural funds for smart specialisation, it should be noted that these funds are not aimed at building R&D capabilities and knowledge per se, but at stimulating growth and regional development. However, to be successful and attractive in the long term, it will also be important for lagging regions to build institutional R&D capability to support existing companies and to attract external companies to invest in a region, and not only to hire consultants or external researchers to solve some regional companies' immediate problems. But how to stimulate and foster existing or emerging markets that are regionally anchored?

⁸ Neffke, F., M. Henning and R. Boschma (2011), How do regions diversify over time? Industry relatedness and the development of new growth paths in regions, *Economic Geography*, 87 (3): 237-265.

⁹ Dominique Foray and Xabier Goenaga (2013) The goals of smart specialisation, JRC Scientific and Policy Reports, S3 Policy Brief n°1/2013.

¹⁰ For an analytical development of this argument, see P. David, "Economic geography, history and destiny: reflections on Paul Krugman's elegant naked models in space", World Bank Conference, Washington DC, 1998.

However, identifying which activity to work with, the scope of the activity with regard to economic activities and geographical space, timing of activities, type of interventions and what level of aggregation to involve, is not straightforward, and more knowledge is needed - both for KETs and applications of these.

3. What are regions doing and what challenges have been perceived?

3.1 Information from workshops and peer reviews on KETs in RIS3

This section presents what regions are doing in the area of KETs and what challenges to further advancement have been perceived by them. The general message conveyed by these various activities is that horizontal priorities need to be defined, in addition to technological, sectoral or cross-sectoral priority areas, and that these could involve the diffusion and/or application of KETs.

The overall impression is that while many regional policymakers are aware of KETs as a horizontal priority, they still have a lot of questions related to state aid and financing of KETs, including rules of financing demonstration projects and infrastructures.

3.1.1 EuroNanoForum 2013

Attendees at this international conference further examined the role of KETs in the new EU funding period. Two workshops ('KETs and Horizon 2020' and 'KETs development and deployment') reconfirmed that while a significant part of future goods and services might not be yet known, one important driving force behind their development would be KETs. Participants further agreed that KETs are of systemic relevance.

One important message conveyed at this Dublin event is that the deployment of KETs through (research) Public-Private Partnerships is recognised by industry (both large companies and SMEs) as an important opportunity to enable the development of new goods and services, and the restructuring of industrial processes needed to modernise EU industry and secure the research, development and innovation base in Europe.

3.1.2 Thematic workshop on KETs in photonics, micro- and nano-electronics

DG JRC was invited to contribute to a thematic workshop in November 2012 focusing on KETs in the field of photonics, micro- and nano-electronics. The event was mainly aimed at policymakers and industry representatives working in these technological areas, but was also well attended by policymakers from approximately ten European regions (most are members of the S3 Platform) with more of a regional strategy development interest, rather than purely sectoral interest. At the event a number of regional case studies were presented, namely from Silicon Saxony, Grenoble, Eindhoven, Flanders, Silicon South-West and Silicon Sicily.

With regard to policy implications, the main issue areas identified during the event were:

- The role of ICT-KETs in the context of Horizon 2020, with a further focus on the issues of industrial leadership in the EU
- Questions of state aid and financing of KETs, rules of financing demonstration projects and infrastructures, and the future of the 'matching clause', as well as
- Perceived differences between some of the regulations developed by DG REGIO and DG COMP.

3.1.3 Thematic workshop on KETs and Agro-food

The S3 Platform together with the Region of Murcia organised a pilot workshop on Key Enabling Technologies for RIS3 on Agro-food on 11/12 April 2013. The purpose of this workshop was to discuss the role of KETs in the process of developing and implementing RIS3. As a number of EU regions have identified agro-food activities in their RIS3 exercises, the event specifically addressed the role and importance of KETs in the agro-food sector understood from a cluster approach, comprising inter alia agriculture, the food industry, logistics, and environmental aspects. The event brought together policymakers, consultants, researchers and business representatives in innovation-related fields at European, national and regional levels.

In particular, the workshop featured presentations from Emilia Romagna (IT), Murcia (ES) and Northern Ireland (UK).

During the workshop the discussions focused on four main themes:

- 1) How to map KETs on agro-food in the regions and addressing the issue of whether it should be a priority for regions;
- 2) Industry and Academia addressing and challenging the 'KETs Discovery Process';
- 3) Regions presenting their RIS3 strategy in relation to their agro-food priority and
- 4) Instruments to promote a KETs market and collaboration in regions, including the use of networks.

The participants at the workshop conveyed the message that Agriculture, and the ability to transform agricultural products into high-quality food, is a key element of the European economic and cultural pattern. All parties involved in smart specialisation valued and would want to preserve agriculture in their regions. At the same time it has been hard, but not impossible, to build bridges between KETs, on the one hand, and agro-food, on the other. In fact, it is making those bridges that promotes, feeds and supports the entrepreneurial process of discovery which is at the heart of smart specialisation.

The importance and relevance of appropriate involvement and monitoring, including the use of indicators in the design and implementation of these strategies, was stressed. The three cases presented from Emilia Romagna (IT), Murcia (ES) and Northern Ireland (UK) - which tackled the issue of KETs in agro-food starting from three different points of view and applying different methodologies - suggested a very similar path to grasp the issue: start with a mapping tool as a reference point and a facilitator for concrete projects (both in research and commercialisation).

Furthermore, in the area of KETs and applications in Agro-food it was noted that the policy borders between different EU initiatives can be complementary: Horizon 2020, regional

funds, rural development funds. They have a common task to be fulfilled at national and/or regional level.

Although coming from only one minor observation, like that of the Murcia workshop, there is an indication that the concrete mapping of capacities and on-going work on KETs at regional level might well be an "entry strategy" to the uptake and deployment of KETs that is commonly used in the European regions, and is consistent with individual economic/business patterns and R&D and knowledge endowments.

3.1.4 S3 Platform peer reviews

An important tool currently offered by the S3 Platform to the EU regions and Member States is its RIS3 peer review workshops. These workshops bring together regions for mutual learning and exploration of ways in which RIS3 strategies can be developed. The S3 Platform aims to create an open and trusting learning environment where practical and conceptual aspects of RIS3 can be discussed and explored through the challenges and experiences of individual regions.

The peer review approach developed by the S3 Platform concentrates activities, both in time and space, by allowing a larger number of regions to be reviewed by peers with different experiences from across Europe. These peer reviews aim to fulfil two main objectives. The first objective is to allow regions to meet their peers (as well as the European Commission staff and experts) to discuss common issues related to Smart Specialisation. The second objective is to allow regions to peer-review each other's work on RIS3.

Over the course of 18 months (2012-2013), the S3 Platform has organised a series of 10 peer review workshops. RIS3 strategies of 32 regions/Member States have been reviewed at these events, which have been attended by over 110 regions (and Member States).

Policymakers from across the EU opt to be peer-reviewed at these S3P workshops with an aim to source both critical and well-timed advice addressing issues which are critical within the context of Smart Specialisation. These peer review workshops are also seen as a good opportunity to build a network of counterparts across Europe.

A number of regions (including Northern Ireland, the Basque Country, the Balearic islands, Centre (France), Alsace, Puglia, Aragon, Piedmont, Ostrobothnia, Languedoc-Roussillon, etc.) have indicated KETS as an existing strength in the region with significant scientific and commercialisation potential at a regional level. These regions have also indicated their interest in further support in a number of areas, including the following:

- Better, more effective tools for identification of related priorities.
- Further guidance on how scientific and commercialisation potential can be estimated in areas such as KETs.
- What is a critical mass? And how large should the agglomerations worked with be?
- Additional policy support for innovation in the context of KETs: how to collaborate with other regions (external research units and companies), how to identify and promote/facilitate the development of required skills.

3.2 Analysis of data in the Eye@RIS3 database

RIS3 is a process, at the end of which regional/national strategies should identify activities in which investing resources is likely to stimulate knowledge-driven growth. The Eye@RIS3¹¹ is a pilot online database that is currently used as a tool to help strategy development rather than a source of statistical data. The purpose of the database is to give an overview of regions' priorities in order to enable others to position themselves, to find their unique niches and to seek out potential partners for collaboration.

The current data in the database comes from presentations of draft RIS3 made by regional representatives at peer reviews, informal assessment reports produced by experts evaluating draft RIS3 strategies, and a national report on French RIS3 strategies, which has been interpreted and inserted into the database by the S3 Platform.

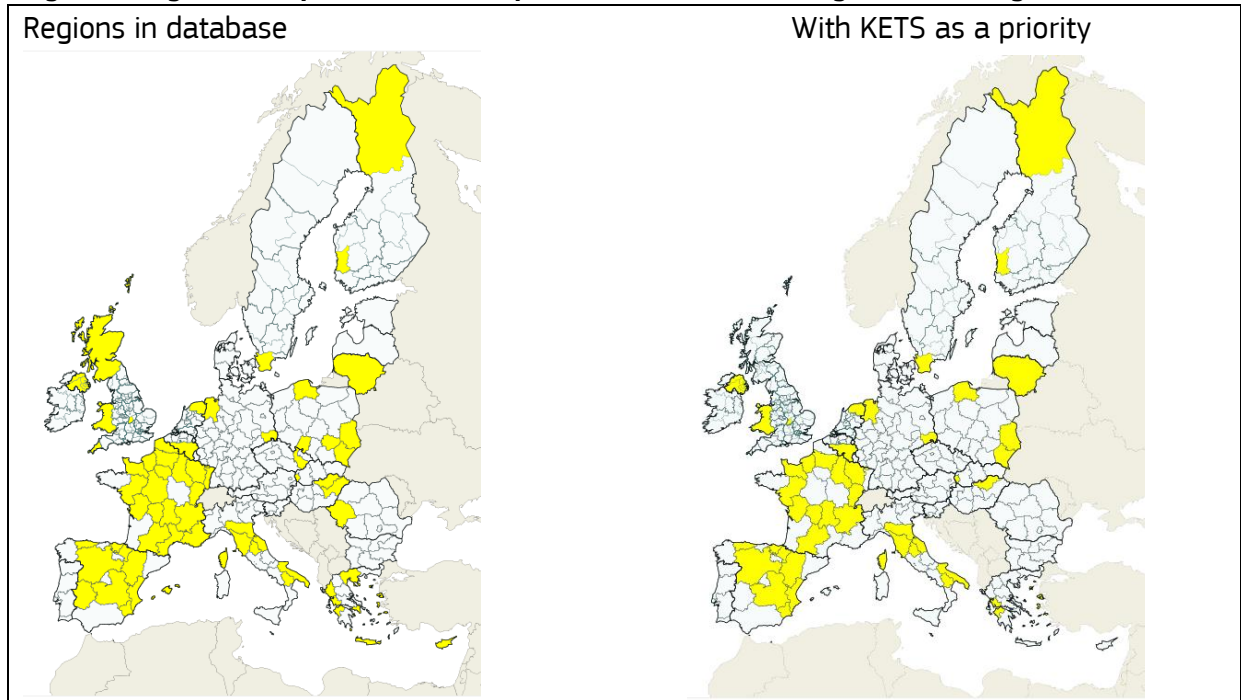
There are a number of caveats regarding the database data; it should be noted that some of the data comes from presentations more than a year old, and a lot could have happened in this time period. Furthermore, regions will only have chosen priorities by the end of 2013 and this should have been done in participation with stakeholders. Thus there might be upcoming changes vis-à-vis these early indications.

3.2.1 Number of regions in the database and regions with KETS in the radar

Currently there are 69 regions in total in the database (see Figure 1 and Annex), which is around 25% of Europe's 271 regions, which is the main level for participation in the S3 Platform. 9 MS have registered recently in the platform but no information is yet available on their priorities. Out of the 69 regions, 48 have indicated an interest in KETs (see Figure 1 and Table 5), which is around 65%. This means that a majority of regions perceive KETs as important and intend to take related action. The total number of priorities indicating KETs is 96, which means that around 20% of total priorities (517 in database) are KETS related. For more detailed information on these priorities, see Table 7 in the Annex, which includes a complete list of regions, name of priority and type of KET.

¹¹ <http://s3platform.jrc.ec.europa.eu/map>

Figure 1: Regions with priorities in the Eye@RIS3 database and Regions indicating KETs



3.2.2 Regional priorities in KETs

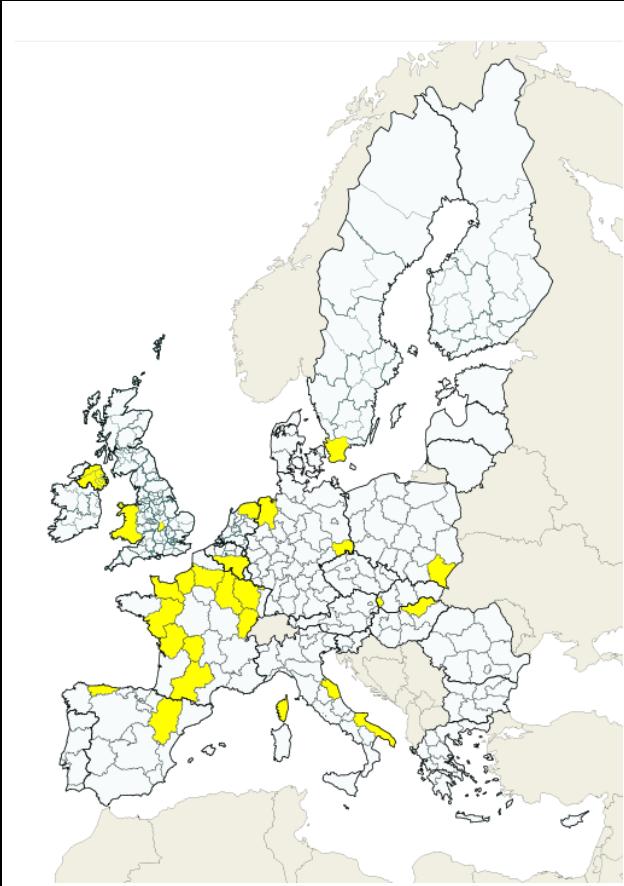
In the database there are 96 priorities indicated with relation to KETs, which is around 20% of all priorities listed in the database. The 96 priorities are spread over the following subcategories as follows:

- Advance materials – 30
- Industrial biotechnology - 25
- Advanced manufacturing systems - 20
- Nanotechnology - 10
- Photonics - 5
- Micro/Nano-electronics - 5

Each of the subcategories of these KETs are presented below, with a map, name of regions with priorities in KETs and the name of the priority.

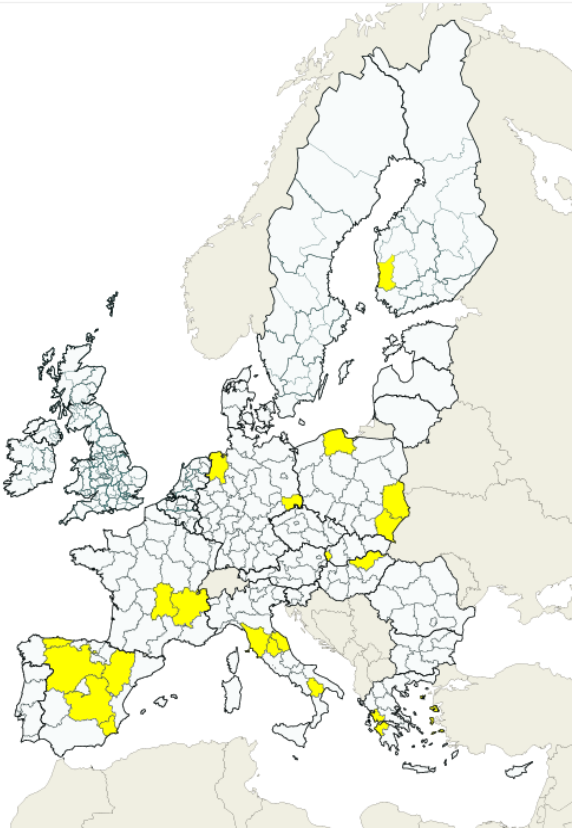
I. Advanced materials

There are 30 priorities within the area of Advanced Materials, and 28 regions opting for this.

	Aragón (ES)	New materials
	Basse-Normandie (FR)	Materials, mechanics & metallurgy
	Bratislavský kraj (SK)	New materials
	Bratislavský kraj (SK)	New materials in electrotechnics, photovoltaics, sensors
	Bratislavský kraj (SK)	Intelligent surfaces
	Champagne-Ardenne (FR)	Materials
	Corse (FR)	Aeronautics & materials
	Észak-Magyarország (HU)	Advanced materials
	Franche-Comté (FR)	Plastics
	Guadeloupe (FR)	Risks and materials
	Haute-Normandie (FR)	Innovative materials & related technologies
	Limousin (FR)	Ceramics
	Lorraine(FR)	Functional materials
	Marche (IT)	New materials
	Martinique(FR)	High speed steel
	Midi-Pyrénées (FR)	Materials, aerostructures & mechanics
	Northamptonshire (UK)	Advanced materials
	Northern Ireland (UK)	Bio materials
	Northern Netherlands (NL)	Smart sensor systems - a combination of sensor technology and chemistry
	Pays de la Loire (FR)	Mechanics & materials
	Picardie(FR)	Mechanics, materials & fibres
	Podkarpackie (PL)	Advanced materials
	Poitou-Charentes (FR)	Mechanics & materials
	Principado de Asturias (ES)	Advanced materials
	Puglia (IT)	New materials
	Région Wallonne (BE)	Sustainable materials
	Sachsen (DE)	New materials
	Skåne län (SE)	Advanced materials
Wales (UK)	Advanced engineering & materials	
Weser-Ems (DE)	Advanced materials	

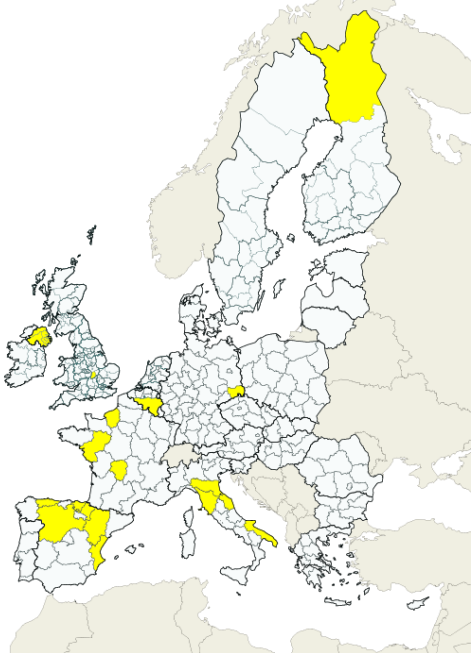
II. Industrial biotechnology

There are 25 priorities in industrial biotechnology, with 24 regions having indicated a priority.

	Aragón (FR)	Health & biotechnology
	Auvergne (FR)	Biotechnologies
	Basilicata (IT)	Agro-biotechnology
	Bratislavský kraj (SK)	R&D in biology active materials, biopolymers, biocompatible and biodegradable materials (e.g. vas implanters)
	Canarias (ES)	Biotechnology
	Castilla y León (ES)	Biotechnology
	Castilla-La Mancha (ES)	Biotechnology (Bio-economy)
	Dytiki Ellada (EL)	Bio-economy
	Észak-Magyarország (HU)	Biotechnology
	Lietuva (LV)	Biomedicine
	Lietuva (LV)	Biotechnology
	Lubelskie (PL)	Bio-economy
	Marche (IT)	Biotechnology
	Podkarpackie (PL)	Biotechnology
	Pomorskie (PL)	Biotechnology
	Principado de Asturias (ES)	Biotechnology
	Região Autónoma dos Açores (PT)	Blue biotechnology
	Región de Murcia (ES)	KETs in agro-food cluster industry
	Rhône-Alpes (FR)	Life sciences & biotechnologies
	Sachsen (DE)	Biotechnology
	Satakunta (FI)	Bio-economy
	Toscana (IT)	Biotechnology
	Umbria (IT)	Agro-food (genomics)
	Voreio Aigaio (IT)	Bio-Agro-Food
	Weser-Ems (DE)	Biotechnology

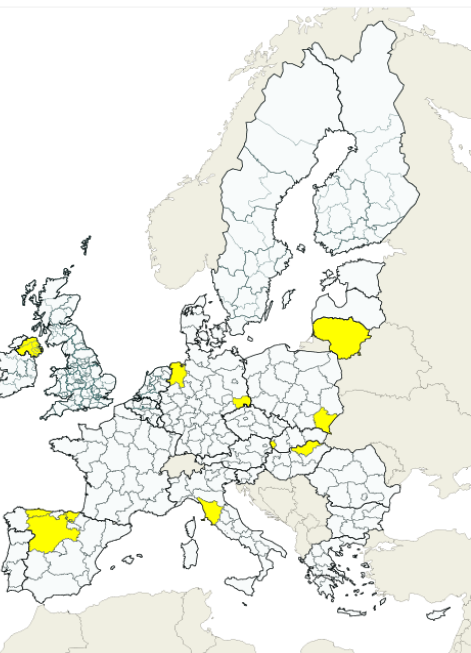
III. Advanced manufacturing systems

There are 20 priorities in Advanced manufacturing systems from 18 regions.

	Aragón(ES)	Automotives
	Castilla y León (ES)	Metal machinery
	Castilla y León (ES)	Automotives (ICT & aeronautics)
	Comunidad Foral de Navarra (ES)	Mechatronics
	Comunidad Valenciana (ES)	Advanced manufacturing, intelligent and clean
	Emilia-Romagna (IT)	Mechatronics
	Haute-Normandie (FR)	Optimisation of production processes
	Lappi (FI)	Traditional process industry
	Limousin (FR)	Mechanics
	Marche (IT)	Furniture
	Northamptonshire (UK)	Automotives
	Northern Ireland (UK)	Packaging and software
	País Vasco (ES)	Advanced manufacturing
	Pays de la Loire (FR)	Automotives
	Principado de Asturias (ES)	Advanced manufacturing
	Puglia (IT)	Advanced manufacturing
	Puglia (IT)	Mechatronics
	Région Wallonne (BE)	Aeronautics & space
	Sachsen (DE)	Advanced production technologies
	Toscana (IT)	Advanced manufacturing

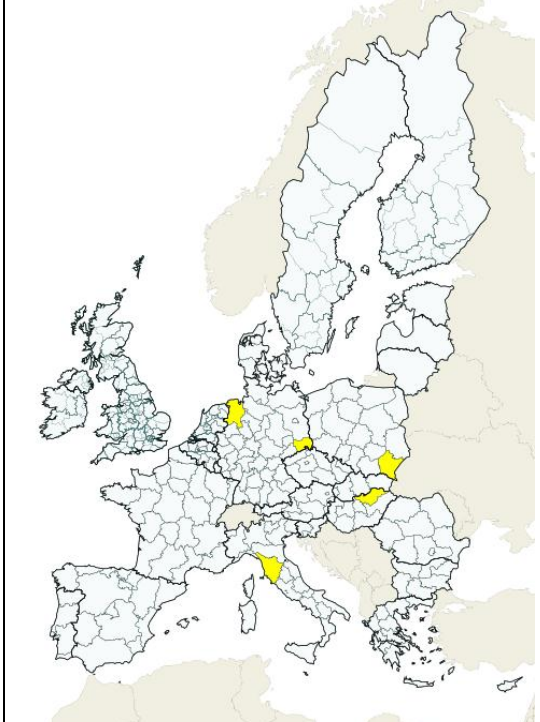
IV. Nanotechnology

There are 10 priorities in Nanotechnology from 10 regions.

	Bratislavský kraj (SK)	Nanotechnology
	Castilla y León (ES)	Nanotechnology
	Észak-Magyarország (HU)	Nanotechnology
	Lietuva (LV)	Nanotechnology
	Northern Ireland (UK)	Nanotechnology
	País Vasco (ES)	Nanotechnology
	Podkarpackie (PL)	Nanotechnology
	Principado de Asturias (ES)	Nanotechnology
	Sachsen (DE)	Nanotechnology
	Toscana (IT)	Nanotechnology
Weser-Ems (DE)	Nanotechnology	

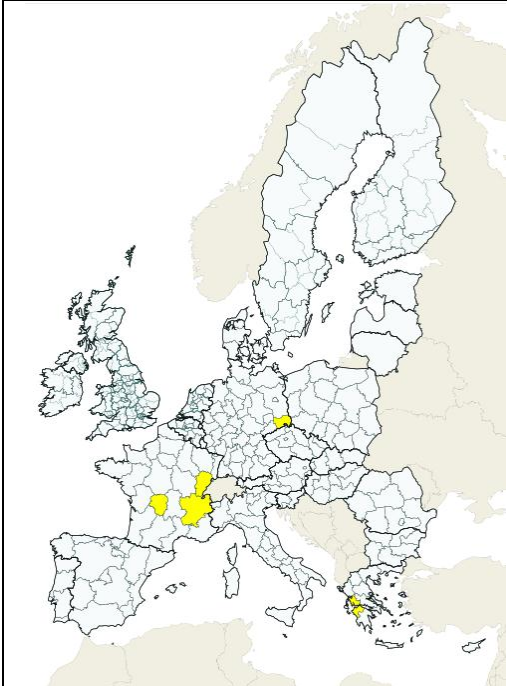
V. Photonics

There are 5 priorities in Photonics from 5 regions.

	Észak-Magyarország (HU)	Photonics
	Podkarpackie (PL)	Photonics
	Sachsen (DE)	Photonics
	Toscana (IT)	Photonics
	Weser-Ems (DE)	Photonics

VI. Micro/Nano-electronics

There are 5 priorities in Micro/Nano-electronics.

	Dytiki Ellada (EL)	Microelectronics
	Franche-Comté (FR)	Microtechnologies
	Limousin (FR)	Electronics
	Rhône-Alpes (FR)	Micro & nano-technologies
	Sachsen (DE)	Microelectronics including organic and polymer electronics (semi-conductors)

3.2.4 Regional Innovation Scoreboard¹²

We have compared the regions indicating that they are likely to make KETs a priority or part of a priority in some way, with regions from the Regional Innovation Scoreboard (RIS). In the RIS, the regions are classified into four categories: leaders (12-10), followers (9-7), moderate (6-4) and modest (3-1). We have compared this classification with the KETs regions (see Table 1 below).

When comparing KETs regions and position in Regional Innovation Scoreboard, there is no clear pattern. All types of regions aim for KETs, not only leaders. There is no special focus around types of clusters among the regions either, nor any difference in the detail of the priorities envisioned. Thus it cannot be identified from this scoreboard whether regions are going for applications of KETs or to build strength in the KETs.

Table 1: KETs regions listed in Regional Innovation Scoreboard

Name of Region	Name of priority	Type of KET	Degree of innovativeness
LEADERS			
Skåne län	Advanced materials	Advanced materials	12
Lappi	Traditional process industry	Advanced manufacturing systems	11
Satakunta	Bio-economy	Industrial biotechnology	11
Sachsen	Advanced production technologies	Advanced manufacturing systems	10
Sachsen	New materials	Advanced materials	10
Sachsen	Biotechnology	Industrial biotechnology	10
Sachsen	Microelectronics including organic and polymer electronics (semi-conductors)	Micro/Nano-electronics	10
Sachsen	Nanotechnology	Nanotechnology	10
Sachsen	Photonics	Photonics	10
FOLLOWERS			
Comunidad Foral de Navarra	Mechatronics	Advanced manufacturing systems	9
Emilia-Romagna	Mechatronics	Advanced manufacturing systems	9
País Vasco	Advanced manufacturing	Advanced manufacturing systems	9
País Vasco	Nanotechnology	Nanotechnology	9
Région Wallonne	Aeronautics & space	Advanced manufacturing systems	9
Région Wallonne	Sustainable materials	Advanced materials	9
Aragón	Automotives	Advanced manufacturing systems	7
Aragón	New materials	Advanced materials	7
Aragón	Health & biotechnology	Industrial biotechnology	7
MODERATE			
Bratislavský kraj	New materials	Advanced materials	6
Bratislavský kraj	New materials in electrotechnics, photovoltaics, sensors	Advanced materials	6
Bratislavský kraj	Intelligent surfaces	Advanced materials	6

¹² The European Regional Innovation Scoreboard provides a comparative assessment of innovation performance across NUTS 1 and NUTS 2 regions of the European Union, Norway and Switzerland. The 2012 edition is available at http://ec.europa.eu/enterprise/policies/innovation/files/ris-2012_en.pdf.

Bratislavský kraj	R&D in biology active materials, biopolymers, biocompatible and biodegradable materials (e.g. vas implanters)	Industrial biotechnology	6
Bratislavský kraj	Nanotechnology	Nanotechnology	6
Castilla y León	Metal machinery	Advanced manufacturing systems	6
Castilla y León	Automotives (ICT & aeronautics)	Advanced manufacturing systems	6
Castilla y León	Biotechnology	Industrial biotechnology	6
Castilla y León	Nanotechnology	Nanotechnology	6
Toscana	Advanced manufacturing	Advanced manufacturing systems	6
Toscana	Biotechnology	Industrial biotechnology	6
Toscana	Nanotechnology	Nanotechnology	6
Toscana	Photonics	Photonics	6
Marche	Furniture	Advanced manufacturing systems	5
Marche	New materials	Advanced materials	5
Marche	Biotechnology	Industrial biotechnology	5
Northern Ireland	Packaging and software	Advanced manufacturing systems	5
Northern Ireland	Biomaterials	Advanced materials	5
Northern Ireland	Nanotechnology	Nanotechnology	5
Principado de Asturias	Advanced manufacturing	Advanced manufacturing systems	5
Principado de Asturias	Advanced materials	Advanced materials	5
Principado de Asturias	Biotechnology	Industrial biotechnology	5
Principado de Asturias	Nanotechnology	Nanotechnology	5
Puglia	Advance manufacturing	Advanced manufacturing systems	5
Puglia	Mechatronics	Advanced manufacturing systems	5
Puglia	New materials	Advanced materials	5
Basilicata	Agro-biotechnology	Industrial biotechnology	4
Comunidad Valenciana	Advanced manufacturing, intelligent and clean	Advanced manufacturing systems	4
MODEST			
Pomorskie	Biotechnology	Industrial biotechnology	3
Região Autónoma dos Açores	Blue biotechnology	Industrial biotechnology	3
Canarias	Biotechnology	Industrial biotechnology	2
Észak-Magyarország	Advanced materials	Advanced materials	2
Észak-Magyarország	Biotechnology	Industrial biotechnology	2
Észak-Magyarország	Nanotechnology	Nanotechnology	2
Észak-Magyarország	Photonics	Photonics	2
Lubelskie	Bio-economy	Industrial biotechnology	1
Podkarpackie	Advanced materials	Advanced materials	1
Podkarpackie	Biotechnology	Industrial biotechnology	1
Podkarpackie	Nanotechnology	Nanotechnology	1
Podkarpackie	Photonics	Photonics	1

3.2.5 Patents

An exploratory analysis has been done on KETs and patents in the regions, in order to identify matches between priorities and existing capabilities. We have compared the regions with declared priorities in KETs with actual data on patent applications to the EPO from 2009.¹³ We looked for a number of IPC sections and classes that would match the KETs. At this point we did not build a more complex sensitive scheme trying to incorporate all relevant IPC classes, but used a simple rule of thumb method for prediction with a few relevant classes.¹⁴ For Photonics, Advanced manufacturing and Advanced materials it was not possible, as these incorporate too many knowledge bases to make an analysis of a few patent classes relevant. For such an analysis it would be necessary to incorporate more patent classes, and also to carry out more in-depth filtering and robustness checks, which are beyond the limits of this study.

3.2.5.1 Nanotechnology

In the International Patent Classification (IPC), there is one class for Nanotechnology. However there are very few patent applications in this category in total. Among the regions that have indicated Nanotech as a priority, none have a patent. The one leader region among the sample regions of the Eye@RIS3 database is Rhône-Alpes, and they have 1.71 patent applications, which is 33% of the total number of patent applications of the European Union countries. Still, many of Nanotech related patents is probably filed in other categories.

3.2.5.2 Industrial Biotechnology

For Industrial Biotechnology we looked at two categories which were deemed appropriate; i) Organic chemistry; and ii) Biochemistry; beer; spirits; wine; vinegar; microbiology; enzymology; mutation or genetic engineering. For this data, as there were more regions present and with more capabilities, we have looked at the regions' absolute number of patent applications, their shares of the total patents among EU countries, and the regions' relative specialisation quota.¹⁵ The latter looks at a region's number of patents in a specific category compared to the total amount of patents, and then compares that category's share of total patent applications on an EU level. If the number is higher than one, the region has a comparative specialisation in the area. This analysis is carried out in order to see if the specialisation at hand is one where the region might have its comparative advantage.

Specialisation quota Region X= ("Patents in Biotech for Region X"/ "All Patents for Region X")/ ("Patents in Biotech for all Regions"/ "All Patents for all EU Regions")

In table 2, the number of patent applications and their shares of the EU total from regions indicating a priority in Biotechnology are listed. In this table it seems that mainly Rhône-Alpes, Región de Murcia, Toscana Sachsen, Castilla y León and Auvergne have capabilities. Rhône-Alpes is on a par with the other leader region in the Eye@RIS3 sample, Île de France, which has 5.42% and 5.36% of total EU patent applications.

¹³ Eurostat (06/2013), http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database#

¹⁴ Makridakis, S., Hogarth, R. and Gaba Anil (2010), *Dance with Chance*, Oneworld Publications

¹⁵ Ejermo, O. and Andersson, M. (2006), *Technology and Trade: An Analysis of Technology Specialization and Export Flows*, Circle working paper 2006/05

Table 2: Region patent applications in Biotechnology

		Organic chemistry		Biochemistry	
Name of region	Name of priority	Absolute #	% of EU Tot	Absolute #	% of EU Tot
Aragón	Health & biotechnology	0.22	0.02%	0.67	0.08%
Auvergne	Biotechnologies	1.62	0.14%	3.61	0.43%
Basilicata	Agro-biotechnology	-	-	-	-
Bratislavský kraj	R&D in biology active materials, etc.	0.25	0.02%	-	-
Canarias	Biotechnology	0.28	0.02%	-	-
Castilla y León	Biotechnology	4.55	0.39%	0.53	0.06%
Castilla-La Mancha	Biotechnology (Bio-economy)	0.98	0.08%	-	-
Dytiki Ellada	Bio-economy	0.5	0.04%	-	-
Észak-Magyarország	Biotechnology	0.1	0.01%	-	-
Lietuva	Biomedicine	0.33	0.03%	2.33	0.28%
Lietuva	Biotechnology	0.33	0.03%	2.33	0.28%
Lubelskie	Bio-economy	-	-	-	-
Marche	Biotechnology	0.1	0.01%	0.22	0.03%
Podkarpackie	Biotechnology	0.2	0.02%	0.03	0.00%
Pomorskie	Biotechnology	0.47	0.04%	1	0.12%
Principado de Asturias	Biotechnology	0.42	0.04%	0.45	0.05%
Região Autónoma dos Açores	Blue biotechnology	-	-	-	-
Región de Murcia	KETs in agro-food cluster industry	14.33	1.22%	16.17	1.92%
Rhône-Alpes	Life sciences & biotechnologies	52.48	4.46%	25.4	3.02%
Sachsen	Biotechnology	7.84	0.67%	6.66	0.79%
Satakunta	Bio-economy	-	-	-	-
Toscana	Biotechnology	8.76	0.74%	7.09	0.84%
Umbria	Agro-food (genomics)	0.17	0.01%	0.4	0.05%
Voreio Aigaio	Bio-Agro-Food	-	-	-	-
Weser-Ems	Biotechnology	1.54	0.13%	2.78	0.33%

However, in order to better understand the possibilities of the regions in the sample which indicate Biotechnology as a priority, we have also looked at the specialisation quota to see if they have a comparative advantage in this sector. From this analysis the Eye@RIS3 regions presented in Table 3 came out as regions with a specialisation in Biotech. It is notable that Ile de France specialisation is almost none, even though in absolute numbers it is a giant in Europe. The regions with the highest specialisation quotas are Lietuva, Dytiki Ellada, Kentriki Makedonia and Pomorskie, of which all intend to take action related to Biotech, except for Kentriki Makedonia.

Table 3: Regions' specialisation quota

Name of region	Organic chemistry	Biochemistry
Alsace	1.52	0.97
Aragón	0.14	0.59
Attiki	0.57	3.31
Auvergne	0.61	1.91
Bratislavský kraj	1.20	-
Canarias (ES)	2.59	-
Castilla y León	5.56	0.91
Castilla-la Mancha	2.48	0.00
Champagne-Ardenne	0.04	6.51
Comunidad Valenciana	1.13	0.58
Dytiki Ellada	11.00	0.00
Észak-Alföld	6.70	0.00
Île de France	1.03	1.02
Illes Balears	3.20	4.48
Kentriki Makedonia	7.18	2.34
Kypros	1.89	1.10
Languedoc-Roussillon	2.57	4.79
Lietuva	1.94	19.15
Midi-Pyrénées	0.99	2.27
Nord - Pas-de-Calais	1.53	1.98
Northern Ireland (UK)	2.86	1.98
País Vasco	0.30	2.71
Picardie	0.46	2.25
Podkarpackie	1.39	0.29
Pomorskie	2.44	7.26
Principado de Asturias	0.80	1.19
Provence-Alpes-Côte d'Azur	1.21	1.79

3.2.5.3 Micro & nano-electronics

For Micro and Nano-electronics we looked at two categories which seemed appropriate; i) Microstructural technology and ii) Basic electronic circuits. For this data, as there were more regions present and with more capabilities, we have looked at the regions' absolute number of patent applications, their shares of the total patents among EU countries, and the regions' relative specialisation quota.

Among the regions in the Eye@RIS3 sample indicating this specialisation, Dytiki Ellada, Franche-Comté and Limousin have no patent applications. Rhône-Alpes is the leading region in the sample with 16 and 36 patent applications (30% and 10.5% respectively of EU patent applications) and Sachsen a follower that represents 4% and 0.9% respectively of EU Applications. With regard to regions with specialisation in Microtechnology in our Eye@RIS3 sample, Rhône-Alpes is once again notable, then Nord - Pas-de-Calais and Puglia.

Table 4: Specialisation quota in Micro and Nano-electronics

Name of region	Microstructural technology	Basic electronic circuitry
Basse-Normandie	-	2.24
Comunidad Valenciana	-	1.41
Haute-Normandie	2.78	1.07
Languedoc-Roussillon	1.46	0.24
Midi-Pyrénées	-	2.02
Nord - Pas-de-Calais	8.16	0.00
Pays de la Loire	-	1.36
Provence-Alpes-Côte d'Azur	-	1.30
Puglia	8.79	-
Rhône-Alpes	10.30	3.56
Sachsen	4.57	0.96

4. Conclusions - Preliminary findings and next steps

The information gathered and the analysis carried out so far leads to the following initial conclusions and envisaged next steps:

1. Regions tend to indicate that in the context of the RIS3, exercise horizontal priorities need to be defined, in addition to technological, sectoral or cross-sectoral priority areas, and that these could involve the diffusion and/or application of KETs.
2. However, they still have a lot of questions related to state aid and financing of KETs, including rules of financing demonstration projects.
3. With regard to the Regional Innovation Scoreboard, all types of regions aim for KETs: not only leaders, but all of the range from leader to modest. There is no special focus around types of clusters among the regions either, nor any seeming difference in the detail of the priorities envisioned.
4. Around 2/3 of all regions whose data are included in the "Eye@RIS3" database mention KETs as a priority of their RIS3. Around 20% of all priorities declared by regions whose data are included in the "Eye@RIS3" database are related to KETs.

To follow up this work, a survey will be carried out amongst the regions registered in the S3 Platform after the summer of 2013, in order to allow a more in-depth understanding of the actual level of awareness of the role and potential of KETs in the context of RIS3 and of the perceived obstacles or limitations.

Annex 1: Regional Priorities and KETS based on data from Eye@RIS3

Table 5: Regions in Database (69)

Alsace (FR)
Aragón (ES)
Attiki (EL)
Auvergne (FR)
Basilicata (IT)
Basse-Normandie (FR)
Bratislavský kraj (SK)
Canarias (ES)
Castilla y León (ES)
Castilla-La Mancha (ES)
Centre (FR)
Champagne-Ardenne (FR)
Comunidad Foral de Navarra (ES)
Comunidad Valenciana (ES)
Cornwall and Isles of Scilly (UK)
Corse (FR)
Dytiki Ellada (EL)
Emilia-Romagna (IT)
Észak-Alföld (HU)
Észak-Magyarország (HU)
Extremadura (ES)
Friesland (NL)
Guadeloupe (FR)
Guyane (FR)
Haute-Normandie (FR)
Île de France (FR)
Illes Balears (ES)
Ipeiros (EL)
Kentriki Makedonia (EL)
Kriti (EL)
Kýpros (CY)
Languedoc-Roussillon (FR)
Lappi (FI)
Lietuva (LV)
Limousin (FR)
Lorraine (FR)
Lubelskie (PL)
Marche (IT)
Martinique (FR)
Midi-Pyrénées (FR)
Nord - Pas-de-Calais (FR)
Northamptonshire (UK)
Northern Ireland (UK)

Opolskie (PL)
País Vasco (ES)
Pays de la Loire (FR)
Picardie (FR)
Podkarpackie (FR)
Poitou-Charentes (FR)
Pomorskie (PL)
Principado de Asturias (ES)
Provence-Alpes-Côte d'Azur (FR)
Puglia (IT)
Região Autónoma dos Açores (PT)
Région Wallonne (BE)
Réunion (FR)
Rhône-Alpes (FR)
Sachsen (DE)
Satakunta (FI)
Scotland (UK)
Skåne län (SE)
Střední Morava (CZ)
Swietokrzyskie (PL)
Toscana (IT)
Umbria (IT)
Vest (RO)
Voreio Aigaio (EL)
Wales (UK)
Weser-Ems (DE)

Table 6: List of regions indicating KETs (48)

Aragón (ES)
Auvergne (FR)
Basilicata (IT)
Basse-Normandie (FR)
Bratislavský kraj (SK)
Canarias (ES)
Castilla y León (ES)
Castilla-La Mancha (ES)
Champagne-Ardenne (FR)
Comunidad Foral de Navarra (ES)
Comunidad Valenciana (ES)
Corse (FR)
Dytiki Ellada (EL)
Emilia-Romagna (IT)
Észak-Magyarország (HU)
Franche-Comté (FR)
Guadeloupe (FR)
Haute-Normandie (FR)

Lappi (FI)
Lietuva (LV)
Limousin (FR)
Lorraine (FR)
Lubelskie (PL)
Marche (IT)
Martinique (FR)
Midi-Pyrénées (FR)
Northamptonshire (UK)
Northern Ireland (UK)
País Vasco (ES)
Pays de la Loire (FR)
Picardie (FR)
Podkarpackie (PL)
Poitou-Charentes (FR)
Pomorskie (PL)
Principado de Asturias (ES)
Puglia (IT)
Região Autónoma dos Açores (PT)
Región de Murcia (ES)
Région Wallonne (BE)
Rhône-Alpes (FR)
Sachsen (DE)
Satakunta (FI)
Skåne län (SE)
Toscana (IT)
Umbria (IT)
Voreio Aigaio (EL)
Wales (UK)
Weser-Ems (DE)

Table 7: KETs connected priorities (96)

Region Name	Description	EU policy objectives
Aragón (ES)	Automotives	Advanced manufacturing systems
Aragón (ES)	New materials	Advanced materials
Aragón (ES)	Health & biotechnology	Industrial biotechnology
Auvergne (FR)	Biotechnologies	Industrial biotechnology
Basilicata (IT)	Agro-biotechnology	Industrial biotechnology
Basse-Normandie (FR)	Materials, mechanics & metallurgy	Advanced materials
Bratislavský kraj (SK)	New materials	Advanced materials
Bratislavský kraj (SK)	New materials in electrotechnics, photovoltaics, sensors	Advanced materials
Bratislavský kraj (SK)	Intelligent surfaces	Advanced materials
Bratislavský kraj (SK)	R&D in biology active materials, biopolymers, biocompatible and biodegradable materials (e.g. vas implanters)	Industrial biotechnology

Bratislavský kraj (SK)	Nanotechnology	Nanotechnology
Canarias (ES)	Biotechnology	Industrial biotechnology
Castilla y León (ES)	Metal machinery	Advanced manufacturing systems
Castilla y León (ES)	Automotives (ICT & aeronautics)	Advanced manufacturing systems
Castilla y León (ES)	Biotechnology	Industrial biotechnology
Castilla y León (ES)	Nanotechnology	Nanotechnology
Castilla-La Mancha (ES)	Biotechnology (Bio-economy)	Industrial biotechnology
Champagne-Ardenne (FR)	Materials	Advanced materials
Comunidad Foral de Navarra (ES)	Mechatronics	Advanced manufacturing systems
Comunidad Valenciana (ES)	Advanced manufacturing, intelligent and clean	Advanced manufacturing systems
Corse (FR)	Aeronautics & materials	Advanced materials
Dytiki Ellada (EL)	Bio-economy	Industrial biotechnology
Dytiki Ellada (EL)	Microelectronics	Micro/Nano-electronics
Emilia-Romagna (IT)	Mechatronics	Advanced manufacturing systems
Észak-Magyarország (HU)	Advanced materials	Advanced materials
Észak-Magyarország (HU)	Biotechnology	Industrial biotechnology
Észak-Magyarország (HU)	Nanotechnology	Nanotechnology
Észak-Magyarország (HU)	Photonics	Photonics
Franche-Comté (FR)	Plastics	Advanced materials
Franche-Comté (FR)	Microtechnologies	Micro/Nano-electronics
Guadeloupe (FR)	Risks and materials	Advanced materials
Haute-Normandie (FR)	Optimisation of production processes	Advanced manufacturing systems
Haute-Normandie (FR)	Innovative materials & related technologies	Advanced materials
Lappi (FI)	Traditional process industry	Advanced manufacturing systems
Lietuva (LV)	Biomedicine	Industrial biotechnology
Lietuva (LV)	Biotechnology	Industrial biotechnology
Lietuva (LV)	Nanotechnology	Nanotechnology
Limousin (FR)	Ceramics	Advanced materials
Limousin (FR)	Mechanics	Advanced manufacturing systems
Limousin (FR)	Electronics	Micro/Nano-electronics
Lorraine (FR)	Functional materials	Advanced materials
Lubelskie (PL)	Bio-economy	Industrial biotechnology
Marche (IT)	Furniture	Advanced manufacturing systems
Marche (IT)	New materials	Advanced materials
Marche (IT)	Biotechnology	Industrial biotechnology
Martinique (FR)	High speed steel	Advanced materials
Midi-Pyrénées (FR)	Materials, aerostructures & mechanics	Advanced materials
Northamptonshire (UK)	Automotives	Advanced manufacturing systems
Northamptonshire (UK)	Advanced materials	Advanced materials
Northern Ireland (UK)	Packaging and software	Advanced manufacturing systems
Northern Ireland (UK)	Biomaterials	Advanced materials
Northern Ireland (UK)	Nanotechnology	Nanotechnology
Northern Netherlands (NL)	Smart sensor systems - a combination of sensor technology and chemistry	Advanced materials
País Vasco (ES)	Advanced manufacturing	Advanced manufacturing systems
País Vasco (ES)	Nanotechnology	Nanotechnology

Pays de la Loire (FR)	Automotives	Advanced manufacturing systems
Pays de la Loire (FR)	Mechanics & materials	Advanced materials
Picardie (FR)	Mechanics, materials & fibres	Advanced materials
Podkarpackie (PL)	Advanced materials	Advanced materials
Podkarpackie (PL)	Biotechnology	Industrial biotechnology
Podkarpackie (PL)	Nanotechnology	Nanotechnology
Podkarpackie (PL)	Photonics	Photonics
Poitou-Charentes (FR)	Mechanics & materials	Advanced materials
Pomorskie (PL)	Biotechnology	Industrial biotechnology
Principado de Asturias (ES)	Advanced manufacturing	Advanced manufacturing systems
Principado de Asturias (ES)	Advanced materials	Advanced materials
Principado de Asturias (ES)	Biotechnology	Industrial biotechnology
Principado de Asturias (ES)	Nanotechnology	Nanotechnology
Puglia (IT)	Advanced manufacturing	Advanced manufacturing systems
Puglia (IT)	Mechatronics	Advanced manufacturing systems
Puglia (IT)	New materials	Advanced materials
Região Autónoma dos Açores (PT)	Blue biotechnology	Industrial biotechnology
Región de Murcia (ES)	KETs in agrofood cluster industry	Industrial biotechnology
Région Wallonne (BE)	Aeronautics & space	Advanced manufacturing systems
Région Wallonne (BE)	Sustainable materials	Advanced materials
Rhône-Alpes (FR)	Life sciences & biotechnologies	Industrial biotechnology
Rhône-Alpes (FR)	Micro & nano-technologies	Micro/Nano-electronics
Sachsen (DE)	Advanced production technologies	Advanced manufacturing systems
Sachsen (DE)	New materials	Advanced materials
Sachsen (DE)	Biotechnology	Industrial biotechnology
Sachsen (DE)	Microelectronics including organic and polymer electronics (semi-conductors)	Micro/Nano-electronics
Sachsen (DE)	Nanotechnology	Nanotechnology
Sachsen (DE)	Photonics	Photonics
Satakunta (FI)	Bio-economy	Industrial biotechnology
Skåne län (SE)	Advanced materials	Advanced materials
Toscana (IT)	Advanced manufacturing	Advanced manufacturing systems
Toscana (IT)	Biotechnology	Industrial biotechnology
Toscana (IT)	Nanotechnology	Nanotechnology
Toscana (IT)	Photonics	Photonics
Umbria (IT)	Agro-food (genomics)	Industrial biotechnology
Voreio Aigaio (EL)	Bio-Agro-Food	Industrial biotechnology
Wales (UK)	Advanced engineering & materials	Advanced materials
Weser-Ems (DE)	Advanced materials	Advanced materials
Weser-Ems (DE)	Biotechnology	Industrial biotechnology
Weser-Ems (DE)	Nanotechnology	Nanotechnology
Weser-Ems (DE)	Photonics	Photonics

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Abstract

The KETs preliminary report consists of information on KETs and Smart specialisation that the S3 Platform has developed and diffused in different forms, as well as relevant information that has been identified by participation in different kinds of events.

The first part of the report focuses briefly on the role of KETs in smart specialisation as a means of regional development, i.e. the policy rationale for regions to invest in KETs. The second part summarises policy recommendations and tools with regard to Smart Specialisation and KETs, as have been identified in events on the topic, where the S3 Platform has participated. The third part provides maps on regional priorities related to KETs. The data for this section come from the new web-based priority mapping tool called Eye@RIS3. This tool displays a range of priorities identified and declared by regions for their RIS3 and includes, the names of the regions that are in the database (69), the names of those that have indicated a priority with relation to KETs (48 in total), a list of the priorities related to KETs (96 -around 20% of the total number of listed priorities), connection to regional innovation scoreboard, and connection to patent data as an indicator of regional capabilities.

The report presents the following initial conclusions and envisaged next steps: i) Regions tend to indicate that in the context of the RIS3, exercise horizontal priorities need to be defined and that these could involve the diffusion and/or application of KETs; ii) still there are many questions related to state aid and financing of KETs; iii) all types of regions aim for KETs: not only leaders, but all of the range from leader to modest; and iv) around 2/3 of all regions whose data are included in the "Eye@RIS3" database mention KETs as a priority of their RIS3. Around 20% of all priorities declared by regions whose data are included in the "Eye@RIS3" database are related to KETs.

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