EC-OECD Pilot Action: Regions in Industrial Transition

North Middle Sweden's High Impact Action:

The North Middle Sweden Challenge Lab

In-depth assessment

Table of contents

FIGURES

BOXES

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In Brief

Industrial transition in North Middle Sweden

North Middle Sweden is an industrial region, with a manufacturing and extractive sector that accounts for a third of regional revenues and 50 000 regional jobs. At the same time, employment in regional manufacturing has been declining in recent years, and the low-carbon transition is placing pressure on policy makers to identify ways to build a regional economy that is more environmentally sustainable. The region also faces other industrial transition challenges, including having a significantly lower skills base than the Swedish national average, which risks posing a threat to regional livelihoods and well-being.

In order to address industrial transition challenges (e.g. lower-than-average education and employment levels, limited innovation activity, a need to support the low-carbon transition, and improve well-being outcomes, etc.) and ensure that livelihoods can be sustained and improved over time, regions need to draw on a strong innovation capacity so that they can identify and act upon opportunities for sectoral and/or cross-sectoral transformation. However, North Middle Sweden is less innovative than the national average owing to a series of challenges in its regional innovation ecosystem, including a lack of engagement from large companies and rigidity among stakeholders. To address these issues, more effective collaboration among a wide range of actors in the public, private and civil society sectors is needed.

The North Middle Sweden Challenge Lab

The North Middle Sweden Challenge Lab was a collaborative and experimental policy initiative designed to tackle industrial transition challenges by encouraging multi-sectoral innovation and systems-wide transformation. Four workshops aimed to create a space for participants to share knowledge and support whole-of-system learning and network-building that could help resolve North Middle Sweden's low-carbon transition challenge. The organisers also set up a Seed Fund, which financially supported collaborative projects from across Middle North Sweden that targeted advancing an industrial transition focused on a low-carbon future.

Governance and management of the Challenge Lab

A pivotal element in the success of the Challenge Lab's design and implementation was the experimental, mission-based, methodological approach that it adopted. The approach sought to create a conducive space for social collaboration between relevant stakeholders on complex future challenges, by deploying several established concepts. These included various visual metaphors to encourage stakeholders to think outside the box on system-wide challenges and solutions. They also included a backcasting exercise, staggered across the four workshops, whereby participants first identified a desired future, and then worked progressively backwards towards the identification of systems-wide solutions that could bring that future to fruition.

The Challenge Lab's implementation depended on the effective leadership and skills of workshop organisers and facilitators, and the involvement of relevant stakeholders from governmental and non-governmental sectors alike. In particular, the Challenge Lab's promise of linking hydrogen-related seed funding to the ideas that were set to be discussed in workshops provided a financial incentive for companies to engage in the process.

Results of the Challenge Lab and impact on North Middle Sweden's industrial transition

The Challenge Lab has supported North Middle Sweden's industrial transition on a number of fronts. With regards to the challenge of transitioning to a low-carbon economy, the Challenge Lab workshops helped build knowledge among regional stakeholders with regards to new ways in which hydrogen can play a greater role in the energy mix. The workshops also supported the creation of new networks or connections that can support industrial change in the hydrogen sector. However, the Challenge Lab's activities have not sought to tackle other industrial transition challenges facing North Middle Sweden, such as the regional skills deficit.

Policy experimentation, scalability and lessons learned from the Challenge Lab

The Challenge Lab constituted an experimental initiative in a variety of ways. By orienting the workshops around a common mission that relates to delivering a better future, organisers encouraged a discussion on innovation possibilities that transcended traditional sectoral boundaries and constraints. Moreover, the experimental, pedagogically-sequenced structure of the workshops, which began in an ideal future and ended with a discussion of how concrete actions and next steps that could support its achievement, encouraged a discussion of innovation solutions that was future-oriented and also grounded in practical realities. Furthermore, the linkage of mission-oriented, cross-sectoral innovation discussions with seed funding constituted an experimental attempt to turn mission-oriented ideas into tangible solutions.

The Challenge Lab's implementation also generated valuable policy lessons. First, the Challenge Lab concept can serve as an important trust-building lever for regions in industrial transition. In particular, it supports the creation of cross-sectoral innovation networks, which can help stakeholders to establish collective visions for transformation needs and pathways. Second, and relatedly, the establishment of robust cross-sectoral innovation networks depends, in turn, on engaging stakeholders with sufficient knowledge and authority to make innovation-related decisions. Third, measuring the impact of regional innovation initiatives takes time. When monitoring and evaluation activities take place sufficiently far downstream of the initiative's implementation, they are more likely to be able to capture how the cross-pollination of ideas has led to tangible innovation-related outcomes. Fourth, funding mechanisms for regional innovation need to be sequenced in a way that maximises their impact. In particular, if funding is to be made available for multiple innovation initiatives that are collectively aimed at solving a single industrial transition challenge, organisers should plan for their implementation to be sequenced so that they complement one another. Fifth and finally, dedicated and skilled staff are essential to supporting policy experimentation. These employees need to effectively navigate the design, implementation, facilitation, and monitoring and evaluation of experimental initiatives, and should be fully trained prior to the launch of an initiative in order to ensure optimal outcomes.

The Challenge Lab concept is highly scalable and can, in principle, be applied to any industrial transition challenge. It is particularly fruitful at a regional level because it connects stakeholders from a wide range of sectors that nevertheless share a relatively close geographical proximity, which helps to build trust and a common purpose. This makes it particularly relevant in the context of smart specialisation, which builds on the assets and resources available to regions through a place-based approach. At the same time, Challenge Lab activities could also be successful at the national level, if the industrial transition challenge that needs to be tackled has a national-level resonance.

Introduction

This case study provides an in-depth assessment of North Middle Sweden's High Impact Action (HIA). The North Middle Sweden Challenge Lab was a challenge-driven innovation and co-creation platform, which aimed to support the transition to a more sustainable society. The process sought to explore how hydrogen could play a role in supporting circular and low-carbon industrial transformation and, by extension, better lives in the region. The Challenge Lab was comprised of four workshops, which created a space for collaboration between organisations in academia, industry, the public sector and civil society. Based on a backcasting methodology, the Challenge Lab explored possible roles for hydrogen from multiple perspectives and identified leverage points where there is potential for bridging the gap between a desirable, sustainable future and present systemic realities.

The purpose of the case study is to explore how new approaches to governance and policy can support industrial transition through a process of experimentation as applied through the Challenge Lab. Experimental governance is an iterative process of goal setting, exploring alternative approaches, and learning and monitoring (Morgan, 2018[1]) (Wolfe, 2018[2]). The experimental design and effective implementation of the Challenge Lab workshops created a platform for the cross-pollination of new knowledge and networks that could further support the integration of hydrogen into North Middle Sweden's energy system. Subsequently, the Challenge Lab has played an important role in supporting regional projects in the hydrogen space, both through the Challenge Lab Seed Fund and through the external collaboration of Challenge Lab participants on new hydrogen projects.

The first section of this case study considers the context of industrial transition in North Middle Sweden and related challenges that the regional economy faces today. The second section looks at the role of the Challenge Lab and its contribution to addressing some of North Middle Sweden's industrial transition challenges. The third section considers the experimental nature of the HIA that has characterised its design and implementation, while exploring lessons learnt, including the initiative's scalability. The final section concludes the case study.

Industrial transition in North Middle Sweden

North Middle Sweden is an industrial regional economy. The manufacturing and extractive sector (primarily involving steel production) generates the largest revenues and employment share of any industry in the region, employing just over 50 000 people and accounting for one-third of the region's revenues. It is primarily comprised of a few large industrial companies (Region Varmland, Region Dalarna, Region Gavleborg, 2022[3]). At the same time, however, the number of workers employed in manufacturing and extraction has declined significantly in recent decades – by more than 20% between 2008 and 2020, while the numbers of workers employed in other industries, such as the public sector, hospitality and trade, has risen (Region Varmland, Region Dalarna, Region Gavleborg, 2022[3]).

Although the manufacturing sector is expected to retain its regional economic importance in North Middle Sweden over the coming decades, its regional employment share is likely to decline further due to technological advances such as automation. In order to ensure that social cohesion can be maintained during this industrial transition, regional policy makers have stressed the importance of supporting groups whose position in the labour market may come under increasing pressure (Region Varmland, Region Dalarna, Region Gavleborg, 2022[3]).

The region's industrial economic base also represents a challenge in the context of the low-carbon transition. While 62.6% of Sweden's gross final energy consumption came from renewable sources in 2021, by far the highest level in the E.U., North Middle Sweden has higher rates of fossil fuel consumption and greenhouse gas emissions than the Swedish average (OECD, 2018[4]; Eurostat, 2023[5]). This mainly reflects the role of heavy industry in the region's economy, including the steel sector as well as forest-

based paper and pulp industries. An additional emissions-related challenge comes from the transport sector, which is more energy-intensive than in some other parts of Sweden owing to the region's low density, export-oriented nature and lack of urban centres (OECD, 2018[4]).

An additional challenge in the context of the industrial transition is the regional workforce's relative lack of skills. The three counties that make up North Middle Sweden (Varmland, Dalarna and Gavleborg) have a significantly lower proportion of residents who are educated to a post-secondary level than in the country as a whole (37% and 46% respectively) (Statistics Sweden, 2022[6]). This skills deficit is a function of two elements: a) failure to retain students in the region and b) a failure to attract new workers. (Region Varmland, Region Dalarna, Region Gavleborg, 2022[3]). For example, data show that, of the students that graduated from secondary school in North Middle Sweden in 2019, 25% chose to leave their home region following graduation, compared to an average of 12% nationally (Statistics Sweden, 2022[6]). Brain drain indeed poses a threat to regional livelihoods. Currently, North Middle Sweden is the only region in the country where GDP per capita is less than the European average. It is also the Swedish region with the lowest year-on-year GDP per capita growth (Eurostat, 2023[7]).

In order to address industrial transition challenges and ensure that livelihoods can be sustained and improved over time, regions need to draw on a strong innovation capacity so that they can identify and act upon opportunities for sectoral and/or cross-sectoral transformation. While EU data suggest that Sweden is the EU's most innovative Member State, they also indicate that there is a growing gap between its most and least innovative regions (European Commission, 2022[8]). The 2021 Reglab Innovation index identified two of North Middle Sweden's counties (Regions Gavleborg and Dalarna) as being the least innovative in the country, and a third (Region Varmland) as being less innovative than the national average (Region Varmland, Region Dalarna, Region Gavleborg, 2022[3]). In addition to innovation, a 2017 study by the European Observatory for Clusters and Industrial Change (EOCIC) found that North Middle Sweden also significantly lagged behind the Swedish average across other composite indicators for industrial change, such as creativity, entrepreneurship and new or emerging technologies (EOCIC, 2017[9]). Low innovation capacity has been found to be particularly prominent in SMEs in North Middle Sweden (Region Varmland, Region Dalarna, Region Gavleborg, 2022[3]).

While there are a range of elements that can account for North Middle Sweden's relatively weak innovation capacity, the EOCIC suggested that the relatively closed innovation process in its SMEs is an important contributing factor. In addition, it cited a number of threats to the regional innovation ecosystem, including a lack of engagement from large companies and rigidity among stakeholders in the regional innovation ecosystem. As such, there is a need for more effective collaboration among a wide range of actors in the public, private and third sectors, in order to improve the innovation capacity of regional stakeholders. In particular, improved collaboration can help stakeholders identify new innovation opportunities while ensuring that innovation resources can be deployed more effectively and efficiently in pursuit of those opportunities. These elements, in turn, can help policy makers to address industrial transition challenges, such as supporting a low-carbon future, more effectively.

Smart specialisation can also serve as an important tool to overcome regional innovation challenges. In particular, a smart specialisation strategy (S3) can help to identify key areas for policy intervention based on analysis of the regional economy's strengths and growth potential. In this regard, it should be noted that the low-carbon transition is an important policy priority in North Middle Sweden's S3.

The North Middle Sweden Challenge Lab

The North Middle Sweden Challenge Lab is a policy experiment to advance industrial transition locally. Launched in 2019, the Challenge Lab was a collaborative and experimental initiative that aimed to encourage multi-sectoral innovation and systems-wide transformation. The Challenge Lab recognised that industrial transition challenges, such as supporting the low-carbon transition, are often multi-faceted. As

such, they require effective collaboration and co-ordination among a wide range of actors in order to fully understand the extent of the problem and identify holistic solutions that can address it. Through its activities, the Challenge Lab sought to:

- Improve and broaden knowledge of industrial transition challenges among regional stakeholders.
- Identify transformative interventions that could contribute to sustainable industrial transition while improving regional livelihoods and well-being.
- Enhance the capacity of regional stakeholders to work purposefully together to advance industrial transition and support the creation of new networks that can help facilitate industrial change.

Overview of the Challenge Lab and its related activities

The Challenge Lab organisers sought to create a platform for sustainable systems transformation and entrepreneurial discovery that could go beyond traditional product and service innovation, and into the realm of exploration (Challenge Lab NMS, n.d.[10]). In pursuit of this goal, they developed four workshops as a tool to help implement the Challenge Lab's vision, and to help advance the region's transformation to a low carbon, circular and resource-efficient industrial economy. Funding was provided by the European Regional Development Fund (OECD, 2022[11]). The Challenge Lab concept derived its methodological foundation from an approach developed at Chalmers University of Technology in Sweden, which has been further developed and refined over time (OECD, 2022[11]).

The Challenge Lab concept involves taking a "mission-oriented" or "challenge-oriented" approach to supporting the industrial transition, whereby a single cross-sectoral challenge becomes the driver of systems innovation into the future, rather than needs-driven product and service innovation. Following the formation of a working group in late 2019 that sought to identify a core regional industrial challenge that the Challenge Lab could address, the following topic was chosen: "Exploring the role of hydrogen in realising a good life in North Middle Sweden through circular and low-carbon industrial transition" (Challenge Lab NMS, n.d.[10]).

The choice of hydrogen as a specific topic reflected its emerging importance as a possible fuel that could support more sustainable industrial production within the region. At the same time, participants wished to ensure that the potential role for hydrogen in the energy mix could be explored within the context of social sustainability, while improving livelihoods and well-being (Challenge Lab NMS, n.d.[10]) (OECD, 2022[11]). The workshops aimed to create a space for participants to share knowledge and support whole-of-system learning and network-building in the context of resolving North Middle Sweden's low-carbon transition challenge (Challenge Lab NMS, n.d.[10]).

In addition to the Challenge Lab, the organisers set up a Seed Fund, which financially supported collaborative projects from across Middle North Sweden that sought to support an industrial transition focused on a low-carbon future and on creating a resource-efficient industry and society. The Seed Fund was mainly, but not exclusively, intended to be a support mechanism for ideas generated during the Challenge Lab workshops (Challenge Lab NMS, n.d.[10]). The call for funding was open from March to May 2021 and funded 10 projects. Criteria for projects being considered for seed funding were the following:

- That they be based on/related to a challenge or mission-oriented process.
- That they purposefully engage with large companies in addition to SMEs, in order to engage different types of companies in the regional innovation ecosystem.
- That they aim to fund early stage, explorative ideas to address longer-term transformative change.
- That they encourage cross-sectoral and intra-regional connections.

The Challenge Lab organisers had planned for a review of the Seed Fund and its projects, and their impact in supporting industrial transition, to be completed by the end of 2021. Interviewees were unsure of whether or not this review was ever carried out (OECD, 2022[11]; Challenge Lab NMS, n.d.[10]).

Governance and management of the Challenge Lab

The governance and management of the Challenge Lab was underscored by a number of elements. In particular, the methodological approach to the Challenge Lab's design and implementation – including the "cruise ship and expedition concepts" (see below), as well as the backcasting method deployed during workshops – supported collective knowledge-sharing and enhanced stakeholder capacity to address in a meaningful way both present and future complex, whole-of-system industrial transition challenges in North Middle Sweden. In addition, the effective leadership by workshop organisers, facilitators and evaluators of the Challenge Lab ensured that such collaboration remained mission-oriented, while bringing together a broad range of cross-sectoral and intra-regional stakeholders that could support North Middle Sweden's low-carbon energy transition.

Methodological ingenuity is key to the Challenge Lab's successful design and implementation

In contrast to traditional innovation processes, which often focus on the near-term and support incremental system improvements to meet specific, present-day challenges, industrial challenges are often multi-faceted, and depend on stakeholders' ability to develop a longer-term and more holistic view of systems transformation. At the same time, encouraging stakeholders to develop such a view can be challenging, owing to their natural predilection for collaboration in fields of their own expertise, rather than engaging with other stakeholders from outside of it to address societal challenges.

A pivotal element in the success of the Challenge Lab's design and implementation was the experimental, mission-based methodological approach that it adopted. The approach, which was initially developed by Professor John Holmberg of Chalmers University of Technology (who subsequently acted as an advisor to the Challenge Lab project), seeks to create a conducive space for social collaboration on complex future challenges by deploying of a number of established concepts (Challenge Lab NMS, n.d.[10]).

First, the "cruise ship and expedition" metaphors used in workshops provided a visual prompt to encourage stakeholders to think outside the box on system-wide challenges and solutions (Box 1). While the cruise ship metaphor denotes a business-as-usual approach to meeting organisational or business challenges (e.g. improved efficiency or systems optimisation), the expedition metaphor denotes the need for learning and discovery in uncharted waters (Challenge Lab NMS, n.d.[10]). This encourages participants to build a comprehensive understanding of systems and how they can be transformed, rather than immediately reaching for quick wins. Other metaphors, such as the sustainability lighthouse (which visually depicts how ecological, economic and social factors are interlinked in supporting human wellbeing), supported an industrial transition focus that was holistic rather than technically or sectorally limited (Challenge Lab NMS, n.d.[10]). These elements provided a basis for participants to test a wide range of cross-sectoral ideas on industrial transition challenges linked to the low-carbon transition, as well as possible solutions.

Box 1. Cruise ship and expedition metaphors

The Challenge Lab approach used two metaphors to encourage stakeholders to think outside the box on system-wide challenges and solutions. The first metaphor, the "cruise ship," denotes the normal activities of an organisation or business, including a focus on improvement, efficiency and/or optimisation. While such activities are a known quantity for organisations and business, and can

therefore provide them with reassurance, they may not lead to the profound organisational transformation that can take place in uncharted waters (e.g. when thinking outside the box).

The second metaphor, the "expedition," denotes the new learning and discovery that can come from exploring new and uncharted waters. The metaphor denotes the exploration of new ideas in a positive light, and as providing the chance to generate learning that can lead to profound organisational change. The two metaphors are inter-linked through a third "docking" metaphor, which posits that new learning generated by expeditions can be "docked" at the cruise ship (or shared with organisations) in order to support systems-wide transformation.

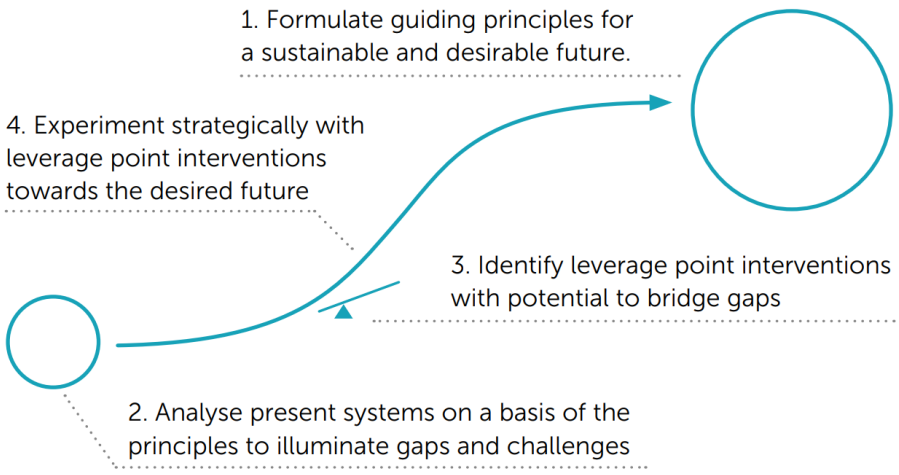
Source: (Challenge Lab NMS, n.d.[10])

In addition to metaphors, the Challenge Lab's backcasting methodology provided participants with a mental framework to conceptualise holistic and industrial change (Challenge Lab NMS, n.d.[10]). Backcasting contains four elements:

1. Formulating guiding principles for a sustainable and desirable future (defined by Challenge Lab as 30 years from now).
2. Analysing the current situation to illuminate gaps and challenges standing between the present and the future.
3. Identifying possibilities with the potential to bridge the gaps.
4. Identifying priority actions and next steps.

These elements, each of which comprised one of the four Challenge Lab workshops, supported a collaborative backcasting exercise whereby participants first identified a desired future, and then worked progressively backwards towards the identification of systems-wide solutions that could enable that future. The effect of the model was to set the foundation for stakeholders to identify industrial transition challenges and solutions that went beyond their field of expertise and, instead, supported more cross-sectoral and broad-based forms of innovation (Challenge Lab NMS, n.d.[10]).

Figure 1. Primary steps contained in a backcasting methodology



Source: (Challenge Lab NMS, n.d.[10]).

The practical execution of the Challenge Lab methodology depends on effective leadership by organisers

The execution of the Challenge Lab workshops depended on the effective leadership and skills of various organisational groups. This included the leadership and skills of those involved in developing each workshop's structure and content, as well as those involved in facilitating the workshops and evaluating feedback from participants, so that key lessons learned from the process could be used to improve the subsequent workshops in the series (Challenge Lab NMS, n.d.[10]).

Each of these elements helped build trust among workshop participants, thereby supporting more effective collaboration and an easier exchange of ideas within the context of Challenge Lab's mission-oriented approach to industrial transition. For example, facilitation can help to ensure that stakeholder discussions are guided in a challenge-oriented way (OECD, 2022[11]). As noted by one participant, it "allows [participants] to take a leap from what you normally do as a technology manager and embark on an expedition" (OECD, 2022[11]). It should be noted that each of the roles that supported the execution of Challenge Lab workshops are skills-intensive and their successful completion depends on organisers having benefited from training in project design and management, facilitation, and evaluation.

The Challenge Lab relies on the right stakeholders being involved

For Challenge Lab-like exercises to support systems-wide transformations for industrial transition, there is a need for a wide range of relevant stakeholders from different sectors and territories to be involved. In the case of Challenge Lab itself, between 17 and 27 participants were present at each workshop. Companies represented around 40% of participants, clusters, and science parks around 25%, higher education institutions (including the research and evaluation teams) around 25%, and regional authorities around 10%. Of North Middle Sweden's three counties, 46% of participants were from Gavleborg, 23% were from Dalarna, 15% were from Varmland and 17% were from outside the region (Challenge Lab NMS, n.d.[10]).

Participants were personally invited by organisers to take part in the Challenge Lab workshops. The vast majority of them had previous experience working with hydrogen energy transitions. This sowed the seeds for a focused discussion on relevant industrial transition challenges and solutions. Participants felt that their main contribution to the process was being able to provide a different perspective to the discussion (e.g. different sector, different application area for hydrogen – such as energy, transport or manufacturing, different technical or social system, niche or broad/holistic viewpoint) (Challenge Lab NMS, n.d.[10]). The main incentive for being involved in the Challenge Lab that participants identified was non-financial and related to the timeliness and relevance of the hydrogen topic to their work. They were also curious to learn more about the backcasting method, in order to be able to apply it to other contexts. The Challenge Lab's promise of linking hydrogen-related seed funding to the workshop discussions provided a financial incentive for companies to engage in the process (Challenge Lab NMS, n.d.[10]).

Challenge Lab accomplishments and contributions to North Middle Sweden's industrial transition

The Challenge Lab supported North Middle Sweden's industrial transition on a number of fronts. With respect to the industrial transition challenge of transitioning to a low-carbon economy, a significant benefit has been building knowledge among regional stakeholders regarding new ways in which hydrogen can play a greater role in the energy mix. In a survey conducted at the end of the Challenge Lab, 55% of respondents felt that they had gained, during the workshops, a substantial amount of new knowledge and insight related to the hydrogen system challenge. Relatedly, 86% of workshop participants felt more confident and able to contribute to the region's energy transition (Challenge Lab NMS, n.d.[10]).

These data were also reflected in OECD interviews. Stakeholders indicated that, in addition to the Seed Fund, which funded ten early-stage innovation projects with potential to support the energy transition, the

participants from Challenge Lab launched a number of other innovation projects amongst themselves, in order to explore new ways in which hydrogen can be used to support the construction, transport, pulp and paper, and steel-making sectors (OECD, 2022[11]) (OECD, 2022[11]). Interviewees also noted that the Mid-Sweden Hydrogen Valley, an initiative to foster cross-sectoral collaboration on hydrogen solutions among companies in the region, was inspired and established by participants from the Challenge Lab and is co-ordinated by Region Gävleborg, with participation from Region Dalarna (OECD, 2022[11]).

Another key outcome of the workshops has been the creation of new networks or connections that can support industrial change. This represents a form of social capital, in the sense that it generates ties among stakeholders brought together to work on cross-sectoral challenges that they would otherwise have only tackled in a vacuum. As noted by one stakeholder, "[work towards creating] a system for resilient [regional energy] production would not have happened if it had not been for the Challenge Lab. We wouldn't be thinking about forestry and steel together – we would be thinking about them in siloes" (OECD, 2022[11]).

One dimension of industrial transition that some participants felt had not been explored during the workshops was the need to support the development of new skills – a critical component of successful industrial transition (OECD, 2022[11]). As mentioned, North Middle Sweden suffers from a skills deficit when compared to the Swedish average. Given that the Challenge Lab's aim placed a significant emphasis on supporting an industrial transition that could improve well-being, the relative lack of discussion of skills development is somewhat unexpected, since skills provide an important foundation for improved career opportunities. In this regard, it should also be noted that interviewees suggested the main underrepresented group in the Challenge Lab workshops were students (OECD, 2022[11]). It is worth considering whether a higher level of student participation in the workshops might have yielded a stronger focus on skills, given that students – as early career stakeholders – are particularly dependent on effective skills development to effectively meet workforce needs.

Policy experimentation, scalability and lessons learned

The Challenge Lab constituted an experimental initiative in a number of ways. In particular, the backcasting methodology provided a novel approach to supporting regional innovation. By orienting the workshops around a common challenge that relates to delivering a better future, the Challenge Lab encouraged a discussion on innovation possibilities that transcended traditional sectoral boundaries and constraints. Moreover, the experimental, pedagogically sequenced structure of the workshops, which began in an ideal future and ended in a discussion of how concrete actions and next steps that can achieve it, also encouraged a discussion of innovation solutions that was future-oriented and also grounded in practical realities. Furthermore, the linkage of mission-oriented, cross-sectoral innovation discussions with Seed Funding constituted an experimental attempt to turn challenge-oriented ideas into tangible solutions. Finally, it should be noted that the HIA represents the first time that the Challenge Lab methodology has been used to tackle regional innovation challenges in North Middle Sweden.

Scalability of the Challenge Lab

The Challenge Lab concept can, in principle, be applied to any industrial transition challenge. OECD interviewees indicated that it has already been applied to a number of other regional-level and local-level industrial challenges, including strategic climate mitigation in Region Västra Götaland and electromobility transitions in Gothenberg City, as well as university transition processes in South Africa (OECD, 2022[11]; Holmberg and Widbom, 2020[12]). It was noted during the interviews that the Challenge Lab is particularly effective at a regional level because it connects stakeholders from a wide range of sectors that nevertheless share a relatively close geographical proximity, which helps to build trust and a common purpose (OECD, 2022[11]). This makes it quite relevant in the context of S3, which builds on the assets and resources available to regions through a place-based approach. OECD interviews indicated that local

stakeholders are considering incorporating the Challenge Lab concept in their mission-oriented setting of the new S3.

However, in addition to the possibility of it being adopted by other regions, interviewees also suggested that Challenge Lab activities could also be successful at the national level. At the same time, the extent to which Challenge Lab is nationally scalable depends on the challenge at hand. Interviewees felt, for example, that an industrial transition challenge tackled at the national level would need to have a very narrow focus, in order to ensure that the discussions lead to the identification of concrete solutions, rather than vagaries. As one stakeholder commented: "if the [challenge at hand] is too broad, you will not create co-operation between different projects and sectors because it is too far away, too different" (OECD, 2022[11]).

Conversely, however, stakeholders were clear that for a Challenge Lab to be successful, the challenge at hand must not be framed too narrowly, because doing so would fail to involve a sufficient number of different sectors and thereby forego any possibility of achieving systemic transformation. As such, while the Challenge Lab concept is in and of itself highly-scalable, both at the subnational and national levels, great care should be taken by organisers when setting up the challenge to ensure it supports collaborative discussions on innovation opportunities that exist between different sectors and industries. At the same time, discussions should remain grounded in technical realities.

Policy lessons from the Challenge Lab

The design, implementation, and monitoring and evaluation elements of the Challenge Lab generated a number of valuable insights for the region's innovation ecosystem stakeholders as they look to apply the Challenge Lab concept to other industrial transition challenges. Furthermore, the Challenge Lab also provides lessons for both national and/or subnational authorities that are either interested in or actively implementing initiatives based on the Challenge Lab concept to support the industrial transition.

- **Strengthening cross-sectoral innovation networks and partnerships using challenge-oriented approaches can serve as an important trust-building lever for regions in industrial transition.** Collaborative knowledge-sharing that is centred around a common goal can help stakeholders establish collective visions for transformation needs and pathways. Overall, stakeholders involved in the workshops felt that they had played an important role in helping support the low-carbon transition in North Middle Sweden. As one stakeholder noted: "[the workshops were] a good way to identify new possibilities in hydrogen, by mixing and building relationships with people that you're not used to meeting" (OECD, 2022[11]).
- **Financial incentives are not always the main driver of participation in experimental activities.** It is noteworthy that, despite the existence of a financial incentive to participate in the Challenge Lab (through the Seed Fund), participants felt that its primary benefits and drivers for engagement were non-financial. Rather, participants indicated that one benefit was related to collaborative knowledge-building on an industrial transition challenge that was highly relevant to their work (OECD, 2022[11]).
- **Establishing robust cross-sectoral innovation networks depends on engaging stakeholders with sufficient knowledge and authority to make innovation-related decisions.** Involving high-level government and non-governmental stakeholders, who have technical knowledge of the innovation-related challenges and opportunities at hand, in an experimental collaborative action is important in order to ensure that collaboration is both substantive and focused on concrete actions.
- **Lack of technical knowledge by certain participants may have inhibited knowledge-sharing in the case of the Challenge Lab**. It was noted that while nearly half of the workshop participants were from the private sector, many of them had a sustainability-focused background, rather than

a background rooted in the technical aspects of energy production. Some interviewees felt that this inhibited the extent to which stakeholders were able to hold technical discussions on innovative possibilities for hydrogen in the energy mix (OECD, 2022[11]). In addition, there was a lack of high-level political participation in the workshops, which some stakeholders felt may have limited discussions on how the public sector can best support regional innovation opportunities. For example, it was noted that while participants included smart specialisation leaders from each of North Middle Sweden's three counties, there were no regional politicians involved in workshop discussions (OECD, 2022[11]). This was rather surprising given that, as indicated by interviewees, a sizeable number of politicians in North Middle Sweden have a good grasp of how the hydrogen industry works (OECD, 2022[11]).

- **Measuring the impact of regional innovation initiatives takes time to capture results.** When monitoring and evaluation activities take place sufficiently far downstream of the initiative's implementation (e.g. at least 18-24 months later), they are more likely to be able to capture how the cross-pollination of ideas has led to tangible innovation-related outcomes. Measurement mechanisms should be in place *ex ante* to make it easier to identify such outcomes (and, ideally, their impact) and to ensure accountability for project funding. In the case of the Challenge Lab, because no time was allowed to elapse between the end of the Challenge Lab workshops and when final interviews were conducted, it is difficult to know whether, and to what extent, the Challenge Lab workshops contributed to the development of concrete regional innovation solutions. No review of the projects selected for Seed Funding was ever conducted, which could have ensured accountability throughout the funding cycle (OECD, 2022[11]).
- **Dedicated and skilled staff are essential to supporting policy experimentation.** Such staff are necessary to effectively navigate the design, implementation, facilitation, and monitoring and evaluation of experimental initiatives. They should be fully trained prior to the launch of an experimental initiative in order to ensure optimal outcomes. It was noted during interviews that facilitation needs were not well-anticipated at the outset of the Challenge Lab. While training efforts were made, they were generally *ad hoc*, and consisted of on-the-spot training immediately prior to workshops rather than a structured and pre-planned training programme (OECD, 2022[11]). This may have affected the quality of implementation.

Conclusion

The North Middle Sweden Challenge Lab is an innovative governance experiment that has already made a significant contribution towards addressing regional industrial transition challenges linked to the low-carbon transition. Methodological ingenuity, such as the backcasting method and the use of metaphorical concepts to encourage stakeholders to think outside the box, in addition to effective leadership and relevant stakeholder participation, supported knowledge exchange and network-building regarding how hydrogen can play a greater role in the energy mix. At the same time, there was likely additional scope for the Challenge Lab to concurrently support knowledge and network-building on how other industrial challenges could be addressed, such as the regional skills gap, should organisers have wished to do so.

Further fine-tuning of various Challenge Lab aspects, such as monitoring and evaluation, stakeholder participation and related funding and financing mechanisms, will help future initiatives to be as effective as possible in meeting regional industrial transition challenges. Moreover, the Challenge Lab's scalable potential at an either regional or national level makes it a useful prospective approach for supporting the resolution of industrial transition challenges in other regions and countries across the European Union.

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Annex: The EC-OECD Pilot Action on Regions in Industrial Transition

In 2018, the European Commission/DG REGIO with support from the OECD launched the pilot action *Regions in Industrial Transition* to support ten regions and two countries[1] in industrial transition prepare their Smart Specialisation Strategies (S3) and innovation policies for the 2021-2027 period. The pilot action was designed in two phases. The OECD supported the first phase with a series of five thematic workshops held with two cohorts of participants, each including five regions and one country. The findings from these workshops were collated into an OECD synthesis report, Regions in Industrial Transition: Policies for People and Places.

As part of the project, eight of the original regions and the two countries received a EUR 300 000 grant from DG REGIO as well as tailored advisory services to design a High Impact Action that could support their industrial transition strategies.

The OECD is supporting the European Commission with an assessment of each High Impact Action. The aim is to take stock of the potential benefits of different types of High Impact Actions on industrial transition and of the policies that support them. Each assessment considers the actual or expected results of individual High Impact Actions through an understanding of their objectives, activities, governance mechanisms and experimental nature. The in-depth analysis also explores how each pilot region/country expects their individual High Impact Action to contribute to their industrial transition and advance their smart specialisation strategies and governance.

[1] The regions are Cantabria (Spain), Centre-Val de Loire (France), East North Finland (Finland), Grand Est (France), Greater Manchester (UK), Hauts-de-France (France), North Middle Sweden (Sweden), Piedmont (Italy), Saxony (Germany) and Wallonia (Belgium). The countries are Lithuania and Slovenia.

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