



**Värmland Research and  
Innovation Strategy for  
Sustainable Smart Specialisation  
2022 – 2028**

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# Preface

In Värmland, we see our smart specialization strategy as a smarter way to create value. Värmland's research and innovation strategy for sustainable smart specialization 2022–2028 is based on the Värmland Strategy 2040 – the county's regional development strategy.

Värmland has many strengths but also challenges. Among other things, the challenges relate to the fact that large parts of the business world operate in a global market with high competition. The region is characterized by a low level of education in comparison with the rest of Sweden, as well as by gender-stereotyped educational choices and a strongly gender-divided labor market. With the strategy for smart specialization, we deepen the work of finding innovative and innovative ways to meet the challenges.

Smart specialization is about increasing competitiveness within a selection of promising areas and at the same time contributing to the transformation of society that is required for sustainable development. This is by taking advantage of innovation, entrepreneurship, research and innovation and opening ourselves up to the outside world. The strategy contributes to new ways of organizing existing regional assets, more jobs and smarter ways of creating value for Värmland and its inhabitants. It is both about what we are good *at* and what we are good *for* !

The strategy has been developed during the spring and autumn of 2021 and a wide range of actors have been involved. The work has been based on a combination of analyses, knowledge base and dialogues. The region's actors have contributed actively with environmental intelligence, needs, experiences and visions of the future. In total, more than 250 people have participated from the cluster organisations, companies, the university, institutes, authorities, municipalities, the region, non-profit organizations and a number of other actors.

Region Värmland has decided to integrate gender equality into all decisions, and this also means that the strategy for smart specialization has been integrated into gender equality.

We want to see results from the strategy and our efforts. Therefore, monitoring, follow-up and evaluation are important elements in the smart specialization work for us politicians and for legitimacy.

It has been an extensive process to develop Värmland's research and innovation strategy for smart sustainable specialization and we therefore want to take the opportunity to thank everyone who contributed knowledge and time to the work .

# Background

The concept of "smart specialization" was introduced by the EU Commission in connection with the regional fund programs 2014–2020. It is both a strategy and a method for regional development with the aim of increasing regions' economic competitiveness. The method is based on four pillars; leadership, strategy, entrepreneurial opportunities, monitoring and learning.

Concretely, smart specialization means that the region identifies and prioritizes sectors and technologies based on existing areas of strength and new development opportunities. The aim is to consolidate investment and innovation measures to create long-term competitiveness, a sustainable and equal labor market with more jobs and better development opportunities for the region's residents.

Smart specialization is an important tool within the EU's cohesion policy. The concept has gradually developed towards Strategies for Sustainable Smart Specialization Strategies (S4) to also include the need for a green transition, digitization and economic recovery after the corona pandemic <sup>1</sup>.

In order to take part in the EU's regional fund funds, the European Commission is demanding from 2021 that each region must have a smart specialization strategy, and must meet the requirements for good governance of this.

The European Commission has set as a condition for the regions to have access to funding from the European Regional Development Fund (ERDF) for objective 1:1 and objective 1:4 that there must be one *good governance of the regional strategy for smart specialization* of smart specialization . What this means is made clear with seven criteria <sup>1</sup>.

Evaluations of the previous Värmland strategy for smart specialization 2015–2020 show that the strategy has contributed to setting out common visions and directions, deepened the cooperation between central actors around the smart specialization areas and resulted in a series of concrete investments. The strategy has also functioned as a link between the actors at the local, regional and national level, but also to the EU's overall growth and industrial strategies.

There are high expectations linked to the strategy of smart specialization . On the one hand, the region and the world in general are facing major challenges, including in demography, climate and digitalisation. In part, the previously successful collaboration has created a demand for continued joint work based on trust and consensus between the central actors. With the new specialization strategy, the region takes the next step to develop the way of working with smart specialization to continue to be at the European forefront.

The strategy shall contribute to :

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<sup>1</sup> The definition of smart specialization can be found in communication COM/2017/03762 and the European Commission's working document SWD/2017/02643.

- Värmland becomes part of a European network for smart specialization, which means opportunities for experience exchange and cooperation with other regions, as well as for influencing the EU's regional policy.
- Värmland has an increased focus on sustainability and digitization that can contribute to a green transition, based on the EU's growth strategy 2021–2027.
- Värmland takes advantage of the opportunities to raise the level of knowledge and innovation in the region and create conditions for increased international competitiveness.
- Värmland can create better and more sustainable jobs, improve equality, increase gender equality, strengthen service development, contribute to global development and become a clearer partner in European cooperation.

## From the Värmland Strategy 2040 to a strategy for sustainable smart specialization

Värmland's strategy 2040 is Värmland's regional development strategy and has been drawn up on behalf of the government. It is the county's joint plan to develop Värmland in an equal, equitable and sustainable manner both socially, environmentally and economically. The vision A sustainable Värmland that changes the world sets the direction for the work.

Region Värmland coordinates the work, but the strategy is shaped and implemented by a variety of actors. It forms a basis for decisions and governs how project funds are to be distributed at regional level. It also acts as a compass in negotiations with authorities, the government and the EU. The Värmland strategy is sector-wide and identifies a vision, long-term goals and areas of action towards 2040.

The strategy identifies four priority areas of action:

- Improve living conditions
- Increase competence
- Develop attractive locations
- Strengthen competitiveness

In order to create the conditions for implementation, three so-called keys to change have been identified; it's about leading courageously, collaborating in new ways and proactively exploring ( Värmlandsstrategin 2040 ).

Värmland's research and innovation strategy for sustainable smart specialization is one of several sub-strategies and action plans for the Värmland Strategy. The smart specialization strategy is expected to be able to contribute to a large extent in all four areas of effort identified in the Värmland strategy. However, according to the Värmland Strategy 2040, smart specialization is primarily aimed at deepening the field of action Strengthening competitiveness:

*" Develop the work with smart specialization by gathering actors, resources and investments around the industries and areas of knowledge where we have or can have strong development. Together, we will develop existing regional assets and, through the synergies between them, create innovations to meet societal challenges. The method contributes to more and stronger companies and innovations. "*

(The Värmland Strategy 2040, page 36)

The starting point for smart specialization is that it should be a regional gathering of forces behind the most promising areas for innovation, entrepreneurship, growth and employment. The work must contribute to sustainable development and meet societal challenges identified in the Värmland Strategy. An important difference is that the strategy for smart specialization is more specific and has a shorter time horizon, 2022–2028, than the Värmland strategy, which applies until 2040.

The implementation of the Värmlandsstrategin as well as the strategy for smart specialization is about involving actors at different levels, from local and regional level to national and international level. The strategy means that Värmland's knowledge and resources are utilized from a European perspective and that Värmland can take part in the EU's policy, funding and initiatives.

# Värmland - a description of the current situation

There are many parameters that influence a region's innovative capacity, for example openness, investments in R&D, business structure, international networks, access to capital, levels of education, unique and more complex skills and the structure of the labor market. In comparison to other Swedish regions, Värmland has somewhat worse basic conditions, above all because the population has a lower level of education. Investments in R&D are also low in Värmland compared to other regions. When it comes to public sector expenditure on R&D, Värmland is the lowest of all regions. The acquisition rate among those born abroad is low and Värmland's labor market is very divided by gender. This worsens the conditions for competence supply and innovative power.

The women work to the greatest extent in the public sector and the men in the construction industry, transport and manufacturing. A higher proportion of women than men have post-secondary education and the proportion of women has increased relatively much, while the proportion of men with post-secondary education has increased very little. Despite that, the percentage of managers in 2019 was lower among women (39 percent) than among men (61 percent). Just over half of the managers in the public sector were women, while business life is dominated by men who are managers.

At the end of 2020, Värmland's population amounted to 282,885 people, but by 2040 Statistics Norway estimates that the population will have decreased to 279,300 people. Värmland's population already today has a larger proportion of older people than the national average, and the proportion continues to increase compared to other age groups. It has consequences for the burden of support when a shrinking labor force has to support more and more elderly people.

Värmland is an industrial region with its base in the forest, steel and engineering industries. Here there is also an extensive business life in the food sector and an IT sector which is significant both with cutting-edge areas and as support for the digital transition. Värmland's exports have had an upward trend since 2016. Of Värmland's approximately 28,000 companies, approximately 5 percent are exporters. It is mainly in male-dominated companies in traditional industry that goods are exported, for example in paper and pulp, workshops and steel and metal. Retail trade and the food industry also have a relatively high share of merchandise exports in Värmland.



# The development of smart specialization in Värmland

Through smart specialization, a joint effort is made to strengthen the parameters that together contribute to a regional innovation climate, for example:

- competence supply
- research funding
- business life's ability to renew
- entrepreneurship
- innovation
- capital supply
- export
- equality
- equality
- commercialization
- international networks.

Smart specialization should therefore not be seen as a single strategy, but as a framework for how different areas can interact to strengthen the areas of specialization.

The development of smart specialization in Värmland has taken place gradually over a couple of decades - from the cluster development that started in the early 2000s, to a closer collaboration between Karlstad University and Region Värmland and the strategy for smart specialization 2015 - 2020. This gave the work a direction and resulted in many concrete initiatives that contributed to strengthening the smart specialization areas, developing the innovation climate in Värmland and strengthening the region's international competitiveness.

Compared to other small Swedish and European regions, Värmland has a strong platform for smart specialization with robust cluster organizations, a unique collaboration between the university and the region, and a culture in the innovation ecosystem that is characterized by great trust and a genuine interest in collaborating to find and take advantage on synergies <sup>2</sup>. More and more actors are joining the work with smart specialization, not least of which applies to the education system and the municipalities. The political leadership stands firmly behind smart specialization. At the same time, the region has structural challenges to overcome or compensate for, which makes the continued work on smart specialization and the transformation of the region's economy extra urgent. In the next step, it is about involving more companies, continuing to develop research and education that strengthens the smart specialization areas. The region also needs to develop more appropriate test beds and promote investments and exports. Collaborations and innovation processes can become even stronger, and with new combinations of people, knowledge and other resources, the region can contribute to finding solutions to important societal challenges. This requires that Värmland raise the level of ambition, become even better at what are called entrepreneurial discovery processes and use an exploratory approach to meet societal challenges. In the development of smart specialization, it will be important to strengthen cooperation within and outside of Värmland. Cooperation with neighboring regions in Sweden and with Norway can strengthen specializations and

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<sup>2</sup> OECD evaluation of the Academy of Smart Specialisation

contribute to joint strengths and synergies. Värmland's proximity to Norway constitutes a special opportunity that few other regions in Sweden have.

# A new strategy for smart specialization in Värmland

Smart specialization is about creating competitiveness within a number of designated areas and at the same time contributing to meeting societal challenges both in Värmland and internationally.

Based on previous work, analyzes of prerequisites and areas of strength, as well as a broad dialogue between the region's actors, seven smart areas of specialization have been identified. These are thematic areas where there is a business community with potential, qualified research and cluster organizations that can contribute to mobilization during implementation. The geographical spread in Värmland varies between the specializations. Overall, the geographical coverage is judged to be good.

The seven areas are:

- Forest based Bioeconomy
- Digital Health Innovation
- Advanced Manufacturing and Complex Systems
- Sustainable System Solutions with Photovoltaic in Focus
- Attraction Through Sustainable Place Development
- Food in Sustainable Interactions
- Computer Games and Gamification

With the seven areas, many good forces are mobilized for regional competitiveness. Each area has differences in terms of organization, collaborative culture, business structure, research and other strengths and opportunities for specialization and innovation. Each specialization must therefore be handled according to its specific conditions. The combined portfolio of areas of specialization means resources from different parts of the regional economy that can meet each other and lead to innovations.

In order to stimulate innovation and meetings between different areas of knowledge, the specializations meet seven perspectives where sustainable development is the most comprehensive perspective. Other perspectives are Circular economy, Digitization, Equality and inclusion, Social innovation, Value-creating services and Community safety.

Open platforms are organized to strengthen the areas of specialization and the prioritized perspectives. In addition, new working methods are introduced to create cross-border cooperation towards missions and towards

concrete entrepreneurial opportunities. It is often in the gaps or connections between areas and knowledge that the new emerges.

Missions involves a new way of working that addresses societal challenges, creates meetings between areas of knowledge that are broader than individual specializations and sets a joint long-term ambition. Initially, the missions Smart sustainable energy system and Sustainable, healthy and equal smart societies have been selected to bring together a large number of actors who can make a real difference.

The strategy contributes to the overall vision in the Värmland strategy, "A sustainable Värmland that changes the world". To clarify the ways in which smart specialization can contribute to the vision, there is an addendum for each specialization.

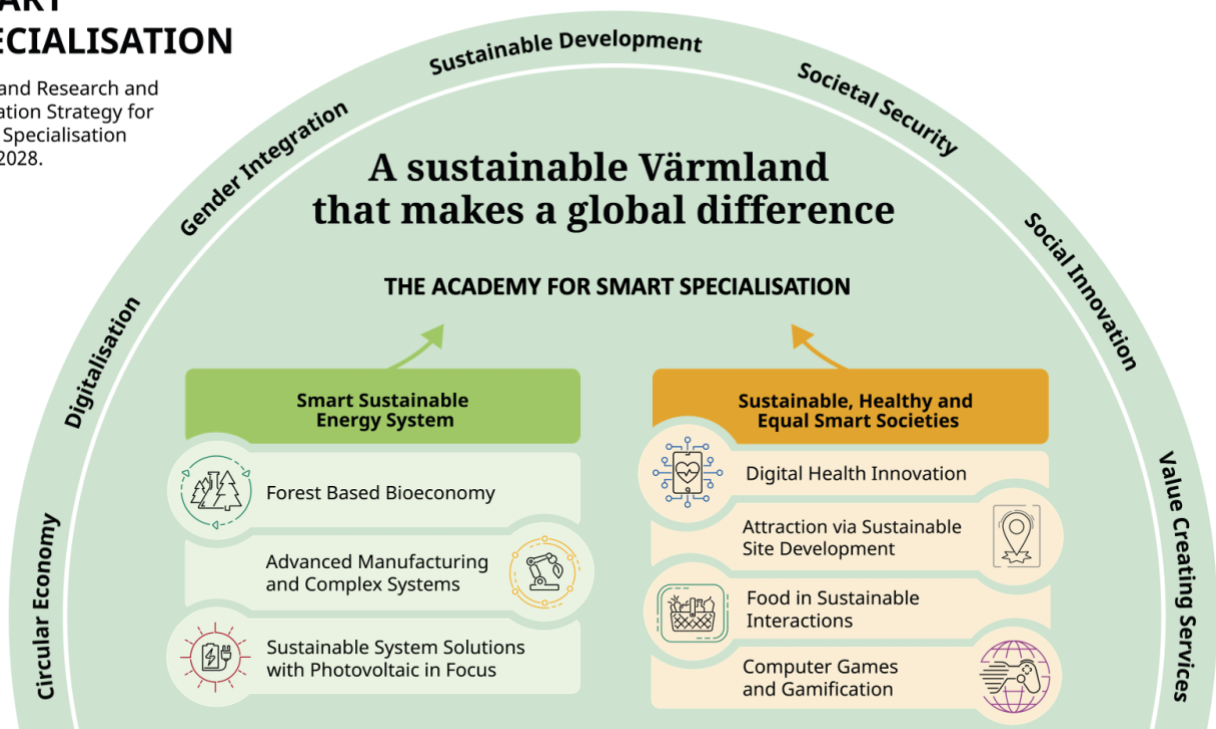
The strategy of smart specialization is both a strategy and a method of development. The method is based on focusing and bringing together the region's actors from academia, research, business, the public sector and civil society around a common vision. The strategy should contribute to releasing and making visible the potential we have for innovation and growth, which also helps us to profile the areas of specialization and to build the Värmland brand. With the strategy, we can become clearer towards actors nationally and internationally and act more forcefully. It is about developing both what we are *good at* and what we are *good for*.

The Värmland strategy's three keys to change: leading courageously, collaborating in new ways and proactively exploring should characterize the implementation of the smart specialization strategy .

Smart specialization is smart ways of organizing and developing existing regional assets to create sustainable values for users and society. In short, smart ways to create sustainable values.

## SMART SPECIALISATION

Värmland Research and Innovation Strategy for Smart Specialisation 2022-2028.



# Värmland's smart specialization areas

## Forest based bioeconomy

### Introduction

Värmland's strength lies in a strong and complete ecosystem for innovation in the forest bioeconomy. It consists of several interconnected actors, for example clusters, companies, forest owners, entrepreneurs, investors, academia, the public sector and civil society.

In the forest there is the raw material, in our companies there is the competence. We have a wide range of companies in different size classes as well as research environments and test beds. Together, they have a unique ability to create conditions for innovation and change. The cluster organization Paper Province gathers the actors in the ecosystem in a large network that enables innovation and development. Through Sting Bioeconomy, there is specific business development support for startup companies in the bioeconomy. Karlstad University offers education and research at advanced level in forest bioeconomy, competence provision, internationalization and marketing. RISE runs the LignoCity test bed and contributes knowledge as well as national and international networks. All in all, this means that Värmland is one of the leading environments in Europe in forest bioeconomy.

The focus of the forestry bioeconomy specialization is a more cohesive innovation ecosystem that aims to create the best value of the forest based on a sustainability perspective based on circularity .

### Vision

*A sustainable Värmland makes a global difference by creating the best value from the forest.*

Värmland must, through forest bioeconomy, be recognized as a forerunner nationally and internationally for how to carry out transformation in cooperation. Based on value-creating cooperation, such as gathering companies around a common challenge or opportunity, we transform business life. At the same time, it realizes and industrialises products and services that lead to sustainable inclusive growth and strengthens Värmland's, Sweden's and Europe's competitiveness. Namely; Värmland is changing the world.

### Strategic intentions/focus

A transition to a circular bioeconomy is a necessity that smart specialization must focus on in order to cope with climate change and the increased need for resources in the world. The industry must be renewed and adjusted. The forest industry and hence a significant part of the forest-based bioeconomy is characterized by conservative patterns and the need for technical and mental mobility. Smart specialization must contribute to this transformation. An important strategic intention/orientation within smart specialization is therefore to strengthen the conditions for attracting a broader competence base in terms of individuals and knowledge. The

forest industry's core, which consists of volume products, must be developed and thereby strengthen the industry's competitiveness. An important direction for the smart specialization is to strengthen the industry's conditions to take advantage of the possibilities of digitization and to create new products, materials and services. Added to this is the need for the forest industry to develop its understanding of how the products can create value for the customer and how this forms part of the final product. Värmland will lead the transition towards a bioeconomy that challenges existing technology, based on needs and demand, where we contribute to meeting the major societal challenges. A change to a sustainable forest bioeconomy is not only about a change in production systems, but also requires a change in consumption habits where the norms and values of civil society form an important part. Processes linked to social innovation can contribute to this change. Exploring and managing goal conflicts, for example linked to climate, biological diversity and growth, contributes to more sustainable development and reduces unnecessary risk-taking.

Collectively, this means that within the smart specialization we ensure the vision through a balanced development of:

- the best products from forest raw materials (materials, prototypes and services) with higher added value
- the circular value chains
- sustainable forestry with biological diversity and value creation from different areas of use of the forest
- ownership and management of forests as well as opportunities for new business models and social innovations for increased value creation from the forest
- gender equality, equality and inclusion to create the conditions for the best skills to apply for the smart specialization
- economic sustainability that is also based on social innovations
- develop the region's public and private research and innovation environments ( FoI ) and connect us to the strongest national and international environments.

## **Development forward**

Paper Province has been instrumental in the development of innovation capacity and a more attractive and competitive forest bioeconomy innovation ecosystem in the county. However, this is not enough to be able to actively drive the transformation towards an even stronger bioeconomy as an innovation environment, especially at national and EU level. To be able to utilize the full potential that the forest represents in the region, a development of the innovation ecosystem and the existing platforms for innovation and transformation is required, for example the Vinnväxtplattformarna with government funding from Vinnova . This needs to happen in the region but also through clear links and collaborations with other innovation and knowledge environments (both public and private) outside Värmland County. Primarily with the neighboring regions but also outside the immediate area. The focus should be on mobilizing and involving excellence in various areas to continue the development of an innovation ecosystem that can actively contribute to the development of the forest bioeconomy.

## **Signs of success**

Below are presented signs of success for the area of specialization. This will then be developed in a monitoring work.

- The smart specialization with all associated actors has together attracted entrepreneurs, innovators, investors and companies who want to realize their ideas because for them it is the best place in the world to develop. Paper Province is an important enabler in this.
- The work within the smart specialization has contributed to establishing functioning and long-term sustainable processes as well as services to support innovation of the bioeconomy.
- The work within smart specialization has contributed to developing cooperation on both a strategic and operational level between actors, which has led to more efficient innovation processes.
- The work within the smart specialization has contributed to the establishment and development of leading knowledge nodes in strategically selected areas linked to forest-based bioeconomy. This is in collaboration with research actors both in Sweden and internationally.
- The work within smart specialization has contributed to attracting both funding and expertise from Sweden but also from other countries.
- The number of start-up companies related to forest-based bioeconomy has increased in the region.
- The number of participating companies in projects and processes from industries outside the paper and pulp industry has increased.
- Research activities within Karlstad University have developed and led to even more collaborations with national and international research environments.
- We have increasingly involved the public sector and civil society organizations in the development of the green economy in the region. This is a step in building the large-scale demonstrator where Värmland can show off a variety of applications of forest bioeconomy.
- The understanding of how knowledge about gender, equality, equality and inclusion can be used to create sustainable growth has increased among companies, which is also reflected in concrete actions.
- The understanding of and handling of societal challenges has increased as a result of the specialization area's efforts.

# Digital health innovation

## Introduction

Sweden and Värmland are facing urgent and complex health challenges where, for example, the corona pandemic showed how health issues affect the whole of society. Public diseases are spreading and the inequality in who is affected is clear. Our healthcare system is fragmented. Responsibilities and roles are about to change because health is created in many ways and not by one actor. Today, the majority of public resources are spent on care and very little on preventive measures in schools, with individuals or in other parts of society such as civil society or urban development. Digital health means the digitization of services where the goal is to create health and prevent and manage diseases more effectively. The new possibilities offered by digitization can be applied to a wide variety of uses – from virtual school and psychological support to early disease detection or self-help for better health. Digital technology can link different organizations' work on health by sharing data, medical history or facilitate contacts with the authorities so that we can create efficiency in situations that users today often experience as culverts. Digital health is thus fundamentally about contributing to an increased focus on people's well-being. Digital technology has the potential to improve the quality of an individual's health as well as significantly reduce healthcare costs. There are great opportunities in the meeting between the public sector (including regions and municipalities), business and academia to develop new solutions.

One challenge is that the owners of needs are both women and men, while those responsible for technology solutions are often men. Integrating an equality perspective on innovation development can create new types of solutions.

The global market in digital health is expected to amount to SEK 408 billion in 2025 and creates opportunities for new jobs and regional growth. Health in this specialization is focused on making it easier for people to achieve good, equal health and strengthening people's own resources for greater independence and participation in community life.

## Vision

*A sustainable Värmland that makes a global difference by being a leader in driving health innovation together.*

An investment in digital health innovation takes place so that more people can live a healthier life and that we can cope with the complex societal challenges linked to health that lie ahead. We aim to achieve good, equal and equal health and strengthen people's own resources for increased independence and participation in social life. No actors can solve this on their own. Therefore, we need to work together to find the solutions that contribute to a sustainable society. Värmland has a unique ability and conditions that can strengthen the development of future digital health services. That makes us leaders in health innovation together. Through this strength, we attract the best employees, companies and researchers. Skills that can make a global difference.

## Strategic intentions/focus

The specialization and the Värmland Winnväxt initiative DigitalWell Arena will create attractiveness and a sustainable and healthy smart society. This must be done by focusing on:

- People and organizations should feel safe using safe and effective digital health services.

- Innovative companies and the public sector must develop new collaborations so that the digital health services of the future can meet the increased demand for health, care and care in society.
- Enable existing and new tech companies to invest in digital health innovation that will lead to regional growth.
- Attract the best competence, the best companies and the best employees to work with digital health innovation in Värmland.
- Create an internationally attractive research environment around digital health innovation .

## **Development forward**

In order to create digital health services that can meet our complex societal challenges, new ways of working and changed behaviors of individuals must be developed. The complexity of the societal challenge must be met with increased collaboration between public institutions to find new solutions to needs. In order for these new solutions to have an impact, the investment must develop clear conditions for innovative collaborations between owners of needs and innovators. This means that new rules of the game and culture, i.e. innovation of policy, are created at system level. In Sweden, equal health is important. A basis for creating equal health is that public organizations with social responsibility take an active role. In Värmland, we develop the ability to collaborate across many different types of borders and thereby create a unique prerequisite for success with digital health services. Business contributes to the public sector with competence and creativity around digital technology. Digital health services can be created in the meeting between companies and the publicly funded care, care, health and medical care sectors in Värmland. Historically, in Sweden, we have built a strong IT sector through the public sector and larger companies being clear demand makers.

Within the specialization, the actors must develop clear frameworks for what public organizations need and how quality is evaluated, this provides a unique opportunity to support the emerging sector of digital health services. Overall, the specialization should create an attractive force that attracts both new business establishments and favors the growth of new entrepreneurial companies. Companies that contribute to solving societal challenges with both new skills for the region and job-creating growth.

The areas of strength in the specialization give us the conditions to clearly influence development as well as an opportunity to create attractiveness for Värmland. We do this by gathering primarily in the DigitalWell Arena where the mission is to stimulate innovation for digital health services of the future. Digitization and the use of data create great opportunities to customize services and increase people's own ability to improve their health. It also creates conditions for organizations to involve people in the development of value-creating services for increased efficiency and quality.

## **Signs of success**

In addition to efforts and results, there are expectations that the investment will contribute and lead to further development. Successes can be different, sometimes unforeseen and usually dependent on external factors. Therefore, the points below should be seen as examples. Completely different and unexpected effects may occur in connection with the interventions.

Listed below are examples of things that are desirable to happen in whole or in part as a result of activities within the specialization Digital health innovation.



- Residents of Värmland feel that new health services make it easier to live a healthier life.
- Several national and international companies have chosen to establish themselves in Värmland.
- Municipalities and regions have succeeded in creating higher value with less resource use through new services.
- The innovation environment has helped a start-up company that sells digital solutions and was later valued at more than a billion dollars, a so-called unicorn .
- Established digital companies have created new businesses in digital health and attracted digital excellence for their expansion.
- Residents and organizations feel safe using a certified health application.
- Digital solutions that facilitate social contacts have contributed to breaking people's isolation, and digital services have created new solutions that facilitate everyday life for people who are on the margins of society.
- Research has developed further in an environment that attracts both capital and resources to Värmland.
- An investor culture has developed in Värmland and our investment companies attract capital from all over the world.
- An independent body for certification of health applications has been established in Karlstad.
- Värmland has agreed on a common challenge in health that we gather around. For example, there is a goal that "by 2030 there is good support for all young people with mental illness".

# Advanced manufacturing and complex systems

## Introduction

Advanced manufacturing and complex systems form an important part of industry in Värmland and span several different sub-sectors. According to an analysis in 2021 from Region Värmland, 29 percent of all employees covered by the region's strategy for smart specialization are found in the area of specialization. The companies had high profitability and generated a turnover of approximately SEK 28 billion. Competitiveness is based on a number of internationally leading companies, for example in green steel, high-strength steel, 3D printing with powder steel, propulsion and hydrodynamics as well as automation/robotization. Around these are supporting companies and subcontractors in various size classes spread across the entire county. The specialization means driving the transition to a more circular and green industry with the help of new technologies and innovations. The specialization is also part of the implementation of the joint strategy for industrial transformation in Northern Central Sweden.

## Vision

*A sustainable Värmland makes a global difference through the development of new solutions for advanced manufacturing and complex systems with lifelong learning as a foundation.*

Värmland's industry has come a long way in its transformation and contributes to the development of a more sustainable society. New solutions for more advanced and resource-efficient production are developed and disseminated through close cooperation between companies, researchers and supporting actors. The multi- and interdisciplinary, industrially related research at Karlstad University, the innovation platform Sustainable Steel Region, the engineering expertise in the region and a high degree of digitization in business contribute to the development of advanced production methods and complex system solutions. These are methods and solutions that include human aspects, take advantage of differences and attract both women and men to the industry. The products and services that are sold are developed from a sustainability perspective and create value for suppliers and customers as well as employees and residents. The interest in our region is great internationally and the industry in Värmland attracts competence and employees from all groups, both within and outside the county, nationally and internationally.

## Strategic intentions/focus

The specialization should contribute to:

- Sustainable social development through resource-efficient production.
- A green transformation of the industry.
- An increased interaction between research and industry.
- A development of strong innovation environments.

Access to research and innovation environments is important for the development and dissemination of new solutions. In order to develop and strengthen collaboration between researchers, companies and the public sector, the interdisciplinary research center and innovation environment DAMI was established at Karlstad University. The center focuses on advanced manufacturing and complex systems, but also integrates other parts of smart

industry such as forest-based bioeconomy, solar power and value-added services . DAMI also addresses human, social and societal aspects.

Companies in the area of specialization must offer attractive workplaces for employees and create value for residents, including through reduced climate impact. In 2020, the Sustainable Steel Region was established , a large-regional innovation platform with a focus on the strength area of advanced steel. The aim is to generate new innovations and companies out of the regional steel industry's need for a green transition, which then form the basis for a new high-tech industry in the region. Another strong innovation environment to be developed is linked to the area of hydrodynamics. The specialization will make use of knowledge, actors and collaborations, mainly in Northern Central Sweden, but also in other places.

## **Development forward**

There are clear ambitions for the continued development of the industry, above all through the joint Strategy for industrial transformation in Northern Central Sweden, which was adopted in 2021 and points out a number of strategically important areas of action. Large parts of the industry are facing major global pressure for change. The requirements for resource-efficient production and green conversion are increasing. Green hydrogen, biogas and other fossil-free solutions as enablers for transport, in agriculture, for green steel production and electrification are important pieces of the puzzle for reducing carbon dioxide emissions. Industry, the transport sector, academia and the public sector in Central Sweden have come together in the Mid Sweden Hydrogen Valley initiative , which will contribute to fossil-free industrial production, green transport and stable, regional energy systems. Although many large companies are already part of global value chains today, this remains a major challenge on the subcontractor side.

In recent years, several initiatives have been taken which, in the long term, can contribute to strengthened adaptability in small and medium-sized companies, more innovation, increased competence and lifelong learning in the business world. However, several of the investments are new and need further development. Examples of efforts to improve the supply of skills at different levels are the establishment of the Industrial Council Värmland, a structure for vocational training and industry nodes.

Together with, among others, the National Industry Council, Teknikcollege Värmland (TC) and Innovation Park in Karlstad, six municipalities have decided to build up local industrial nodes. Offering individuals and companies training as well as test and demo environments should contribute to the companies' development, facilitate the supply of skills and create positive attitudes towards the industry among the residents. The initiative has the potential to develop into a national testbed for regional infrastructure models for vocational training and lifelong learning.

The transformation of the specialization is supported by the following points:

- Green conversion and energy efficiency in industrial production and transport, for example increased use of non-fossil fuels and waterways.
- More efficient industry with the support of digital solutions and lean production, for example artificial intelligence and robotization/automation.
- Increased resource efficiency with new techniques and materials, for example 3D printing with powdered steel.

- Mechanics and mechatronics and the interconnection of systems are becoming increasingly important and demand a holistic perspective and systems competence in the workforce.
- The industry's need to be attractive as a workplace and career choice for everyone, not least women and people with a foreign background.

## Signs of success

In addition to concrete efforts and results, there are expectations that ongoing and new investments will contribute to further development of the strength area. Therefore, the points below should be seen as examples. Completely different and unexpected effects may occur in connection with the interventions.

- A more equal and egalitarian working life with improved access to both broad and cutting-edge skills.
- Increased industrial competence when it comes to monitoring, controlling and adaptively optimizing technical processes.
- Increased mechatronic competence and an additive manufacturing that is integrated with digitization solutions that optimize manufacturing processes.
- Increased collaboration in research projects and innovation environments such as DAMI, Lean Factory , AT Lab and hubs/testbeds within business.
- Spreading knowledge about the potential of advanced manufacturing to more small and medium-sized companies that contribute to increased exports also at the subcontractor level.
- More innovations in the business world, thanks, among other things, to an increased interaction between several of the smart areas of specialization.
- Increased growth in affected companies (employees and/or turnover) and increased profitability.
- Increased attention and more strategic collaborations nationally and internationally, for example through projects within Horizon Europe.
- Establishment of a national test bed and demo environment in industrial competence supply and lifelong learning in the region.
- Increased attractiveness for investors, companies and skills from other regions (nationally and internationally).
- Larger companies choose to place, develop or maintain their R&D resources in the region, among other things because Värmland is an attractive region for competence and an accessible region in terms of green electricity and fossil-free logistics (for individuals as well as products).
- Existing or new companies bringing innovations linked to the green transition of the steel industry to a global market.
- Establishment of new value chains in the region that strongly contribute to national and international climate goals.
- A regional industry that is well on its way to CO<sub>2</sub> neutrality.
- More industrial companies that through digitization and automation have increased their competitiveness and thereby contribute with exports to the global value chains.

# Attraction through sustainable place development

## Introduction

With a continued strong anchoring in the previous smart specialization Nature, culture and the digitized experiences of the place, this specialization broadens the work to also include the development of attractive places throughout Värmland. This makes the work more complex with more actors that need to be involved and more perspectives that must be considered. Previous specialization has produced a new digital innovation method, initiated testbeds and created new collaborations within the hospitality industry. This work will now be deepened, developed and include more organisations. Arenas and meeting places for innovation are created where companies in the hospitality industry together with other stakeholders are given the opportunity to further refine our common natural and cultural heritage, including for places with potential for great attractiveness. With the combined skills that exist within the area in Värmland, there is potential for the hospitality industry to be strengthened at the same time as community services are developed, mainly in rural areas. The specialization takes advantage of technological advances in terms of, for example, digitization, visualization, AI, VR and analysis of data. Service design perspectives are adopted with the user as a co-creator of their own experiences and in how the user assimilates value from the experiences.

## Vision

*A sustainable Värmland that makes a global difference by showing the way for value-creating destination and place development.*

Sometime after 2030, we can state that innovative and sustainable destination and place development where digital technology has been combined with spatial planning and storytelling has contributed to a growing tourism industry, increased immigration and more business establishments and investments in Värmland. New successful solutions and concepts have been developed in sustainable, attractive and safe places that are based on the participation of a variety of actors, an understanding of the interests and needs of different target groups as well as resource efficiency and local renewable materials. Companies in the hospitality industry have developed innovative concepts and products. The methods have been characterized by experimentation in fast processes where the guiding star has been "fail fast" to learn from failures and quickly arrive at solutions that work. The concepts for attractive places have spread widely in the region after they have been adapted to local conditions with little means. The solutions are smart in that they are resource-efficient, cost-effective, make use of digital technology and synergies between different resources and create value for a diversity of visitors, residents and businesses. The work has contributed to visitors and residents encountering places with a clear profile that strengthens the identity of Värmland as a forward-looking, open and inclusive region.

A success factor has been the trust built up between the actors, a non-prestige approach, a desire on the part of the participating people to contribute to something better and greater than what they would otherwise be able to do in the contexts they normally find themselves in.

Interest in our region has increased both as an effect of a number of new attractive places and thanks to innovative methods of place development that have attracted international attention.

## Strategic intentions/focus

The specialization strengthens Värmland's attractiveness through an industry based on the co-creation of new and

innovative solutions for sustainable value-creating experiences. The specialization has the unique conditions of places in Värmland as the basis for the experience, but the method is cross-border in terms of, for example, geographical areas, research disciplines, industries within the business world and various parts of the public sector. The specialization uses digitization as a tool to create new dimensions of experiences, but also to make the experiences available to more people.

No actor is able to achieve the desired change alone, but needs cooperation with others. The specialization focuses on offering a platform with meeting places for innovation and collaboration with the ambition to develop and change. The starting point is companies in the hospitality industry, but where more skills are used, new forms of cooperation are developed and several positive effects are created that also contribute to society at large. The platform must also provide support for organizations in their individual missions.

### **The development forward**

The ability to build a common vision and target image, and to gain support for this, is central to the transformation and to creating an innovative and sustainable way of working within the specialization. Together with the majority of actors in Värmland such as entrepreneurs, companies, landowners, municipalities, the county administration, the region, the university and civil society, Visit Värmland will offer an open platform to facilitate cooperation in the work with the smart specialization. The aim is to jointly build competitive advantages through development and matching between the knowledge that research can contribute, the resources available in the public and business world, as well as the needs of the companies and the market's demand. The specialization has a particular focus on the needs and potential of small and medium-sized companies.

The transformation of the specialization is supported by the following points:

- Adjustment towards a closer market (higher proportion of visitors from the immediate area, the rest of Sweden and neighboring countries) but also the strengthening of the companies' global competitiveness.
- Changeover and development of the hospitality industry's companies.
- Attractiveness and location development as a common point of departure in the specialization.
- Prioritizing places with potential for attraction or that even give rise to longer journeys.
- Create new innovation arenas and test beds.
- Increase collaboration with other clusters such as Compare , Paper Province and Nifa to create cross-fertilized innovations and take support from the common perspectives in the strategy.
- The participation of a diversity of the resources available in the public sector,
- Embrace new technology to create new dimensions to experiences, increase value and make experiences available to more people, but also see and understand that people need both connection and disconnection at different times to feel relaxation.
- Raise the level of education in the hospitality industry.
- Sustainable and equal hospitality industry in Värmland.
- Strengthen community services for both residents and visitors and thus increase the opportunity to live, work, live and visit the whole of Värmland.

## **Signs of success**

Below are presented signs of success for the area of specialization. These will then be developed in a monitoring work.

- New reasons to travel or move to Värmland .
- More start-up companies and a higher survival rate for these.
- Growth in existing companies that "want to grow".
- Innovations.
- Site development with cross-border cross-fertilizations.
- Export of Värmland culture, music and other products/services that belong to the specialization.
- Innovation and collaboration arenas.
- The research activities within Karlstad University have been broadened and developed and led to even more collaborations both with regional actors but also with national and international research environments.
- Increased pride locally and increased satisfaction globally.
- Increased sustainability within the specialization.

# Sustainable system solutions with solar at the center

## Introduction

The basis of the specialization is the hub that Glava Energy Center forms in processes with collaborative partners such as Karlstad University, business, municipalities and the region for the development of solar energy and energy systems. In addition to the direct development of solar energy, the specialization also deals with how solar energy should interact with other energy production from hydro and wind power as well as biofuel-based power production. Energy storage in batteries and hydrogen as well as control of energy systems are also central areas of specialization. The energy system of the future requires greater interaction with energy use, which means that systems for collaboration with energy use (energy flexibility) in society, industry and private households are also included. Just as important as the technical systems are how the energy systems interact with people in, for example, energy communities and cooperative models. The specialization should be seen as a significant contribution to the ongoing electrification and climate change that is taking place in Sweden and internationally.

## Vision

*A sustainable Värmland that makes a global difference with photovoltaics at the center where we create innovative solutions for the sustainable energy system of the future.*

Access to energy is central to society, businesses and private households. By creating innovative solutions with solar power at the center, we enable the development of a sustainable energy system for Värmland with room for new establishments, while the solutions can also be exported to the rest of Sweden and the world. As Värmland is at the forefront of development, we will attract competence, companies, innovators and researchers in a positive development spiral. By creating testbeds around different energy focus areas around Värmland's municipalities, an innovative and attractive energy region is created where concrete development takes place and where the region becomes a natural gathering place for energy actors and establishments.

## Strategic intentions/focus

According to many scenarios, Sweden's electricity use will more than double from 2022 to 2045. This is an enormous challenge, but the specialization focuses on the energy source that has among the lowest production costs for new electricity production in Sweden and that can be expanded the fastest - solar energy (focus area 1). To handle the increased amount of energy and the variations in solar and wind power, the specialization also includes sustainable distribution, smart control and energy storage (focus area 2) as well as sustainable energy consumption and flexibility (focus area 3). Energy communities (focus area 4) enable, for example, private households to interact more with the energy system, which is positive from a societal perspective.

Värmland has a great advantage with industrial competence and research around solar energy, data/IT/AI (for smart control of energy systems), wood/biomaterials (to replace steel and aluminum in solar energy systems and thereby reduce the climate footprint) and workshop and process know-how (for development of energy-flexible manufacturing processes).



By analyzing and processing today's and future challenges in the energy system, the problems are converted into business opportunities through the development of innovations, services and business models. During development, innovators, companies, universities, clusters, testbeds, society and individuals interact, which means that real, realistic products are produced that can make a difference in the near term and in the future. High speed in the innovation processes is essential and resources in the form of incubators, accelerators, project funds and risk capital develop into a seamless chain. At present, this chain is partly fragmentary in Värmland and in order to reach full effect, all functions need to be developed, established and available regionally.

## **Development forward**

The specialization invests in areas with the greatest potential to influence the development of a smart, sustainable energy system with solar at its core. For each area, a network of strategic partners is created and testbeds are developed or further developed (if already established) for the development of innovations, services and business models. Collaboration with other specializations and clusters is central as all companies depend on sustainable energy for their operations and future development, while there is great potential in cross-industry solutions. New areas of technology require new education at YH, high school and university level. Due to its position in the specialization, Karlstad University has the greatest opportunity to capture these new needs and translate them into new educations at university level.

## **Signs of success**

In addition to concrete efforts and results, there are expectations that ongoing and new investments will contribute to further development of the smart specialization within solar/sustainable energy systems. Therefore, the points below should be seen as examples. Completely different and unexpected effects may occur in connection with the work within the smart specialization.

- The solar industry continues to grow by 60 percent per year (installed power) in Värmland and Sweden. To compare with an expected global growth rate of 34 percent per year on average.
- Värmland companies in the solar industry grow more in terms of turnover and profit than the national average in the industry.
- Glava Energy Center has positive growth in members, project volume and innovation projects.
- Karlstad University's research within specialization is increasing, new courses are being developed and graduated students are on par with the area's growth rate and needs.
- Successful establishment of testbeds (partners, funding and location on site):
  - Solar energy combined with hydropower and smart control.
  - Solar energy in combination with wind power and smart control.
  - Energy communities.
  - Energy cooperative.
  - Management of energy storage in the form of batteries and hydrogen.
  - Energy flexibility in buildings.
  - Solar energy in transport infrastructure (game fence, noise board, road/rail bank).
  - Solar energy in power line streets.
  - Electrification of agriculture.
  - Electrification of the transport sector including energy infrastructure (battery/hydrogen/power grid).

- Successful cooperation with hydrogen filling stations under establishment.
- Successful establishment of the mission Smart sustainable energy system in Värmland.
- Successful collaboration with Sting Bioeconomy, DigitalWell Ventures , Almi and other innovation and funding support organizations.
- Establishment of accelerator for companies in solar energy and energy systems at Glava Energy Center.
- Successful cooperation with venture capital for financing innovations.
- New establishments in the region by companies in the energy sector.
- Successful competence center for solar energy, SOLVE for Karlstad University with partners.
- Successful collaboration with other specializations and clusters.
- Successful participation in Horizon Europe project .
- Export success for several companies even today within the specialization.

# Food in sustainable interactions

## Introduction

With Värmland's food industries in focus, a new smart specialization is being developed.

The starting point for the specialization is the possibility of increasing the added value both in the food sector and in other industries. It must be done for situations where food is consumed by creating new concepts where value chains, industries or industries are integrated. A concept could, for example, be ready-made food bags for home delivery, shop-cooked food or subscription to food from a local farm. At the same time, sustainability must be part of these concepts. Situations mean, for example, larger events where the meal is important, in care for the elderly and school meals or where there is a demand for meals related to the climate. The focus of the specialization should be to create concepts and services that enable several areas of strength to interact to develop the food area with food as a lens and starting point.

The cluster organization Nifa brings together the actors in the private and public sector and acts as a bridge builder between the food chain and other areas of strength to create conditions for innovation and growth.

Taking stock of "situations" must mean that the added value must be able to increase at each step in the value chain (and thus the removal of value at each step), that is, in each part of the processing. Companies in every part of the processing chain must be able to strengthen their ability for product and service development and thus sustainable growth.

As an effect of strengthening the food sector, including primary production, the capacity for own food supply in a crisis is strengthened.

## Vision

*A sustainable Värmland that makes a global difference through value-creating products and services for the sustainable processing and consumption of food with Värmland roots.*

Värmland's ability to develop sustainable value chains and concepts based on food should produce the best results (economically, environmentally, socially) where food is processed and consumed. It requires an international perspective. The concept must also be globally adaptable, i.e. work in different geographical and cultural contexts. The vision should lead to attention and legitimacy on a national and international market for Värmland's food products and for the concepts that Värmland offers. This is to establish and develop sustainable value chains with food as a starting point.

A more competitive and unique industry is emerging with greater access to venture capital for innovation, including research-based evidence for the products' value creation. At the same time, an attractive development and production environment is created for companies and employees. Employment, value added and export value from value chains linked to food are increasing while the climate footprint is decreasing. Focusing on demanding customers who pay more for the concept than for traditional products increases the opportunities to drive development in the desired direction. We consumers can all contribute by choosing the right products. In addition, we get more lively countryside with open landscapes where we eat Värmland more beautifully.

Värmland's ability to develop sustainable and profitable value chains, based on food, is also completely in line with Värmland's food strategy. According to the food strategy, the industry must move from focusing on process and production logic to focusing on value creation for consumers and to do so with the whole world as a potential market. In this way, the movement from being unprofitable producers to becoming profitable entrepreneurs begins.

## **Strategic intentions/focus**

The envisaged specialization is dependent on and makes use of all designated areas of strength in Värmland. The combination is not found in any other region, and creates uniqueness for the region. It also interacts well with, and benefits from, the specializations of several other regions, both in the neighborhood and further afield. This means that Värmland can act as a locomotive for entrepreneurial opportunities and scaling up in larger markets.

We will develop concepts that create synergies within and between value chains and benefit from integrating the identified perspectives in the strategy as well as the three sustainability dimensions. It provides unique and hard-to-copy innovations that ultimately create long-term value and competitiveness. The concepts must be able to be applied in different sectors, such as school, care, Friday coziness, the working lunch, the gym, outings and emergency situations. They must also be able to be adapted and scaled up geographically, to other regions in Sweden and internationally.

We must move away from today's food chain where the focus is on the food as such. This is because this chain can be labor-intensive with low profitability, where the region's companies have little opportunity to grow in volume and employment. Another reason is that the chain is automated to secure profitability where the risk is that there will be negative employment growth. Instead, we should approach a knowledge-intensive food chain that utilizes and facilitates connections between value chains where the starting point is how and in what situation food is consumed. Such a change provides great opportunities for business to grow in attractiveness, employment, entrepreneurship and economic values. It also provides the opportunity to secure and make sustainability visible as a value for both public and private actors and consumers. This, in turn, can create the conditions for a larger market, a higher willingness to pay, an increased degree of self-sufficiency and a more robust food chain.

## **Development forward**

Based on the vision, strengths, weaknesses and efforts have been inventoried in relation to essential actors. In addition to these, some more general interventions have been identified as important for specialization. They are based on the fact that the specialization should enable the high degree of cross-border cooperation that the vision requires.

The activities are general in nature, but their content and actors must reflect the concept of value-creating food where competitiveness and sustainability lie in interaction, in and between value chains.

New and strengthened collaborations between academies, companies, authorities, organizations and individuals are needed with the aim of removing bottlenecks within smart specialization as well as taking advantage of and further developing strengths.

The following efforts will be central to creating a platform for actors from different industries with the aim of enabling the development of value-creating collaborations that lead to unique products and other values:

- mapping, analysis, statistics, strategies and plans
- e tabulation of networks/councils and recruitment of key personnel
- process management, mobilization, profiling and events
- applications and funding
- demonstrators, testbeds, Science center, accelerator and innovation support
- competence development
- design processes.

The transformation of the specialization is supported by the following points:

- See food from a holistic perspective and value-creating product/service that contributes to a competitive business structure and sustainable development.
- The idea that the entire value chain from farm to table is included.
- Make a difference and test things that can inspire nationally and internationally.
- Food for life can be transformed into a concept.
- Create role models for how to do things.
- Develop services around the food supply.
- Opportunities to attract new startups to Värmland, with a connection to value-creating food, need to be built up to increase competitiveness and create synergies.

## **Signs of success**

Below are presented signs of success for the area of specialization. This will then be developed in a monitoring work. Signs of success relate to different audiences (here they are collected):

### **General signs of success**

- Adapted regulations for the industry.
- Increased proportion of procurers and buyers who apply sustainable, circular and innovation-driven criteria in food-related business
- Clearly increased share of Värmland-produced food and sustainable food concepts in public procurement.
- Gold Label certified cluster.
- A cluster that is a role model and known for its strengths based on cross-border cooperation according to the criteria below.

### **Geographically cross-border cooperation**

- Increased cooperation between country and city with the aim of forming a scalable, robust and marketable concept to test and secure the sustainability of the food system all the way from farm to table.
- Increased cooperation between levels, and between small and large companies, with the aim of reaching larger markets, an increased export value outside the region and an increased degree of self-sufficiency with food and food-related products and services from Värmland.

### **Demographic cross-border cooperation**

- Increased inclusion (equal, equal) in the food-related nutrition structure, the production chain and the education system, is deliberately used as a lever for economic, social and environmental sustainability.
- Increased awareness and active participation among children and young people for sustainable food production and consumption
- Increased supply of skills, innovativeness and entrepreneurship in the food system.

## **Interdisciplinary cross-border collaboration**

Food in sustainable interactions is the common denominator for:

- An interdisciplinary platform for innovation with specific goals such as:
  - Increased number of startup companies, successful exits , patents, licensing
  - Innovative cross-fertilization between food and other products and services
  - A new generation of entrepreneurs (age-wise but mainly method-wise)
  - Increased capital investment
  - Attractive test beds for food-related products and services
- Increased research capacity and educational opportunities at KaU and other learning centers within the county,
- Increased collaboration with other universities/research centers nationally and internationally.
- Increased collaboration with other clusters in and outside of Värmland for a climate and environmentally sustainable food industry with a particular focus on the circular, digitization, service creation and automation. Examples of this could be:
  - A successful collaboration with Sting Bioeconomy, Almi and other innovation and funding support organizations
  - Increased electrification within primary production

# Computer games and gamification

## Introduction

The gaming industry is one of Sweden's most successful industries. It had a turnover of SEK 34.7 billion in 2020, to be compared with the export of iron ore (SEK 28 billion) and paper pulp (SEK 23 billion) in the same year. The Swedish gaming wonder has de facto become a new base industry. The industry currently accounts for one percent of employment in Värmland, but is growing faster than the region's business life as a whole, both in value added and number of employees. The Great platform Journey's , TGJ (part of Innovation Park), extensive studio and business expertise and worldwide contacts with the gaming company Embracer at the forefront, have laid the foundation for significantly more people to be able to build the gaming industry in Värmland for a global market. The specialization is based on Värmland's strengths and aims to build a competitive gaming environment in Värmland.

## Vision

*A sustainable Värmland makes a global difference through the development of computer games and gamification in user-driven and inclusive gaming environments.*

The computer game industry is in many ways a forerunner and benchmark for industries undergoing a digital transformation. The vision for the specialization is to contribute to the transformation of business through diversification, innovation and structural change through game development and gamification as it is commonly called. Game development contributes to diversifying the business structure. By virtue of strong location factors in the Värmland ecosystem (competence, processes, value base), the specialization promotes a fast-growing and fundamentally global and location-independent industry. Establishments of computer game companies in the region also offer new distributed ways of working where the people are spread out in different places in the world, enabling the region to attract companies and talent from more industries. Gamification helps to innovate other industries. Use of game methodology, and the special business logic of digital products strengthens uniqueness, reach and value creation even in companies outside the game sector. By virtue of the Värmland combination of expertise in games, storytelling and service research, the specialization promotes value creation, regardless of industry. Game development and gamification respectively deliver transformative results in their own right. The Värmland ecosystem also enables mutual development of both orientations, which contributes to changing the structure of the gaming industry as such.

## Strategic intentions/focus

We want to develop a stronger game ecosystem with more studios (groups that develop games together) to create new digital products, user behavior services and business models. This must take place in close contact with the cultural sector. The uniqueness of Värmland's gaming industry lies in the talent production of individuals and companies that the innovation environment provides, as well as the values that the cultural and creative industries contribute. In addition, we are rooted in the storytelling tradition as well as the entrepreneurship that business contributes with.

The Center for Service Research at Karlstad University is intended to contribute to development through research and the transfer of knowledge between the gaming industry and other industries.

The specialization's strategic intentions and focus is to contribute to transformation, both of its own industry and others, through the focus areas of game development and gamification. Within these two areas there are six sub-areas:

**1. Entrepreneurship**

The company Embracer has paved the way by building its business on developing, acquiring and refining copyrighted game titles or the IP as these are known in the industry. Transferred to newly started computer game companies, so-called startup studios, it is expressed in the drive to develop new IPs and game titles. The innovation environment The Great Journey , which also includes an accelerator, promotes the drive to develop new IP /game titles by welcoming game developers and strengthening their ability as entrepreneurs. This also includes developing the support system's ability to match the logic of the gaming industry in terms of risks and business models. A future general tech incubator will strengthen the industry's attractiveness in the region.

**2. Breadth of competence**

Game development relies on a range of skills, such as design, art, literature, behavioral science, psychology, programming and project management. The industry is highly hands-on and both requires and enables the development of both pedagogy and didactics. Inclusion and equality are part of the strategy to bring out new IPs /games and reach new target groups and markets.

**3. Cultural heritage**

Stories are part of Värmland's cultural heritage and a treasure to be scooped up for game ideas and game development. Exploring synergies between culture and games is natural. Computer games are also in themselves a cultural expression and part of our future cultural heritage.

**4. Value creation**

The gaming industry has a strong focus on user-friendly and inclusive development. The methodology can be used to promote other industries' ability to organize and innovate in order to strengthen customer experiences, with sustainability as a basis.

**5. Digitization**

Companies in the video game industry are at the forefront of creating and capturing value through fully digital offerings. Computer game development, for example, gives cultural and creative industries the opportunity to translate literature, oral tradition, music, dance, performing arts and visual arts into digital experiences and products.

**6. Cross-border**

Computer games include disciplines within, for example, design, art, literature, behavioral science, psychology, tech , programming and project management. The mix and a cross-disciplinary way of working gives the opportunity to reflect and develop most arenas of human activity.

## **Development forward**

The biggest challenges and opportunities are linked to skills and inclusion, especially when it comes to game developers. It is about more training places, which is fundamental to bringing game developers, games and



sustainable companies. The needs extend far beyond cutting-edge programmers and developers. The value base work in the region provides the opportunity to attract a diversity of talent to the building of an ecosystem around new games, studios, IPs and markets. The Nordic region's integrated cooperation on labor markets and educational opportunities benefits computer game production. There are opportunities in strengthening connections to national initiatives for synergies and seeking collaborations with other regions.

The emergence of a Värmland gaming industry provides strong incentives for research collaborations and new research questions. The researchers need to stay close to the developers and vice versa. It is a three-minute walk between Karlstad University and The Great Journey . Embracer , with headquarters in Karlstad, has extensive information, data and a large network that can be made available for research and research collaboration at various levels. Embracer could become a preferred partner for research into consumer behaviour, communities , business models, user experience ( UX ) and market understanding. There is also potential for research collaborations linked to computer science, cultural science, media and communication science and the formation of the Geomedia center. The industry is a so-called " born global", which means digitized development that enables global distribution and use right from the start. With limited use of physical inputs and few and location-independent people, large processing and export values can be created. It provides different premises for company valuation than in traditional industries.

## Signs of success

Below are presented signs of success for the area of specialization:

- More programs, training places and students per year in relevant subjects (high school, folk high school, polytechnic and university).
- More interdisciplinary and multidisciplinary education programs and R&D projects.
- More studios.
- More startups .
- More companies in the gaming industry establishing themselves in the region.
- The establishment of a Science center in Värmland where games are part of the experience.
- The gaming city Karlstad is manifested through various experiences and demonstrators in the urban space.
- More game developers moved into the region.
- Collaborations with Compare and others in the field of " gaming for health ".
- The available risk capital has increased in Värmland.
- More IP owners.
- More IP/game titles.
- Greater added value created by the gaming industry.
- Higher export value.
- More number of employees.
- More number of downloads/players.
- More companies/organizations using gamification also in the other specializations.
- A stronger and more competitive ecosystem compared to benchmarks such as Arctic Game Lab and Game Incubator in Skövde.
- More active companies in the ecosystem.

- An ecosystem that contributed to reducing the use of fossil-based energy and reducing the gaming industry's climate footprint.
- International attractiveness – companies and individuals moving to the region.
- More women in the industry (students, game developers, game entrepreneurs).
- More female founders/owners of gaming companies.
- More products made by women.

# Strategic methods and working methods

In addition to the seven areas of specialization, the strategy includes new ways of working. It is about working mission-driven, taking advantage of greater entrepreneurial opportunities within the specializations and consciously letting the specializations meet the seven different perspectives. In addition to this, the entire strategy must contribute to sustainable development from an environmental, social and economic perspective.

## Mission-driven work

The way of working with missions has been introduced in European politics to more clearly address the major societal challenges. Within the EU, they work with missions to bring together and coordinate policy, regulations, funding and actors from the EU's member states. It can apply to regional and local actors in the public or private sector, such as researchers, farmers, landowners, entrepreneurs and investors.

The European Commission has identified five priority missions:

- Adaptation to climate change, including societal transformation
- Cancer
- Healthy oceans, seas, coastal and inland waters
- Climate -neutral and smart cities
- Soil health and food

The aim is to create lasting change and actionable, concrete solutions to some of our biggest societal challenges. Solutions are created, among other things, by giving innovation and research and residents a new role in social development at the same time as new forms of collaboration, management and governance are created.

*“Missions are bold and inspiring with broad social relevance. They provide clear direction, are ideally targeted and measurable. They are based on actionable innovation work and ambitious and factual research. These are delivered through multiple top-down and bottom-up activities and place their trust in interdisciplinary, cross-sector contexts that create action power with relationships with different types of actors and multiple levels simultaneously.”* ( Vinnova . Translated into Swedish.)

A process will be developed to design missions in Värmland that are based on Värmland's challenges and that connect as much as possible to the EU Commission's priority missions. The work involves relevant actors, including many of those who are central to smart specialization. In the missions, the ambitions must be set high and create the conditions for new ideas and solutions to be developed. Missions must be equal, courageous, inspiring and concrete, and contribute to a mobilization towards the common objectives. Important parts of a mission-oriented way of working are the ability to mobilize actors towards goals, explore different perspectives, identify goal and interest conflicts, test and learn together and find new integrated solutions. It is also a way to give existing investments and collaborations a larger context that is favorable to the issues being pursued.

In the initial work, the challenges are further defined, actors with the opportunity to make a difference are invited. The overall objective is broken down into quantified and timed sub-goals and the work is organized into different focus areas.

Two areas that may become relevant as missions in Värmland are:

- Sustainable, healthy and equal smart societies.
- Smart sustainable energy system.

## **Sustainable, healthy and equal smart societies**

### **Challenge**

In the world, just like in Värmland, there is a climate and health crisis with social injustices and deficiencies in gender equality and equality. Unequal distribution of economic resources, urbanization, and partial lack of viable rural areas are other challenges that we all face. In Värmland, we see that different development projects often do not talk to each other in different sectors and areas. Many of the projects do the same things. Other areas that need to change are not taken care of.

### **Background**

More local solutions and new ways of working need to be introduced to respond to the above-mentioned challenges.

The mission could, for example, be about actively linking complex challenges. One of these challenges is selected and the work is carried out by taking advantage of synergies so that there is an impact on other areas in the desired direction. It is important to find good so-called leverage points where the effects of the efforts will be greatest.

An example of a working method is to examine how "the whole system in the room/in places" can be met by focusing on four directions and transformations:

- Increased public health in various Värmland communities.
- Sustainable and equal mobility for all Värmlanders where children's access to mobility (for example public transport and safe walking and cycling routes) is taken into account.
- Significantly strengthened conditions for biological diversity and community-based food production.
- An equal and equal support system to equal opportunities for entrepreneurship in the broadest sense.

### **Goal setting**

By 2030, Värmland will have come a long way to live up to Värmland's part of Agenda 2030 and the global goals. Establishing the mission begins with mapping the system of actors who need to be involved in order to tackle these directions.

The specializations that are primarily judged to be able to contribute to the mission are:

- Attraction through sustainable site development.
- Digital health innovation.
- Food in sustainable interactions.

- Computer games and gamification .

Other specializations are involved to varying extents.

## **Smart sustainable energy system**

### **Challenge**

Värmland's communities and companies risk a lack of electrical energy in the near future.

### **Background**

The energy transition underway in Sweden has and will have an important impact on the energy situation in Värmland. Currently (2022), Värmland has its own electricity production of around 70 percent. With the new establishment of electricity-intensive industry in Norrland, much less wind and hydropower from Norrland will reach Värmland within a few years. The restrictions in the main grid mean that it is only possible to connect a limited amount of new electricity production to the regional grid. It inhibits the development of larger solar energy facilities and stops wind power installations in most of Värmland until 2030, when the bottleneck must be resolved. Even with the bottleneck resolved, there are limitations in the regional network. At the same time, technologies such as energy storage, energy flexibility and smart control open up opportunities for other solutions that relieve the electricity grid and reduce the need for investments.

### **Goal setting**

The mission could, for example, be about ensuring access to sustainable energy for Värmland communities and companies and enabling new establishments.

Establishment of the mission takes place mainly through the participation of the specialisations:

- Sustainable system solutions with solar at the center
- Forest bioeconomy
- Advanced manufacturing and complex systems.

Other specializations are involved to varying extents. The mission will require the mobilization of relevant actors from business, the public sector, the university and civil society.

## **Entrepreneurial opportunities**

New entrepreneurial opportunities are another central concept within smart specialization. It is about opening up to new possibilities and ideas during the process . It can be transversal initiatives or effects of investments in smart specialization, for example the development of a new promising industry or a larger company establishment. In order to identify and quickly mobilize around new major entrepreneurial opportunities during the program period, the working method needs to be developed. Actively integrating resources from the regional innovation system with investments in entrepreneurial ideas and driving forces not only contributes to developing the areas of specialization but also strengthens the innovation system.

The clusters and their members, Karlstad University, Region Värmland, the municipalities concerned and, not least, establishment functions are examples of actors who need to collaborate.

Two areas for new major entrepreneurial opportunities that have been identified initially are land-based fish farming and year-round testing of vehicles in winter climates. Both have connections to the region's innovation system, they are found in the borderland between several of the seven specialization areas and involve, among others, Karlstad University and several municipalities.

## **Land-based fish farming**

Here there is a range of competences in the region's smart areas of specialization that can strengthen the development of the industry, for example process know-how from Forest bioeconomy, as well as opportunities to produce fish feed from secondary raw materials and to use waste heat from the forest industry. Within Food in sustainable interactions there is know-how on how to refine raw materials and within Advanced manufacturing and complex systems there is competence in how to design complex systems (such as a fish farm). There are also suppliers of components and software here, as well as specialist expertise in hydrodynamics that can be used to optimize water flows. Karlstad University has research in several areas that may be of relevance, such as aquatic biology, digitization and automation of production, lean production, innovation, business development, equality and equality. Land-based fish farming can also make use of the already existing Norwegian distribution systems.

## **Climate testing of vehicles**

The facility will be able to perform both hot and cold testing. It will be possible to test in rain, snow and other varying weather conditions. There are a large number of resources here that could be useful or benefit from an establishment. Examples of connections to the smart areas of specialization can be found in simulation and games, testing of solar systems in controlled and repeatable climates, AI and machine learning, big data analysis , 5G and real-time networks, cloud computing , security and Internet of things . The tourism industry will also benefit both during the construction of the facility, which is planned to be built in wood, and when the facility is in operation.

## **Shared perspectives and working methods**

During the period, deliberate work will be done to combine the specializations with each other and with perspectives that can contribute to renewal and sustainability. It is often at the intersection between areas of expertise and perspectives that Värmland can develop uniqueness and where new solutions can emerge. Sustainable development is an overarching perspective that must be integrated into the entire strategy for smart specialization. Competence areas and methods from the perspectives of social innovation, equality and inclusion, circular economy, digitization, social security and value-creating services to be integrated with the work in the sectoral specialization areas. These perspectives contribute in different ways to strengthening sustainable development. Through common perspectives and working methods, new forms of cooperation are developed. Actors who previously did not cooperate are getting closer to each other. This also includes creating meetings between rural and urban areas and between different parts of Värmland. In order to build up knowledge and competence and drive the work of integrating the perspectives in all specializations, an organization will be given responsibility for a platform for each perspective.

## Sustainable Development

As a basis for all regional development work, there is the requirement for sustainable development. The strategy for smart specialization must contribute to meeting challenges, seize opportunities and drive development based on Agenda 2030 and for a transition in a sustainable direction. Smart specialization should help companies to sustainable growth through equality, integration, climate and environmental adaptation and internationalization. Sustainable development is based on the three dimensions of environmental, social and economic sustainability. It is also the basis for meeting our and future generations' basic needs. Just as the 17 goals in Agenda 2030 are indivisible, the three dimensions are connected.

- **Environmental sustainability** is, simply put, the framework we have to relate to in order to live wisely without consuming the earth's finite resources. We use forests, soil and water to create good living conditions, ensure ecosystems and the long-term function of biological diversity. This means that we must act resource-efficiently and protect biological diversity and people's development and livelihood opportunities.
- **Social sustainability** means that basic human needs are met and that each individual, based on their circumstances, should have equal opportunities for a good life and to participate in society. This means that we must work for equal and equal conditions for people to work, live, live and work in the whole of Värmland.
- **Economic sustainability** is about us using and caring for the resources that exist and using the economy as a means to create welfare and long-term good living conditions. It also means that we must work for a system where resources and values are circulated. The economic dimension is about creating stable and healthy economic conditions. A strong and competitive business community must contribute to sustainable growth through increased productivity and the ability to innovate, without endangering the environment or people's well-being. But economic sustainability is also dependent on how economic values are distributed throughout the value chain, how the economic space created within the private and public sector is used and invested, and what consumption consists of.

The economy's resilience depends on its long-term ability to handle changes and continue to develop. A diversified, equal and inclusive business life with a high level of knowledge and competence, preferably with unique competences, is considered to be favorable for a sustainable and resilient economy.

In addition to this, it is beneficial for a sustainable and resilient economy if there is a developed innovation ecosystem with a range of functions such as:

- research with relevance for the region's sustainable development
- incubators and accelerators
- entrepreneurs, innovators, investors and business angels (smart capital)
- export and investment promotion
- well adapted education system
- strong networks combined with openness, tolerance and trust
- international networks and collaboration partners.

The perspectives presented contribute in different ways to strengthening sustainable development.

## **Circular economy**

Circular economy is an expression of economic models and business opportunities where circular cycles are used rather than linear processes. The aspiration is that waste should not exist but be seen as a raw material.

We start from five overarching areas for the circular economy:

- Sustainable production and product design.
- Sustainable ways of consuming and using materials.
- Products and services.
- Non-toxic and circular circuits.
- Actions that promote innovation and circular business models.

Through test beds, incubation environments, new business models and smart requirements in public procurement, the conditions for sustainable consumption and a lifestyle permeated by a circular approach (Cradle to Cradle) are strengthened. Service research and service design can strengthen business life in its development towards a more circular economy, with resource-efficient, sustainable production and conditions for industrial symbiosis. Based on their different needs, the areas of specialization can contribute to a more resource-efficient and sustainable extraction, production and consumption that does not threaten biological diversity. In order to promote innovation, circular business models and a sustainable lifestyle, many actors from business, the public sector, academia as well as civil society and residents need to be involved.

Paper Province is proposed to be responsible for the Circular economy platform.

## **Digitalisation**

Digitization is to a great extent an enabler for innovation, efficiency, new business models, working methods and value-creating services, increased inclusion and increased opportunities to solve complex challenges and shape a sustainable society. "Tech" is a general term for digital technical services, products, platforms or hardware. Tech affects all industries and can be described as one of our new base industries. The digital transition in society is going fast and the use of tech is demanding both cutting-edge and broad-based digital competence. Karlstad University conducts research and education in several scientific areas that enable digitization and innovation, for example within the center formation Digitalized Adaptive Manufacturing Industry 4.0 (DAMI). The cluster organization Compare gathers around 100 companies with digital excellence in various tech areas. There are several regional initiatives underway to create platforms that aim to stimulate digitization in companies and organizations. The digital perspective needs to be taken into account within all smart specializations, missions and other perspectives in order to take advantage of the region's tech resources.

There is a need for process management to, among other things, develop cooperation with actors within the smart specializations. The platform is expected to drive investments to attract, develop and make available both breadth and cutting-edge expertise in companies and organizations and offer a regional tech incubator as support for new companies and innovation.



Compare is proposed to be responsible for the Digitisation platform.

## **Equality and inclusion**

Primarily gender equality and also equality are two of the most important driving forces for Värmland's development and innovation capacity, they contribute to higher profitability and make use of innovations and the potential of many. Equality is also one of the major challenges for Värmland. In order for Värmland to become a more attractive region to stay in and apply to, we need to see fewer gender-stereotyped educational choices. Värmland's business life is concentrated around a few male-dominated industries, while the most common professional sector for women is healthcare. This means that Värmland has a more gender-segregated labor market than the rest of Sweden. At the same time, research and labor market analyzes show that this has negative consequences for new recruitment and income distribution between women and men in the county.

Equality, equality and inclusion are a prerequisite for making use of everyone's competence, experience and knowledge in order to increase the power of innovation and identify new areas of development and markets within the areas of specialization. These are strategic perspectives for recruitment and for attracting competent employees, not only from Värmland, but also from other parts of the country and other parts of the world. In practice, it is about integrating the perspectives of gender equality, equality and inclusion in all parts of all processes and activities, such as in the composition of project and steering groups, in impact analyses, in resource allocation, communication and follow-up of efforts and outcomes. It signals a conscious direction towards a more equal and sustainable Värmland in the future and contributes to strengthening the Värmland strategy's ambition of the county as a region with a broad consensus on equal opportunities and a good quality of life. The smart areas of specialization can draw on support and knowledge from, among others, the Center for Gender Research at Karlstad University and Region Värmland, as well as through national guides and tools. In the work with the specialization areas, increased gender equality and inclusion will be both a goal in itself but also a means for increased competitiveness and innovation.

Region Värmland is proposed to be responsible for the Equality and inclusion platform.

## **Social innovation**

Social innovation aims at a socially sustainable society where increased social benefit and a broad involvement of actors are the driving forces for solving complex social challenges. Social innovation can occur at the local level, community level or contribute to system changes where civil society has a central role. It is about processes to broaden the view of innovation by involving more people in bottom-up processes, taking in new perspectives and increasing learning, starting from the people and the place .

Various methods such as design processes, system innovation and learning trips can contribute to new perspectives, increased accuracy and increased value creation for the smart specialization areas. It can, for example, be about skills supply, attractiveness or environmental aspects, where the areas of specialization can benefit from the local community's customers, residents or stakeholders to increase value creation. Karlstad Innovation Park, Region Värmland, Karlstad University, Coompanion , Värmland's idéborna, and others are working on social innovation through the Social Innovation Värmland platform .

Innovation Park with the previously existing platform for Social innovation in Värmland is proposed to be responsible for the platform Social innovation within smart specialization.

## **Value-added services**

Value -creating services is a cross-cutting approach that focuses on creating value for customers and residents. It is about changing the perspective from the internal challenges of manufacturing or production to the concrete and specific needs of the customer. As the companies, public sector and other organizations that offer the services become better at understanding the customer, they can offer more relevant and attractive services. This starts a customer-driven process that can lead to innovation in service development, business and organizational development.

Value-added services were already an area of specialization in the previous smart specialization strategy. With the new strategy, we increase the focus on sustainable value-creating services and resource efficiency - we must both do the right things and do things right. At the same time, insight is created that value-creating services are an approach to customers, residents and partners. With the help of, for example, life cycle analyses, companies and organizations can streamline and increase value production, both at the detail level and at the system level, which today often needs to be done in collaboration with other actors. Regional core values and the business and development potential found in sustainable development can, through need-driven value-creating services, contribute to a competitive advantage for Värmland and a more growth-oriented business life.

The Center for Service Research at Karlstad University is proposed to be responsible for the Value-Creating Services platform.

## **Societal Security**

Societal Security is a transversal approach in the strategy. The issue is becoming increasingly important regionally, nationally and internationally. Värmland has a number of strengths in the area of public safety, among other things as a competence center and within the academy, but also because the specializations themselves have clear connections in different ways. The re-establishment of A9 in Kristinehamn, the new authority for psychological defense, the Norwegian Public Service Agency and the Authority for Community Protection and Preparedness contribute to creating a strong environment for these issues. The Center for Research on Social Risks, Computer Science with a focus on information and cyber security and the Center for Research on Sustainable Social Change at the university constitute an important knowledge and research resource.

Some examples of how societal security can connect to the specializations are:

- Information and cyber security will be a critical part in the development of new health services.
- Security of supply is important in relation to energy and food.
- Additive manufacturing and the value chains for certain products will be required in a crisis.
- The gaming industry could form the basis for the development of educational, training and simulation tools.

The idea is that this transversal perspective will catalyze discussions and collaborations across specializations and industries. The perspective can generate a developed regional innovation system around the issues but also new types of work forms, services and products. The perspective can also be seen as part of a larger context around social security with a need for coordination.

Karlstad Municipality is proposed to be responsible for the Community Safety platform.



# Summary model for implementation

The starting point for the strategy for smart specialization is the Värmland strategy's vision of a sustainable Värmland that changes the world. The specialization strategy must particularly contribute to the target area of competitiveness. In order to consolidate efforts, seven smart areas of specialization have been selected. In addition to this, the strategy contains missions, new major entrepreneurial opportunities and common perspectives and working methods that should guide the implementation.



Figure 1: The implementation of Värmland's research and innovation strategy for sustainable smart specialization 2022–2028

The research and innovation strategy for sustainable smart specialization is a strategy for transformation or transformation, a development process where new steps to work innovation-driven are taken successively and where new collaborations and networks are created and further developed, both within and outside of Värmland. A consequence of that is that one accepts that everything cannot be predicted in advance, and that room must be left to act on new unexpected opportunities. It's about proactively exploring to find new opportunities to create value, collaborating in new ways and having courageous leadership that gives people the confidence to explore and take risks and supports them, through and through. It is also about expanding the functional geography and collaborating primarily with neighboring regions, but also with other strategic partners. This is to supplement Värmland's innovation systems and collect resources for important investments as well as build complete innovation environments.

# Operational implementation

In addition to the strategic methods and working methods presented earlier, a further number of principles will characterize the operational implementation of the strategy:

- Development of the regional innovation ecosystem.
- A platform-based way of working.
- Innovation-driven procurement.
- Communication to drive development.
- Network control.
- Access to financing.
- Monitoring, evaluation and learning.

## Development of the innovation ecosystem

In order to benefit from and mobilize the regional resources in order to develop the smart areas of specialization, a regional innovation ecosystem with a series of central functions is required. It is about meeting places, facilitation (leading development processes), competence provision, business development, consulting, internationalization, financing, testbeds, incubators and accelerators, innovation-driven procurement, analysis, communication, monitoring and more. This is about how the business and innovation promotion system of actors in Värmland can be developed and support the needs connected to the smart specialization areas (in addition to best supporting companies, entrepreneurs and innovators in general). The work with smart specialization means, among other things, that we must identify opportunities to develop the innovation system by taking advantage of knowledge and resources both within and outside the region. Smart specialization should therefore not be seen as a single strategy, but as a framework for how different areas can interact to strengthen what is to be achieved with smart specialization.

## A platform-based way of working

Värmland's work with smart specialization is based on strong cluster organizations (or other actors with equivalent capacity) that gather actors to work in a common direction. During the period 2022–2028, this work will be strengthened and then the respective cluster organisations has a stated platform mission for each specialization. The platform mission involves offering an open arena for actors to collaborate on so that together they will have the best conditions to realize the vision for each specialization. It is up to the platform manager to engage a larger grouping of actors and support them in jointly driving the specialization forward. The platform mission means, based on the specialization, to continuously search for new opportunities and to involve the actors (also outside the cluster), the resources and other opportunities that can contribute to innovative development work. This means a unifying and collaborative leadership that will both drive development forward strategically and contribute to the operational implementation of new types of projects and collaborations. Understanding the conditions, missions and incentives of the other actors involved is an important basis for success. All in all, the assignment is about what in smart specialization is called the entrepreneurial discovery process.

It is in the nature of the assignment to have an overview of the implementation. The so-called monitoring of smart specialization.

Tasks within the platform assignment:

- Run the platform work in a way that includes the central players in the respective specialization.
- Build a culture of trust and gather actors to explore opportunities and new ideas.
- Drive the work in the direction of specialist ingen 's vision and the Värmlandsstrategin's vision.
- Innovate and develop networks and partnerships regionally, nationally and internationally.
- Actively explore and take advantage of entrepreneurial opportunities.
- Actively explore and take advantage of synergy opportunities with other areas of specialization and the seven perspectives.
- Identify goals and conflicts of interest and explore integrated solutions.
- Drive the areas that can strengthen the specialization area's competitiveness (for example, education, skills supply, internationalization, financing, research, innovation, establishments, marketing, business promotion and entrepreneurship efforts).
- Initiate collaborative projects, contribute to the realization of ideas and contribute to the development of the innovation system.
- Communicate with the platform's actors and external stakeholders.
- Contribute to joint learning.
- Lead in transformation and system change.
- Monitor, i.e. constantly follow developments within the specialization and report to Region Värmland.

In addition to identified platforms for each area of specialization and the seven perspectives, there is also the Academy for smart specialization, which is an established platform for research and innovation at Karlstad University with Region Värmland as co-owner.

## **Innovation-driven procurement**

Innovation-driven procurement is a strategic tool for strengthening innovation work in smart specialization where the public sector has a central and decisive role. Organizations' purchasing functions are a strategic resource for driving innovation (although innovation is not always a stated goal). However, innovation cannot be the primary mission when public actors purchase goods and services. It is a perspective that can be added when appropriate. One way is not to ask for a specific solution, but instead to ask for a function that potentially has several conceivable solutions in the form of products and services. Buying something that is not yet on the market is often demanding and involves risk-taking. Therefore, a well-thought-out way of working and a clear mission from political level and/or management are needed.

In innovation-driven work, procurement skills need to be broad. For example, knowledge is needed in law, economics, digitization and the environment, but above all, subject matter expertise is needed early on in the process. It is in the needs analysis and the market analysis that the innovation potential is clarified. Properly handled, procurement has great potential to drive development towards more sustainable and effective products and services. For the company, it may be about getting a first customer and a reference object. Important issues today are how the public organizations can strengthen their ability to contribute to innovation-driven

procurement, but also how the procurement can also reach innovative small and medium-sized enterprises (SMEs).

In Värmland's work with smart specialization, joint skills development work will be carried out between the various public organizations with the aim of strengthening the ability for innovation-driven procurement. A collaboration in Northern Central Sweden and also with other parts of Sweden provides opportunities to create larger consortia with the potential for larger deals and thus stronger incentives for suppliers to develop innovative solutions. This must be supplemented with innovation-driven procurement where even smaller and local companies have the opportunity to participate.

## **Communication to drive development**

Well-functioning communication is a support that is central to achieving the results and effects expected from smart specialization. Implementation of the strategy is decentralized and largely voluntary. Communication is therefore important to facilitate collaborations and keep involved and potential new actors up to date. The communication can consist of making visible what is going on but also strengthening the implementation of smart specialization in the form of coordination, cohesive activities, knowledge seminars and meeting places. Communication also contributes to making visible the innovative work going on in Värmland and attracting individuals and resources, both within and outside the region.

Communication responsibility will lie with the various platforms for smart specialization and not least with Region Värmland. The efforts benefit from being coordinated and closely connected with the communication about Värmland based on the Värmland Strategy.

When the cluster organizations have laid the foundation for their platform-based way of working, it is suggested that Region Värmland gather the platforms and the municipalities to come up with the design of a joint, coordinated communication work that can support the implementation of the smart specialization strategy.

# Governance and leadership in networks

The implementation of the strategy is based on commitment, a high degree of participation and anchoring among central actors in business, the public sector, the university and the Värmland research environments. Political leadership is important at regional and local level.

The leadership of the strategy needs to be courageous, equal and inclusive. This means that the power of many people making decisions, acting in a coordinated manner towards common goals and visions is taken advantage of. No single actor leads, instead all participants need to take responsibility for their part in the work while everyone takes joint responsibility. It is a matter of feeling co-responsibility for the overall perspective of the strategy, seeking new opportunities and creating equal and inclusive forms of cooperation that favor the desired development. There will be a need for functions that coordinate and support a joint overall leadership of the strategy.

Region Värmland has a special role in the work by being the organization that must respond to the European Commission's demands for smart specialization and the government's expectations about regional development responsibility. In it lies being the organization that develops and establishes the strategy for smart specialization. It is also about coordinating the implementation of the strategy, ensuring that a functioning monitoring takes place, ensuring that there are processes to take advantage of entrepreneurial opportunities, being an important financier and promoting the regional, national and international networks.

## Access to financing

In order to realize the ambitions contained in the strategy, the capacity to attract external financing needs to be strengthened. Coordination will be required between Region Värmland, the municipalities, Karlstad University and the cluster organisations. As a proposal, Region Värmland therefore gathers the actors to come up with how this should happen. A first step has been taken in that the cooperation agreements between a number of actors and Region Värmland include tasks within smart specialization. The agreements involve a certain base funding and also certain expectations to contribute to attracting external funding.

Through various regulations, the European Union has stated that work with smart specialization is a necessary condition for financing from parts of the regional fund. Horizon Europe and other programs also base some of their calls on the regions' smart specialization strategies. The Regional Fund in North Central Sweden can contribute to financing to develop and improve research and innovation capacity and the use of advanced technology. It can also support efforts to develop skills for smart specialisation, structural transformation, entrepreneurship and digital technology, improving SME growth and competitiveness and more. With well-thought-out announcements within and between the regions of Northern Central Sweden, the funding opportunities for projects and business support can be combined. Even national authorities require that efforts be in line with the region's smart specialization strategy. National and European research and innovation funds are exposed to fierce competition. One ambition is to make efforts that strengthen Värmland's ability to participate in such more competitive programs and calls for tenders. This may apply to programs such as Horizon Europe and some of Vinnova's programs.



In order for actors in Värmland to receive an increased number of granted applications, long-term cooperation is needed. Working together to make funding opportunities visible and mobilizing for joint applications will be a success factor. This also requires that Värmland participates in the right national and international networks.

## Monitoring, evaluation and learning

One of the requirements that the European Commission places on Region Värmland is to have tools for monitoring and evaluation to measure the results in relation to the strategy's goals.

Smart specialization is both about building on existing structures and having an experimental approach to create changes in the short and long term. It can be about changes that are more extensive than those that are of the nature of "continuous improvement", but more of the nature of transformation and societal transformation. One of the challenges is that the path to the desired and necessary state is not known in its entirety. Monitoring, evaluation and learning therefore play an important role in the implementation of strategy and are an important part of the management of implementation.

In the Värmland Strategy, there are goals and indicators that aim to show the direction towards the goals. A sample will be used to follow up the implementation of smart specialization. These will also be supplemented with specific goals, indicators for the smart specialization strategy and images of what can characterize success.

- **Monitoring** - that continuously monitor the implementation of the strategy to capture activities as well as results and effects, identify deviations, and produce a basis for decisions on corrections with the support of quantitative and qualitative indicators. As the entrepreneurial discovery process is central, it is not possible to define in advance exactly what the monitoring should include. Visions, strategic orientations and signs of success are indicative of what the monitoring work should pay attention to. Routine monitoring should be digitized and automated as far as possible. The indicators must be divided by gender when relevant, and a companion researcher with gender expertise needs to follow the process all the way. The host organizations for the platforms for the specializations are proposed to be responsible for the monitoring of the respective specialization. Region Värmland's responsibility is to keep the various monitoring processes together and to be responsible for the overall monitoring. The responsibility also includes integrating the monitoring into the region's own quality assurance/follow-up linked to, for example, the Värmland Strategy 2040 and the digital tool "Hela Värmland". The monitoring appropriately follows the annual planning cycle of the platforms' host organizations and brings the actors together for joint learning.
- **The evaluation** – to analyze the implementation of the strategy with an emphasis on change processes and mechanisms and how these affect innovation, as well as to provide evidence for reprioritization within the framework of the strategy. Are we doing the right things, in the right way and to a sufficient extent? Evaluation will also take place through impact evaluation at half-time and at the end of the program period in order to more thoroughly evaluate the process and monitor the effects.
- **Learning** – Värmland's strategy for smart specialization is based on the fact that different actors in the region must work together to drive renewal. In such a process, a systematic, joint learning is needed which is based on the monitoring and the evaluations are carried out with the aim of creating mobilization power.



# Actors and collaborations and how it developed

What is today included in Värmland's innovation system has developed over time. Karlstad University became Karlstad University in 1999, and at the same time cluster organizations began to emerge. Initially, the clusters were created by the business community itself for the common need for competence provision and later for the development of research collaborations between the university and the business community. To strengthen the collaboration between Karlstad University, Region Värmland and the regional work with smart specialization, the Academy for smart specialization was established in 2016. Gradually, testbeds and research groups have joined and efforts to adapt the education offer to the region's needs have been made continuously. In recent years, the accelerators Sting Bioeconomy and DigitalWell Ventures have been added and the municipalities' involvement has increased. A couple of municipalities have made investments in innovation and training centers linked to smart specialization areas. In Karlstad, Karlstad Innovation Park was established in 2014 with nodes in Arvika, Hagfors/Ekshärad, Kristinehamn and Sunne.

Industry Council Värmland also established nodes for vocational training in the same municipalities as well as a few more in municipalities.

Värmland has also received national and international support and awards in the work with smart specialization. In the region there are two ongoing national Winnväxt initiatives (Paper Province 2.0 and Digital Well Arena) and one of the clusters has a Gold Label certificate (the highest level in the EU's quality assurance of cluster organisations). These contribute to strengthening the innovation ecosystem in Värmland and inspire the actors within the various specializations to learn from each other.

The work in Värmland with exports and investment promotion takes place in collaboration with Business Sweden, based on Värmland's areas of specialization. The cooperation in smart specialization with Dalarna and Gävleborg in North Central Sweden is well established, while the cooperation with Region Örebro and Västra Götaland is in its infancy but has great potential. There are also collaborations with the newly formed Norwegian border regions. European cooperation has developed thanks to Region Värmland's EU office in Brussels, Karlstad University's Grants and Innovation Office and the efforts of the leading clusters. The region also participates in the Vanguard initiative, which is a European collaboration for industrial regions. The way of working with smart specialization is established with most of the actors, and most have also found their roles in the collaboration.