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Jukka Teräs, Alexandre Dubois,
Jens Sörvik and Martina Pertoldi

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Contact information
Institute for Prospective Technological Studies
Address: Edificio Expo, C/ Inca Garcilaso, s/n 41092 Seville, Spain
E-mail: jrc-ipts-secretariat@ec.europa.eu
Tel.: +34 9544 88318
Fax: +34 9544 88300

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Implementing Smart Specialisation in Sparsely Populated Areas

Jukka Teräs,* Alexandre Dubois,** Jens Sörvik***[a] and Martina Pertoldi,***[a]

*Nordregio, Stockholm (Sweden)

**Swedish University of Agricultural Sciences, Uppsala (Sweden)

***European Commission, JRC-IPTS, Seville (Spain)

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Abstract

This Working Paper explores Research and Innovation Strategies for Smart Specialisation (RIS3) in Sparsely Populated Areas (SPA). The paper discusses the most significant elements of Smart Specialisation (S3) in SPA focusing on its theoretical background as well as on the empirical processes related to the introduction and implementation of the S3 concept in selected European regions. Presenting both issues emerging from theoretical debates and practice-based examples, this paper provides a critical discussion on the operationalisation of S3 in the specific context of European Sparsely Populated Areas.

SPA should not be seen as regions lagging behind by definition but as regions with specific characteristics including challenges and opportunities. The analysis of the case study regions demonstrates that SPA have been able to create innovative environments in sparsely populated and remote areas and that there is a mind-set and willingness to utilise the possibilities provided by S3 processes. However, in doing so SPA need to strengthen their competitiveness with extra-regional knowledge and networking pipelines and even more so than other types of regions in

consideration of the lack of critical mass. The specific characteristics and features of SPA often with abundant natural resources, but with limited human capital and lack of agglomeration economies need to be carefully studied and the regional actors need not only to be heard but also to be invited to an inclusive S3 process. The cases discussed enlighten the need to address S3 as an overarching framework for territorial development based on the integration of complementary policies.

Keywords: Regional Policy, Smart Specialisation, Sparsely Populated Areas, territorial diversity, place-based approach, policy integration.

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[a] The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission.

CONTENTS

1. Introduction

Research and Innovation Strategies for Smart Specialisation (RIS3) have been diffusing at a rapid pace among European regions in recent years. Clearly, the legal requirement related to RIS3 as an ex ante condition for a Member State (MS) wishing to use the European Regional Development Fund (ERDF) has pushed European regions to engage with the Smart Specialisation (S3) concept. Yet, the S3 concept seems to stand on its own with regions embracing it, including a broad range of Non-EU regions and countries that are voluntarily designing and implementing RIS3s like Nordland from Norway as well as more recent sub-regional initiatives[1]. In fact, the S3 concept is attractive to a broad range of actors such as academics, practitioners and policymakers concerned with promoting growth and well-being in regions.

The S3 concept is rapidly diffusing in policy circles (Foray et al., 2011; Foray, 2015), yet it is still an emerging one. This is related, firstly, to the fact that the S3 concept has moved from its origins in research and innovation policy into regional policy, and from an aspatial and narrower sectoral way of thinking about innovation into a more multi-dimensional approach (McCann and Ortega-Argilés, 2013a). Secondly, the concept is responding to the unprecedented policy experimentation taking place across Europe, as an increasing number of regions adopt it and design strategies departing from their own preconditions. As a consequence, the knowledge base is still growing and there are several aspects that deserve a more in-depth study.

S3 corresponds to an evolution of regional innovation strategies in line with the notion of place-based development that has emerged from the European regional policy debate (Barca, 2009). The S3 concept does not suggest a *panacea* solution that can be applied to all regions irrespectively of their context (EC, 2012), but to align innovation processes with the knowledge dynamics and the specific socio-economic, institutional and geographical conditions encountered in each region (McCann and Ortega-Argilés, 2013a; Morgan, 2013).

Sparsely populated areas (SPA) correspond to areas that can be characterised by specific spatial and demographic features including low population located in scattered small settlement structure, continuous land masses of open landscapes, long distances to main urban centres and often harsh climatic conditions (either cold or dry climate) together with the abundance of natural resources (Gløersen *et al.* 2006). In Europe, SPA can be found in the Northern and Eastern parts of the Nordic countries, in the Highlands and Islands region of Northern Scotland and in central parts of Spain (Dubois and Roto, 2012).

1 Other non-EU regions directly engaged in the S3 process are Vojvodina (Serbia) and East Marmara (Turkey) who are also members of the S3 Platform (S3P). The OECD and the World Bank are also carrying out activities related to Smart Specialisation. The S3P are also receiving much interest from organisations globally interested in learning more about the concept and in developing their own approaches based on the concept. In addition, local RIS3s have been elaborated by Local Action Groups (LAGs) in Spain on a voluntary basis which indicates the enlargement in ownership of the strategy and its applicability to different polity levels.

Recent changes in the approach of European regional policy emphasise achieving growth from every region moving "from a narrow interpretation of cohesion in terms of redistribution and disparities into supporting latent growth capabilities wherever these are to be found" (Landabaso, 2012). This has resulted in a situation in which generating economic growth and job opportunities has become a key priority in low density regions, requiring regional and national governments to find new ways to promote broad-based economic development. At the same time, the "green economy" narrative has placed SPA, and their high endowment in natural resources, in a new position of opportunities for investments and growth (OECD, 2015) related to economic initiatives as renewable energy technologies or the sustainable supply chain of raw materials as well as the cross-sectoral use of other natural resources (ESPON, 2012). Likewise the increased global demand for primary materials combined with new political initiatives such as the EU Raw materials initiative and the EIP on Raw materials have created new development opportunities in those regions .

There are a number of challenges related to the elaboration and implementation of RIS3 in SPA that have not been raised conceptually and explored empirically in the S3 literature so far. Issues that firstly can be referred to the socio-economic structure of SPA - where firms face challenges related to the specific features of their environment, such as the limited size of the regional economy, poor connectivity and a modest level of diversification of economic activities - and secondly stemming from past policy inadequacies in addressing the needs and challenges of "low densities economies" (OECD, 2015).

This working paper provides a critical discussion on the conceptualisation and operationalization of S3 in the context of Europe's SPA and on the extent to which RIS3 strategies are applicable for developing the future of such territories by discussing the following research questions (RQs):

RQ1 – Can S3 be a solution to the longstanding challenges of these territories and harness future development opportunities?
RQ2 - What critical issues does the implementation of S3 raise in the context of SPA?
RQ3 – How can the experiences of RIS3 implementation in SPA contribute to consolidating academic and policy understandings of the link between 'territory' and 'innovation processes' at the regional level?

The conceptual part of this paper is based on a literature review, while the empirical section presents data that comes from a workshop organised by the Smart Specialisation Platform (S3P) together with the region of Lapland in Rovaniemi (Finland) in June 2014. The workshop discussed the topic of RIS3 in SPA and six regions presented their work and opportunities and challenges perceived in designing RIS3. The six regions participating were Aragon (Spain), Lapland (Finland), Nordland (Norway), Podlaskie (Poland), Scotland (UK) and Västerbotten (Sweden). After the

workshop complementary questions have been sent to the regions in order to clarify and supplement information provided at the workshop.

The paper is structured as follows. First, in chapter 2 the key issues of the spatialisation of regional innovation strategies, the territorial dimension, geographic specificities and locational disadvantages are introduced and discussed. This is followed by a discussion of common challenges, different strategies and emerging opportunities arising from the shift towards growth and investments of the new regional policy approach (OECD 2006, 2013, 2015). The key S3 concepts, their theoretical underpinnings and policy implications in relation to Sparsely Populated Areas (SPA) are discussed in chapter 3. The empirical part, consisting of data and feedback from the Rovaniemi S3 thematic workshop on SPA, is analysed in chapter 4, including an analysis of how the six European regions are approaching the S3 concept within regional policy. Concluding remarks and recommendations are presented in chapter 5.

2. The territorial dimension of innovation strategies

S3 is part of Europe's response to the present economic crisis and is a crucial element to address all Europe 2020 objectives by aiming at integrated, place-based economic transformation agendas that support more and better investments in research, innovation and entrepreneurship (EC, 2012).

The emphasis towards a place-based approach to regional innovation strategies (RIS) emerged from the relative failure of one-size-fits-all approaches to regional policy and sectoral innovation strategies (McCann and Ortega-Argilés, 2013b). It also addressed the issue of a more effective use of Cohesion Policy funds both at community and national levels by bringing in the territorial dimension in the operationalization of the Europe2020 strategy and thus making up for the shortcomings due to 'spatial-blindness'. In fact, the previous shortcomings have often been linked to the lack of anchoring previous regional innovation strategies or RIS in local institutions and the regional economic fabric (Kroll, 2015). The translation of sectoral policies as innovation policy into a regional setting has traditionally not been easy. It requires considering specificities of the single regions and of their specific innovation processes and modes (Camagni and Capello, 2013) as well as governance and institutional settings.

2.1 The territorial dimension introduced

The Territorial Agenda TA2020, adopted by the EU Member States in 2011, is the strategic policy document that calls for the promotion of territorial development across Europe. It aims especially at connecting the themes and objectives set out in the Europe 2020 strategy with issues related to the local and regional development through a cross-sectoral, multi-level and multi-actor approach. As

the Territorial Agenda TA2020 states, "*the Europe 2020 Strategy for smart, sustainable and inclusive growth can only be achieved if the territorial dimension of the strategy is taken into account*". Furthermore, the TA2020 explicitly indicates that "*the use of social capital, territorial assets, and the development of innovation and smart specialisation strategies in a place-based approach can play a key role [in] ensuring global competitiveness of the regions based on strong local economies*". In that respect, we have identified three notions that have contributed at bringing to the fore the territorial dimension in European policymaking despite of very different ways in which "territorial" is being interpreted throughout Europe.

The first notion is *territorial cohesion*. The Green Paper on Territorial Cohesion (EC, 2008) has made explicit the need to achieve territorial cohesion as one of the policy objectives of the European Union in response to the steady processes of spatial polarisation and increased disparities among European territories: between MSs (e.g. North-South and East-West divides), between regions within the same country (e.g. between urban and rural regions), but also within regions. Territorial cohesion concerns not only the territorial dimension of the Cohesion Policy (Art. 174 of the TFUE), but also extends to other competences of EU policymaking with strong spatial impact (Böhme *et al*., 2011). Being formally recognized in the Lisbon Treaty as a shared responsibility for the EU, territorial cohesion has been pursued through the promotion of a greater level of coordination between sectoral policies, a greater degree of cooperation between the EU and its MSs, and a stronger mobilisation of regional and local actors in the elaboration and implementation stages of policies.

The second important notion, especially in relation to SPA, is *territorial diversity* as introduced in the Green Paper on Territorial Cohesion (EC, 2008). The notion is a paradigm shift in European policymaking as it advocates that each region should contribute to the overarching objectives of Europe 2020 to the measure of its development potential (ESPON, 2010). Hence, territorial diversity moves away "from viewing geographic specificities as 'handicaps' and towards recognising their assets, balancing 'compensation' and 'promotion' efforts, and taking 'non-market values' or positive externalities into consideration in policy instruments" (ESPON, 2012, p. 71). This paradigm shift occurred in conjunction with changes in EU regional policy from a traditional, redistributive approach, for which funds are mostly directed towards least-developed regions, to a place-based, growth-oriented one that aims at making the most of each territory's assets (Damsgaard *et al*., 2008) in both advanced and less developed regions, necessitating new sets of interactions between human capital, natural resources and governance structures (Gløersen and Dubois, 2010).

The third notion is the *place-based approach*. The notion as such has gained momentum in academic and policy debates alike in the aftermath of the "Barca report" (Barca, 2009) and has emerged as the most influential input to the current European Union regional development and cohesion policy (EC, 2011). The Barca Report defines a place-based policy as "*a long-term strategy aimed at tackling persistent underutilisation of potential and reducing persistent social exclusion in*

specific places through external interventions and multilevel governance (Barca, 2009, p. VII). Hence, what the report advocates is that the design of policies needs to take into greater consideration the social, economic, cultural and institutional contexts of the regions in which they are implemented in order for them to realize their potential at the same time avoiding the risk of becoming captured by local private interests. It emphasizes especially the role of subsidiarity[2] (Barca, 2009, p. 41) as a key policy mechanism within multilevel governance implying the interplay between local actors and external agencies. In a parallel line of work, other influential studies (World Bank, 2009; OECD, 2009a; 2009b) clearly posited that the role of development intervention is to mobilise regional assets by understanding the individual characteristics of regions and their place specificity. In the context of our reflections, it is important to underline that "while place-neutral approaches emphasise efficiency in the core, place-based approaches focus on institutional change and issues of adaptation and transformation in all regions" [...] in order "to tap into untapped potential [...] in a co-ordinated and systematic way" (McCann and Rodríguez-Pose, 2011, p. 211).

2.2 Addressing territorial specificities through a flexible policy framework

The Green Paper on Territorial Cohesion (EC, 2008) made reference to '*regions with specific geographical features',* such as mountain areas, islands and sparsely populated areas, as facing *'particular development challenges'*. Main challenges identified in the literature on SPA include: i) high transport and transaction costs induced by long distances to the main continental markets, ii) the absence of agglomerative economies for regional firms induced by scattered spatial structures have been described as daunting obstacles for the development of these territories, iii) high costs of service provision to persons and businesses and low rates of entrepreneurship and innovation are seen as contingent to these location-based disadvantages (Copus, 2001).

In a recent survey conducted in regions with specific geographical features these observations were reconfirmed (Dubois and Roto, 2012). On the question around the most pressing development challenges in their own region, the stakeholders listed unfavourable demographic patterns, small size of the local economy and the labour-market, as well as remoteness from large centres. The concern about the lack of critical mass by regional stakeholders reflects the absence of agglomeration economies in terms of low market potential (i.e. too few potential customers), low cluster effects (i.e. too few firms in the same sector and place) and limited labour-market resources (i.e. too few potential employees). Their concern is shared by mainstream regional development

[2] The European Union operates according to the principle of subsidiarity, which means that the EU does not take action unless it is more effective than action taken at the national, regional, or local level. For some areas EU works exclusively (e.g. the customs union, the common commercial policy, competition rules, and monetary policy for euro countries), for others there are shared responsibility and the jurisdiction is shared between the EU and the Member State (e.g. internal market rules; aspects of social policy; economic, social, and territorial cohesion, etc.). Then there is MS jurisdiction with support from the EU, where EU actions can support, coordinate, or supplement Member State activities (e. g. industry; spatial planning; culture; tourism; education, etc.).

thinking that sees such mechanisms as the primary vector of regional economic growth (World Bank, 2009). However, it is relevant to underline that the stakeholders also identified two comparative advantages: (1) high level of social capital and (2) high endowment in natural resources, including energy and tourism potential. It is also visible in current regional development strategies of peripheral regions that there is a change in their approaches. They have increasingly shifted towards a dual focus on the emergence of SMEs as a new vector of growth and on the ability of ICT usage to allow peripheral actors to overcome their location in terms of knowledge formation and exchanges (Nuur and Laestadius, 2010).

The promotion of regional development in peripheral settings admittedly calls for a "*regional development policy with a focus on growth and within which knowledge formation to promote the emergence of new industry appears to be centre stage*" (Nuur and Laestadius, 2010, p. 294). This requires unlocking the local economy from relying solely on their small domestic market. Hence, regional development strategies in SPA need to combine elements aiming at improving the capacity of economic actors to compete 'fairly' with actors located in more central regions, and at enabling them to draw more effectively upon their territorial strengths and comparative advantage.

The three notions introduced in the previous paragraph do not imply neglecting or trivialising major criticalities these regions have to confront in their social and economic development. However, the focus of policies is no longer on maintaining activities in spite of these difficulties or on compensation. Instead, the purport is to build on local assets so that competitive businesses can emerge, also by adapting the economic development strategy to the specific social and ecological conditions. The concept of S3, which is one of the new generation of regional innovation policy approaches in the EU (Morgan, 2013), can be a basis to undertake such an ambitious turn. The shift from "*current economic performance*" to "*potential economic performance*" of territorial units (of a State, a region or a specific sub-regional area) inherent to S3, and particularly to the necessary structural up-grading of the economic base, requires a reasonable understanding of the development potential of European territories as well as of their future development trajectories. This could be reinforced by a deeper awareness of how territorial specificities affect this development potential.

The place-based paradigm and the new generations of policy instruments (e.g. Community Led-Local Development, Smart Specialisation, macro-regional strategies) have also provided a more flexible range of funding schemes and programmes that can be customized and adapted to the specific geographical, institutional and socio-economic contexts as well as endogenous local assets of these territories. Territorial conditions are not neutral with respect to the policy outcomes (Pike *et al.*, 2006) and the detection of distinctive features of S3 in SPA may pave the way towards a sound inclusion of R&I policies into an appropriate regional development policy framework.

With S3 aiming at articulating place-based local development policies (McCann and Ortega-Argiles, 2015) the spatial turn of innovation strategies is clearly under way. At the European level, it

means that there needs to be a closer integration already at policy design stage between Research and Innovation policies on the one hand and territorial policies, such as Cohesion policy and Rural Development policy, on the other. Furthermore, stronger coordination of tools, funds and instruments at the disposal of regional actors (for instance ERDF, ESF, or Horizon 2020) would support the implementation of integrated approaches. At the regional level, the operationalization of S3 necessitates a closer collaboration between different kinds of professionals both within the public sector (e.g. regional planning, economic development, urban development, infrastructures, etc.) but also with respect to the engagement of societal actors, especially firm representatives (small and large) directly, or through industry organisations, and sectoral associations as well as universities and research institutes, NGOs and other civil society organisations, in both the strategy's design and implementation process. This is also aligned with the Territorial Agenda 2020 calling for greater coordination and integration of EU and national/regional sectoral policies.

3. Smart Specialisation and SPA: bringing together theory and practice

Smart Specialisation has often been referred to as "*a policy running ahead of theory*" (Foray *et al.*, 2011), which tends to reveal the rather experimental nature of its implementation. The origin of S3 comes from a mix of academic thinking from multiple disciplines as well as from experiences within the EC from previous programming periods of the structural funds. It is based on the understanding that previous generations of innovation strategies were not efficient enough to achieve the ambitious goals set out in Europe 2020. Hence the implementation of S3 in different regions and the consolidation of the theoretical framework can largely be characterised as inter-related processes during which practical observations and theoretical insights consolidate the general understanding of S3 as a policy learning process. In that sense, S3 can therefore be seen as a heuristic approach aiming at gradually improving the capacity of regions to use knowledge as a key driver of economic growth and societal change.

Another key feature of S3 is that it is, in theory, applicable in all types of regions. However there is little evidence in the literature about the applicability of RIS3 in regions with geographic specificities, such as SPA. Of interest though is that Dominique Foray, who coined the term Smart Specialisation, has raised the concern that lack of critical mass can be a major constraint for the successful implementation of S3 (Foray, 2015, p. 68).

In the following section, we intend to create a dialogue interface between the key elements of the S3 concept and critical issues regarding its operationalization in SPA. The conceptual insights are based on a literature review, whereas the operational insights do not derive from "lessons learned" related to present or past interventions (since S3 as a policy instrument has been only recently applied), but they stand as logical extensions of the conceptual and empirical analysis

based on the authors' own knowledge of territorial development in SPA, as well as the experiences of regional policymakers involved in the S3 process that were collected by the authors in 2015.

Table 1: Synthesis of the theoretical and operational issues on S3 implementation in SPA

	Theoretical underpinnings	**Critical issues in SPA**
Entrepreneurial discovery	Prominent role of entrepreneurial actors. Iterative process (trial-and-error). Cyclic process and evolving prioritization. Structural evolution of the whole regional economy.	Lack of middle-range innovative firms. The role of intermediary organisations for innovation support. Distributed network arrangements supporting innovation outside university-towns. Distance slows down the organization of multi-actor processes but may be eased as process evolves. Alignment between design and implementation of the strategy.
Related variety	Cognitive relation between existing sectors. Economic transformation across sectors highlighting the spatial dimension of innovation processes.	Thinner and more porous sectoral boundaries in small regions facilitate readiness for domain emergence. Large commodity firms are key agents for the emergence of high degree of relatedness in SPA. Developing novel approaches to optimise physical connectivity in SPA is a joint concern.
Domains and Lead markets	The targets for activities are not statistical sectors or single projects, but mid-grained functional economic unit stretching over multiple sectors. Focus on market creation, not single projects Realize economies of scope and scale in knowledge application across sectors.	The risk inherent to the emergence of new domains is borne by a smaller group of actors thus potentially putting off entrepreneurial endeavours. SPA as showrooms for technologies improving the efficient use of natural resources.
Mobilization of extra-local resources	Not all needed assets are present in the regional context (actors and markets) Introducing novelty in local know-how through the sourcing of extra-local factors.	Role of regional universities and research institutes as brokers between science-based knowledge and local know how. Large firms and trade associations are the main brokers of market intelligence necessary for supporting entrepreneurial endeavours. Digital and physical connectivity are crucial for better positioning actors in global networks. The demise of local banking institutions changes the way how entrepreneurs connect with such institutions, less in terms of loans and more in terms of financial and market intelligence.
Broadened view of innovation	Technical development integrated into local know-how. Applying technical knowledge developed elsewhere. Not only technological products, but also service and social innovation. Increased role of market intelligence.	Socially innovative and collective initiatives may provide novel, sustainable responses to long-standing SPA challenges. Digital technologies can trigger novel applications in the service sector. Broadened view of use of natural resources: Better harnessing of the potential for natural resources processing may turn SPA into more diversified regional economies.

3.1. Entrepreneurial discovery and economic transformation

According to Foray (2015), the "*fundamental act*" of S3 is *entrepreneurial discovery*. The reference to '*entrepreneurial*' reflects the prominent role to be played by entrepreneurs as the central actors of the strategy, while the use of '*discovery*' highlights the non-deterministic, iterative process of identifying potentially novel applications from regional entrepreneurs, which is opposite to the '*pick the winner*' approach from past industrial policies. Indeed, S3 undertakes a more pragmatic approach as "*entrepreneurs [….] are in the best position to discover the domains of R&D and innovation in which a region is likely to excel given its existing capabilities and productive assets*" (Foray *et al*., 2011, p. 7). It is important to note, however, that "entrepreneurs" in S3 literature are understood broadly to encompass all actors (including e.g. individual entrepreneurs, companies, universities, technology transfer offices and regional development agencies) that have the capacity to discover the S3 domains (Foray and Goenaga, 2013).

In S3 thinking, entrepreneurial discovery is conceived as a recurring, cyclic process. This means that it leads to successive processes that aim to "*concentrate resources on the development of those activities that are likely to effectively transform the existing economic structures through R&D and innovation*" (Foray, 2015, p. 3).

Entrepreneurial discovery is intended to foster a systemic innovation process (in opposition to promoting individual innovations) leading to structural transformation of the regional economy. In the literature, four main types of economic transformation have been described: modernisation, diversification, transition and radical foundation (Foray and Goenaga, 2013). It is important to highlight the fact that these transformations may occur simultaneously, as well as at different pace in different parts of a regional economy, depending on the existing economic structure and the novel applications introduced by the entrepreneurs.

The potentially multiple forms of economic transformation require a new way of designing and implementing policy priorities at the regional level. Foray termed that as '*evolving prioritization*' (Foray, 2015, p. 49), which illustrates the need for a flexible approach to defining priorities which includes mechanisms to select and possibly deselect priority areas during the implementation of S3. Moreover, entrepreneurial knowledge and discoveries must be seen as instrumental to realise and validate the policy vision directing the efforts towards the structural change that is particularly desirable for the regional economy (Foray and Rainoldi, 2013, p. 3).

Critical issues when operationalising S3 in SPA

Lack of middle-range innovative firms

The economic structure in SPA often consists of a few well-performing, internationalized large firms in the primary sector and a constellation of micro-firms involved in diverse sectors. Large firms can undertake research and develop novel applications on their own without external involvement.

Micro-firms, on the other hand, have much limited capacity to develop own R&D, and are also constrained in how much external contacts they can handle. The lack of middle-range firms that combine the flexibility of small firms with a certain degree of in-house innovation capacity may be constraining the S3 implementation in SPA.

The role of intermediary organisations

As RIS3 design and implementation goes "*beyond the top-down and bottom-up dichotomy*" (Foray, 2015, p. 41) and its successful implementation may be promoted by the presence of an effective network of intermediary organizations that can facilitate the alignment between the entrepreneurial endeavours and the policy support mechanisms. An important goal for RIS3 is to stimulate the "*generation of information spill-overs*" (Foray, 2015, p. 45) in order to create emulation among actors within the region and the growth of new entrants into the economic domain enhancing clustering. Intermediary organizations are suitable actors for promoting information spill-over in the region. Although intermediary organizations in SPA are very active and provide strong innovation support, in terms of finance and expertise, they may be too few to cover enough issues, thus limiting the potential economies of scope.

Moving innovation outside university-towns

The SPA have in the last couple of decades been endowed with important research infrastructures, such as universities. These university-towns have developed into vibrant places of innovation, with a strong interaction between researchers, entrepreneurs and policymakers. However, the diffusion of spill-overs to the rest of the SPA territory has been rather limited. More distributed forms of cluster arrangements could not only increase the introduction of innovative behaviours in different places of the SPA but should better support regional policymakers in the exploration and experimentation of that specific entrepreneurial knowledge needed to connect emerging societal demands with local assets.

Organizational challenges to actor interplay

Long distances between the settlements in SPA mean that the interaction between actors from different parts of the SPA is more difficult to organize practically and less likely to be organised repeatedly. It becomes thus more difficult to induce new relations between actors, and especially across sectors. However, the relative slowness of the early stages of the process may be compensated in later stages by the high level of social capital and trust among actors which strengthen their capacity to act collectively, by speeding up the iterative entrepreneurial discovery process of "test-retest" (Moyes et al., 2015).

Alignment between the perspective of the ones that design and the ones that implement the strategy

This issue can be aggravated in SPA where there is a great difference between main urban centres and rural areas. The strategy development is often designed for the whole territory in and by representatives from the main urban centre and may lack the involvement of entrepreneurial actors in rural areas, both in the design and implementation. As a consequence, opportunities for growth from all places rather than only certain cities or sectors could be missed, affecting the objective of structural change inherent to the application of S3 to regional policy.

3.2. Related variety

Related variety refers to "*the variety of industries in a region that are cognitively related*" (Boschma, 2013, p. 3). "Cognitively related" means sharing a similar base of knowledge, although they may belong to different sectors. S3 argues that innovation can be induced simultaneously across multiple sectors by targeting the introduction of novelty based on this shared knowledge-base. Previous generations of RIS tended to support innovation processes and knowledge production and application more *within* individual sectors of the regional economy. Related variety also indicates that new domains more often emerge out of existing regional capabilities, even though occasional cathedrals in the desert can occur (Boschma, 2013),

The S3 thinking thus advocates that those innovation processes that aim at a profound economic structuring of the regional economy should be designed in order to potentially benefit multiple sectors simultaneously and depart from existing regional capabilities. Related variety acts as the common ground from which "*the fundamental logic of translating entrepreneurial discovery and subsequent new activity into structural change*" (Foray, 2015, p. 29) is enabled. This logic of relatedness represents the key element that argues in favour of a spatial dimension to innovation strategies (McCann and Ortega-Argilés, 2015). The resulting economic transformation can be characterised as neither pure specialisation, as occurring independently within specific sectors of the regional economy, nor diversification, which would support the emergence of (too) many sectors that stay at an embryonic stage due to the impossibility to draw on significant economies of scale regionally.

Critical issues when operationalizing S3 in SPA

Small regions: thin sectoral boundaries

In smaller regions, such as in the SPA, the boundaries between economic sectors are very thin and porous because each sector on its own is constituted of a relatively small number of actors, making it more common for learning between firms from different sectors than in regions with a larger

number of companies and more institutionally thick with more specialised innovation support structures. It means that firms in SPA have a tendency to be more open and used to process knowledge coming from other sectors. In that sense, it may be easier for entrepreneurs and policymakers alike to identify emerging cross sectoral domains. Finally, as suggested earlier, large firms from traditional industries tend to act as brokers between these sectors. In that regard, domains that extend over several sectors can potentially be found more 'natural' in SPA.

Large firms as the nexus of related variety

A few large internationalized companies are the key actors in the primary sector. These firms are often backed by a dense network of local small firms that supply them with specific products or services. Hence, these large corporations are at the nexus of the endeavour to create a higher degree of related variety in SPA due to their central position in the primary sector and their engagement in a multiple set of related sectors, from energy production, construction, manufacturing or service provision.

Identifying related technologies

The specific territorial preconditions of SPA in terms of their small size and long distance to the main markets mean that firms usual develop common ways of coping with the 'cost of distance'. Export is a necessity for firms in SPA. Small firms often collaborate with each other in order to find appropriate logistical solutions and reducing the transport costs for individual businesses. Hence, novel applications of new technologies may improve the capacity of firms to organize their supply and demand issues in a joint manner, paving the way to further collaboration.

3.3. Domains and lead market

Foray defines a *domain* as the level at which S3 priorities are identified, assessed and supported which should neither be too high (an entire sector) nor too low (individual firm) (Foray 2015, p. 41). A domain thus corresponds to a mid-grained economic unit that stretches across several sectors, without covering them entirely. This is evidently less intuitive than the traditional perspectives based on either entire sectors or individual firms. The challenge for designing and implementing S3 lies in the capacity to identify and support the development of such domains. The promotion of new domains rather than entire sectors in S3 aims to "*realize the potential for scale, scope and spill-overs in knowledge production and use*", and to "*develop distinctive and original areas of specialisation for the future*" (Morgan, 2013, p.104), which means a focus on functional relations between companies and innovation supporting organisations and the potential emergence of a critical mass of actors where there is spill over.

The concept of lead market has also influenced the development of the S3 theory (CSES and Oxford Research, 2011). Lead markets may be defined as geographical areas, e.g. countries or regions, in which the demand for and the use of innovation are widespread before they are diffused to wider global markets (Beise, 2006; Jänicke and Jacob, 2004). Lead markets are thus places where new sectors, new activities and new market demands are created before getting diffused by early adopter regions or countries globally. Lead markets are characterised by a high degree of economic specialisation in a specific sector, both regionally and internationally. Hence the mapping and identification of the existing strongholds in regional research and innovation with a view to their potential contribution to the development of new domains and potentially lead market status is a critical step in the formulation and implementation of S3.

Critical issues when operationalizing S3 in SPA

Lack of critical mass hampers entrepreneurial behaviour

The presence of few economic actors in SPA means that firms have a more limited choice in terms of potential partners and knowledge pooling to promote new domains. It means as well that fewer actors may be able to contribute financially to the 'start up' phase of the discovery process, as there is a disproportionally large risk.

Leading by example

New domains founded on the historic economic legacy of SPA may take advantage of the emerging debate on the global issue of the sustainable exploitation of natural resources and the move towards a more circular economy. SPA are most often resource driven economies with high international competitiveness in these areas and could be the site for the testing of new applications of these resources. SPA could benefit from this opportunity by developing as showrooms for global technologies aiming at optimizing the use of natural resources with potential spill overs in multiple sectors and markets worldwide.

3.4. Mobilizing external resources

Contemporary innovation studies have emphasized the collaborative and relational nature of innovation processes based on reciprocal exchanges of information, knowledge and experiences between actors. A large share of innovation exchanges occur in close geographical proximity, at the same time these need to be 'boosted' through the sourcing of external knowledge. This duality in the spatial dimension of innovation processes has been captured in the metaphor of 'local buzz and global pipelines' (Bathelt *et al.*, 2004).

These two processes are not distinct from one another, but need to be thought of as reinforcing each other. Hence, innovation strategies should aim at inducing a balance between the consolidation of regional networks and the establishment of extra-regional ones. This has to do with the cognitive proximity between actors. Small cognitive distance, i.e. in the form of high level of social capital, shared perceptions of the world and how to carry out activities, facilitates the communication and flow of information between actors (Boschma, 2005). Small cognitive distances foster trust, increase the absorption capacity of the community and enhance the likelihood to achieve jointly shared goals (Nooteboom, 2004). This is typically found in locally bounded spaces. Large cognitive distance, on the other hand, favours variation and novelty. Novelty can be based on the sourcing of new knowledge that is not already existing or circulating among local. Non-local ties are considered to be instrumental for firms to secure access to such a wider range areas of knowledge (Nooteboom, 2006). Access to extra regional resources and a broader ecology of innovation services can expand the capacity of small firms in these regions (Uyarra *et al.*, 2014, p. 62).

Critical issues when operationalizing S3 in SPA

Science-based knowledge triggering novel applications

With the exception of large firms and universities, there are admittedly few actors in SPA that may generate new science-based knowledge. The capacity of actors in SPA to channel such knowledge from other places and translate them in terms of new business opportunities is a critical factor. Regional universities appear to be the natural brokers between the external science-based knowledge and the local know how. However, the centralisation of these facilities in few locations of the SPA tends to limit the contact interface between researchers and the more remote firms. The establishment of a presence in the form of decentralized campus, or regular workshops and meetings across the whole territory, is a necessary condition for developing trustful relations between these actors and connect them to external resources.

Greater awareness of global market demands

S3 implementation necessitates a greater awareness of local actors on the latest developments from multiple markets. Large corporations in the primary industries are already part of global value chains and they are also well tuned in to the specific demands of their sectors. Hence, they can support smaller firms by sharing the latest trends in standards and technologies of their 'global market'. They are also better used to navigating in global networks and can thus provide valuable experiences to smaller firms on how to develop wider networks in their respective field. At the same time there is a dependency risk for SMEs that rely upon supplying one firm, both from a market intelligence and a revenue perspective. Trade and sectoral associations and Chambers of Commerce have good connections into international markets thanks to their global networks of peers, and can

also support the sourcing of international market intelligence. At the same time large companies in these sectors more often make reference to suppliers as sources to innovation than for example universities, showing that large companies need suppliers to innovate. This can be both based on sourcing knowledge externally, but also on local suppliers. Therefore large companies not only benefit their local environment, but also benefit by being located in an environment with innovative suppliers.

Finding new routes to external markets

Small firms need to find new routes to mobilize resources not available in close proximity. Due to the small size of the regional economy, each firm in SPA is almost one of a kind. Hence, the development of novel applications may be induced thanks to the cooperation with small firms with similar interests or concerns, but located in other regions. Peer-to-peer networking, promoted for example by Enterprise Europe Network, may speed up the diffusion and application process. Finding new routes to external markets necessitates the continued upgrade of the connectivity infrastructure of SPA, both digital (broadband, mobile networks) and physical (transport and shipping).

Access to on-the-fly financial information

The role of banks is changing. Not only many local banks in SPA have closed, but the role of banks and other financial institutions has shifted from providing loans to keeping local firms up to date with the latest development in the financial markets worldwide.

3.5. Broad view of innovation

In previous generations of RIS, innovation processes were essentially designed to promote technological advancement. Key to this process was to improve the capacity of regions as potentially new sites for science-based knowledge production. In S3, the focus depends on the region, where some might pursue a strategy of being providers of general purpose technologies (Foray, 2009), whereas for others, like most commonly in SPA, the focus is rather on developing more specialised application of knowledge in the region (McCann and Ortega-Argilés, 2013a). Smart specialisation is not about technology development per se, but rather about how to apply knowledge in new ways, which necessitates for regions to be tuned in to the systemic nature of innovation processes; and where the technological aspects may be only one aspect among others (Charles et al., 2012).

In that new frame of reference, the sourcing of science-based knowledge is important, but should be complemented with other types of knowledge in order to turn these novel ideas into sound business opportunities. For instance, the sourcing of knowledge related to market intelligence,

societal and user needs, organizational techniques and funding/financing opportunities plays a greater role in entrepreneurial discovery and economic transformation processes. There is a greater emphasis on concepts that go beyond technological development, like service and social innovations. Hence, a first step for the design and operationalization of S3 is to map a regions' economic and institutional profile and especially its position in terms of "knowledge-related innovation" (McCann and Ortega-Argilés, 2013a, p. 418). Moreover, related variety suggests that the way forward is to promote "specialized diversification into related technologies" (Boschma, 2013 p. 8).

Critical issues when operationalizing S3 in SPA

Social innovation and governance experimentation

The long standing and unique nature of challenges in SPA calls for novel approaches to problem-solving practices. Social innovations as new modes of collective governance relate to the engagement of local action groups. Intermediary organisations constitute the main basis for hybrid forms of local governance for sustainable rural development policy implementation. Experimentations in territorial governance may also provide new leverages for tackling such long standing issues, such as the impact of depopulation on local welfare.

The greater presence of social capital in the SPA can benefit these regions in embracing the broader view of innovation that emphasises the involvement of both suppliers and users of innovation in development processes facilitating the implementation of the Quadruple Helix innovation model promoted by S3. Moreover, the implementation of S3 in SPA could harness existing social capital and catalyse more stable QH arrangements.

Broadened view of use of natural resources

The opening up of a completely new array of opportunities to nature-based resourceful SPA could need to mobilise external knowledge but also to integrate local producers in global supply chains that may be different from those currently existing in SPA, and may call for a different set of knowledge and a different interplay between human and natural resources.

For example, many SPA have successfully developed service innovation strategies related to tourism. This is a new use of natural resources and also one where more knowledge and science based development trajectories are possible. When doing so, it also becomes increasingly important to broaden the range of actors involved in developing the RIS3, as here are potential issues related to different interests among stakeholders as, for instance, in the case of nature-based tourism where the interests in the short term of the forest industry are not necessarily the same as the interests of the tourism sector.

Virtual connections, real added-value

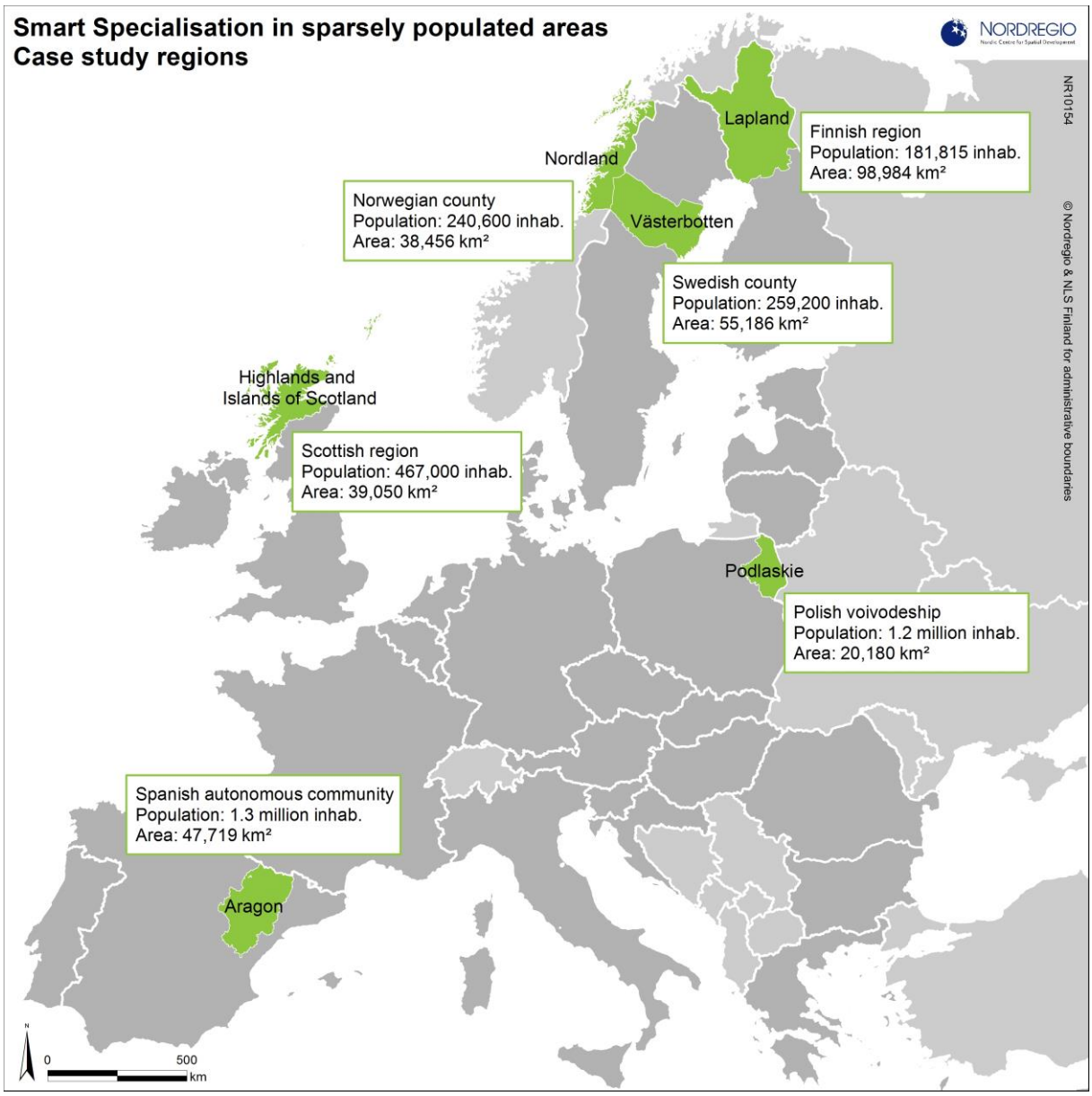
Digital infrastructure is important to improve the place of SPA actors within global flows of knowledge. Digital technologies may also trigger novel applications especially related to issues of provision of services. For instance, in SPA 'virtual' health-care solutions are increasingly tested as a result of dispersed population. Such creative use of technology to solve societal issue may support the emergence of a domain related to new technologies for coping with long distances.

4. Smart Specialisation in sparsely populated regions: empirical cases

This paper analyses six European regions and the challenges and opportunities they have experienced in developing and implementing their RIS3 strategies. The following regions are included in the empirical part: Aragon (Spain), Lapland (Finland), Nordland (Norway), Podlaskie (Poland), Scotland (UK) and Västerbotten (Sweden).

The following map illustrates the six European regions presented in this case study.

Map 1: Overview of case study regions



Source: Nordregio

There are similarities between the case study regions such as significant natural resources, ranging from agriculture and forestry areas to minerals, water-related resources and recreation areas. The industries are largely based on the natural resources in the region, although the traditional industries have undergone major changes in many regions in the past decades. The innovation support system in the case study regions is often based on one dominant university located in the main urban centre of the region, with satellite offices of the university located in the smaller communities of the region. The spatially distributed nature of the educational and research activities is also often complemented with the participation to technology or knowledge parks in order to create an interface between the university and small and large businesses in the region. Note that these 'parks' are often located in or nearby the main campus. There are, however, considerable differences to be identified between the regions analysed, too. Firstly, there is a huge variation between the population densities of the case study regions, ranging from 1.8 persons per

km2 (Lapland) to 59 persons per km2 (Podlaskie). Secondly, the intra-regional and extra-regional travel distances, and thus the issue of regional and local accessibility, vary considerably.

Hence, although SPA regions can be identified as "*shared geographies*" (Gløersen, 2012) due to significant structural similarities, it should also be underlined that there is a great variety regarding their innovation systems and institutional dimensions (OECD, 2011). To address this crucial point the recent KIT ESPON project has attempted to introduce a territorial approach to the way innovation policies are framed (Camagni and Capello, 2013). In spite of the valuable efforts, the ESPON classification seems unable to provide a comprehensive picture of the territorial patterns of innovation and the occurring innovation performances where SPA represent relevant parts of the region, mainly because of the micro scale of observation that is required working in SPA.

The six regions presented their S3 approach and RIS3 at the thematic workshop on "*Smart Specialisation implementation in Sparsely Populated Areas for the sustainable management of natural resources*" that was held in Rovaniemi (Finland) in June 2014.

Our analysis of the six RIS3 approaches focuses on the key challenges as presented by the regions and frames them under the main issues discussed in section 3: Entrepreneurial discovery, Related variety, Domains and lead market, Mobilizing external resources, and Innovation beyond technology. Data discussed in this paper are largely based on the regional presentations and the complementary survey sent to the case study regions in 2015. The main empirical observations are presented in Table 2.

Table 2: Synoptic Table of the case study regions

Region and RIS3 priorities (according to Eye@RIS3)	**Major observations**				
	Entrepreneurial discovery	**Related variety**	**Domains and lead market**	**Mobilizing external resources**	**Innovation beyond technology**
Aragon Logistics & transport; ICT; Tourism & trade; Health & biotechnology; New materials; Automotive; Energy & hydrogen; Water; Energy efficiency; Agri-food; Education & training	More actors requested to support innovation and entrepreneurial discovery process	Difficulties with the primary industry to be open to new activities	Large firms play a crucial role	EU Regions of Knowledge appreciated Triple Helix appreciated	Promising good practice EU projects in the region
Lapland Mining; Information society; Tourism safety; Traditional process industry	S3 perceived as a new, difficult-to-understand concept especially among practitioners	Need to develop more products and services that raise from the needs of base industries in Lapland	"Too few smart people to create competitive domains"	The Arctic Smartness Portfolio (ASP) initiative by Regional Council of Lapland 2015 - also to increase transnational cooperation	"New wave", cross-sectoral, multidisciplinary cluster initiatives
Nordland Industry processes; services and products; Suppliers to seafood industry; Experience economy: creative, culture and tourism industries	RIS3 perceived as essential but time consuming. It is a process, not a quick-fix solution. First-comer dilemma/natural resource-based industries discussed	Perceived as an essential and important concept	How to develop KIBS businesses to support the emerging /existing domains?	Many initiatives, but still challenging to find cooperation partners in the peripheral context	Research initiatives to understand better the nature of work and innovation in Nordland
Podlaskie Silver economy; Gateway to the east; Eco-development; High quality foodstuffs	RIS3 perceived as important but challenging. How to better utilize our assets?	The role of Key Enabling Technologies (KET) highlighted	Doubts on the applicability of S3 to create domains in SPA	RIS3 EU Platform - interest in using the S3 forum more actively	How to stimulate non-agricultural activities? How to find sources of income for people living in areas of natural protection?
Scotland /H&I Food & beverages; Energy; Universities; Tourism; Life sciences; Creative industries; Marine energy; Financial & Business services	How to guarantee innovation support services?	Good Practice cases e.g. digital healthcare	"Lack of critical mass for entire sectors. Our chance is in sub sectors "	Place attractiveness plays a crucial role	"High on the agenda "
Västerbotten Sustainable energy and environmental technology; Digital service sectors for smart regions; Life science; Innovations in healthcare; Experience based and creative industries; Testing activities; Technology and service development for industry	How to extend university industry collaboration to smaller places, too? Innovation support: incubators in SPA? Quadruple Helix to strengthen the interaction within the innovation ecosystem	Four COs: CO-design, CO-creative development, CO-constructive development, CO-innovation	How to include more international /global thinking into domain/lead market discussion?	North Sweden European Office, Brussels, and Regional Representation Office, Stockholm, seen as meeting places and co-operation promoters	Regional Forums such as Meetpoint Lycksele to attract a broad range of actors to innovate together

4.1. Cases: Aragon (Spain)

Aragon has a geographical area of 47,719 km2, sharing 136 km of border line with France, and a population of 1.3 million people. The population density in Aragon is 27.2 persons per km2 whereas in Spain as a whole, the population density is 91 persons per km2. Half of the population of Aragon lives in the main city of Zaragoza. Aragon is one of the autonomous community regions of Spain. Aragon is divided into urban provinces, especially the Zaragoza province, and rural provinces with low population density (Huesca with 51,000 inhabitants is the only other city in the region with a population greater than 50,000). The traditional agriculture-based economy of Aragon from the mid-20th century has undergone transformation, and currently service and industrial sectors are the backbone of the economy in the region. The University of Zaragoza with more than 30,000 students is the major university in the region.

The Aragon Government listed at the Rovaniemi 2014 workshop the following *key challenges* for the elaboration and implementation of the RIS3 in relation to its sparsely populated feature:

- Challenge 1: Is the S3 strategy capable of facing the real challenges of sparsely populated regions? The Aragon region asks whether S3 is able not only to positively influence its growth path but also to contribute to long-term, structural improvements. Moreover, the region calls for methods to build up dynamic and integrative governance mechanisms to streamline stakeholder involvement.
- Challenge 2: Can public authorities use the RIS3 to benefit from local growth? The Aragon region gives credit to the S3 process for inviting different kinds of authorities to participate in the process of defining the expected regional growth path. The region asks for specific measures to encourage coordination and interdepartmental dialogue through the S3 process.
- Challenge 3: Can S3 compensate for the non-continuation of the EU Regions of Knowledge (RoK) projects? The region has implemented two RoK projects with good experience. Unfortunately, the RoK programmes have disappeared from the EU Horizon 2020 Agenda. In addition, the region would like to identify the specific areas in which cooperation on demographic basis would be fruitful, suggesting e.g. innovative rural communities.

The Aragon region has identified the following Smart Specialisation priorities: *connectivity*, *resource efficiency*, and *well-being and quality of life*. As presented at the Rovaniemi 2014 workshop, the operationalization of these priorities will include initiatives taken in the fields of logistics & transport, ICT, tourism & trade, health & biotechnology, material sciences, automotive industry, energy & hydrogen, water, energy efficiency, agrifood, and education & training.

The cluster concept appears to have played an important role in translating the S3 ideas into concrete actions in the region. For instance, the connectivity priority has been undertaken through a logistics cluster initiative in 2011-2014, largely based on the EU Regions of Knowledge initiative.

The resource efficiency priority, also originating from the EU Regions of Knowledge initiative, is currently being developed into an Urban Water Efficiency Cluster. The well-being and quality of life priority, closely related to issues related to an ageing regional population, is planned to be developed into a mountain-tourism cluster.

In their comments to *entrepreneurial discovery*, the Aragon region emphasises the role of the resource providers (technology actors and funding actors). According to the region, they are currently not capable of orientating their knowledge to match the needs of the SMEs as few technological inventions or discoveries are presented in a way that leads to immediate commercial applications. They highlight the role of business and trade associations and other intermediary organisations in linking together actors and creating brokering activities and relationships. RIS3 is seen as having a key role in developing the skills of the intermediary organisations in Aragon, and in developing the capacity of these organizations to act as advisors.

Regarding *related variety*, the Aragon region acknowledges the difficulty for the primary sector industry to be open to new activities. At the same time. Aragon mentions "innovation in the context of community-led local development strategy building on local needs and strengths".

Regarding *domains and lead market*, the large firms settled in the Aragon region – the champions - are considered as the lead markets and the champions create demand large enough for suppliers to provoke the specialization in new *domains* useful both for the champions and for the suppliers. The champions know their needs and frequently help suppliers in the design process, giving feedback and/or suggesting even more innovative solutions. This is why the possibilities to realize especially incremental product innovations are considered to be high in Aragon.

In *mobilising external resources*, the Aragon region states that the development of innovation clusters brings together universities, research centres, enterprises, regional authorities and other stakeholders across Europe. These clusters are capable of creating dynamic innovation environments, assisting in knowledge transfer, and facilitating collaborations between regions and institutions that might otherwise never meet each other. In addition, the region favours the aim and objectives of the Regions of Knowledge (RoK) projects, of which the region has positive experiences, in particular about the implementation of the Joint Action Plan also addressing transnational collaboration.

Regarding *innovation beyond technology* or broadened view of innovation, the Aragon region acknowledges that firms and public sector actors can only fully benefit from technological innovation if technological innovation is embedded into social innovation.. The optimal utilization of the potential workforce is needed. The Aragon region highlights technology-based projects such as e-RESATER project (Health and Telemedicine Network for Rural Areas) and EU LIFE Zero Residues project in the context of local development. Moreover, the Aragon region highlights innovation projects in connection to the Cultural Park initiative. The key focus of the Aragon approach is to use innovation to create new economic value from a territorial disadvantage (of being a SPA region).

4.2 Cases: Lapland (Finland)

Lapland has a geographical area of 100,369 km2 and a population of 182,000 people. The population density is 1.8 persons per km2 (in Finland as a whole, the population density is 18 persons per km2). Lapland is an Arctic region with harsh climate and long distances, but with an advanced industrial and logistical infrastructure. The main economic areas include forestry and metal industries, mining, tourism, and industrial services. The biggest city in the region is Rovaniemi with 62,000 inhabitants. The Lapland region has the University of Lapland and Lapland University of Applied Sciences as major R&D and educational institutes.

The Regional Council of Lapland listed the following *key challenges* for the elaboration and implementation of S3 in relation to its sparsely populated feature:

- Challenge 1: Lack of experts to implement the RIS3 in Lapland. The implementation of the RIS3 requires a lot of human capacity - but there is lack of critical mass of talented people with expertise in Lapland to answer to the demands of the markets – simply "too few smart people"?
- Challenge 2: Combining the interests of various businesses and business sectors in Lapland. The region asks how one can reach win-win solutions in combining the interest of various actors/sectors e.g. mining and tourism - and how the research and innovation strategies could support in finding these solutions.
- Challenge 3: Deeper understanding of the S3 concept of entrepreneurial discovery process. The Lapland region finds the entrepreneurial discovery process useful and it has been well received and accepted by regional actors. They ask, however, whether the entrepreneurial discovery process and its impact on regional growth and prosperity is really understood by all the key actors.

The Arctic Smart Specialisation programme for Lapland (Regional Council of Lapland 2013) was prepared in 2012-2013 under the coordination of the Regional Council of Lapland.[3] The preparation of the programme included active participation in the peer review events organized by DG JRC-IPTS (e.g. Mallorca peer review event in 2013). The programme includes the following major elements: accessibility, the sustainable utilisation of natural resources and natural conditions, increasing value added, making more efficient use of the expertise already accumulated in Lapland, and Arctic pride. Moreover, Lapland's Arctic Specialisation Programme contains proposals for action under three main categories: the refining of Arctic natural resources, utilisation of Arctic natural conditions and cross-cutting development enabling Arctic growth. The programme is linked with Lapland's Arctic

[3] Jukka Teräs participated in the S3 Lapland document preparation in 2012-2013.

Specialisation roadmap, which sets out the phasing of the various actions for the period 2014-2020.

In their comments to *entrepreneurial discovery*, the Lapland region acknowledges that Lapland has already started the first round of the entrepreneurial discovery process during the preparation of the Arctic Smart Specialisation project in 2012-2013, including a broad participation of public and private sector actors. The regional representatives emphasize that the Smart Specialisation concept should be explained to regional actors more thoroughly, including the concept of entrepreneurial discovery. Moreover, the Lapland region would like to see the connections of Smart Specialisation to other EU programmes (e.g. DG Growth SMEs) and cluster policies: how and to what extent they support the implementation of Smart Specialisation in the region? The willingness to better utilize the assets in the region was highlighted by Lpaland S3 document "*Lapland´s S3 - with a focus on emerging industries growing out of existing industries*", also connected to the concept of *related variety*.

Lapland emphasizes the need to develop services and industries arising from the needs of basic industries. Again, the need to open up related variety as one essential development concept to practitioners in the region is mentioned. Regarding identification and development of *domains* of competitive advantage and *lead market,* the lack of critical mass is taken up by the Lapland region. "*The challenge in Lapland is that we have too few smart people, there is lack of critical mass to answer to the demand of the economy [...] Implementation of the S3 in Lapland will need a lot of human capacity, and strategic and clever decisions*"

The Regional Council of Lapland started in 2014 a process to implement the Arctic Smart Specialisation project. Five spearhead initiatives were identified as "new wave clusters/cluster initiatives": Cleantech on Arctic industries, Arctic safety and security, Arctic Smart Rural Communities, Arctic innovation and testing environments, and Arctic design. In 2015, a specific project Arctic Smartness Portfolio (ASP) was started by the Regional Council of Lapland to work on the development of domains based on the five selected clusters/cluster initiatives.

The *mobilisation of external resources* is an essential part of the ASP project, too. The benchmarking of international clusters having similarities with ASP initiatives as well as a specific effort to translate the relevant documents related to the identified domains into English, are examples of recent practical activities.

Innovation beyond technology is being introduced by the ASP "new wave" clusters/cluster initiatives. The new wave clusters reachalso beyond technological innovationsonly.

4.3 Cases: Nordland (Norway)

Nordland has a geographical area of 36,090 km2 and population of 240,000 people. The population density is 6.6 persons per km2 (in Norway as a whole, the population density is 15.5 persons per km2). Nordland is a resource-driven economy with large areas, including ocean, islands, mountains, fjords, and agricultural areas. Nordland is the largest producer of Atlantic salmon and trout in Norway. Moreover, Nordland produces hydroelectric power, and possesses oil and gas resources on the continental shelf, and large metal and mineral resources. The strong export sectors include experience based tourism, too. Nordland has 10 small cities out of which Bodö is the largest one with 50,000 inhabitants. The innovation support system includes University of Nordland and two university colleges, three incubators and three Knowledge parks.

The Nordland County Council listed at the Rovaniemi workshop in 2014 the following *key challenges* for the elaboration and implementation of the S3 in relation to its sparsely populated feature:

- Challenge 1: Development of new industries to use the potential energy surplus in the region. How can Nordland add new industries to use the potential energy surplus in the region, and how should the smart development of a new green industry be developed?
- Challenge 2: How can Nordland increase the dialogue between regional and national level? Today, the dialogue is not at a satisfactory level, according to the regional representatives
- Challenge 3: How can Nordland strengthen the electro-technical knowledge base in the region? Nordland, as well as Norway, has a weak electro-technical industry. Due to this shortcoming, Nordland lacks a basic precondition for green energy driven industrialization. Nordland highlights the specific need of a partner region with technological companies and knowledge institutions which could complement the regional innovation system in Nordland
- Challenge 4: How can Nordland improve the planning process in practice? The region states that the utilization of natural resources is controlled by lots of regulations and is affected by spatial planning directives. Successful experiences in this matter are suggested to be introduced in the Nordland region, too.

At the Rovaniemi workshop a research paper on challenges for RIS3 in resource based regions was introduced in the presentation of the Nordland region (Mariussen *et al*., 2014). The paper highlights the challenges of the Smart Specialisation approach in Nordland related to wind energy projects, and proposes a smart green energy region strategy with a comprehensive public program on spatial planning for green energy production, and a strategy on new technology absorption and industrialization. A joint technology foresight is suggested, too, where "*a partner region which is strong in electro-technical issues could help in planning a new energy region strategy*" (ibid., p.30).

Nordland was one of the first non-EU regions to prepare a S3 strategy. The Nordland RIS3 is largely based on the following horizontal strategies: build-up of innovation capacity, increase of business relevant education and research, cluster development in supporting industries, and improvement of planning processes. Moreover, the Green Industry development in Nordland is highlighted in the S3 preparation (Nordland County Council, 2014).

The Nordland region acknowledges that *entrepreneurial discovery* is an essential but time-consuming process to build up new and deeper understandings of the innovation system in the region. The entrepreneurial discovery process is needed to identify new combinations of knowledge and actors, and to establish cross-sectoral cooperation. The entrepreneurial discovery process is not expected to offer a quick-fix-solution in the region. Nordland highlights the importance of "good spatial planning" as an important part of the entrepreneurial discovery process and new industry development in the "transformation of nature into resources". The Nordland delegation is facing a well-known dilemma in the Entrepreneurial Discovery Process: any private initial entrepreneur who makes the "discovery" can capture only a small part of the societal and economic value that this knowledge generates (the innovator does not get his money back from the initial investment). Due to this issue, many potential development opportunities in the region are left unexplored. According to the Nordland representatives, this is a crucial issue for regions such as Nordland with large natural resources and with plans for smart energy production, such as wind energy. A smart wind power strategy should include more risk taking from the part of the regional authorities and support for entrepreneurial discoveries.

Related variety is seen as an essential concept for Smart Specialisation in Nordland.

Regarding major *domains and lead market*, the existing key export industries in Nordland - manufacturing, seafood, and tourism - are seen as the major *domains*. The region attempts, however, to develop KIBS (knowledge-intensive business services) to strengthen the regional economy. The lack of research infrastructure is mentioned by Nordland as a bottleneck in developing internationally competitive domains. "*We tried to develop research institutions in Nordland in technical research for decades. They are still small and have limited capacity*."

Mobilising external resources is currently an important issue; Nordland is building up international partnerships e.g. in tourism (Interreg Europa programme) and in seafood industry (regional cooperation with Spain, Scotland, and France). The region finds it, however, challenging to find ways of cooperation. Moreover, Nordland invites extra-regional expertise including e.g. the request of Nordland to increase cooperation with knowledge institutions and companies in other regions in order to find a partner region which is strong in electro-technical issues and which could help Nordland in planning a new energy region strategy.

Regarding *innovation beyond technology*, or broadened view of innovation, the region is planning a research project to study and follow-up the work done in Nordland. The research project aims to strengthening the understanding of innovation in Nordland, too.

4.4 Cases: Podlaskie (Poland)

Podlaskie is a Voivodeship (region) with a geographical area of 20 187 km2 and population of 1.1 million people. The population density is 59 persons per km2 (the lowest population density of the sixteen Polish Voivodeships in Poland, where the average population density is 123 persons per km2). Podlaskie includes varied landscape, enabling e.g. agriculture and forestry related economic activities. Production of dairy items, veneered items, weaving materials, fruit and vegetable processing, forestry related activities, and production of agriculture and forestry machinery are the dominant economic activities in the region. The biggest city is Bialystok with 295,000 inhabitants. There are about 50,000 academic students in the Podlaskie region, the University of Podlaskie being the major university.

The Podlaskie Marshall´s office listed at the Rovaniemi 2014 workshop the following *major challenges* for the elaboration and implementation of the S3 in relation to its sparsely populated feature:

- Challenge 1: Implementing RIS3 in a sparsely populated region. There is considerable doubt in the Podlaskie region whether S3 could be fully applicable to sparsely populated regions, where concentration and critical mass (agglomeration) is missing, and where high technology specialisation is practically difficult;
- Challenge 2: Constructing a proper policy mix between (more advanced) S3 areas and more general level innovations, or Key Enabling Technologies (KETs). The Podlaskie region finds the construction of an appropriate mix of S3 areas and KET areas as a real challenge as they consider most actors in the region as innovation followers rather than innovators. Moreover, they raise a more general question whether the focus on "overly narrow specialisations" in sparsely populated areas is appropriate;
- Challenge 3: timing of the S3 process. The Podlaskie region finds designing an effective Regional Operational Programme for Podlaskie in 2014-2020 challenging in a situation where S3 processes are not yet completed
- Challenge 4: Consensus building. According to the Podlaskie region, a full consensus among innovation actors on the specialisations selected has not been reached.

The Podlaskie region updated in the years 2011-2013 the regional innovation strategy through an inclusive process (377 people attended the reviewing meetings). The region has recently prepared the Podlaskie 2020 Strategy, taking into account the preparations for the EU Programme period 2014-2020. Moreover, a vision of the Podlaskie region in 2030 has been prepared ("Podlaskie – a Green, Open, accessible, and Entrepreneurial region"). The 2020 regional development strategy focuses on Green Podlaskie (Eco) and Accessible Podlaskie (Gateway to the east). The Podlaskie S3 is seen as one main tool for the implementation of the Podlaskie 2020 Strategy.

Entrepreneurial discovery process is seen as important but challenging, according to representatives of the Podlaskie region. The willingness to better utilize the assets in the region was frequently mentioned at the Rovaniemi workshop.. For instance, it was asserted that "*Podlaskie must make use of its greatest assets, which include higher education institutions supporting innovation*". Moreover, the Podlaskie region raised the question of establishing mechanisms to support and capture the outcomes of the entrepreneurial discovery process.

Related variety was not explicitly taken up by the Podlaskie region at the Rovaniemi workshop. The region highlighted, however, the role of Key Enabling Technologies (KETs) in introducing novelty to the existing knowledge in the region, as an alternative way to proceed compared to high technology specialisation for sparsely populated areas.

Regarding *domains and lead market*, the Podlaskie region has expressed doubts whether S3 could be fully applicable to SPA where concentration, agglomeration, and critical mass are missing. A voiced concern was that finding the right level for selecting specialisation, i.e. finding an appropriate domain, is difficult to achieve in practice.

Regarding *mobilising external resources*, the Smart Specialisation Platform is mentioned as a forum for extra-regional assistance by the Podlaskie region.

The broadened view of innovation and *innovation beyond technology* is emphasized by the Podlaskie region. They emphasize that entrepreneurship does not apply to business people only but to the society as a whole. They highlight stimulation on non-agricultural activities in rural areas and seeking of alternative sources of income for people living in protected areas of natural beauty.

4.5 Cases: Scotland /Highlands and Islands (The United Kingdom)

Scotland has a geographical area of 77,924 km2 and a population of 5.3 million people. The Highlands and Islands of Scotland covers half the area of Scotland and includes the Scottish Highlands, plus Orkney, Shetland, and the Western Isles. The population density of Highlands and Islands is 11 persons per km2 (in Scotland as a whole, the population density is 67 persons per km2). The major industrial and economic activities include renewable energy, life sciences and marine biotechnology, and business services, together with tourism, food and drink and creative industries. While these are priority sectors across the whole of Scotland, sub sector specialisations and the relative importance of sectors vary across Scotland. The University of the Highlands and Islands, with partnerships of 13 colleges and research institutions, is the region's university and a primary source of R&D and further/higher education capacity.

The Highlands & Islands Enterprise HIE listed at the Rovaniemi workshop in 2014 the following *key challenges* for the elaboration and implementation of the S3 in relation to its sparsely populated feature:

- Challenge 1: The strength of the S3 proposal, including the selection of proper actors. HIE raises the question of bringing together the right mix of S3 actors – within and outside the region. Moreover, they emphasize the need of building a strong regional infrastructure to support the "once in a generation opportunity" to be seized – the sustainable utilization of renewable energy to support wider regional economic activity and benefit the region's communities.
- Challenge 2: connectivity and place attractiveness to support the S3 initiatives. The region finds it important to invest in place attractiveness also from the viewpoint of anchoring the economic benefits in the region. The region emphasizes physical, virtual, business, academic, and public sector connectivity. It is also important to focus on talent attraction – retaining and attracting skilled people to the region.
- Challenge 3: How to guarantee a stable regulatory environment to implement the S3 strategy, in relation to renewable energy developments?

The S3 Policy framework in Scotland is based on the Scottish Economic Strategy and the Scottish Innovation Strategy – "*Scotland Can Do*". In the Highlands and Islands, this translates into developing a region that is: an international marine renewables centre, a digital region, growth businesses in international markets, expertise on digital healthcare and marine science, dynamic and sustainable communities, and an attractive region for young people. Renewable energy plays a significant role not only due to natural resources in Scotland but also due to evolving experience and expertise, firstly in the development of hydro power and then in the oil and gas sector. Scotland has the vision to become a world leader in renewable energy especially in marine renewables. A focus of activity is the European Marine Energy Centre EMEC - tidal and wave power R&D and test centre in Orkney Islands. Regarding renewable energy, successful elements of the S3 strategy identified by the region related to Quadruple Helix interactions benefitting from Government commitment and engagement, input of private sector and academia and communities, supporting the creation of some clustering of expertise within the Highlands and Islands. However, a stable regulatory environment to encourage business investment in R&D, testing and deployment is still a weakness and infrastructure constraints related to connectivity (grid, digital) represent main bottlenecks.

The role of local communities as the final beneficiaries of the S3 policies is clearly depicted as in the case of the community renewable projects already undertaken. This underlined the need of capturing the economic and social benefits of future development while supporting community capacity and capability to develop and deliver renewable energy projects.

Regarding *entrepreneurial discovery*, the Highlands & Islands region emphasizes their attempts to the provision of innovation support (finance and access to advice/expertise). This aims

to deepen the innovation activity in those businesses that are already innovating and encourages and enables a larger number of businesses to innovate.

As examples on *related variety* in the Highlands & Islands, the region mentions digital healthcare as an example of related variety, as a result of a dispersed population, increased digital connectivity and life science business/academic expertise. The HIE highlights the need to understand "*how renewable energy fits with other economic activities*".

Regarding *domains* of competitive advantage and *lead market*, the region states that the competitive advantage areas can be defined as sub-sectors. The region acknowledges that the lack of critical mass is an obstacle for the creation of lead market in the region, given its small and sparse population. Within life sciences, digital health and marine bioscience are particular strengths. In energy, marine renewables is an area of focus. The region emphasizes the importance of connectivity (both physical and digital) in opening up new market opportunities.

In *mobilizing external resources*, the region finds it necessary to access external expertise to enable regional specialisms to develop. The role of educational and research centres is considered very important. Sometimes the expertise is facilitated through a so-called interface service. In others, it is facilitated through Highlands & Islands Enterprise. Some Scottish universities have establishes a presence in the region e.g. Heriot Watt University from Edinburgh and International Centre for Island Technology ICIT in Orkney. The region states that while it is important to mobilise external resources, it is equally important to build the region's own capacity and capability. The Highlands & Islands region emphasizes place attractiveness as a strategy to attract talented people, businesses, and investments to the region, too.

Innovation beyond technology is pointed out as high on the agenda: according to the region, most innovations in the region are likely to be based on factors other than technology, although acknowledging the importance of e.g. digital connectivity as a driver and enabler of innovation.

4.6 Cases: Västerbotten (Sweden)

Västerbotten in North Sweden has a geographical area of 55,190 km2 and population of 261,000 people. The population density is 4.7 persons per km2 (in Sweden as a whole, the population density is 23.2 persons per km2). Västerbotten is dominated by forest area (40% of the region) with long tradition of wood processing and forest products, and mountain area (30 % of the region) with mining, tourism, and reindeer herding as key economic activities. The biggest city in the region is Umeå with 118,000 inhabitants. The Västerbotten region possesses three universities with 36,000 students.

The Regional Council of Västerbotten listed at the Rovaniemi workshop the following *key challenges* for the elaboration and implementation of the RIS3 in relation to its sparsely populated feature:

- Challenge 1: Extending the university-industry collaboration to companies outside the university cities. How to develop the university-industry collaboration between universities and industry into applied research and connection to companies even outside the university cities? The motivation and/or attitude of the university in the region regarding university-industry assignments in regions outside the university cities is being questioned.
- Challenge 2: Equality issues. How to devise a system that ensures equal innovation support activities meeting the needs of individuals regardless of gender, ethnicity, or cultural background?
- Challenge 3: The role of business incubators in sparsely populated areas. The region takes up a GIS related business incubator in rural area as a good practice example, and asks how to extend innovation support system (especially incubators) to sparsely populated areas with insufficient critical mass of actors
- Challenge 4: Lack of venture capital in sparsely populated areas. How can the availability of venture capital be strengthened to companies in sparsely populated areas to develop smart specialisation activities?

The Regional Council of Västerbotten coordinates the regional development strategy in relation to the S3 approach. By the time of the S3 conference in Rovaniemi in 2014, Västerbotten had not prepared an "official" S3. The region had, however, adopted an Innovation Strategy in April, 2014, which included focus areas for smart specialisation:sustainable energy and cleantech, digital service sectors for smart region, life sciences, innovations in health care, experience industries and creative industries, testing in cold climate, technology and service in the industry, and intersection points between the selected focus areas. Västerbotten had also developed a governance mechanism in the form of an Innovation Forum which gathers representatives of major public and private sector organisations to value ideas and projects and steers them to the selected priority areas of Smart Specialisation.

Regarding *entrepreneurial discovery*, Västerbotten states that there is a lively innovation ecosystem in the region consisting of knowledge transfer organisations, business incubators, and business accelerators. They find entrepreneurial discovery as a conceptual approach to the innovation process in the region. Västerbotten states that the recently established Regional Innovation Council with a Quadruple Helix approach aims to strengthen the interaction within the innovation ecosystem. It was stated by a representative of Västerbotten that the term "entrepreneurial discovery" is not used as such in Västerbotten at the moment, despite several activities highly related to the concept.

Related variety is seen as an important tool in Västerbotten to meet better the time-to-market pressure for new innovative products and services. The region emphasizes public-private-

partnerships and importance of four Cos: Co-design, Co-creative development, Co-constructive development, and Co-innovation.

Regarding *Domains* and *Lead market*, Västerbotten emphasizes the importance of the seven domains identified in the RIS3 work in the region. A more international, or even global, approach would be needed in the development of domains of competitive advantage and lead markets, according to Västerbotten interviews. It was stated that sometimes focusing on one region only prevents the actors to realize the true potential and international competition within the identified domain.

In *mobilizing external resource,* Västerbotten mentions the role of the regional representative office in Brussels (North Sweden European Office) and the regional representation office in Stockholm where the region intends to create collaborative platforms and meeting places for companies, organisations, and research institutions. The region has also, together with local and national representatives and industry partners, set up an agency to attract external resources of capital and know-how.

Innovation beyond technology is demonstrated by activities such as e.g. Meetpoint Lycksele(Mötesplats Lycksele), with annual top events and innovation loop activities, attracting a broad range of public and private sector actors and citizens.

5. Critical reflections on the S3 implementation in SPA: reflections from the S3 thematic Workshop in Rovaniemi (Finland)

The Rovaniemi S3 workshop in 2014 was able to highlight many issues common to SPA regarding smart specialisation strategies with the following major conclusions and findings.

The S3 exercise promoted by the European Union cohesion policy has already initiated significant processes in the case study regions. Despite the young history of the concept of S3, most SPA regions participating in the Rovaniemi workshop had already implemented comprehensive and inclusive processes to create a common and widely accepted regional Smart Specialisation strategy and to start the implementation phase.

Furthermore, it is evident that the six regions have shown a *willingness* to test the concept and develop proposals for its implementation. For any region, i.e. sparsely populated or not, translating the concept into new forms of regional practices is not a straightforward operation. Hence, the willingness of the regional authorities to take up the challenge of S3 can be seen as an indication of a positive view of S3 by the regions. It is also a sign that these regions strive for finding new ways of regenerating their region's development paths. In that sense, we deem that Smart Specialisation has encouraged regional actors to think 'outside the box'.

The overall understanding of the S3 concept among the six regions was at a relatively high level taking into account the novelty of the concept. Beyond the key S3 elements presented earlier in this paper (entrepreneurial discovery, related variety, granularity, major domains and lead market, outward looking dimension and broader view on innovation), the main themes discussed among participants referred to how to deal with critical mass, how to capture and keep "smart jobs/people" by addressing the issue of "place attractiveness" where demographic shrinking is a significant threat, and governance in terms of how to ensure participation/engagement of actors from low density areas - a sensitive issue in regions with both sparsely and densely populated areas where there is a risk of denser areas dominating the S3 process.

Having said this,the interpretation of some of the key S3 concepts varied between the regions. For instance, the concept of a domain was defined by some as the combination of two or more 'mature' sectors while others intended it as only a specific part of a larger sector (sub-sector) or as one sector dragging the development of other sectors (e.g. renewable energy).

Sectors related to exploitation of natural resources are perceived as central to many of the regional priorities, because these are the most evident assets for these regions. A number of relevant reflections relate to this specific aspect.

Some regions argued that their innovation processes were dominated by experience-based innovation processes with limited innovation capacity, as this is the current main approach in natural resources sectors.. Hence, the issue of a '*broadened view of innovation*' was a very pertinent part of their S3 in order to avoid this innovation 'lock-in' in the future.

Complementing this point, most regions also underlined the role of *science-based knowledge* and universities supporting local entrepreneurs to more seamless application of such knowledge bases. Moreover, the process of linking science-based knowledge to more practically oriented knowledge such as engineering and market intelligence was seen as an important area of efforts for the regions. Many regions still see the production of new technologies as an important focus of their S3. This is a clear remnant of the old paradigm of RIS focusing on the regional co-production of science-based knowledge rather than promoting the application of such type of knowledge, even when it comes from elsewhere. The symbolic importance of technological development as the 'silver bullet' for regional development is still very much present, even if its economic leverage might be less significant than the market outcomes of novel applications of existing technologies to local assets by regional entrepreneurs. Indeed, promoting the production of science-based innovations requires substantially more investments in the research infrastructure than promoting innovative applications.

The role of regional universities was presented as essential to strengthen the level of innovation in the region by supporting the collaboration with local industry towards applied research underlining the gains deriving from the application of existing (even extra-local) knowledge to specific (local) contexts and regional economic sectors.

Awareness of the importance of place attractiveness i.e. the capacity not only of retaining local population but also of attracting new people, businesses and investment in the context of S3 was considerably high. This point was also linked to simultaneous improvements in horizontal policy areas as services, education, infrastructure and human capital in order to take full advantage from S3.

All the six regions pointed out that the S3 process necessitates the establishment of new forms of relational capital, i.e. new governance mechanisms and the mobilisation of external resources. All regions highlighted this as one of the major practical challenges they have faced. The governance challenges mentioned by the regional representatives range from i) not reaching a stakeholder consensus on which specialisation fields to select (e.g. Podlaskie), ii) to the risk of S3 remaining a theoretical exercise, iii) with poor role in the S3 process for SPA due to the extractive role of actors based in the main urban centres (e.g. Aragon) and iv) the strong compartmentalisation of the EU programmes themselves which increases the need for regional actors to integrate and coordinate interventions downstream. There were not only challenges reportd. ,Some regions reported also inclusive and well-coordinated process (e.g. Lapland with Regional Council of Lapland taking up the role of leader) and others reported a satisfaction with the broad involvement of stakeholders in their S3 process (e.g. Podlaskie with 377 attendees). It should be noted, however, that the governance aspects may not have been put to the test truly yet; and will not be so until the implementation phase of the RIS3.

With regard to the *entrepreneurial discovery process*, one can see that the six regions have made attempts to turn their locational characteristics into potential development opportunities. Regional stakeholders have understood that S3 needs to be based on their region's own territorial assets rather than just aiming at catching up or replicating development strategies taking place in larger regions, e.g. the concentration of efforts on cold-climate technology in Northern SPA. S3 has also been seen as a way of combining the need to address some of these regions' structural concerns with the need to develop new businesses based on new technological applications. For instance, the development of distance-bridging technologies, such as digital health care initiative in Scotland, may enable these regions to become pioneers in new technological applications and possibly especially so in service provision.

However, observations show that it is very difficult for regions to abstain from 'picking the winners'. Indeed, what we can observe is the persistent tendency from the regional representatives to beforehand select a few sectors (which in SPA are often dominated by a few large companies), to be supported through the S3. This is, naturally,against the idea behind the rationale for the entrepreneurial discovery process. This concern is not probably limited to SPA onlybut is most likely encountered in all EU countries when translating the S3 concept into concrete actions and investments. What is giving some hope though is that regional authorities seemed to be aware that they should not preselect sectors in theory, but that it is difficult to undertake in practice. Evidently,

as for new paradigms, the implementation of S3 has a steep learning curve, and it is a fair acknowledgement to say that future generations of S3 will probably be better able to address this difficult issue.

Also, it has to be mentioned that even when the prioritisation process has focused on emerging opportunities for SPA, the main economic return of the R&I investment under RIS3 could not benefit local communities, as it is often the case with energy related investments. Regarding this point, and linked to the ultimate objectives of S3 as agendas for economic and territorial development, concerns were expressed about realizing community benefits at the local level. An example of proactive ways to tackle this issue was presented by Scotland, where Highlands and Islands Enterprise (the Regional Development Agency) mission statement set out to "sustain fragile communities". In this respect HIE is unique in the UK as an enterprise agency which is able to pursue not only economic but also community development. In alignment with its mission, supporting community capacity and capability to develop and deliver renewable energy projects, e.g. through Community Energy Scotland (CES) and Community and Renewable Energy Scheme (CARES), are intended to complement their S3. In this regard, a relevant point refers to the capacity of regional policymakers to put in place an effective feedback mechanism between the policy vision for the region and the search for entrepreneurial knowledge able to make such a vision real, and to foster the quality of entrepreneurial discoveries by promoting informed dialogue (Sen, 1999) as it will affect subsequent decisions and choices about the vision itself (Foray and Goenaga, 2013).

The Rovaniemi S3 workshop also raised the issue of different businesses in SPA being competing for the utilisation of natural resources and therefore of possible conflicts of interest between those business sectors e.g.mining industry and tourism. In fact, the majority of the SPA currently seems to base their development largely into a handful of industrial sectors, often including natural resources, renewable energies, and tourism. All case study regions share some questions in developing their S3 strategies: to what extent does availability of diverse natural resources open up possibilities to promote alternatives to resource-based development? What are the possibilities for related variety and diversification of regional and local economies in a sustainable manner? For example, in the case of forest utilisation,there may be a competitive need for industrial exploitation (e.g. timber for the sustainable construction industry or renewable energy) as well as nature-based tourism or ecotourism. There were no clear cut answers at the Rovaniemi workshop, , but an emphasis on the need to take into account the demands of the different areas, while at the same time facilitating renewal and taking into use resources presently not fully valorised.

In addition, the Rovaniemi workshop highlighted specific spatial issues related to the S3 implementation in SPA e.g. land use matters in developing industries based on natural resources utilisation. This also underlined the need to match the long-term vision and the policy mix to take into account the feasibility of specific actions and their alignment with existing policies and

regulations. In relation to this, there were discussions on the need to align national and regional policies and to seek to overcome conflicts and enhance the effectiveness of complementary interventions as the need to take action in policy areas other than R&I to make those initiatives to flourish, as "*building the infrastructure to support the opportunity*" (Scotland).

6. Conclusions

6.1 Main findings

In the introductory chapter we have identified three research questions essential for understanding the current unfolding of S3 processes in sparsely populated regions. This section discusses those research questions in the light of our theoretical and empirical analysis.

6.1.1 Can S3 be a solution to the longstanding challenges in SPA and harness future development opportunities?

The S3 concept has a young history in regional policy, and the implementation of it is currently only taking its first steps in Europe. Therefore, it is at this point too early to evaluate whether the S3 will be successful in transforming SPA and overcome the existing challenges. In fact, there are positive signals that it can be a useful approach, but also criticalities with regard to conceptual issues like critical mass, and challenges to the implementation with regard to governance and EDP.

In the policy discourse around potential benefits and shortcomings of the S3 approach in SPA, there is a general concern that, despite this new paradigm for regional innovation to be applicable in all territorial context, the limitations of SPA especially expressed in terms of the lack of a critical mass of economic actors and intermediary organizations, and shortcomings in connectivity are too much of an obstacle for any policy measures. However, what we can discuss at this stage refers to the processes so far developed by regional authorities together with stakeholders.

Related to the main novelty of S3 as the entrepreneurial discovery process, there are some concerns around getting the right actors involved, which can be even more difficult in SPA, which are often dominated by a few large companies in a limited number of sectors - which clearly are important for the success of a S3. However, there is also a risk that these companies might not be interested in renewal or were not able to provide this input needed to the process. Then, on the other hand, there are also many less strong actors, which may lack the experience of engaging in this kind of processes, and do not have resources or capabilities to participate in the S3 process. This might reduce the possibilities for success due to a lack of sufficient stakeholder involvement for regional renewal.

The role of research infrastructure and actors in the innovation process, and the need to broaden the view of innovation to include more actors and perspectives into innovation processes, have been reinforced by the S3 process. Regional stakeholders also seem to pay much attention to new forms of governance mechanisms and relational capital; as well as to the identification of future opportunities based on regional characteristics. In that regard, the role of regional authorities seems to be the most difficult to determine: they are asked to design the S3 process, but they are expected not to steer it in its implementation phase. This is a difficult balance that is best illustrated by the old habit of managing authorities to 'selecting' beneficiaries of the investments, rather than trusting the pertinence of the entrepreneurial discovery process.

Furthermore, SPA regions still find the lack of critical mass a daunting obstacle for the S3 implementation. Indeed, there is an understanding that the regions are too small in order to be able to concentrate enough investments to create sizeable domains. This is partly linked to the previous point raised. Concentration of investments may not be enough if you wish to recreate in each region a complete research infrastructure, able to cover the full chain of innovation from idea to new ventures. However, we argue that this is not what S3 aims at. It aims at promoting innovative uses of science-based knowledge, i.e. the downstream end of the innovation chain. Such a pragmatic view does indeed require less sizeable investments in the research infrastructure in the region as it tries to mobilise more effectively external resources instead of developing everything 'in house'.

The force of the S3 concept lies in its leverage during the implementation of the entrepreneurial discovery, and not as a mere repackaging of old practices under a new term. The cases discussed show not only that SPA have developed a rather deep understanding of the main differences between the S3 concept and standard - still relevant - industrial policies but also that S3 has forced regional stakeholders in SPA to rethink future territorial development in their region both in terms of new objectives to be met and in terms of new means for achieving them. In their ambition for S3, for example, the place of natural resources seem to be the obvious starting point for the emergence of new domains in SPA. However, if there are strong similarities in the discursive approach to S3, there are important differences in the means mobilized to achieve these new objectives. This is a rather positive development, as it means that regions have understood that S3 is not about applying regionally generic recipes for innovation, but rather requires important evolutions of regional practices.

In addition, the S3 paradigm has the merit of having shifted the focus from current economic performances to economic development potential, underlining the need to identify emerging dynamics of change and engage those agents that can be activated in innovative and transformative activities. This represents a favourable shift for SPA, moving from the search for industrial technological specialisations to the elaboration of territorial development strategies built around local and often untapped potentials where innovation and technological dynamics can play a role in the form of product, process, managerial and organizational innovation.

The place-based approach of S3, in particular the relevance given to multilevel governance, constitutes another positive element with regard to SPA where local know-how and human resources are not always able to provide all the capabilities needed to manage such an ambitious agenda for change. Applying S3 across EU regions and MSs has put in place a trans-regional learning framework that has provided visibility to SPA and enlarged their visibility as strategic partners by promoting policy learning loops vertically, i.e. across levels from the regional to the European, and sideways, i.e. between regions. One key issue that has been preventing policy learning from taking place before has been the difference in standpoints that these actors traditional have argued for: on the one hand, European policymakers have the responsibility to design instruments, programmes and schemes that can be implemented and operationalized in all European regions; on the other hand, regional and local stakeholders have tended to argue for the 'uniqueness' of their region and calling for dedicated types of policy interventions. Hence, there has been a 'policy void' between the macro (i.e. pan-European) and micro (i.e. region-specific) argumentations that have tended to oppose the pros-and-cons of a generic, standardized (maybe less efficient, but highly operational – from EU perspective) approach to regional policy to a customized one of a case-by-case approach, (more efficient, but hard to operationalize). The introduction of territorial diversity and geographic specificity as organizing principles in R&I policies through RIS3 has provided a *middle-ground* approach that has promoted policy learning between the two levels: the diversity argument means that policy interventions need to be designed in a way that can make them more adaptable to the regional setting while still keeping some key priorities; whereas regional stakeholders are encouraged to learn from other European regions that face similar types of challenges and with which a dialogue around new forms of strategic planning could be fruitful to regenerate their own regional practices.

6.1.2 What critical issues does the implementation of S3 raise in the context of SPA?

If the S3 concept is fully applicable in SPA, special attention and a tailor-made approach is needed in order to take into account the specific characteristics of those territories e.g. challenges with critical mass and limited absorptive capacity. Consistency, patience, coordinated and systematic effort are needed in order to first create awareness and thereafter commitment to the S3 processes in the regions by means of an inclusive process where actors with different entrance points (i.e. top-down and bottom-up) can jointly contribute to build up an ambitious but realisable S3 process.

The SPA have very often been built up around natural resources and large companies focusing on exploiting natural resources are the backbones of the economic fabric of these regions. It is hard to replace the habit of relying on them in SPA, and to move to new areas, or new uses of natural resources. Therefore, in SPA it is very important not only to explore the introduction of new

technologies/knowledge, new modes of organising activities and business models, but also to support the emergence of entirely new economic domains and new actors. Here, the particular challenges of aging population in SPA can function as test beds for new technologies and new ways of organising social services. There is a need to cost-effectively manage the challenge, which is a pressure on these territories, and at the same time can be beneficial for social and service innovations - if solutions are found they could be repeated elsewhere.

The lack of internal resources (both providers of goods and services and size of market) creates challenges in developing the exporting industry, but also in connection with suppliers. Likewise due to the size and fewer local actors, there are potentially fewer actors in SPA taking the risk of introducing novelty. Furthermore, SPA's economic structure is mainly dominated by few large companies and then small firms, but medium sized companies are very few. Recent innovation research points to the important role of medium sized companies for innovation, as small ones lack resources and large ones are locked into existing chains, often global and disconnected from the local economic system. This makes it even more important for SPA than other regions to be able to apply the S3 outward looking approach for sourcing in external knowledge and introducing novelty in the local know-how.

The regional dimension of S3 creates pressure on the innovation support organisations, which may have more limited ranges, as these will be smaller and targeting more limited areas, thematically and geographically. Here it will be important for SPA actors to take on different and complementary roles to reach outside of the central university-towns. Otherwise, priorities will be defined only by the only actors that are easily accessible to regional policymakers and interested in regional strategy making, i.e. those from local science. Quite naturally, however, discovery processes that become in this sense publically driven for lack of better options will not result in very application oriented strategies.

Distances also create challenges in arranging multi stakeholder processes. On the other hand there is research indicating that the lack of critical mass and these distances are made up in SPA with higher levels of social capital that can be conducive to new cross sectorial innovation. The thinner and more porous sectoral boundaries in small regions facilitate readiness for domain emergence. Community empowerment can be the key in the development of S3 in SPA, both in formulating the regional needs and in finding solutions for the delivery of new services as many of the new challenges will not only be solved by technology, but require new social organisation. At the same time, it is of major importance that the mobilisation of stakeholders does not have too strong local focus, but remains open to integrating new external resources and knowledge. The solution is not isolation, but connection with global networks and value chains. Digital and physical connectivity are crucial for better positioning of the regional actors in global networks. Furthermore, the special circumstances could also promote innovations that can be taken to other contexts, such as services provided digitally.

Another criticality refers to the prioritisation choices and the tendency of S3 to focus on the issue of how the regional economy can become more globally competitive. In many cases, this leads down the path of identifying significant high value industry clusters and key enabling technologies where the region can gain significant competitive advantage through investment. R&I policymakers are often resistant to the notion that R&I policy should be contribute also to territorial development objectives, instead preferring the place-blind approach of investing in excellence. S3 tries to overcome the challenge by promoting investment in building capacity in few niche areas with high global growth and value potential, as these have the potential to transform the economic performance in the long term although such investment is inherently very high risky. However, this prioritisation should be mirrored by investments in building innovation capacity across a larger business base, as this has the potential to provide vital employment opportunities in SPA even if this will not necessarily be in high-value and high skill sectors.

6.1.3 How can the experiences of S3 implementation in SPA contribute to consolidating academic and policy understandings of the link between 'territory' and 'innovation processes' at the regional level?

It is too early in the S3 implementation process to draw clear-cut conclusions that can be used as new insights for theory advancement about smart specialisation. However, based on the empirical observations in SPA, there are definitely some interesting developments that should be further scrutinized in the coming years.

A first field of future research relates to the role of the region's size as a precondition for successful S3 implementation. The absence of critical mass is a concern for regional stakeholders. So far, research has not been able to reveal if such a critical mass is a necessary precondition and, if it is, how to define it empirically. However this is a recurrent issue in regional innovation (see for instance Boschma, 2005 and Torre and Rallet, 2005). This literature categorises proximity dynamics, i.e. the process that gets businesses or individuals to interact with each other, into two analytical categories: geographical proximity, based on co-localization, and relational proximity, based on social, cognitive, organizational or institutional similarities. There is now a large understanding in innovation research that geographical proximity should not be considered as a necessary precondition for the development of innovative behaviour, but rather as a 'relational accelerator', that speeds up the process. In that respect, the SPA may provide some interesting new insights on the extent to which an initial high level of social capital, cognitive likeness and institutional homogeneousness, which are considered strong in remote rural regions, may as well play such a role of 'relational accelerator' within small regions, of which SPA are the most emblematic representatives. This is especially interesting from the point of view of relatedness: smaller regions have smaller sectors in size, but the boundaries between those sectors are often thinner than in

larger regions, due to the high level of social proximity between economic actors, independently from their sectoral belonging.

A second field of future research relates to how innovation processes may improve the conditions for future territorial development by optimizing the interactions between a region's physical environmental and its human capital. The S3 implementation in SPA, with a strong focus on natural resources, may provide a common ground to bring closer different policy areas and research fields addressing territory and innovation on the basis of the ongoing experience in policy making provided by S3 across EU. The notion of territory is instrumental in bringing together features of the natural or physical environment, with features from the institutional, social and economic structures (Filippi et al., 2011). Territory covers aspects related to both geographical proximity, i.e. actors located within relatively short physical distance, and relational proximity, i.e. actors sharing a high level of cognitive alignment, social kinship and economic interactions (Boschma 2005, Filippi et al., 2011; Dematteis and Governa, 2005). It would, thus, be of specific interest to investigate the role of different forms of knowledge-bases (e.g. such as the science-based, experience-based or symbolic) in catalysing the process of consolidation of the interplay between the physical and the human.

6.2 Recommendations

Smart specialisation strategies constitute a shift in regional innovation policies and the way R&I policy interacts with the territorial dimension of innovation. In particular, they introduce an explicit future-oriented collective dimension and focus on experimentalism (McCann and Ortega-Argilés, 2013b; Foray and Goenaga, 2013). Smart specialisation strategies require regional policymakers with envisioning capacity to leverage and detect hints for potential economic performances and to move from the preparation of definitive policy programmes to the design of evolving "policy trajectories" (Rosa Pires et al., 2014).

Based on the analysis of S3 implementation in SPA described in this paper, the following recommendations can be made:

Firstly, considering the S3 process as part of the place-based approach in which careful consideration of the economic, social, and institutional contexts is taken into account, the question *"how to make the most out of the conditions in the region"* is especially valid in SPA regions, often with abundant natural resources but with limited human capital. SPA should not be seen as regions lagging behind by definition. They have in many cases significant industrial bases which have been quite profitable and have also attracted migration. The challenge is and has been a tendency of having too few different economic activities and being overly connected to natural resources, which have made these regions vulnerable to increased global competition and shifts in demand. Specific

characteristics and features of SPA need to be carefully evaluated and regional actors need not only to be heard but also invited to an inclusive S3 process.

- We encourage regions to sharpen the Entreprenerial Discovery processes that have been put in place in the design phase of RIS3 and to avoid remaining only with the previously "picked" winners. It may be that there are areas of strength that have been relevant for the regional economy in the past – and were at one point top down selected by public policy. Our recommendation is that SPA regions keep paying attention on how better organise the continuous EDP under their specific context, and regularly evaluate the portfolio of priorities. This can imply that unsuccessful priorities will be eliminated while new ones will be introduced as they are more fine-tuned with local features and potential.
- Furthermore, there may be an even greater need in SPA for continuous top down introduction of novel areas over time, but it is important to put in place mechanism to close down non-working areas in time.
- To overcome challenges related to an overreliance on natural resources, we recommend these regions to embrace a broad view of innovation and not only support incremental innovation in established industries by adding new science-based dimensions but also to aim for new niches and new organisational forms.

Secondly, SPA need to *strengthen their competitiveness with extra-regional knowledge and networking pipelines*. The lack of critical mass is almost always present in the SPA, and qualified external experts are needed. In the long run, SPA need to attract and keep talented people with an interest to work in the region. The development of tailor-made, place-specific innovation support environments with professional intermediaries, place attractiveness and connectivity are key factors in improving the competitiveness of SPA..

- Formal and informal intermediate institutions need to be actively engaged and supported through the S3 implementation phase as in many cases they are the only spaces for negotiation and dialogue among stakeholders in SPA. It is of significant importance to mobilise and integrate intermediaries into the development process. By creating linkages among private, public and education sectors and profiting from the support of the S3 policy framework across EU, intermediate institutions can also strengthen the SPA's "voice" in dealing with other regions and countries.
- It is important to identify and link emerging societal demands/needs with the mobilization of local resources to those demands/needs e.g. the enlarging global demand for resources and activities provided by natural resources in SPA (e.g. raw materials, food, energy, water, fibre, plant-based activities, etc.).

Thirdly, *human capital development* is a vital ingredient in SPA. Universities can act as vital anchor institutions in stimulating this development, which is why reinforcing their presence in SPA is a highly valid strategy for the use of regional development funds, to engage students in the region who would not otherwise consider a university education, and to motivate them by promoting investments in activities that require jobs for which qualifications are necessary (Unicreds, 2012).

- This could be achieved by the creation of "multi-university shared campus" in remote communities - as Campus Skellefteå in Sweden - based on strong partnerships between municipal and regional authorities, in cooperation with businesses and regional universities
- Better connection between research centre and companies outside university cities should be promoted. On the academic side, for example, through better incentives for academics to engage with companies as part of their research work tasks and on the business side by financing demand-led funding schemes to encourage SMEs to approach Universities as a business resource.
- Upgrading the skills of low-skilled workers may, however, be as important for growth as policies aimed at expanding higher education and should be tackled through intervention in other policy areas.

Fourthly, as SPA often have less resources and are institutionally thinner than other regions, there is a *high need to align different programmes and strategies to coordinate institutions, share costs and increase efficiency* in reviewing regional RIS3. In particular in regions with differentiated territorial patterns policymakers should demonstrate how these strategies offer SPA with sufficient opportunity to develop capability in R&I-led growth sectors and sufficient flexibility to capitalise on competitive advantage through innovation in their more traditional industries.

- It is important to introduce outcome-driven regulations and policies in the SPA. Outcome-driven policy mix measures effectiveness performance against efficiency and compliance with procedural requirements. Outcome-oriented regulation accepts that there may be more than one way (i.e. more than one process) to achieve a goal. That is a relevant point for the SPA, where in many cases it could be challenging besides nonsense to apply detailed procedures because of the non-standard nature of product and activities, their variety and the typology of economic actors.
- Many efforts have been made to support synergies between S3 and H2020 goals and funding opportunities. In addition, the promotion of better alignment between S3 and rural policy in SPA could provide regions with a clearer and more joined-up framework between the different funds available to support regional growth. Therefore, urgent effort should be

applied to better engage EAFRD[4] in the ESIF[5] planning process and the development of RIS3. Some experiences have been developed so far in Spain but a cross-EU action should be supported at different governance levels, i.e. EU, National and regional level, also with implication at the sub-regional level where Rural Development Local Action Groups are active.

[4] The European Agricultural Fund for Rural Development (EAFRD) promotes and finances sustainable rural development throughout the Union.

5 The 'European Structural and Investment Funds' or 'ESIF' are the European Union's main investment policy tool and the common framework under which five different EU Funds operate: the European Regional Development Fund (ERDF), the European Social Fund (ESF), the Cohesion Fund (CF), the European Agricultural Fund for Rural Development (EAFRD) and the European Maritime and Fisheries Fund (EMFF). Smart Specialisation is ex-ante conditionality for ERDF.

References

Barca, F. (2009). An Agenda for Reformed Cohesion Policy: A place-based approach to meeting European Union challenges and expectations. Independent Report prepared at the request of Danuta Hubner, Commissioner for Regional Policy. European Commission, Brussels.

Bathelt, H., Malmberg, A. and Maskell, P. (2004). Clusters and knowledge: Local buzz, global pipelines and the process of knowledge creation. Progress in Human Geography, 28 (1), pp. 31-56.

Beise, M. (2006). Die Lead-Markt-Strategie: Das Geheimnis weltweit erfolgreicher Innovationen, Springer-Verlag.

Böhme, K., Doucet, P., Komornicki, T., Zaucha, J. and Świątek, D. (2011). How to strengthen the territorial dimension of Europe 2020 and the EU Cohesion Policy. Report prepared at the request of the Polish Presidency of the Council of the European Union.

Boschma, R. (2005). Proximity and Innovation: A Critical Assessment. Regional Studies, 39 (1), pp. 61-74.

Boschma, R. (2013). Constructing Regional Advantage and Smart Specialisation: Comparison of Two European Policy Concepts. Papers in Evolutionary Economic Geography, 1322, Utrecht University.

Camagni R. and Capello R. (2013). Regional Innovation Patterns and the EU Regional Policy Reform: Towards Smart Innovation Policies. Paper presented at the S3 thematic workshop Economic Indicators and Monitoring and Evaluation Tools for Smart Specialisation Strategies (RIS3) 24-25 January 2013, Groningen, The Netherlands.

Charles, D., Gross, F. and Bachtler, J. (2012). Smart Specialisation and Cohesion policy – A strategy for all regions? IQ-Net Thematic papers, 30 (2).

Copus, A. K. (2001). From Core-Periphery to Polycentric Development; Concepts of Spatial and Aspatial Peripherality. European Planning Studies, 9 (4), pp. 539-552.

Damsgaard O., Dubois A., Roto J., Schmitt P. (2008). Nordic inputs to the EU Green Paper on Territorial Cohesion. Nordregio Working Paper 2008:4.

Dematteis G. and Governa F., eds. (2005). Territorialità, sviluppo locale, sostenibilità: il modello SLoT, FrancoAngeli, Milano.

Dubois, A. and Roto, J. (2012) Making the best of Europe's Sparsely Populated Areas, Nordregio Electronic Working Paper, 15.

European Commission (2008). Green Paper on Territorial Cohesion: Turning Territorial Diversity into Strength. COM(2008) 616 final. European Commission, Brussels

CSES and Oxford Research (2011). Final Evaluation of the Lead Market Initiative. Final Report; Sevenoaks.

European Commission (2012) Guide to Research and Innovation Strategies for Smart Specialisation (RIS3). Publications Office of the European Union, Luxembourg.

ESPON (2012). Geographic Specificities and Development Potentials in Europe. Final Report. Available at http://www.espon.eu/main/Menu_Projects/Menu_AppliedResearch/geospecs.html

ESPON (2010). TEDI - Territorial Diversity in Europe. Final Report.
Available at http://www.espon.eu/main/Menu_Projects/Menu_TargetedAnalyses/espontedi.html

Filippi, M., Frey, O., and Torre, A. (2011). The modalities of Territorial Embeddedness of French Cooperative Groups. In: Torre A. and Traversac J.B., eds, Territorial Governance, Local Development, Rural Areas and Agrofood Systems, Springer. Verlag, N. York, Heidelberg.

Foray, D., David, P.A., and Hall, B.H. (2011). Smart specialisation. From academic idea to political instrument, the surprising career of a concept and the difficulties involved in its implementation. MTEI-working paper, Lausanne.

Foray, D. (2015). Smart Specialisation. Opportunities and Challenges for Regional Innovation Policy. Routledge. Abingdon (UK) and New York (NY).

Foray, D., and Goenaga, X. (2013). The goals of Smart Specialisation. JCR Technical Reports. S3 Policy Brief 01/2013.

Foray, D., and Rainoldi A. (2013). Smart Specialisation programmes and Implementation. JCR Technical Reports. S3 Policy Brief 02/2013.

Gløersen, E. and Dubois, A. (2010). Handbook of Territorial Diversity, ESPON & Nordregio.

Gløersen, E., Dubois, A., Copus, A. and Schürmann, C. (2006). Northern peripheral, sparsely populated regions in the European Union and in Norway. Nordregio report, 2.

Jänicke, M. and Jacob, K. (2004). Lead markets for environmental innovations: a new role for the Nation State. Global Environmental Politics 4(1), pp. 29–46.

Kroll H. (2015). Efforts to Implement Smart Specialization in Practice—Leading Unlike Horses to the Water. European Planning Studies, 23 (10).

Landabaso, M. (2012). What public policies can and cannot do for regional development, in Cooke P., Parrilli M.D. and Curbelo J.L., eds., Edward Elgar Publishing.

Mariussen, Å., Gjertsen, A., Lindelov, B. and Lovland, J. (2014). Challenges for smart strategies in resource based regions: The case of wind energy in Nordland. Working Paper presented at the S3 thematic workshop, 17-18 June 2014, Rovaniemi, Finland.

McCann P., and Ortega-Argilés R. (2013a) Transforming European regional policy: a results-driven agenda and smart specialisation. Oxford Review of Economic Policy, 29 (2), pp. 405–431.

McCann, P., & Ortega-Argilés, R.. (2013b). Modern Regional innovation Policy. Cambridge Journal of Regions, Economy and Society, 6. pp. 187–216..

McCann P., and Ortega-Argilés R. (2015). Smart Specialisation, Regional Growth and Applications to European Union Cohesion Policy. Regional Studies, 49(8), pp. 1291-1302.

McCann P., and Rodríguez-Pose A. (2011). Why and When Development Policy Should Be Place-Based. In: OECD, Regional outlook 2011: Building resilient regions for stronger economies, OECD Publishing Paris, pp. 203-213.

Morgan, K. (2013). The Regional State in the Era of Smart Specialisation', Economiaz, 83(2).

Moyes D., Ferri P., Henderson F. and Whittam, G. (2015). The stairway to Heaven? The effective use of social capital in new venture creation for a rural business. Journal of Rural Studies, 39, pp. 11-21.

Nordland County Council (2014). Innovative Nordland. Innovation Strategy for Nordland 2014-2020.

Nooteboom, B. (2004). Inter-firm collaboration, learning and networks – An integrated approach. Routledge, London.

Nooteboom, B. 92006). Innovation, learning and cluster dynamics. In: Asheim, B., Cooke, P. and Martin, R., eds., Clusters and Regional Development: Critical reflections and explorations, Routledge, London, pp. 137-163.

Nuur, C,. and Laestadius, S. (2010). Development in peripheral regions: case studies in Sweden. European Urban and Regional Studies, 17(3).

OECD (2006). The New Rural Paradigm: Policies and Governance, OECD Publishing, Paris.

OECD (2009a), How Regions Grow: Trends and Analysis, OECD Publishing, Paris.

OECD (2009b), Regions Matter: Economic Recovery, Innovation and Sustainable Growth, OECD Publishing, Paris

OECD (2013). Innovation-driven Growth in Regions: The Role of Smart Specialisation, OECD Publishing, Paris.

OECD (2015). New Rural Policy: Linking Up For Growth. National Prosperity Through Modern Rural Policy Conference, Background Document.

Pike A., Rodriguez-Pose A. and Tomaney J. (2006). Local and Regional Development. Routledge, London

Regional Council of Lapland, (2013) Lapland´s Arctic Specialisation Programme. Available at: www.lapland.fi/en/lapinliitto/c/ document_library/get_file?folderId= 53982&name=DLFE-21455.pdf

Rosa Pires A., Pertoldi M., Edwards J. and Hegyi F. (2014). Smart Specialisation and Innovation in Rural Areas. JCR Technical Reports. S3 Policy Briefs 09/2014.

Territorial Agenda (2011). Territorial Agenda of the European Union: Towards an Inclusive, Smart and Sustainable Europe of Diverse Regions. Agreed at the Informal Ministerial Meeting of Ministers responsible for Spatial Planning and Territorial Development on 19th May 2011 Gödöllő, Hungary.

Sen, A. (1999). Development As Freedom, Oxford University Press., Oxford.

Torre, A. and Rallet, A. (2005). Proximity and localization. Regional Studies, 39 (1), pp. 47-59.

Unicreds (2012). University Partnerships for Prosperity - How Higher Education Can Help Build Regional Knowledge Based Economies in Europe. Final report. Available at:: http://www.unicreds.eu/component/docman/doc_download/unicreds-final-report-web.pdf

Uyarra, E., Edler,J., Garcia-Estevez, J., Georghiou, L. and Yeow, J. (2014). Barriers to innovation through public procurement: A supplier perspective. Technovation 34 (10), pp. 631-645.

World Bank (2009). World Development Report 2009: Reshaping Economic Geography. World Bank.

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