European Observatory for Clusters and Industrial Change

Policy Briefing –

North-Middle Sweden

This policy briefing report was carried out for the European Commission by

Authors:
Maria Lima-Toivanen (VTT)
Nina Rilla (VTT)
Andrea Zenker (Fraunhofer ISI)

DISCLAIMER

Luxembourg: Publications Office of the European Union, 2019

PDF ISBN 978-92-9202-657-8 doi: 10.2826/73752 EA-02-19-816-EN-N

Table of Contents

List of Figures

List of Tables

Selection as one of 10 regions in industrial transition

The customised advice on modern cluster policy in support of industrial modernisation provided to the 10 regions in industrial transition is funded by the Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW), as part of the European Observatory for Clusters and Industrial Change (EOCIC). The regions were selected as a result of an open call for expression of interest, published and assessed by the Commission services. The Commission launched a first call for expression of interest on 29 September 2017 and, as a result of demand from regions, a second call was launched on 14 December 2017.[1]

The following regions were selected[2]:

- Cantabria (Spain)
- Centre Val de Loire (France)
- East & North Finland
- Hauts-de-France (France)
- Lithuania
- **North-Middle Sweden**
- Piemonte (Italy)
- Saxony (Germany)
- Slovenia
- Wallonia (Belgium)

The aim of the work being provided by the EOCIC to 10 regions in industrial transition is to define a set of actions in the form of a comprehensive strategy to foster regional economic transformation, identify collaboration and funding opportunities and connect with other regions in regional and cluster partnerships.

This pilot will help test new approaches to industrial transition and provide the European Commission with evidence to strengthen post-2020 policies and programmes.

The output of the first phase of the EOCIC advisory services was an assessment report, which summarises the key challenges of industrial modernisation for the region and the potential policy directions. The second phase of the EOCIC advisory services will build on this report to develop concrete policy proposals for each industrial transition region. DG GROW and the EOCIC are working closely with the Directorate-General for Regional and Urban Policy (DG REGIO) and the OECD to provide advice services for the pilot regions.

More information on the activities carried out by the EOCIC is available at the end of this report.

[1] Details on the selection procedure are available at: https://ec.europa.eu/regional_policy/en/policy/themes/industrial-transition/

[2] 12 regions were initially selected for the overall process of the project on pilot regions in industrial transition, of which 10 then engaged with the project through to the final stages of the work carried out by the EOCIC.

1. Introduction

1.1. Aims and objectives of the exercise

The aim of the work in North-Middle Sweden is to **support regional authorities and stakeholders in designing modern cluster policies that promote broad-based innovation and support industrial modernisation in the region.** Regional policy challenges, proposed strategy and policy recommendations presented in this policy brief are based on the North-Middle Sweden assessment report and dialogue with regional stakeholders.

A first round of interviews and workshops (with different regional innovation systems actors) took place in May 2018 in Stockholm and North-Middle Sweden region, while a policy review meeting, was organised in November 2018 in Stockholm. The latter event was arranged together with 'Regions in Industrial Transition' project and AMI expert[3].

The main contributors to identifying policy challenges in North-Middle Sweden's industrial transition and cluster development have been regional authorities and industry clusters with whom ideas and solutions have been discussed and verified during the project on various occasions. Policy dialogue has continued further with the regional authorities to formulate the regional strategy and recommendations presented in this report.

This document includes the main challenges for the region through a SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis and a PEST (Political, Economic, Socio-cultural and Technological) analysis. Both are described in Chapter 2. Based on these challenges, Chapter 3 provides a customised strategy designed to address the needs and challenges identified. Chapter 4 presents two specific recommendations for policy intervention. Their respective action plans are in Chapter 5.

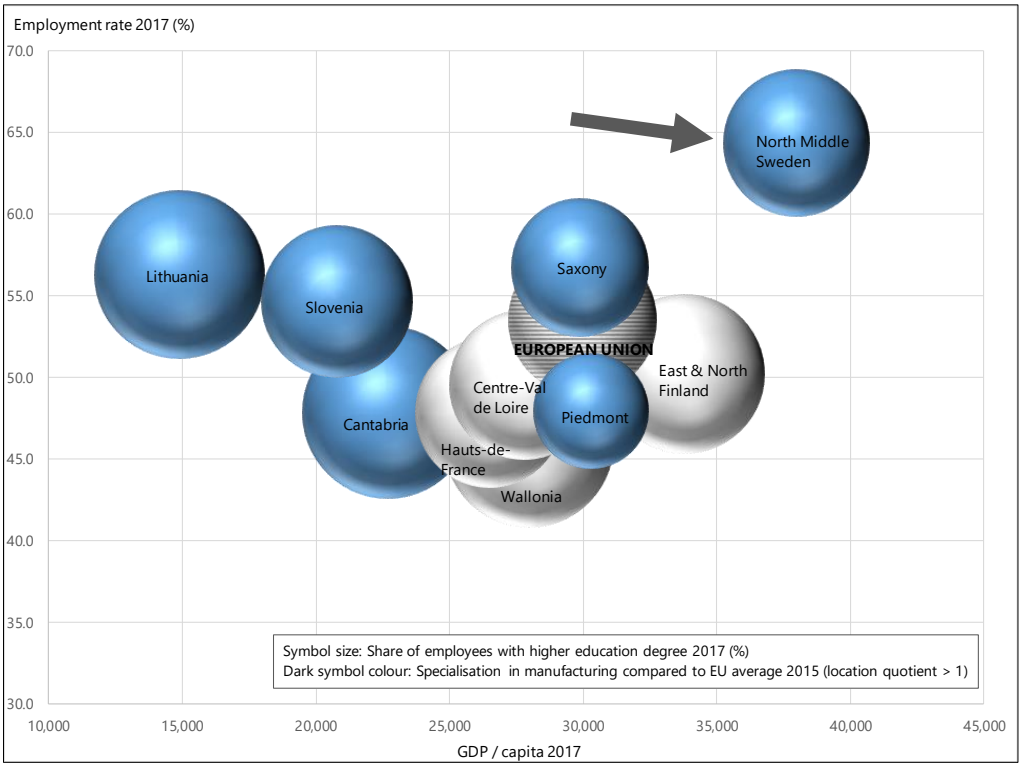
[3] External experts contracted by DG REGIO to provide support to the pilot regions in industrial transition

1.2. Key economic and innovation indicators for the pilot region

In 2017, North-Middle Sweden had a gross domestic product (GDP) of EUR 38 000 per capita, which is above the EU level of EUR 30 000, but below the national figure (EUR 47 200). North-Middle Sweden has the highest per capita GDP of the 10 pilot regions.

Figure 1 combines selected economic indicators for the 10 pilot regions (see also Annex A). It clearly shows North-Middle Sweden's good position in terms of economic strength, measured as GDP per capita. The region also ranks first in terms of its employment rate. With 33.5% of employees with a higher education degree, North-Middle Sweden ranks eighth among the pilot regions and has a below-average level of highly educated employees compared to the EU average (34.4%) and the national share (41.1%). North-Middle Sweden is specialised in manufacturing compared to the EU; the regional location quotient is 1.2789.

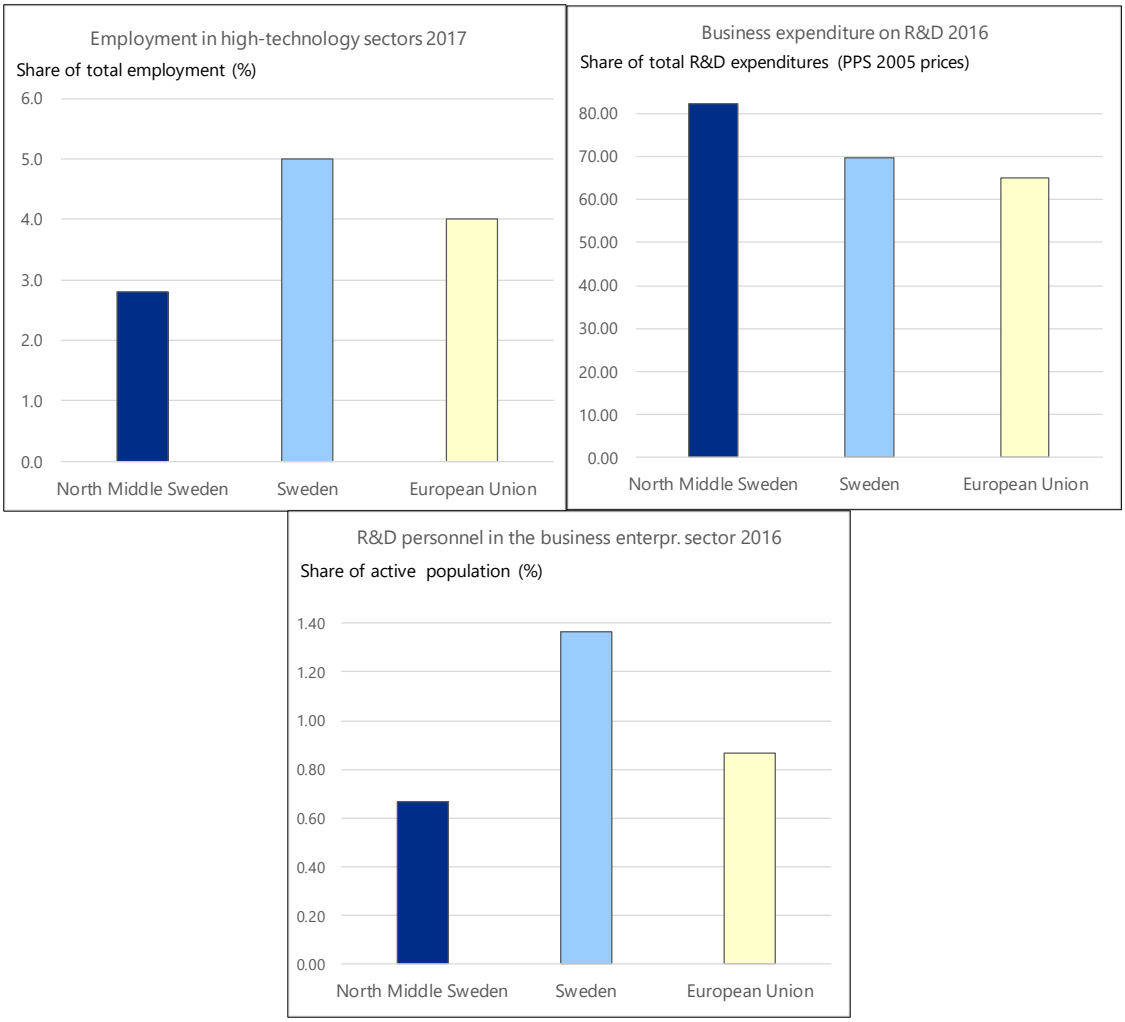
Figure 1: Selected economic data for the 10 pilot regions: GDP/capita, Employment rate, Share of employees with higher education degree and Specialisation in manufacturing



Source: EOCIC, based on Eurostat data and own calculations

North-Middle Sweden's share of employment in high-technology sectors (high-technology manufacturing and knowledge-intensive high-technology services) is below the national and EU levels. The business enterprise sector in North-Middle Sweden spends a higher percentage of the total business expenditure on research and development activities than enterprises in Sweden as a whole and the European Union. However, the region's share of R&D personnel in the business sector is below the EU figure and the national level (figure 2).

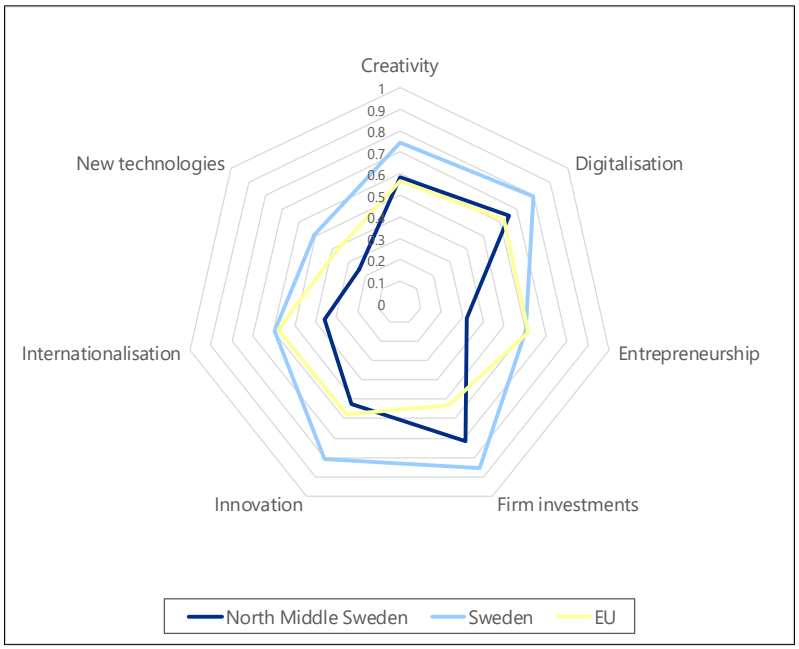
Figure 2: Selected technological indicators for North-Middle Sweden



Source: EOCIC, based on Eurostat data and own calculations

In order to provide insights into industrial modernisation, the European Observatory for Clusters and Industrial Change (EOCIC) provides composite indicators on seven dimensions: Evolution towards a more innovative regional economy; New and emerging technologies; Digitalisation; Firm investments; Internationalisation; Creativity; and Entrepreneurship. Each dimension is represented by a set of specific indicators, which are condensed to a composite indicator. Figure 3 presents the results for those seven dimensions in North-Middle Sweden. The region's highest scores are for the firm investments, digitalisation and creativity dimensions, while its lowest score is for new and emerging technologies. On the entrepreneurship, internationalisation, innovation and new technologies dimensions, North-Middle Sweden is below the national and EU levels. Even though the pilot region's scores are below those for Sweden as a whole on each dimension, North-Middle Sweden exceeds the EU level on its strongest dimensions, i.e. with respect to firm investments, digitalisation and creativity.

Figure 3: Composite indicators for Industrial Change: North-Middle Sweden

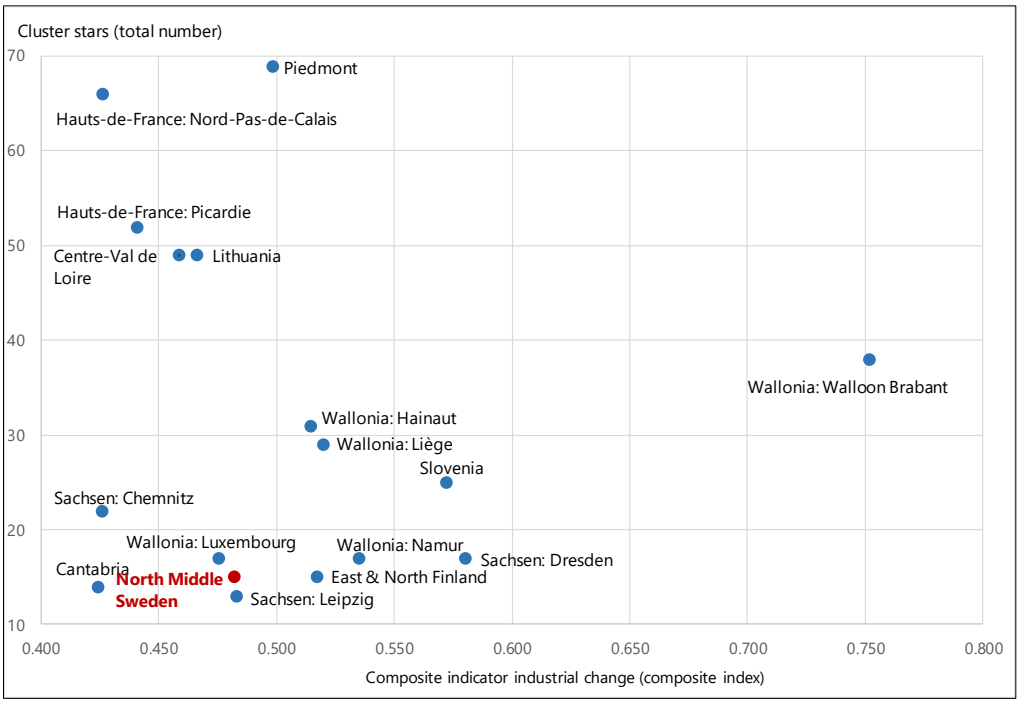


Source: EOCIC, based on various data sources and own calculations

Figure 4 shows the most recent total composite indices for industrial change and the total number of cluster stars in the pilot regions (NUTS2 level). The composite indices show industrial change in a range between 0.4 and 0.8, and the total number of cluster stars in a range between 10 and 70 in the 10 pilot regions. Five NUTS 2 regions have 45 or more cluster stars. Piemonte is the clear leader (69 stars). By contrast, various regions have 20 or fewer cluster stars – among them North-Middle Sweden (15 stars). Figure 4 also shows that the industrial change ranking is led by Walloon Brabant: on a scale of 0 to 1, this NUTS 2 region has a score of 0.751.

Mapping the pilot regions' industrial change and cluster stars reveals three different types of region: (1) high number of cluster stars, but moderate composite index of industrial change (below 0.5) (Piemonte, Nord-Pas-de-Calais, Picardie, Centre-Val de Loire, Lithuania), (2) regions with moderate figures for both indicators (below 35 cluster stars and composite indices of industrial change below 0.6) (Hainaut, Liège, Slovenia, Dresden, Namur, East & North Finland, Leipzig, Luxembourg, North-Middle Sweden, Cantabria, Chemnitz), and (3) Walloon Brabant (composite index of 0.75 and close to 40 cluster stars). In the second group, Hainaut, Liège and Slovenia stand out from the other regions due to the higher numbers of cluster stars. In part, this is also the case for Chemnitz, but it has a lower index for industrial change.

Figure 4: Composite indicator industrial change (total index) and cluster stars (total) for pilot regions

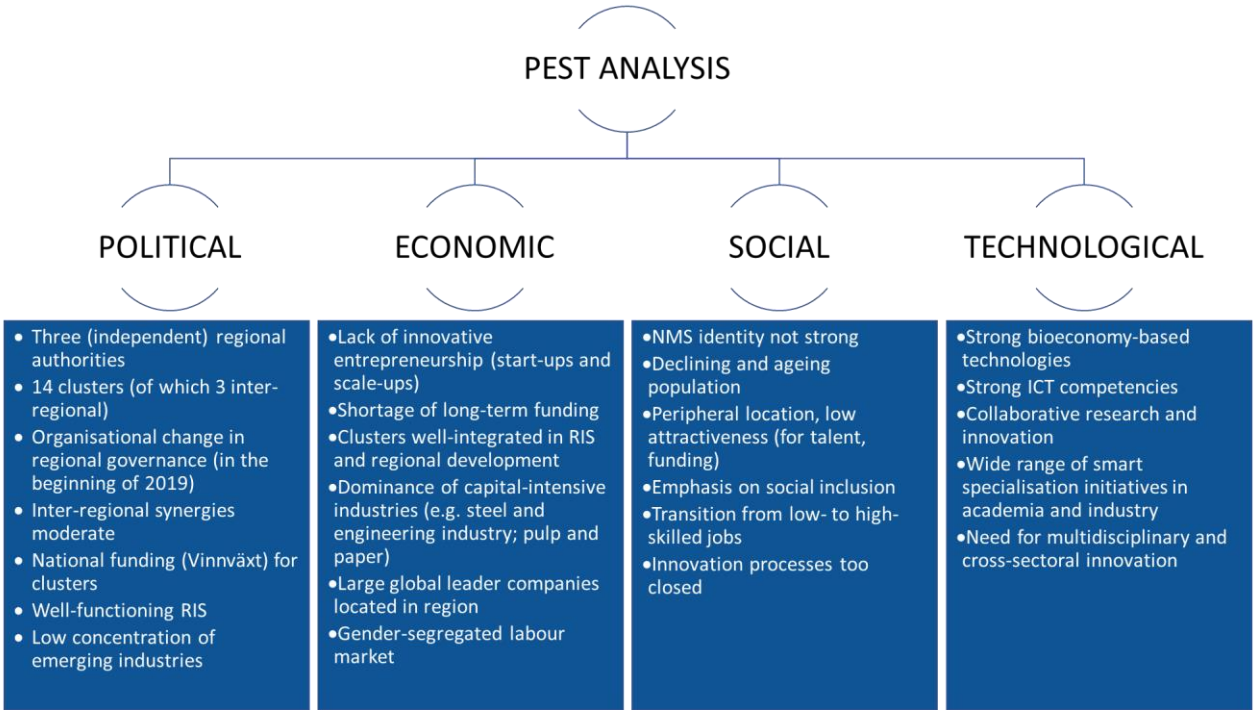


Source: EOCIC, based on various data sources and own calculations

2. Key challenges, barriers, and drivers of industrial modernisation in North-Middle Sweden

This chapter summarises the main findings from the regional assessment report, highlighting key challenges, barriers and drivers related to industrial modernisation in North-Middle Sweden with the help of political, economic, social and technological (PEST) and strengths, weaknesses, opportunities and threats (SWOT) frameworks. The political, economic, socio-cultural and technological conditions in North-Middle Sweden, as seen in Figure 5, reveal that the region suffers mostly because of its peripheral location compared to the capital region of Stockholm. This shows in the region's low attractiveness to private finance, skills and talent, and international companies, to name but a few examples. A key driver in North-Middle Sweden is, in turn, a well-functioning regional innovation system (RIS) that integrates clusters in research, development and innovation (RD&I). Development of co-creation and open innovation platforms will help to disseminate regional RD&I capabilities in national and international contexts.

Figure 5: The regional ecosystem and framework conditions of North-Middle Sweden



Source: EOCIC

Table 1 summarises the SWOT analysis related to industrial transition in North-Middle Sweden. This assessment is based on the regional AMI expert's work. North-Middle Sweden has multiple examples of current good practices, e.g. Academy of Smart Specialisation, which can be replicated in other parts of the region and elsewhere to improve technological and innovation competences. Moreover, developing

new services, for example in the area of open innovation, could bring future opportunities for North-Middle Sweden.

Table 1: Strengths, weaknesses, opportunities, and threats of industrial transition

Strengths	Opportunities
• North-Middle Sweden is strategically focused in Triple-helix collaboration (including clusters) and all the priority areas of the regional innovation smart specialisation strategies (RIS3) are linked to cluster initiatives. • Well-developed innovation support infrastructure. • The Academy for Smart Specialisation to broaden innovation capabilities (a flagship project for S3). • Positive experiences from public private partnership (PPP) in low-carbon and circular economy initiatives. • Relatively strong support for entrepreneurship among young people and students at higher education institutions (HEIs). • Strong focus on gender-equal regional growth'.	• Focused efforts to improve digital and automation skills in smaller companies. • Further development of open innovation platforms and incubators. • Adding service competence at the testbeds. • Inclusion of civil society in innovation processes. • Adapting existing regulations to leverage public procurement as a tool for innovation. • Leveraging connections with resident MNEs to extend collaboration beyond North-Middle Sweden. • Leveraging bioeconomy. • Stronger focus on talent attraction (e.g. immigrants and refugees).
Weaknesses	**Threats**
• Skills mismatch (e.g. inefficiency in vocational training) and lack of workforce. • Relatively 'closed' innovation processes in small and medium-sized enterprises (SMEs). • Cluster participants not able to capture 'value-added' from innovation and internationalisation. • Difficulties in scaling-up demo and test cases (e.g. collaborative leadership). • Weak SME access to testbeds. • Lack of residential attractiveness for talented (international) individuals. • Weak entrepreneurial perspective in education. • High youth unemployment. • Gender imbalance in certain sectors.	• Lack of experimentation with new instruments/policy approaches related to regional labour market. • The Academy for Smart Specialisation does not extend/disseminate to whole North-Middle Sweden. • Clusters lack sustainable financial models. • Lack of large company long-term commitment. • Insufficient awareness and competences to manage trade-offs (e.g. balanced implementation of targets related to circular economy and innovative entrepreneurship). • Rigidity among key stakeholders in regional innovation ecosystem prevent resilience. • Insufficient competences in workforce may result in companies leaving North-Middle Sweden.

Source: Enhanced Strategy for Economic Transformation based on Smart Specialisation - Analysis prepared for Region of North-Middle Sweden (internal report prepared by Emily Wise, Lund University)

PEST and SWOT analyses for the region, in addition to a policy review meeting with North-Middle Sweden's regional authorities and clusters, revealed four broader categories of policy challenges to be addressed in North-Middle Sweden's regional development.

1. Improve conditions for inter-regional integration and collaboration;
2. Generate innovation (including technological and entrepreneurial) capabilities;
3. Strengthen resources and structures for clusters; and
4. Generate opportunities for North-Middle Sweden's innovation ecosystem.

These challenges are addressed in designing policy recommendations and interventions for industrial transition in North-Middle Sweden in Chapter 3. For further description of how these challenges were formed in policy review meeting see Annex B.

3. Proposed regional strategy to address the challenges

Two of the three North-Middle Sweden regions, namely Värmland and Dalarna, have gone through an organisational change in regional governance since the beginning of 2019. In both regions, a new governing organisation was set up which merged the County Council and the federation of municipalities. In Värmland, two local traffic companies (Värmlandstrafik and Karlstadsbuss) were also merged with the new organisation. This recent change will affect regional governance in the near future. A new cluster strategy is in preparation in the Värmland region for 2019.

In parallel to work on regional innovation and cluster strategy, North-Middle Sweden has launched a new smart specialisation project which aims to integrate regional innovation systems into one (referred to in this policy brief by the acronym SSNMS II[4]). This work started at the beginning of 2019 and is being handled by the Dalarna Region. The main focus is to increase the extent and effect of research and innovation among SMEs in North-Middle Sweden, and to stimulate information, skills and resource flows that contribute to better realisation of innovation in the innovation system. **This coordination project is in great synergy with policy recommendations highlighted in this policy brief. Due to the overlap, some of the suggested actions are already under way and funding has been secured. This has made it possible to prioritise and focus on selected actions within this policy brief.**

Because of the background and on-going initiatives on innovation system integration, discussion in the policy review meeting mainly focused on how to improve the integration of the three regions in North-Middle Sweden and how best to take advantage of industrial transition and smart specialisation. Participants in the policy review meeting formulated the following vision for North-Middle Sweden:

"By 2030 the industrial region of North-Middle Sweden will excel as a unique innovation ecosystem in attracting global talents, business players and capital, building upon smart specialization."

Based on the discussions with stakeholders, the aim of the regional strategy is **to create an innovation ecosystem approach which relies on strong integration/collaboration of structures, functions and governance.** As the assessment report showed, North-Middle Sweden has strong clusters and RIS in which structural components are thriving and most of the functions perform well. However, with better integration of central structures and functions, North-Middle Sweden could upgrade its regional innovation activities. Therefore, we suggest adopting an innovation ecosystem approach, which emphasises, for instance, common value creation, openness, trust and co-creation.

The regional strategy encompasses four critical elements:

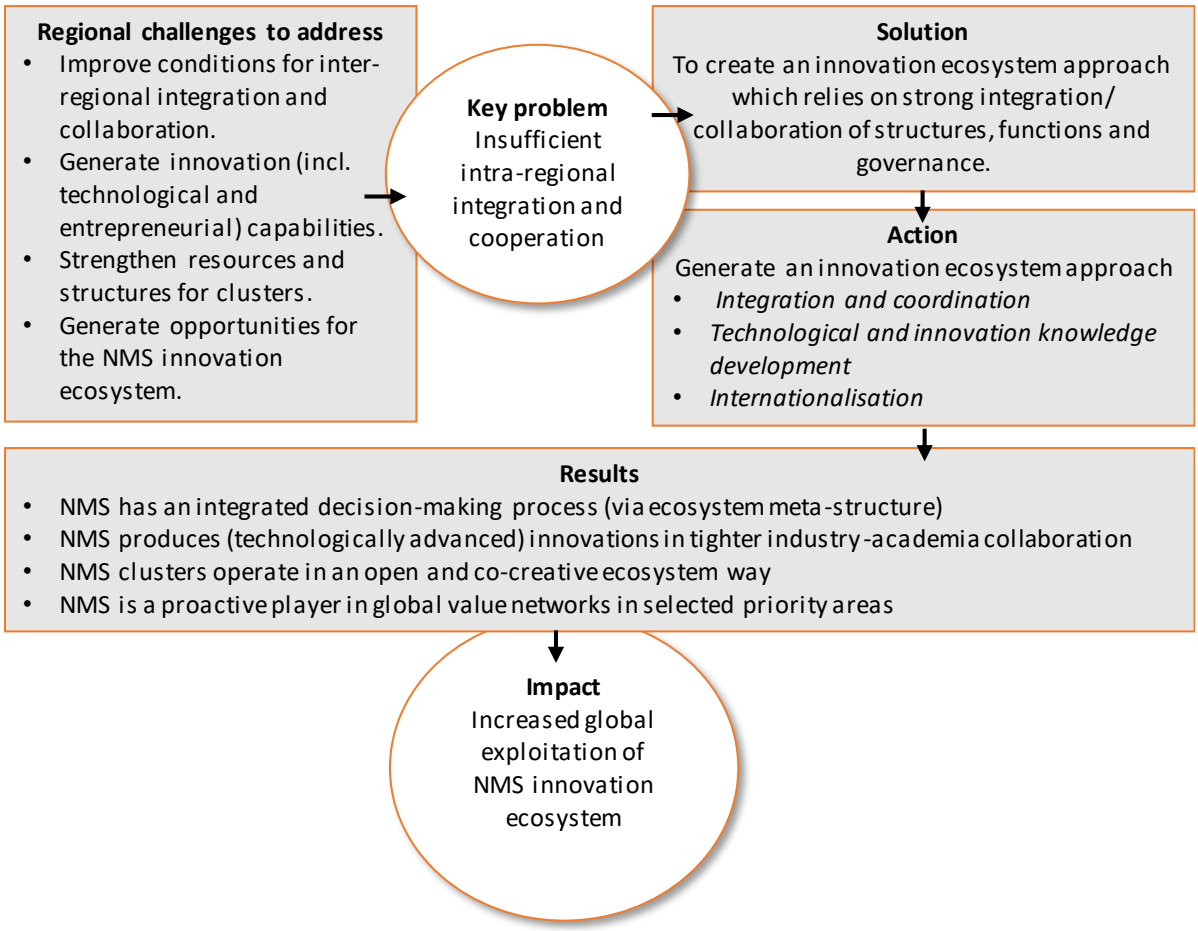
1. activities related to alignment of region- specific priorities to enhance inter-regional collaboration;
2. stronger role of technology in incumbent companies and on the part of technology operators, and better conditions for innovation-based start-ups;
3. upgraded inter-regional clusters in regional development; and

[4] Smart specialisation in North-Middle Sweden II

4. more international connections at all levels of the ecosystem, in both inward and outward internationalisation.

Figure 6 illustrates a process of how the regional challenges identified are addressed in this report to achieve short-term outcomes and long-term impact.

Figure 6: Overview of the regional industrial modernisation strategy in North-Middle Sweden



Source: EOCIC

To embed the proposed ecosystem in the different layers of integration of North-Middle Sweden, both intra- and inter-region, we have selected the three functions that are addressed in the context of this project to improve openness, co-creation and common value creation. These functions relate to:

1) Integration and coordination

For North-Middle Sweden to develop in terms of industrial modernisation, the most essential challenge to solve is generating collaboration conditions that integrate the three regions more closely. Better integration is the most vital issue to solve, given that many of the other challenges identified in the region are related to, and partly dependent on, seeing North-Middle Sweden as a coherent region with common priorities, legitimacy and identity. This challenge provides a starting point for regional strategy.

2) Technological and innovation knowledge development

An innovation ecosystem requires strong RD&I competences, but simultaneously robust experimentation activities and strong governance are necessary on the part of business (start-ups, SMEs, large companies) to cover the whole innovation process from science to commercialisation. As the

assessment report for North-Middle Sweden revealed, the region has innovation system components and functions well in place, but they lack refinement and integration. For instance, several good practices have been identified that are waiting for replication in the whole, or parts of, the region.

3) Internationalisation

By developing greater cross-border connections and partnerships, innovation ecosystems are able to connect with global value networks, in which tangible and intangible flows of resources (people, technology, knowledge etc.) are moving both inward and outward. Internationalisation is an inherent component of ecosystems (and clusters), which needs therefore to be spread to all levels, from individuals and labour to the whole innovation ecosystem and regional governance. In general, stronger international connections are seen to offer future opportunities for North-Middle Sweden.

Clusters are one of the main actors in the regional innovation ecosystem. Therefore, a broader system cannot be separated from the discussion of developing clusters. Clusters have an especially strong role in regional development in North-Middle Sweden. Thus, it was agreed in the policy review meeting that this policy brief should embrace a firm cluster perspective to help regional authorities and cluster managers exploit the industrial transition process. Recommendations and policy interventions are thus discussed from the perspectives of both the regional innovation ecosystem (regional authorities) and clusters in Chapter 4, and a set of policy recommendations and actions is therefore be formulated for these two actor groups to support short-term regional decision making in North-Middle Sweden in particular, but also with a view to the long term.

4. Specific recommendations for policy intervention

Discussions in the policy review meeting focused on how to generate and upgrade conditions for collaboration in North-Middle Sweden. To succeed, there is a need for better alignment of regional strategies and priorities in order to integrate decision-making processes and better streamline North-Middle Sweden innovation activities.

To better foster conditions for collaboration, we propose adoption of an innovation ecosystem approach which leads to a more integrated way of working in different functions of the innovation ecosystem. The ecosystem approach focuses on the interactions between the elements within the ecosystem, and emphasises the dynamics of functions such as knowledge creation, diffusion and absorption within a large community of stakeholders[5].

For an ecosystem to operate, a shared logic, or goal, is an essential element as it enables differing actors to co-exist with minimal friction regardless of their conflicting logics[6]. Mutual trust builds on norms of openness and professionalism. Technological and knowledge interdependencies between actors are another key element of innovation ecosystems. The emphasis here is on multi-disciplinary and cross-sectoral collaboration to identify special competences and capabilities to excel in synergistic and cumulative interaction between ecosystem actors. Specialisation and complementarity of actors' capabilities and competences is the substance from which the value is potentially co-created[7].

Ecosystems are not static but dynamic constellations in which value co-creation and value capture evolve in the course of the ecosystem life cycle as do actors' competences and capabilities. Therefore, ecosystem functions should change in parallel to alternating ecosystems.

For regional authorities, innovation ecosystem thinking facilitates the design of functions from a value creation perspective. In addition, they are potentially able to adopt an experimental policy-making approach for quick pilots and learning, given the dynamisms and resilience of ecosystem functions.

Clusters, in turn, should focus on strengthening the innovation ecosystem approach, such as formulating shared vision and value co-creation statements, and ecosystem services, e.g. an internationalisation strategy and open (and co-creation) innovation services. A recent evaluation of North-Middle Sweden clusters[8] reveals room for improvement, for example in developing value-added for companies, although the innovation work in clusters was valued highly. Furthermore, the role of clusters as a regional development tool needs strengthening, which means clusters could be given more autonomy to implement regional development policies and plans related to smart specialisation and facilitating open and co-creative industrial transformation in North-Middle Sweden.

---

[5] Romano, A. et al., 2014. The innovation ecosystem as booster for the innovative entrepreneurship in the smart specialisation strategy. *International Journal of Knowledge-Based Development*, Vol. 5 (3), 271-288.

[6] Thomas, L.D.W. & Autio, E., 2014. The fifth facet: The ecosystem as an organizational field. Paper presented at the DRUID Society Conference 2014, CBS, Copenhagen, June 16-18.

[7] Adner, R. & Kapoor, R., 2010. Value creation in innovation ecosystems: How the structure of technological interdependence affects firm performance in new technology generations. *Strategic Management Journal*, Vol. 31(3), 306-333.

[8] Oxford Research, 2017. Analys av kluster i Norra Mellansverige, Februari 2017. Rapport för projektet Smart Specialisering – Starka företag i Norra Mellansverige.

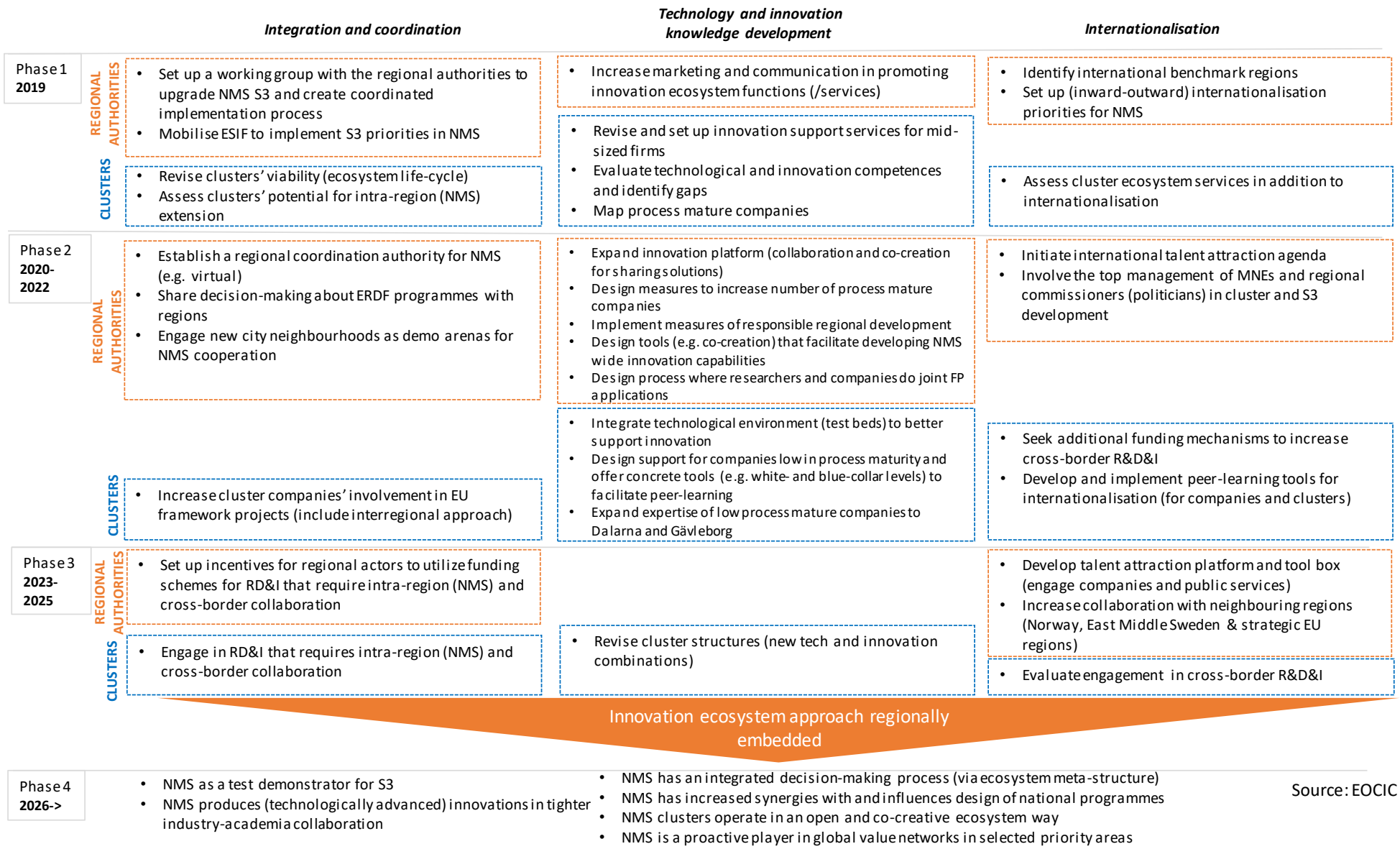
Figure 7 illustrates an action roadmap[9] for creating and embedding such an innovation ecosystem approach in the three selected strategic functions, namely ***integration and coordination***, ***technological and innovation knowledge development,*** and ***internationalisation***. These three functions, or processes, were selected as they reflect best the policy challenges identified in North-Middle Sweden. These functions will be developed in more detail in the following sections. Actions and the division of responsibilities are proposed in three phases over the next seven years to implement such a comprehensive agenda in North-Middle Sweden, with responsibility further divided between regional authorities and clusters.

The first phase, in 2019, would consist mostly of preparatory actions, such as evaluating the current situation, and identifying needs and gaps. These actions require immediate attention for the following phases to materialise. The following two phases occur at three-year intervals up to 2026, and they involve actions that are more related to implementation and launch of concrete tools and mechanisms for different innovation ecosystem functions. Evaluation and impact assessment are also emphasised in later phases in order to monitor ecosystem development and life cycle phases. It is envisioned that North-Middle Sweden will have a regionally embedded innovation ecosystem by 2026 with the region functioning as a test demonstrator for S3 and having strengthened its influence in the design of national RD&I and regional development programmes.

The main challenge in embedding the innovation ecosystem approach in North-Middle Sweden is that transformation might progress more slowly than anticipated. The reasons for this may lie in regional or national politics, internal regional governance and coordination, or draining of funding sources for regional development. No major risks are envisaged given that the suggested change does not require major system alterations but is more related to cognitive models and process changes that are seen to materialise once collaboration between the three regions (at different levels) is intensified.

[9] Actions presented in the action roadmap have been prioritised and verified with regional authorities (Värmland and Gävleborg) from 51 actions originally created for North-Middle Sweden. Verification of actions was carried out in February 2019.

Figure 7: Action plan for creating an innovation ecosystem approach in North-Middle Sweden



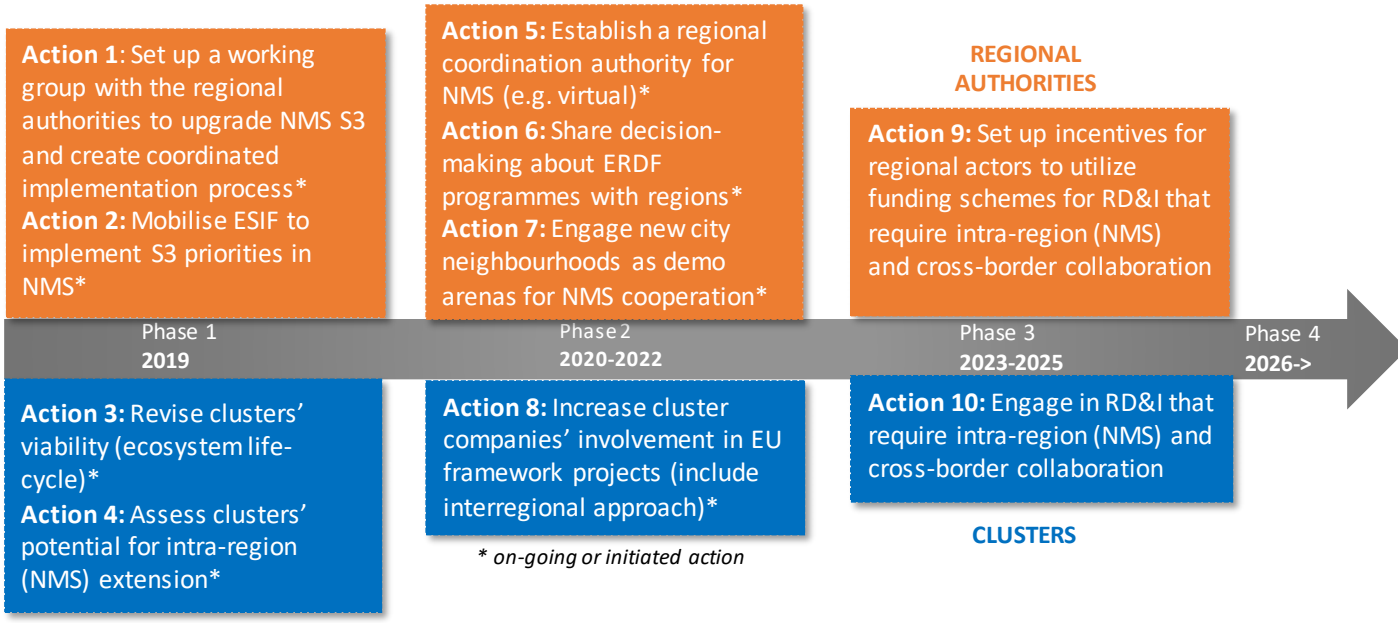
Source: EOCIC

4.1. Integration and coordination function

4.1.1. Description

One of the most important functions of any system is governance. This coordinates the activities of all actors involved. In non-platform-based ecosystems, governance relies more on leadership than ecosystem management. In the case of North-Middle Sweden's innovation system, the main component of governance is the integration and coordination across the three regions of Värmland, Dalarna and Gävleborg. Intensifying collaboration among regional authorities is a prerequisite for an innovation ecosystem approach to be implemented and accepted in North-Middle Sweden, and their role is reflected in the large number of actions designed for them compared to clusters. Because of the systemic and complex nature of implementation of an ecosystem agenda, which evidently creates a large volume of parallel actions, actions were prioritised together in consultation with the regional authorities. Only the most important actions from the whole action roadmap are presented in this policy brief. Figure 8 introduces 10 selected actions to achieve better integration and coordination in North-Middle Sweden's innovation ecosystem. Many of the actions are performed in conjunction with another, often ongoing, project, or they are initiated in another context.

Figure 8: Prioritised actions for integration and coordination function



Source: EOCIC

The first steps in 2019 for regional authorities relate to the assessment of the current situation and initiation of actions, which, according to the regional authorities, are mostly under way. One of the key actions, Action 1, is to launch a working group to steer the proposed action plan forward. The main initiators of this integration process are the three regional authorities in North-Middle Sweden and they are also a key enabler for a working group to achieve meaningful results. Although North-Middle Sweden's regions have a long-term collaboration relationship, there has not been enough coordination and strategic planning of North-Middle Sweden priorities. The working group has to some extent been initiated within the project preparations and agenda-setting for smart specialisation in North-Middle Sweden. Coordination of the process and creation of a document connecting the three S3 strategies will help prioritise actions for implementation even further. The next task in Spring 2019 is Action 2, which

deals with development of an industry strategy for North-Middle Sweden. This is closely linked to the EOCIC and industrial transition projects and should mobilise European structural and investment funds (ESIF) for its implementation.

Two main actions in 2019 for clusters relate to assessing pre-conditions for excellence and complying with their envisaged role as central innovation ecosystem actors in integrating the regions. It is positive that both the actions, namely: Action 3) revising clusters' viability (ecosystem life cycle) and Action 4) assessing clusters' potential for intra-regional extension, are to some extent already under way in the region. The former requires, for example, implementing a cluster survey (following a tested SLIM project-based methodology[10]); the latter requires external consultancy. Some clusters have performed such an assessment (including national level scanning of potential cooperation partnerships) that provides a methodological benchmark for other clusters to replicate. Paper Province cluster is one these forerunners. The two cluster-related actions could potentially feed and update clusters' strategy work. It would be beneficial to perform this simultaneously with S3 work.

In the following phase, 2020-2022, four actions, of which three are the responsibility of regional authorities, are seen as important. All these actions rely on work that has been started in different contexts. Given the recognised importance of strengthening collaboration in North-Middle Sweden, setting up a coordination authority for North-Middle Sweden is high on the region's agenda. Two on-going cooperation projects, namely SSNMS II and Smart Industry North-Middle Sweden 2, will facilitate the founding of a more formal structure for collaboration and coordination among the three regions. These projects have, for instance, a common steering group, but further work is required to establish coordination among regional development agencies (Action 5). One area to modify within the next four years is to move closer to the EU model in European Regional Development Fund (ERDF) decision-making (Action 6). This would transfer decision-making to the regions as the current Swedish model is seen as inefficient in producing regional growth[11]. For this to happen, dialogue between Sweden and the EC should be strengthened with existing resources. The new neighbourhoods to be built as demo arenas for piloting cross-region collaboration (Action 7) are another area where experimentation of integration is possible.

Cluster competitiveness and internationalisation can both be enhanced by their participation in international EU-funded projects. **To increase cluster member companies' involvement in EU framework projects by 2022 (Action 8), a support programme is needed to allow clusters to recruit, for instance, grant advisors.** This position could be a part-time and funding can be sought from the ERDF or national sources.

Actions to be taken within the following seven years have not yet been developed as concretely as earlier actions for helping to embed an innovation ecosystem approach in North-Middle Sweden. However, two important actions have been identified. One falls within the responsibility of clusters; the other is for regional authorities. Engaging clusters in RD&I that requires intra-regional and cross-border collaboration should be included in support programmes designed to increase involvement in EU projects and the costs could be incorporated (Action 9). To foster intra-regional and international collaboration in North-Middle Sweden, new incentives are needed for regional actors to utilise funding schemes. To implement this action, ERDF calls will be utilised. Regional authorities can decide on these within their operational budget (Action 10). In addition, a discussion paper is needed defining priorities

[10] Bjurulf, S. & Vedung, E., A theory-based Triangulation Approach to Impact evaluation: The MCET Method Revised, SLIM-Rapport, 19, 2013.

[11] Since 1 January 2019 a thematic organisation for regional development has been in place that allows national level policy makers to cooperate more closely with the regions.

for S3 and the entrepreneurial discovery process (EDP) to find partners and alliances to implement projects.

4.1.2. Benefits and Costs

One of the main benefits of integrating regional decision-making functions is that it allows North-Middle Sweden to streamline innovation activities by cutting out duplicate work. The actions selected naturally aim to improve the current situation in North-Middle Sweden and therefore many benefits are envisaged. The benefits are summarised below in conjunction with estimated costs. Given that many activities are ongoing, costs are allocated to different budgets. Table 2 extracts estimated monetary costs and funding sources for each of the prioritised actions. In cases where it was difficult to estimate monetary costs, the amount of work required is given.

The overall benefits for current intra-regional clusters are seen in improved collaboration in terms of identifying opportunities and extending activities to the whole North-Middle Sweden, whereas for inter-regional clusters more streamlined collaboration offers scaling up benefits in terms of larger technology and innovation resources, and a larger skills pool. It is also envisaged that actions presented in this policy brief would give more autonomy to clusters to implement regional development policies and plans related to smart specialisation. An innovation ecosystem type of operational logic would challenge and require clusters to act as regional development tools.

Table 2: Benefits and costs for key actions in integration and coordination

Actions	Key recommendation	Benefits	Cost & funding
1	Set up a working group with the regional authorities to upgrade North-Middle Sweden S3 and coordinate implementation process	- Increased information flow - Stronger North-Middle Sweden level leadership - Integrated regional plans and schemes	EUR 100,000/6 months to continue integration process in Spring 2019, i.e. create an industry strategy for North-Middle Sweden Funding (50%) is already available and needs to be allocated on a project basis (to be developed), 50% needs to be acquired from other sources
2	Mobilise ESIF to implement S3 priorities in North-Middle Sweden	- Boost to North-Middle Sweden innovation collaboration	Time devoted to writing the ERDF programme. Costs are in the budget already; no extra funding needed
3	Revise clusters' viability (ecosystem life cycle)	- A common ERDF application - Updated information on clusters' life cycle, strengths and weaknesses	Cost EUR 50,000 per region (EUR 150,000 in total) Funding foreseen from ERDF & national sources
4	Assess clusters' potential for intra-region (North-Middle Sweden) extension	New potential areas for business and cross-fertilisation	EUR 50,000 for professional research services

5	Establish a regional coordination authority for North-Middle Sweden (e.g. virtual body)	- Better coordination of North-Middle Sweden activities - Improved information flow - Stronger cohesion, regional self-esteem, visibility, legitimacy	Costs are within existing budget
6	Share decision making about ERDF programmes with regions	- Increased autonomy for regions for regional development and growth - Better inclusion of clusters in regional development process	Intensification of dialogue can be performed with current resources
7	Engage new city neighbourhoods as demo arenas for North-Middle Sweden cooperation	- Dissemination of good practices throughout North-Middle Sweden - Wide inclusion of civil society (e.g. NGOs, citizens) and companies	
8	Increase cluster companies' involvement in EU framework projects (include interregional approach)	- Improved competence in grant writing - increased involvement in EU and international networks	Cost EUR 50 000/cluster with expected rapid payback time if participation in EU projects increases
9	Set up incentives for regional actors to utilise funding schemes for RD&I that require intra-region (North-Middle Sweden) and cross-border collaboration	- Increased involvement in European-wide collaboration via calls within component 5 in the next programming period - Being more active in S3 platforms, also in relation to the Vanguard Initiative (q.v.)	Costs relate to producing a revised discussion paper, e.g. travel costs for meeting the relevant regional actors, to point out the funding opportunities and mechanisms
10	Engage in RD&I that requires intra-region (North-Middle Sweden) and cross-border collaboration	- Wider innovation collaboration networks, within North-Middle Sweden and internationally	Costs can be included in Action 8, as actions relate to clusters' participation in EC Framework Programme projects

4.1.3. Risks, obstacles and challenges

The need for integration and coordination of North-Middle Sweden's innovation related activities have been acknowledged by the region and actions to improve the situation are being launched independently of this project. Given such a high priority in the region, the policy interventions suggested are complementary to on-going work that improves the chances of achieving the objectives of embedding an innovation ecosystem approach. A potential challenge is the fact that integration might not proceed at the envisaged pace due to regional differences and governance models. Additional emphasis should be placed on assessing the impacts of actions beyond mere monitoring of actions which all have easily observable outputs. The process for achieving tighter integration in North-Middle Sweden has, however already been set in motion, and this will facilitate the progress of other functions too.

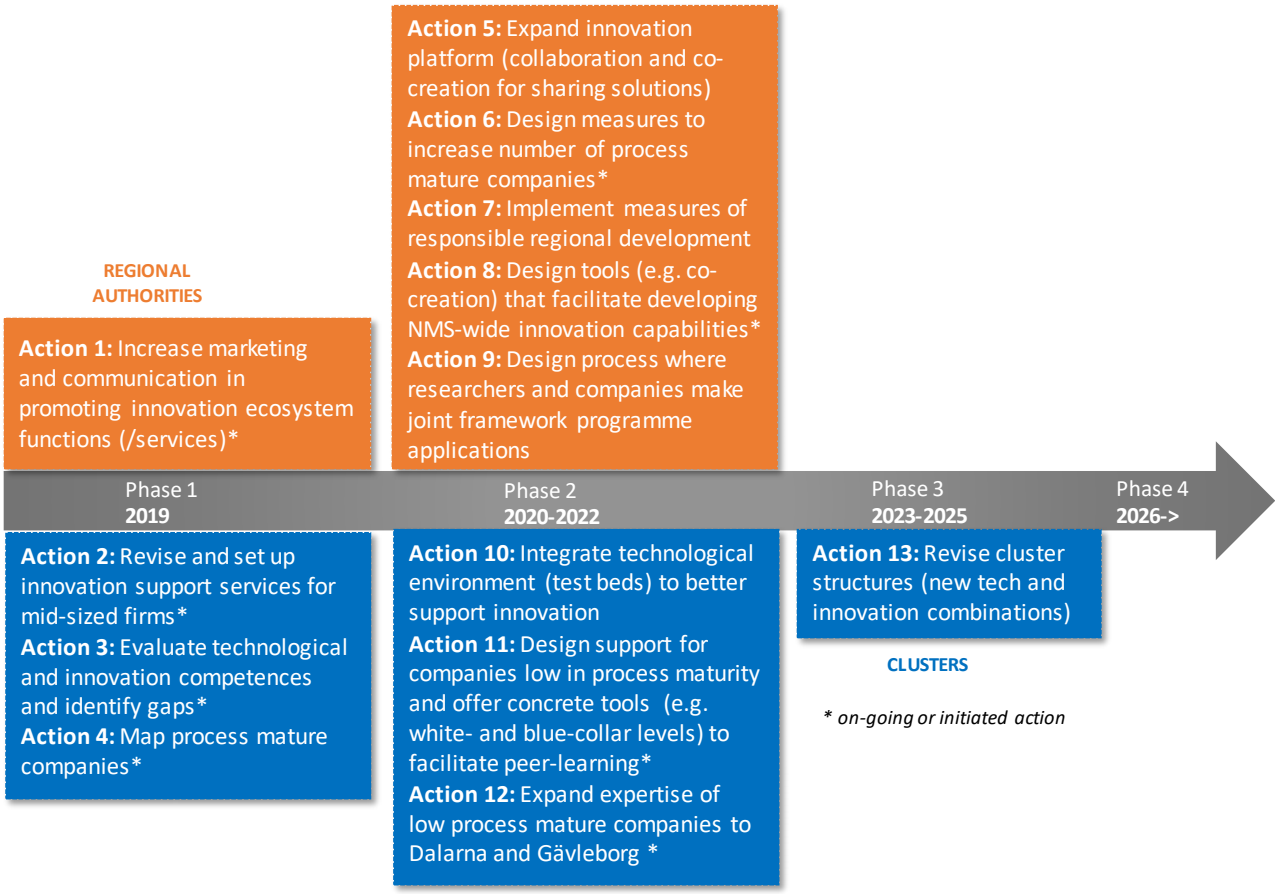
4.2. Technological and innovation knowledge development function

4.2.1. Description

Technological and innovation knowledge development functions are a central process of an innovation ecosystem, providing an innovation knowledge base. They also incorporate business/entrepreneurial experimentation processes on how to face uncertainty. In addition, an ecosystem without a vibrant experimentation space and openness will eventually stagnate. For this reason, four of the challenges identified in North-Middle Sweden, i.e. strengthening the role of technology operators in the innovation ecosystem, creating growth through innovation-based start-ups, improving innovation capabilities in existing companies, and finally integrating clusters into an innovation platform mode of operation are incorporated under the technological and innovation knowledge development function.

In total 13 actions (Figure 9) have been identified to improve technological and innovation knowledge development in the envisaged North-Middle Sweden innovation ecosystem. Most of the actions lie within the responsibility of clusters and are scheduled to be implemented within the next five years. Furthermore, several of the prioritised actions relate to existing practices which require expansion to other regions, thus benefiting from local benchmarks.

Figure 9: Prioritised actions for technological and innovation development function



Source: EOCIC

In 2019, the responsibility of regional authorities is to take action to increase marketing and communication promoting the regional innovation ecosystem (Action 1). This promotion has started but should involve also clusters' S3 work and the Vinnväxt programme, which offers funding for clusters. Furthermore, different arenas for reaching companies (national, EU, international) should be included.

In the first phase, the actions mainly require clusters to evaluate and assess their current services and competences in technology and knowledge development. For revising and setting up innovation support services for mid-sized firms (Action 2) and evaluating technological and innovation competences (Action 3), the Värmland based cluster IUC (Steel & Engineering) offers such support which could be extended to other clusters as a good practice. This concept is called an *industrial dynamics tool* in which SMEs' needs are mapped and connected to researchers mostly identified within the network of Research Institutes of Sweden (RISE) and local universities for solutions. This tool follows a TBN[12]-analysis. This is a standardised tool for detecting development needs in companies and is designed primarily for evaluation of existing/mature companies for industrial transition. Another good aspect is that this analysis takes less than a day to complete and, since it provides standardised information, results can be registered in a database. The IUC network has a national database that provides knowledge at different levels, e.g. individual company, regional or national feedback. National feedback offers information on the needs of Swedish SME industry as a whole. To detect process maturity in

[12] From Swedish Tillväxt i Befintligt Näringsliv, which can be translated as Growth in Mature Companies.

companies (Action 4) with the *industrial dynamics tool*, a new component is currently under development.

Many of the next phase actions (from 2020-2022) also relate to improving cluster competences. This also needs to be carried out in close collaboration with regional authorities. For example, taking a better advantage of test beds (Action 10) should be implemented as part of projects to develop S3 and services to clusters (Actions 5, 6, 8, 9). This implementation also applies to profiling the regions and marketing actions in previous phase. Several parallel processes are envisaged, such as cluster development, profiling university-related services, and services provided by RISE. In Värmland there are test beds that are being used as arenas for cooperation between researchers and companies. Both their operational model and their reach should be duplicated (Action 10). Replication of test beds might potentially be hindered by different rules and regulations for acquisition of equipment in different regions, given that technologies, machines and different types of equipment are expensive but crucial elements of tests beds. The ERDF or other funding sources have been used for acquisition of equipment so far.

In following up actions related to integration and coordination functions, attention should be paid to measures implementing responsible regional development (Action 7), based on the concept of responsible research and innovation. This means the adoption of "*a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products*" (von Schomberg, 2013:63[13]).

Designing and offering support for transformation of companies' processes (Action 11) is another action that demands strong collaboration between clusters and regional authorities. Certain training practices to support process mature companies already exist, e.g. a Knowledge Transfer Programme, in which students develop projects for companies, and trainee programmes, staff training, lead engineer for the company and industrial doctorate programmes. In addition, research projects within the Academy for Smart Specialisation could be helpful here. Nevertheless, adoption of different practices depends on the companies' absorption capacity.

It is the responsibility of regional authorities to design new co-creation tools (Action 8), which could be of the open innovation platform type, or even internet-based. Some good practices have been identified, such as Experio Lab[14]. This is developing citizen-centric healthcare services. A network (coordinated by Värmland) of regions' Experio labs is a good example of a competence group that could be a useful peer learning tool for all regions.

Offering support for companies low in process maturity is one of the core development objectives in North-Middle Sweden to improve the region's technological and innovation competences. Given that good practices exist locally, regional authorities and clusters can easily develop an offer for companies assuming that funding is provided. Gävleborg will, for example, replicate such good practices within its smart region project that is improving the possibility for mutual learning and expansion (Action 12). Since many things happen at the same time, smart coordination and identification of adequate tools is required for smooth running of operations.

The only action prioritised for period of 2023-2025 (Action 13) is the revision of cluster structures (new technological and innovation combinations). This should be carried out at the end of the period (i.e. starting 2025) to be give input to next programming period to start in 2027. This evaluation is the

[13] Von Schomberg, R. (2013). A Vision of Responsible Research and Innovation. In R. Owen, J. Bessant, and M. Heintz (Eds.), *Responsible Innovation*. London: John Wiley, 51–74.
[14] https://experiolab.se/#null (accessed 16.2.2109)

common responsibility of clusters and region. Often such a revision, e.g. a survey of the performance of existing clusters, is introduced by the region.

4.2.2. Benefits and Costs

As indicated **North-Middle Sweden's regions have a variety of good practices which are awaiting replication to other regions,** so that there is no great need for resources to design new actions from the beginning. Because there is this positive starting point for embedding the innovation ecosystem approach in the region, cost estimates are also easier to make. Estimated costs required by each action are presented in **Error! Reference source not found.** in addition to a summary of the envisaged benefits.

Clusters, and, in particular, their member companies, are the main beneficiaries of the function developing technology and innovation knowledge as new services for refining their innovation activities are offered. Following an innovation ecosystem construct, openness and co-creation are at the core of many proposed actions. It is envisaged that these processes will foster knowledge, technology and innovation transfer to lead to novel knowledge combinations and technological complementarities.

Table 3: Benefits and costs of key actions in technology and innovation knowledge development

Actions	Key recommendation	Benefits	Costs & funding
1	Increase marketing and communication in promoting innovation ecosystem functions (/services)	-Improved knowledge of innovation ecosystem services lead to legitimacy	Budget cost estimates EUR 400 000-500 000 per year/region
2	Revise and set up innovation support services for mid-sized firms	- Improved assistance for companies	EUR 100 000 per year/cluster for full time personnel and additional services Funding could be sought from ERDF programmes
3	Evaluate technological and innovation competences and identify gaps	- Informed knowledge of technological/ innovation competences residing in clusters	Costs can be included in action 2. Implementation of other mechanisms for industry-university cooperation may accumulate extra costs
4	Map process mature companies	- Awareness of the state of sectoral competitiveness and opportunities for improvement	Costs can be included in action 2
5	Expand innovation platform (collaboration and co-creation for sharing solutions) – e.g. Gävleborg	- Improved innovation processes and societal acceptability and legitimacy	A coordinator and the actual cost of a specialisation platform is about EUR 400 000 per year/region.
6	Design measures to increase number of process mature companies	- Intensified knowledge transfer - Enhanced professional training	EUR 200 000-1 000 000 per year/region

7	Implement measures of responsible regional development (next ESF programming period starting in 2020)	- Inclusive and transparent regional development programmes (open to citizens and other stakeholders)	Resources in house (analysts) Need to buy some software or consultancy services Costs EUR 50 000-100 000 per year/ region
8	Design tools (e.g. co-creation) that facilitate development of North-Middle Sweden-wide innovation capabilities	- Intensified peer-to-peer learning	Costs EUR 50 000 per year/ region for professional support
9	Design process where researchers and companies make joint Framework Programme applications	- Enhanced industry-academia collaboration - Joint development of advanced solutions at low cost - Enhanced internationalisation	No need for individual budget Costs could be integrated in the budget of grant writers, i.e. EUR 50 000/cluster, as action is strongly related to cluster capacity building
10	Integrate technological environment (test beds) to better support innovation	- Informed knowledge of potential links and use of North-Middle Sweden test beds - Development potential for internationalisation through test beds	Cost estimate for the profiling of technological environment is EUR 50 000 for North-Middle Sweden to be distributed within different projects Equipment costs for test beds are high, e.g. 3D printer cost EUR 500 000 and in test bed on barriers for packaging machine costs are up to EUR 1 000 000
11	Design support for companies low in process maturity and offering concrete tools (e.g. to white- and blue-collar levels) to facilitate peer learning	- Good practices disseminated in North-Middle Sweden	No need for a major effort to transfer methodology among the regions, but some effort has to be made for dissemination Costs EUR 100 000 for North-Middle Sweden for coordination and training among clusters Tools could be financed by different projects
12	Expand expertise of low process mature companies to Dalarna and Gävleborg	See action 11	See action 11
13	Revise cluster structures (new technological and innovation combinations)	- Identification of novel multidisciplinary combinations of innovation	Cost estimate for a consulting service is EUR 50 000

4.2.3. Risks, obstacles and challenges

Given that many activities are already ongoing, designing from scratch is avoided and the potential replication process becomes easier. While lessons can be learned, and potential barriers are known, major challenges can be prevented.

The main challenge foreseen to implement the actions in this function relate to potentially insufficient communication among the actors involved. As the actions are supposed to run in tandem with a process of tightening cooperation among the regions, transparency in the communication process with many feedback loops and joint visioning of desirable future/s should be a mutual and everyday exercise.

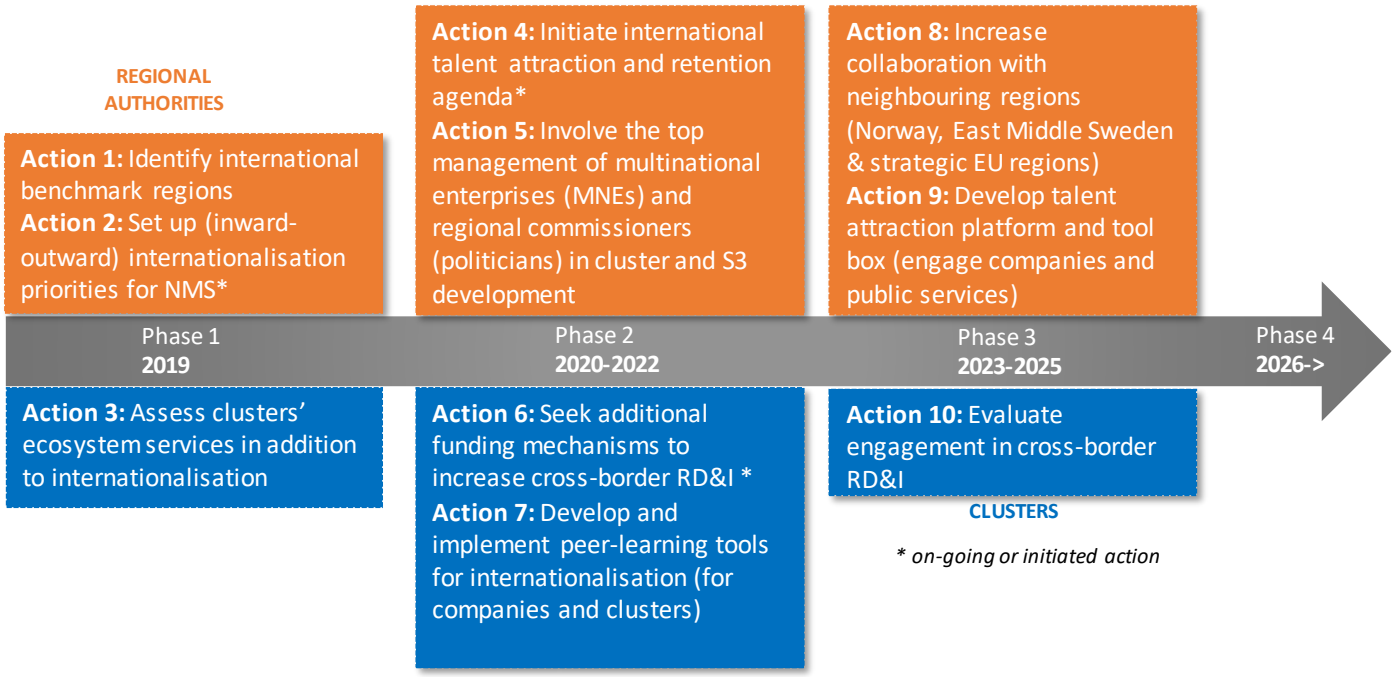
4.3. Internationalisation function

4.3.1. Description

The selected function of internationalisation, in its many forms, is an inherent component of an innovation ecosystem by extending markets for RD&I competences and perspectives for market formation, and resource mobilisation, as well as helping to achieve legitimisation and recognition. Due to its crosscutting and horizontal nature, internationalisation was one of the main topics discussed in the policy review meeting and is hence prioritised in this policy brief. The internationalisation function involves the following regional challenges: widening the clusters' funding base and stimulating cluster policy with new concepts and ideas. Overall, increased internationalisation in the functioning of the innovation ecosystem will translate into better competitiveness and growth of companies.

In total 10 actions are prioritised to improve internationalisation in embedding an innovation ecosystem approach in North-Middle Sweden (Figure 10). These actions are fairly equally distributed in the seven-year action roadmap, and between clusters and regional authorities.

Figure 10: Prioritised actions for internationalisation function



Source: EOCIC

In order to get the internationalisation agenda running in North-Middle Sweden's innovation ecosystem, regional authorities need first to identify international benchmark regions (Action 1) and also set up a comprehensive internationalisation strategy for the region (Action 2). Steps towards completion of the former will be initiated in SSNMS II project. Moreover, the industrial transition project has established a light benchmark, but firmer sector-specific analysis is needed. To provide a focus in regional internationalisation, the governance system requires equal attention that can be facilitated by peer learning among EU regions.

Identifying an internationalisation strategy for North-Middle Sweden should help decision-making and priority setting. This strategy work, which highlights both inward and outward flows, could be incorporated in the Vanguard Pilot Initiative and European Strategy Forum on Research Infrastructures (ESFRI) platforms, and supported by the regional (North-Middle Sweden) EU office in Brussels. The regional office can coordinate and facilitate the participation of different regional offices in the pilots. However, a division of labour between the Värmland and Central Sweden Office (Dalarna and Gävleborg) is needed. These two regions could work on harsh environments (Vanguard Initiative Project), for instance. However, for the Brussels office to actively support the internationalisation strategy for North-Middle Sweden (e.g. secure funding), it must be given a clear mandate on the work to be carried out.

Action 3, assessing clusters' ecosystem services, which is prioritised for 2019, relates strongly to development of the internationalisation strategy. One potential option for arranging the services is to create a 'meta cluster' applicable to a broader geography when considering "spreading" the clusters (e.g. IUC, Triple Steelix or Paper Province). This idea is still in an early phase and requires further concept development, and lessons from other regions of Europe.

For the next phase, 2020-2022, regional authorities would need to initiate an international talent attraction and retention agenda (Action 4) to better incorporate inward internationalisation. Here Copenhagen can be used as benchmark, as it has developed various good practices[15] that can be replicated in North-Middle Sweden. As a local example, the Triple Steelix cluster has been working actively on talent attraction, e.g. it organises a summer school for international students to teach them about industry and ecosystems. In addition, engaging regional multinational companies and regional commissioners (politicians) better in cluster work and S3 strategies is seen as important in fostering internationalisation in North-Middle Sweden. It is worth noting that a lack of experts is a common problem for many of the regions and countries more at the periphery of Europe. For example, Finland is facing similar problems and is working on internationalisation of its higher education and research systems. Talent attraction and retention is one of the strategy's priorities. This shows that these European regions may face competition even among themselves to attract and retain experts in the near future.

To enhance cluster internationalisation two actions are prioritised for 2020-2022, namely searching for additional funding mechanisms for cross-border RD&I (Action 6) and developing and implementing peer-learning tools for internationalisation (Action 7). Building cross-border RD&I projects is challenging because of the current funding mechanisms' applicability rules. For instance, national level policy makers are sceptical about the Interreg programme. Also, the collaboration with Norway is a bit challenging because the budget from Norwegian side is smaller than Sweden's and a support program should consider both countries as a full collaborative entity. There is a clear need to establish a dialogue with national level organisations to show the relevance of cross-border partnerships. The imbalance also applies to foreign investments in test beds. Peer-learning tools for internationalisation could be added in an upcoming North-Middle Sweden project.

In the last phase of the action roadmap 2023-2025, regional authorities should intensify collaboration with neighbouring regions further (and also those overseas) (Action 8). This action could be included in the same upcoming project together with other actions. The next programming period (component 5) approaches EU level collaboration more broadly and potentially offers the means to address international collaboration more thoroughly. A second action for regional authorities is the proposed development of a talent attraction platform and tool box (Action 9), to implement work initiated in the previous phase. Such talent attraction tools should be designed in close collaboration with business

[15] See a benchmark study of immigrants in innovation economy, http://urn.fi/URN:ISBN:978-952-287-503-7

organisations, municipalities, and research and higher education institutes is essential; therefore, strong involvement of the clusters is required. Tools should be designed for both technical experts and entrepreneurs. A local benchmark can be found in the tourism sector in Dalarna. When looking for international benchmarks, Finland's Talent Boost programme[16] led by the Ministry of Economy and Employment can be an example.

Given that it is suggested that many new actions be implemented in North-Middle Sweden and its clusters, it is essential that evaluation of these projects be performed to pinpoint successes and barriers (Action 10). Evaluating cross-border RD&I should include, e.g. RISE's cross-border activities, participation in EU framework projects, joint R&D by companies, and use of test beds, just to name a few.

4.3.2. Benefits and Costs

The benefits of internationalisation to clusters are seen to materialise in a polished innovation ecosystem service portfolio for companies, such as formulating shared vision and value statements, an internationalisation strategy, evaluation and impact assessment, regional branding and communication, and open (& co-creation) innovation services. By including actions related to internationalisation in embedding the innovation ecosystem in North-Middle Sweden, regional authorities are better informed on the current level of internationalisation in companies, clusters, academia etc., and are able to design better policies to improve internationalisation in the region. See below for benefits and costs of key actions related to internationalisation.

Costs related to internationalisation were slightly more challenging to estimate as fewer actions are ongoing or have been initiated compared to the two previous functions.

Table 4: Benefits and costs of key actions of internationalisation function

Action	Key recommendation	Benefit	Costs & funding
1	Identify international benchmark regions	- Integrated in S3 areas - Improved intelligence for regional decision-making	Cost is EUR 200 000 for 6 regions in a 3-year project Foreseen funding source is EU Interreg programme
2	Set up (inward-outward) internationalisation priorities for North-Middle Sweden	- Realisation of North-Middle Sweden-wide internationalisation strategy	Costs about EUR 10 000 per specialisation area in North-Middle Sweden
3	Assess clusters' ecosystem services in addition to internationalisation (e.g. evaluation and impact assessment, regional branding, communication, co-creation)	- Improved innovation ecosystem service portfolio	Costs can be linked to Action 2 (internationalisation strategy)
4	Initiate international talent attraction agenda	- International talent function integrated in internationalisation of region	Cost of implementing an international trainee programme

[16] https://tem.fi/en/talent-boost-en (accessed 06.03.2019)

		- Secure sufficiency of labour in North-Middle Sweden	
5	Involve the top management of MNEs and regional commissioners (politicians) to cluster and S3 development	- Better use of regional internationalisation competences - Intensified policy dialogue	No additional costs foreseen
6	Search for additional funding mechanisms to increase cross-border RD&I	- Better synergies with different funding instruments	Costs relate to human resources for screening possibilities
7	Develop and implement peer-learning tools for internationalisation (for companies and clusters)	- Improved learning and knowledge exchange in cluster network	Estimated cost EUR 10 000 over 3-year period IDEA funding for e.g. workshops
8	Increase collaboration with neighbouring regions (Norway, East Middle Sweden & strategic EU regions)	- Stronger involvement in global value chains	Included in action 6
9	Develop a talent attraction platform and tool box (engage companies and public services)	- Better integration of international talent in business life	Cost estimation has to be done pending definition of features and what already is available in the region.
10	Evaluate engagement in cross-border RD&I	- Detailed information of status of cross-border activities in North-Middle Sweden	Estimated cost is EUR 50 000 for North-Middle Sweden

4.3.3. Risks, obstacles and challenges

The internationalisation function has fewer prioritised actions than the other two functions. This might result in less attention being devoted to it, compared to, for example, integration and coordination related actions due to the latter's importance to regional coherence. This is not, however, seen as a likely scenario because these actions are prioritised by regional authorities, and, as is the case of other ecosystem functions, implementation of some of the actions has started already. To secure funding to carry out several activities simultaneously can be a challenge and sufficiency of personnel might be an obstacle. In general, for any action to be implemented, strong ownership and leadership are needed.

5. Roadmap and action plan with activities, timeframe and actors

Given that the previous section of this policy brief presents selected actions in detail, the owner responsible for the actions, as well as foreseen benefits and costs, only a summary action plan is provided in this section. The section summarises all prioritised actions suggested for the three essential functions, namely integration and coordination; technology and innovation knowledge development; and internationalisation of an innovation ecosystem. Altogether 11 actions require immediate attention in 2019; 16 are suggested for action within the next four years, and the remaining 6 actions, demand attention in the period 2023-2025. In this assessment, ownership of the action is divided between clusters and regional authorities.

Table 5: Action plan

	Action	Timing	Owner
Integration and coordination	Set up a working group with the regional authorities to upgrade North-Middle Sweden S3 and create coordinated implementation process.	2019	Regional authorities
	Mobilise ESIF to implement S3 priorities in North-Middle Sweden.		
	Review cluster viability (ecosystem life cycle).	2019	Clusters
	Assess clusters' potential for intra-region (North-Middle Sweden) extension.		
	Establish a regional coordination authority for North-Middle Sweden (e.g. virtual).	2020-2022	Regional authorities
	Share decision-making about ERDF programmes with regions.		
	Engage new city neighbourhoods as demo arenas for North-Middle Sweden cooperation.		
	Increase cluster companies' involvement in EU framework projects (include interregional approach).	2020-2022	Clusters
	Set up incentives for regional actors to utilise funding schemes for RD&I that require intra-region (North-Middle Sweden) and cross-border collaboration.	2023-2025	Regional authorities
	Engage in RD&I that require intra-region (North-Middle Sweden) and cross-border collaboration.	2023-2025	Clusters
Techno logical and	Increase marketing and communication in promoting innovation ecosystem functions (/services).	2019	Regional authorities

	Revise and set up innovation support services for mid-sized firms.	2019	Clusters (with support of regional authorities)
	Evaluate technological and innovation competences and identify gaps.	2019	Clusters
	Map process mature companies.		Clusters
	Integrate technological environment (test beds) to better support innovation.	2020-2022	Clusters & Regional authorities
	Design measures to increase number of process mature companies.	2020-2022	Regional authorities & clusters
	Implement measures of responsible regional development (next ESF programming period starting in 2020).	2020-2022	Regional authorities
	Design tools (e.g. co-creation) that facilitate developing North-Middle Sweden wide innovation capabilities.		
	Design process where researchers and companies make joint EU framework programme applications.		
	Expand innovation platform (collaboration and co-creation for sharing solutions) - e.g. Gävleborg.		
	Design support for companies low in process maturity and offer concrete tools (e.g. white- and blue-collar levels) to facilitate peer learning.	2020-2022	Clusters
	Expand expertise of low process mature companies to Dalarna and Gävleborg.		
	Revise cluster structures (new tech and innovation combinations).	2023-2025	Clusters
Internationalisation	Identify international benchmark regions.	2019	Regional authorities
	Set up (inward-outward) internationalisation priorities for North-Middle Sweden.		
	Assess cluster ecosystem services in addition to internationalisation (e.g. evaluation and impact assessment, regional branding, communication, co-creation).	2019	Clusters
	Initiate international talent attraction agenda.	2020-2022	Regional authorities
	Involve the top management of MNEs and regional commissioners (politicians) in cluster and S3 development.		
	Search for additional funding mechanisms to increase cross-border RD&I.	2020-2022	Clusters

	Develop and implement peer-learning tools for internationalisation (for companies and clusters).		
	Increase collaboration with neighbouring regions (Norway, East Middle Sweden & strategic EU regions).	2023-2025	Regional authorities
	Develop talent attraction platform and tool box (engage companies and public services).	2023-2025	Regional authorities and clusters
	Evaluate engagement in cross-border RD&I.	2023-2025	Clusters

From Figure 7, it can be seen that North-Middle Sweden envisions having an Innovation ecosystem approach regionally embedded within all its activities by 2025 and, from 2026 onwards to work to become a test demonstrator for S3 (globally) and to increase synergies with and influence the design of national programmes. Although actions to reach these two last goals are not explicitly addressed in this document, they are deemed to be intertwined in the vision established together with local stakeholders.

European Observatory for Clusters and Industrial Change

The European Observatory for Clusters and Industrial Change (#EOCIC) is an initiative of the European Commission's Internal Market, Industry, Entrepreneurship and SMEs Directorate-General. The Observatory provides a single access point for statistical information, analysis and mapping of clusters and cluster policy in Europe, aimed at European, national, regional and local policy-makers, as well as cluster managers and representatives of SME intermediaries.

The aim of the Observatory is to help Europe's regions and countries design better and more evidence-based cluster policies and initiatives that help countries participating in the COSME programme to:

- develop world-class clusters with competitive industrial value chains that cut across sectors;
- support Industrial modernisation;
- foster Entrepreneurship in emerging industries with growth potential;
- improve SMEs' access to clusters and internationalisation activities; and
- enable more strategic inter-regional collaboration and investments in the implementation of smart specialisation strategies.

In order to address these goals, the Observatory provides an Europe-wide comparative cluster mapping with sectoral and cross-sectoral statistical analysis of the geographical concentration of economic activities and performance, made available on the website of the European Cluster Collaboration Platform (ECCP) [17]. The Observatory provides the following services:

- **Bi-annual "European Panorama of Clusters and Industrial Change"** that analyses cluster strengths and development trends across 51 cluster sectors and 10 emerging industries, and investigates the linkages between clusters and industrial change, entrepreneurship, growth, innovation, internationalisation and economic development;
- "**Cluster and Industrial Transformation Trends Report"** which investigates the transformation of clusters, new specialisation patterns and emerging industries;
- **Cluster policy mapping** in European countries and regions as well as in selected non-European countries;
- "**Regional Eco-system Scoreboard for Clusters and Industrial Change"** that identifies and captures favourable framework conditions for industrial change, innovation, entrepreneurship and cluster development;

[17] European Cluster Collaboration Platform, *Official Website*. Available at: https://www.clustercollaboration.eu/.

- **Updated European Service Innovation Scoreboard**[18], that provides scorecards on service innovation for European regions;
- **"European Stress Test for Cluster Policy",** including a self-assessment tool targeted at cross-sectoral collaboration, innovation and entrepreneurships with a view to boosting industrial change;
- **Customised advisory support services** to twelve selected model demonstrator regions, including expert analysis, regional survey and benchmarking report, peer-review meeting, and policy briefings in support of industrial modernisation;
- **Advisory support service to European Strategic Cluster Partnerships**, in order to support networking between the partnerships and to support exchanges of successful practices for cross-regional collaborations and joint innovation investments;
- **Smart Guides** for cluster policy monitoring and evaluation, and for entrepreneurship support through clusters that provide guidance for policy-makers; and
- **Brings together Europe's cluster policy-makers and stakeholders** at four European Cluster Policy Forum events, European Cluster Days, and at the European Cluster Conference in 2019 in order to facilitate high-level cluster policy dialogues, exchanges with experts and mutual cluster policy learning. Two European Cluster Policy Forums took place in February and April 2018, and the European Cluster Conference is scheduled for 14 to 16 May 2019 in Bucharest (Romania).
- Online presentations and publications, discussion papers, newsletters, videos and further promotional material accompany and support information exchanges and policy learning on cluster development, cluster policies and industrial change.

More information about the European Observatory for Clusters and Industrial Change is available at: https://www.clustercollaboration.eu/eu-initiatives/european-cluster-observatory.

[18] Previous versions for 2014 and 2015 were developed by the European Service Innovation Centre (ESIC), see http://ec.europa.eu/growth/tools-databases/esic/index_en.htm.

GETTING IN TOUCH WITH THE EU

In person

All over the European Union there are hundreds of Europe Direct information centres. You can find the address of the centre nearest you at: https://europa.eu/european-union/contact_en

On the phone or by email

Europe Direct is a service that answers your questions about the European Union. You can contact this service:

– by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),

– at the following standard number: +32 22999696 or

– by email via: https://europa.eu/european-union/contact_en

FINDING INFORMATION ABOUT THE EU

Online

Information about the European Union in all the official languages of the EU is available on the Europa website at: https://europa.eu/european-union/index_en

EU publications

You can download or order free and priced EU publications at: https://publications.europa.eu/en/publications. Multiple copies of free publications may be obtained by contacting Europe Direct or your local information centre (see https://europa.eu/european-union/contact_en).

EU law and related documents

For access to legal information from the EU, including all EU law since 1952 in all the official language versions, go to EUR-Lex at: http://eur-lex.europa.eu

Open data from the EU

The EU Open Data Portal (http://data.europa.eu/euodp/en) provides access to datasets from the EU. Data can be downloaded and reused for free, for both commercial and non-commercial purposes.

Publications Office
of the European Union