

STRATEGY DOCUMENT

# 01

Värmland's Research and  
Innovation Strategy for

## *Smart Specialisation 2015-2020*



**Edited by Region Värmland, 2015**

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# TILLVÄXT VERKET

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# FOREWORD

We are convinced that innovation is key to Region Värmland's task of contributing to creating new, good jobs and a sustainable and inclusive growth in Värmland. The people, along with industry, academia, municipal councils and the county council, as well as us - Region Värmland - all need to become more innovative in order for Värmland to be well positioned in our highly competitive world.

Relying on this strategy, Region Värmland, together with the business community, the academic world and the public sector, has put into writing how we in Värmland should prioritise and invest in innovation in order to bolster Värmland's competitiveness.

In spite of the priorities set out in the strategy, we still encourage and support people in finding new areas showing potential for growth. There needs to be latitude for experimentation, and to a certain degree, also failure.

Through our involvement in the EU, we have noticed that it has become increasingly important for regions to be able to profile their business and research sectors. By clearly defining our areas of specialisation, we gain access to fields and networks where we can participate and help influence EU policy, thus facilitating the forming of collaborative partnerships in Europe. This latter point is important, as we know that we cannot propel our development all on our own. Moreover, Värmland has a

great deal to offer!

With the adoption of its Research and Innovation Strategy for Smart Specialisation Region Värmland joins a large movement of regions in Europe - each one having its own strategy for smart specialisation.

Developing and producing this document has been a comprehensive process as all actors involved have understood the importance of having a strategy. Therefore, we would like to thank everyone<sup>1</sup> who has provided knowledge and contributed their time towards the creation of Värmland's Research and Innovation Strategy for Smart Specialisation.

From the outset, we wanted Värmland's strategy to stand out. One thing in which we take great pride is that Värmland is the first region in Europe to have conducted a gender analysis study and thereby undertaken a conscious gender-mainstreaming of its strategy for smart specialisation.

We would also like to thank:

- The Swedish Agency for Economic and Regional Growth for its excellent collaboration and for helping to finance the strategy work through the programme known as, Regional Innovation Work and Clusters.

- Reglab for its assistance in gathering knowledge and in its networking efforts through the Smarter Regions project.
- The European Commission platform for smart specialisation in Seville for its advice, as well as for providing a knowledge base and some good examples and for providing contacts, and in particular encouraging us to conduct a gender analysis of our strategy.

The success of this strategy depends on the involvement of far more entities than merely Region Värmland. Region Värmland can assist in creating the conditions conducive to innovation, but any actual change will depend on the people of Värmland: the researchers, company employees and the public sector.



Tomas Riste  
Regional Council



Stina Höök  
Regional Council

# VÄRMLAND IN THE EUROPEAN COMMUNITY

Launched in 2010, Europe 2020 is the EU strategy for smart sustainable and inclusive growth. Among its goals, the strategy was intended to eliminate the deficiencies of the current growth models and to create the conditions necessary for smart and sustainable growth for all. Smart growth involves developing an economy based on knowledge and innovation.

The EU 2020 strategy concludes that the greatest challenge facing the EU and its Member States is in forming a more strategic approach to innovation. Such an approach must allow innovation to form a part of an overarching political objective, and all instruments, actions and financing opportunities are designed so that they help to ensure that all the initiatives are cohesive and reinforcing.

In order to achieve effective use of public investments in research, the European Commission has established the political innovation concept of smart specialisation, denoted S3 (smart specialisation strategies). The aim of smart specialisation is for regional policies to contribute to smart, sustainable and inclusive growth throughout Europe<sup>2</sup>. This will rely on a regional gathering of power behind the most promising areas for innovation, entrepreneurship and growth. Regional expertise and resources in relation to the rest of the world and current trends shall be taken into account.

Consequently, the European Commission has launched the concept of “RIS3” and invited Europe’s regions to concentrate their efforts on prioritised, smart approaches. RIS3 stands for Research and Innovation Strategies for Smart Specialisation and indicates the direction for a new European regional policy.

Smart Specialisation deals not only with the linear development of existing strong industries, but it also intersects value chains in order to promote innovation and to achieve a greater surplus value. It is a means of joining together to face the societal challenges which have been identified and which require entirely new structures and procedures in order to achieve sustainable change.

The regions have been given the opportunity to develop regional research and innovation strategies for smart specialisation within a common, voluntary framework of concepts, processes and joint learning. The regions are assisted by a platform for smart specialisation, part of the commission’s research institute, the Joint Research Centre, JRC. The platform is located in Seville, Spain.

One of the aims of the Research and Innovation Strategies for Smart Specialisation – RIS3 is to bring together business, academia and knowledge institutes, citizens, women and men, girls and boys and the public sector with the main goal of using

innovation to make a difference.

RIS3 should not be regarded strictly as a strategy for implementing the regional fund programmes (ERUF<sup>3</sup>). It should also be used to influence regional and national policies and to affect and facilitate participation in other European-driven programmes such as Interreg<sup>4</sup>, ESF<sup>5</sup>, EJFLU<sup>6</sup>, Cosme<sup>7</sup> and Horizon 2020<sup>8</sup>.

The base for smart specialisation is regional. In Värmland, Region Värmland is responsible for leading the RIS3 process. This shall be done in concert with Europe 2020, the national innovation strategy, the government’s research and innovation proposal, the National Strategy for Regional Growth and Attraction 2015-2020, as well as at the regional level, the Värmland strategy.

However, as far as Värmland and other regions are concerned, not only does this entail a regional approach, but of equal importance is how we, together, can contribute to meeting societal challenges in a European context.

# SMART SPECIALISATION À LA VÄRMLAND

This strategy shall serve as a tool for sustainable and inclusive development and growth in Värmland. The aim is for the strategy to be a concern for all key groups in Värmland that work with innovation within Värmland's specified areas of specialisation, as well as for actors elsewhere in Sweden, in Europe and globally.

The strategy is a tool which aims to help Värmland to focus on realising our goals. It serves as a means to reveal our potential for innovation and growth. This will in turn aid us in profiling and in building up Värmland as a brand name. Using this strategy, we can gain greater visibility in Brussels and take a more authoritative approach in discussions.

Smart specialisation involves creating competitiveness within a range of areas and also helping to face societal challenges. The specialisations therefore deal not only with what we are good **at** but also with what we are good **for**. For this reason we have chosen to formulate the specialisations as a number of value propositions - promises to customers/users and to society.

Värmland's interpretation of smart specialisation:

Smart specialisation means smart ways to organise and develop existing regional assets<sup>9</sup> in order to create value for users and society.

In short: *Smart ways to create value!*

Users could be customers in the form of consumers or companies in value chains. They could also be users of various types of services, for instance within publicly financed organisations or the non-profit sector. The concept of value in this context includes the users' expressed and latent needs. There can be a huge difference if the user or customer is a woman, man, girl or boy. Creating value for society is also a way to contribute to finding solutions to societal challenges<sup>10</sup>.

In order to be smart in creating value, we have created a horizontal specialisation: Value-creating Services. This specialisation shall permeate the procedure in the five other specialisations so that we always base the innovation work on a customer and user perspective.

The starting point has been to create an innovation strategy for business. However, some of the specialisations have entailed dealing with innovation of the public sector's own services or products

for which the public sector is the customer. For example, this could involve bio-based products that replace fossil-based products in health care or the introduction of digital services in the care and education sectors.

## Gender Mainstreaming

The goal has been to create a gender-integrated innovation strategy for smart specialisation. This is the first time in Europe, as far as we know, a strategy for smart specialisation has been undertaken along those lines.

There is a correlation between companies and industries with more gender equality, and profitability<sup>11</sup>. Therefore, it pays to attach a gender perspective to innovation and growth. This can have a number of different reasons and vary from industry to industry. Gender equality lead to better decision-making in the company.

Calculations indicate that gender-mixed personnel groups in 2012 had twice as much of a chance of exceeding management's expectations of their performance as personnel groups consisting solely of male staff members. Having women in company management increases the company's profitability. Equality improves the opportunities for the entire personnel to be able to develop its full potential.

Staff diversity allows companies to interface

more with different segments of society and with a larger recruitment base. The probability for innovation is almost twice as high in a company with gender equality among the staff.

One of the societal challenges of the strategy is to contribute to finding solutions for: Europe in a Changing World - An Inclusive, Innovative and Reflective Society, in this case, involving both women and men thereby to contribute to more innovation.

In Värmland, as in the rest of Sweden, the labour market is heavily segregated by sex. This is also true within industries in which women and men start their own businesses. A corresponding phenomenon can also be found in the academic world. As said earlier there is a correlation between more gender-equal companies and industries, and profitability. It is therefore important to have a gender perspective in terms of innovation and growth.

For growth to be sustainable - as EU 2020 also indicates - then it must also be gender-equal and inclusive for everyone in Värmland, both women and men. The strategy shall indicate the current situation for women and men in Värmland's innovation climate, as well as the consequences of the prioritisation in the strategy.

The Värmland Region works in the following way with regard to the gender-integration of the strategy. Analytical methods ensure that a gender perspective, i.e., the number of women and men, has been applied to the greatest extent possible and that the gender statistics have been a vital tool. We have applied a gender equality perspective throughout the mapping efforts in which not

only awareness of gender is prevalent, but also a direction towards a more gender-equal innovation and corporate climate in Värmland. We have also applied a gender perspective - an understanding of which attitudes and traditions are of importance within various areas. The consequences that different decisions have for women, men, girls and boys has been a central theme in our assessment of inclusive, sustainable growth.

During the work on the strategy, there has been a discussion surrounding the strengths and challenges existing in relation to gender equality in the choice of prioritised areas for the future strategy. Policy analyses and other preparatory studies have been studied by experts on gender equality. In the prioritising efforts, gender has been included as a variable to be taken into account in the development of areas of strength. The participation and expertise of the people behind the process has also been important - even if it has been difficult to govern volunteer-based participation.

These efforts have produced a process model for how gender-integration of innovation strategies could conceivably be achieved. It will now undergo evaluation and improvement. The Värmland Region is happy to share the lessons learned.

## INNOVATION

Innovation is, succinctly, the entrepreneurial process which generates an idea, a value. Here, the definition developed by the OECD is used.

'An 'innovation' is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations.

## THE RIS3 PROCESS



Figure 1. The RIS3 process is a six-step process.

The following steps are suitable in order to build a regional strategy for smart specialisation<sup>12</sup>:

1. **Analysis of the region's strengths**, paying particular attention to regional assets, European and international competitiveness and links to other markets, as well as entrepreneurial dynamics.
2. **Anchoring and participation** from the market and customer viewpoint. In addition to the traditional Triple Helix work, the society and customers must also be involved in order to gain as broad a view as possible. This can be done through direct involvement or indirect involvement through interest organisations.
3. **Formulating an overall vision for the region**
4. **Identifying those areas which are to be prioritised** by matching a top-down perspective with a bottom-up one. This is where a smart coordination and clustering of overarching, broad goals are introduced, around the existing strong niches and organisations existing in the region.
5. **Plans for implementation**. The strategy is implemented through action plans within which it is important to provide room for experimentation.

6. **Plans for learning and follow up** in order to monitor how well the strategic goals in the strategy are being achieved. One example of a working method is using peer reviews in which the region is matched with other regions.

In this phase of the work, stages 1-4 are implemented. In the next phase, action plans for each respective prioritisation are developed along with a plan for follow-up, assessment and learning (monitoring).

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## ANALYSIS – ABOUT VÄRMLAND AND THE REGION'S CONDITIONS FOR INNOVATION

### Analysis

The Värmland region is part of the NUTS II region, North Central Sweden. Värmland borders Norway and the Oslo region and is thus a border region in the EU. Proximity to Oslo is an important condition for business and employment.

The population of the region in 2014 was 274,691 inhabitants and the population grew by 0.5% from 2009 to 2014. Värmland is facing important challenges, such as slow population growth, a low level of education, low wages and a low degree of employment compared to the Swedish average.

Companies in Värmland are dependent on good communications due to the long distances to the

metropolitan regions. Compared with other regions, Värmland is home to large tracts of forestland, which is promoted as an asset for the region and its forest industry in the Värmland strategy.

The public sector provides most of the jobs in Värmland, followed by the manufacturing and steel industries and retail trade industry. The labour market is gender-segregated both horizontally and vertically, which means that women and men find themselves in different sectors and industries, and in different positions within one and the same industry or workplace. In the case of business and entrepreneurship, most men in Värmland operate businesses in farming, forestry and fishing, while most women run companies offering cultural and

personal services.

Värmland's businesses are concentrated around a few dominant industries which also has been organised into cluster initiatives and networks. The biggest industries in Värmland are the pulp and paper industry (approx. 4,000 employees), IT (approx. 2,000 employees), steel and engineering (>10 000 employees), as well as the hospitality industry which is growing the fastest (approx. 3,000 employees).

Research and innovation is underway within these industries, both within the companies themselves and within the academic world. A vital part of any business network is a well-developed infrastructure for corporate services offering everything from basic services to knowledge-intensive business services, KIBS. These companies often provide services to a number of different industries, which makes them important bearers of knowledge in the region.

Karlstad University started off as a teacher training college back in 1843. It became a university branch in the late sixties and then a university college. In 1999 it was granted university status.

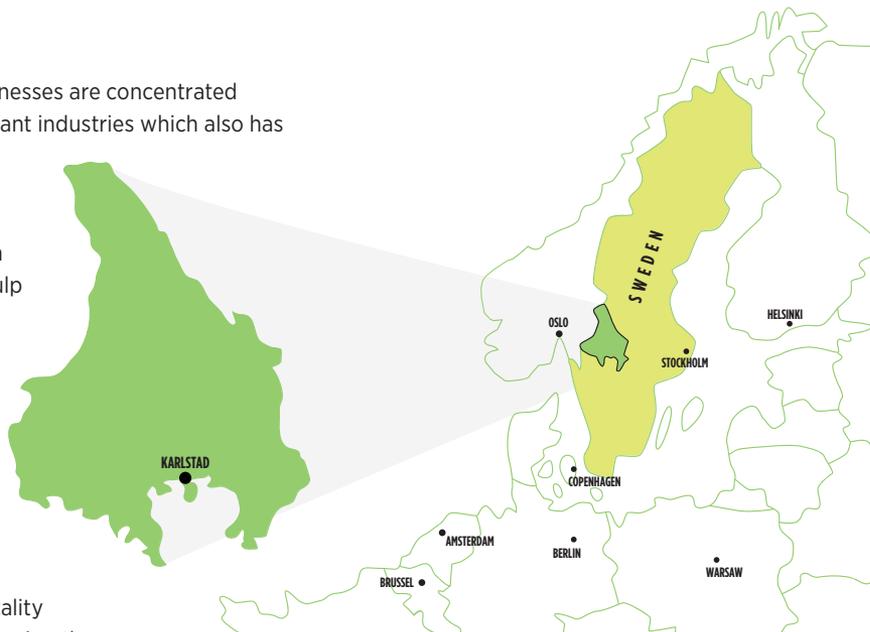


Figure 2. Värmland's location in Northern Europe.

Karlstad University is characterised by a culture of cooperation in which the school regards itself as an international institution which, at the same time has strong connections to the region with many of its research areas matching the business community of Värmland.

The regional innovation support system was developed in stages from the turn of the millennium to the present and consists of public organisations, clusters, businesses, the university and institutes, all working in close cooperation.

Examples of cooperation and initiatives include:

- Cluster organisations: Steel and Engineering, Compare, Paper Province and Visit Värmland.
- Ten new professorships at Karlstad University with strong ties to the clusters.
- Karlstad University's prioritisation of five strong research environments of which four have a definite connection to businesses in Värmland.
- The setting up of a Grants and Innovation Office at Karlstad University which is part of "Fyrklöver", a national innovation office for four universities set up by the Swedish government.
- Innovation platforms: Brobygrafiska and Swe Flex within flexography and packaging design as well as the Glava Energy Center in the photovoltaics sector.
- Innovation Park in Karlstad: bringing together companies and organisations related to innovation and growth.
- Establishment of SP Technical Research Institute of Sweden in the region.
- Paper Province winning the national Vinnväxt grant competition, which entails a ten-year national and regional commitment to developing a forest-based bioeconomy in the region.
- The Värmland County Council's commitment to innovation in health care through the Innovation Hub Vivan and Experio Lab, as well as Nordic Medtest for raising quality within Swedish e-health.

This is described in more detail under the heading "The Innovation Support System" in page 37.

The region is politically governed by the Värmland County Council (health care), the Värmland County Administrative Board (environmental monitoring, plans, corporate support) and Region Värmland (regional development, public transportation, culture etc.).

## INNOVATIVENESS

A study of a number of innovation indexes<sup>13</sup> indicates how Värmland positions itself as an innovation region in Europe. The overall picture is that innovation in Värmland is low compared with Sweden as a whole, but this should be considered in light of the fact that Sweden is one of the top nations in the world in the area of innovation. In fact, in some respects, Värmland is ahead of the EU as a whole.

It is also worth noting that Värmland's collective index value has remained relatively steady from 2004 to 2010 and indicates a comparatively good balance between the three main parameters: fundamental conditions, market capacity and renewal capacity. The renewal capacity parameter has undergone the strongest growth and it is also Värmland's best relative position.

Today, Värmland offers favourable conditions for achieving innovation in the region but the ratio is low in relation to abilities. In other words, the region has a well-developed innovation system but the output is relatively weak. This is mainly due to the level of education in the region, an unbalanced business community and a low proportion of entrepreneurs to convey knowledge and expertise onto the market in the form of new goods and services. The

number of business start-ups in the region is low, which inhibits the conditions for a dynamic business community and the creation of new jobs.

Companies in Värmland have relatively low overhead costs related to research and development, but costs for innovation not associated with R&D are high. This is an indication that companies in

Värmland have a good capacity for creating innovation more by relying on technologies and innovations, which have already been developed elsewhere and less by developing entirely new product and process innovations themselves. This would result in Värmland being described as a "follower" region in terms of innovation.

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# SOCIETAL CHALLENGES

To have societal challenges as a starting point for selecting specialisations is a means of ensuring that there will be a demand for our solutions for a long time to come. This also aims to create a sense of commitment among the actors and finally a means of contributing to the Europe 2020 strategy.

In this strategy, Region Värmland has opted for addressing the societal challenges identified in the EU research programme, Horizon 2020:

- Health, demographic changes and wellbeing.
- Food security, sustainable agriculture and

forestry, marine and maritime and inland water research and the Bioeconomy.

- Secure, clean and efficient energy.
- Smart, green and integrated transport.
- Climate action, environment, resource efficiency and raw materials.
- Europe in a changing world - inclusive, innovative and reflective societies.
- Secure societies - protecting freedom and security of Europe and its citizens.

# THE PROCESS

## Process

The task of developing a regional research and innovation strategy for smart specialisation was assigned by Region Värmland's council when it approved the organisational plan for 2014. The work was then conducted from March 2014 up to and including May 2015. Developing and producing a document of this type is an assignment carried out within a context of previous and existing processes, programmes, plans and strategies. It is possible to track the efforts and investments in industries, as well as cluster initiatives and research environments established at the first regional growth strategy in 2000<sup>14</sup> by way of, for example, the milestone represented by Värmland's participation in an OECD project<sup>15</sup> from 2005 to 2007 up to today's Värmland's strategy.

Work on this strategy therefore began with a review of existing analyses, an updated statistical analysis of the strong industries in Värmland and a review of the strong research environments, primarily at Karlstad University. These analyses then formed the basic information for formulating a number of areas which were considered robust, because they are a combination of a competitive business community and outstanding research. Other factors considered included: the need for growing markets, actors in the region who could be a driving force,

entrepreneurship within the area and whether it was possible to contribute to solutions for dealing with societal challenges within the area.

In order to gain an idea of the international positioning for these areas, a business intelligence analysis was conducted. Five to six areas remained as candidates for smart specialisation. In some of the workshops involving the concerned groups, swot analyses were done and then visions were formulated along with proposals for efforts to achieve the visions. In the end, the work produced proposals for six smart specialisations. One transverse specialisation: Value-creation Services, and then five vertical specialisations: a Forest-based Bioeconomy, Advanced Manufacturing and Complex Systems, Digitalisation of Welfare Services, Nature, Culture and Place Based Digitalised Experiences as well as Systems Solutions with Solar Power.

In conclusion, a gender analysis was done along with a gender adaptation of the strategies. Researchers from the academic world, managers and employees from cluster companies, cluster organisation boards and employees, employees in institutions, management of innovation platforms and employees in public organisations have taken part in the process through workshops and through consultations of draft documents. A total of more than fifty people participated, of whom almost 40

percent were women and just over 60 percent men.

So far, in the time for printing this document, the work has progressed through the first four phases in the Seville platform's planning model. These phases are Analysis, Process, Vision and Priorities. What remains to be done during the Process phase is to supplement it with how the implementation of the strategy will be organised. In the Policy mix stage, we need to draw up plans of action including goals. In the final phase a plan for monitoring, including follow-up, evaluation and learning needs to be drawn. This also includes re-evaluating prioritisations at regular intervals.

## ORGANISATION AND ROLES

Regional development often involves promoting areas where one individual actor is insufficient for solving a problem; finding a solution requires the participation of many. Furthermore, the wider context of globalisation, foreign ownership of companies, economic integration and increased importance of knowledge and technology entails a reduced level of control.

Regional leadership in such an environment puts a number of factors to the test including the level of knowhow, relationships and networks at a local, regional, national and international level, the ability to mobilise, guide and negotiate, financial

opportunities, communication and processing expertise, gender integration etc. In addition, the ability to delegate responsibility and authority based on the requirements of the assignment is key. It is necessary to be able to shift responsibility for initiatives to actors with more detailed knowledge of what is required and what it is possible to achieve. Essentially, regional leadership must be of the kind which affirms the entrepreneurial discovery process. At the same time, the democratic perspective must be taken into consideration.

The Swedish government has established an innovation council headed by the Swedish Prime Minister and consisting of representatives from the government, business, research and labour market sectors. The Government Offices of Sweden would encourage the regions to establish forums with whom the national innovation council can have a dialogue.

By European standards, Värmland is a small region. As a result, the number of actors in the innovation support system is limited. There is a strong culture of cooperation and many of these actors know one another. The region has therefore neither the capacity nor the need for an extensive formal organisation for implementation of the strategy.

Since Värmland has established cluster organisations with clear connections to the specialisations, there are actors with the ability to take a leading role in the implementation stage.

Part of the task of developing proposals for action plans will be to offer suggestions on the



organisation and governance of the implementation.

In parallel with the planning work, Karlstad University and Region Värmland will draw up a partnership agreement, primarily within research

and innovation, but which can also encompass education and training. The aim here is for the agreement to be based on specialisations in VRIS3 and in that way to become a part of the implementation of the strategy.

# VISION

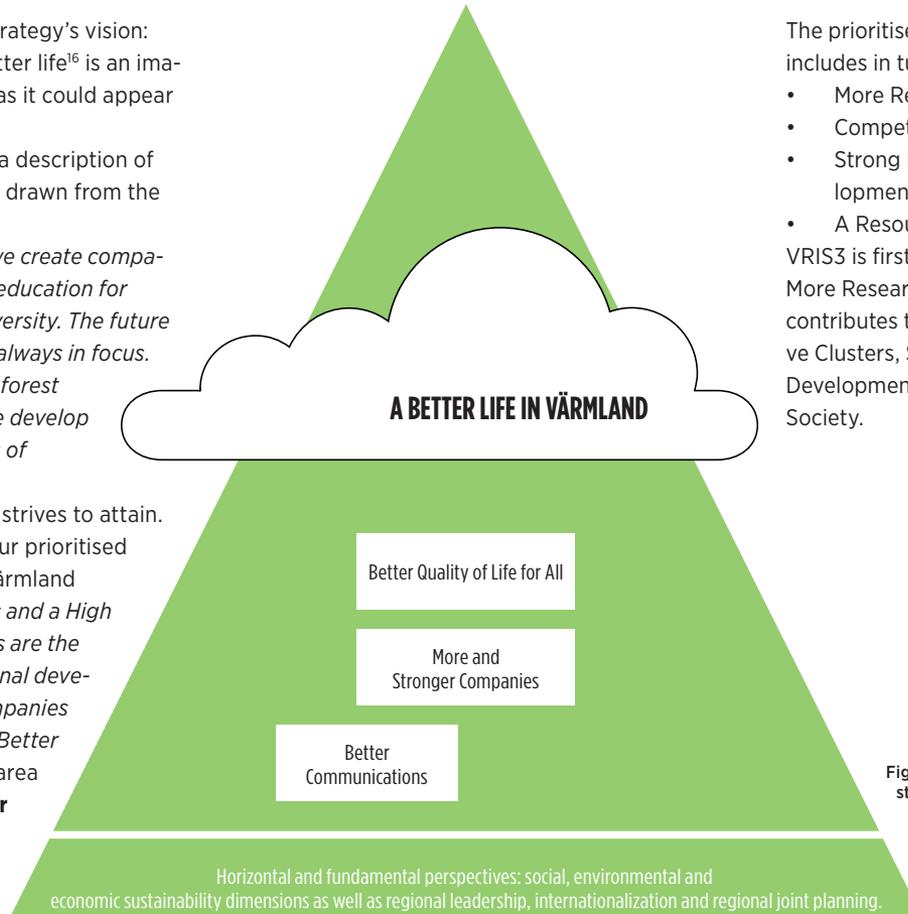
## Vision

The Värmland strategy's vision: Värmland - a better life<sup>16</sup> is an image of Värmland as it could appear in 2020.

The following is a description of life in Värmland in the year 2020 drawn from the strategy:

*In a green, open border region, we create companies and jobs by providing good education for everyone from pre-school to university. The future and well-being of our children is always in focus. Relying on our ingenuity and the forest business as an industrial base, we develop new products and new industries of a world class calibre.*

This is also the vision that VRIS3 strives to attain. In order to achieve this vision, four prioritised areas have been set out in the Värmland strategy. *Better Communications and a High Level of Competence at All Levels are the fundamental conditions for regional development. More and Stronger Companies will enable the achievement of a Better Quality of Life for All.* This latter area is closest to the vision of **a Better Life** in Värmland.



The prioritised area More and Stronger companies includes in turn four measures:

- More Research and Innovation
- Competitive Clusters
- Strong Entrepreneurship and Business Development
- A Resource-efficient Society

VRIS3 is first and foremost a concretisation of the More Research and Innovation Measure, but also contributes to the other three measures, Competitive Clusters, Strong Entrepreneurship and Business Development, as well as a Resource-efficient Society.

Figure 3. The four prioritised areas in the Värmland strategy. Better Communications and a High Level of Competence at All Levels are the fundamental conditions for regional development. Having More and Stronger Companies is the enabler for the achievement of Better Quality of Life for All which in turn is decisive for the vision - A Better Life.



Figure 4. Measures within the prioritised area More and stronger companies in the Värmland strategy.

These four measures shall lead to More and Stronger Companies and even more and better jobs and an economy in Värmland which makes good living conditions possible. With that, VRIS3 helps to reinforce the prioritised area, namely, Quality of Life for Everyone. This, in turn, links directly to the vision - Värmland - a Better Life.

In addition to the vision set out in the Värmland

Strategy, there is also a vision for each specialisation pointing to a desirable direction for a defined area. These visions shall provide support in the development of result-oriented action plans and serve as a cohesive bond for individuals and organisations who are involved in their own respective specialisation. The visions are presented together with the specialisations.

# VÄRMLANDS' S SMART SPECIALISATIONS

## Priorities

In order to determine which areas are to be prioritised within the strategy, several criteria have been of importance. The potential for earning international recognition within both business and research have been vital criteria. Other criteria have included a critical mass

of companies, innovation capacity, how well business is organised within cluster organisations and networks, entrepreneurial dynamics, opportunities for development of a gender-equal business climate and to what extent societal challenges are met.

The specialisations involve what we are good at, and also what we are good for. This means that the

specialisations are formulated as a number of value propositions, promises to customers/users and for meeting societal challenges. To succeed at this we configure regional resources into smart, value-creating constellations. We have also formulated the value-added this can offer companies and researchers to participate in these constellations.

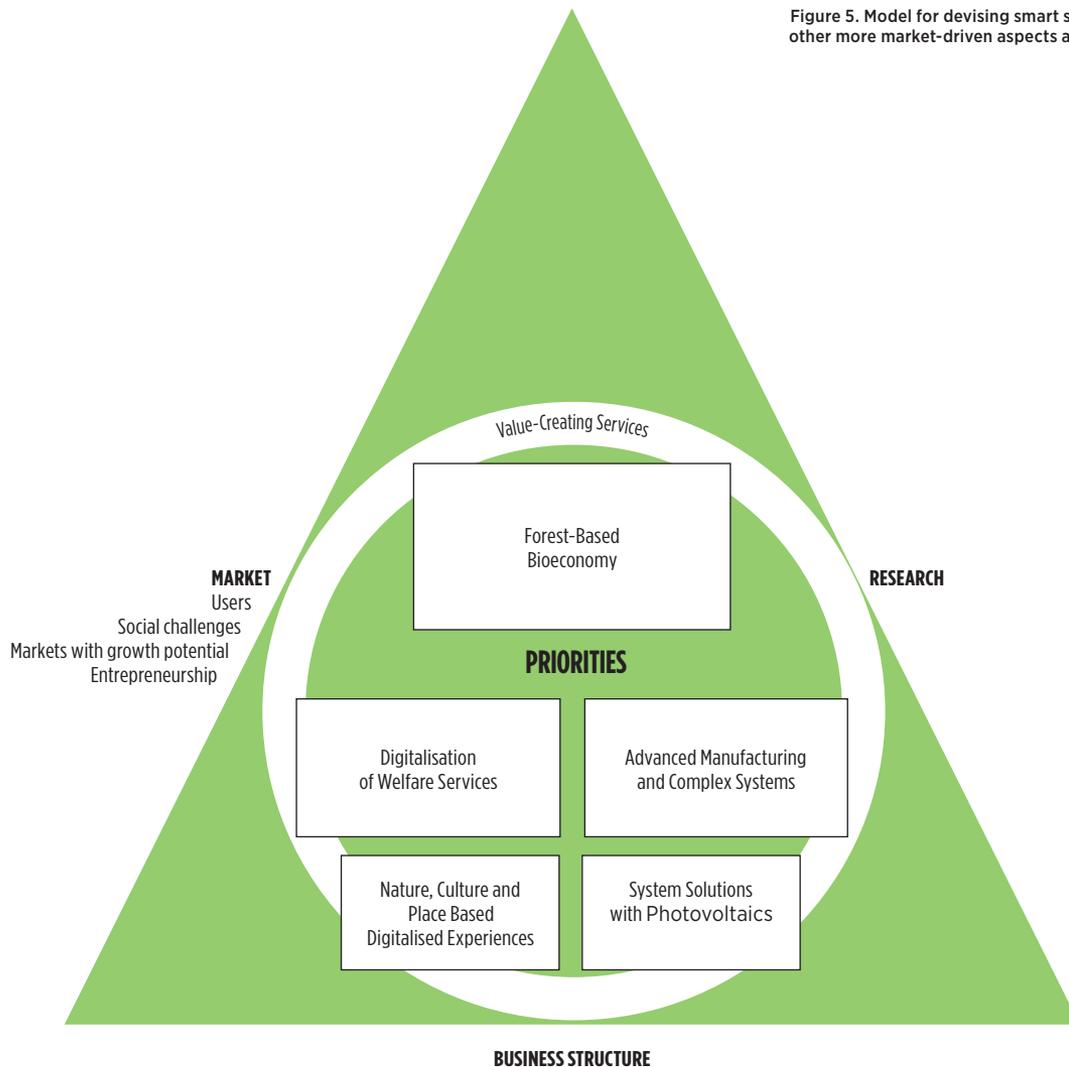


Figure 5. Model for devising smart specialisations. Strong industries and strong research groups coupled with other more market-driven aspects are combined in prioritised smart specialisations.

We have based this on areas of strength, which have been chiselled out over the course of a decade and a half of regional growth work. These have then undergone various types of analysis<sup>17</sup>.

Thus, the combinations of areas of strength and strong research groups have been formed. These have then been assessed based on the criteria related to the opportunities for competitiveness in an international perspective<sup>18</sup>.



| SERVICE RESEARCH AND SERVICIFICATION |                                       |                                    |  |                         |   |                      |               |                                      |                  |                           |                           |                       |
|--------------------------------------|---------------------------------------|------------------------------------|--|-------------------------|---|----------------------|---------------|--------------------------------------|------------------|---------------------------|---------------------------|-----------------------|
| Strength areas                       | Pulp and paper and packaging material | Packaging                          | IT and Telecom                             | Steel and manufacturing |   | Hospitality industry | Food products | Cultural and creative industries     | Solar power      |                           | Newly identified area     | Newly identified area |
| Smart specialisations                | PRIORITISED SPECIALISATIONS           |                                    |  |                         | SPECIALISATIONS UNDER QUALIFICATION                     |                      |               |                                      | FUTURE ADDITIONS |                           |                           |                       |
|                                      | VALUE-CREATION SERVICES               |                                    |  |                         |   |                      |               |                                      |                  |                           |                           |                       |
|                                      | Forest-based bioeconomy               | Digitalisation of Welfare Services | Advanced Manufacturing and Complex Systems |                         | Nature, Culture and Place Based Digitalised Experiences |                      |               | System Solutions with Photo-voltaics |                  | New smart specialisations | New smart specialisations |                       |

Image 6: Correlation between areas of strength in business and smart specialisations.

## VÄRMLAND'S SPECIALISATIONS

The analysis and prioritisation work has produced five areas for smart specialisation, all with one or more industrial directions, as well as the first specialisation which is to be included in the other specialisations.

The first and transverse specialisation is:

- Value-creating Services

The five subsequent specialisations in order of priority are:

- Forest-based Bioeconomy
- Digitalisation of Welfare Services
- Advanced Manufacturing and Complex Systems
- Nature, Culture and Place-Based Digitalised Experiences
- System Solution with Photovoltaics

In addition to the fact that the region has a robust business climate and relevant research, other elements are necessary as lubricant and process managers in the implementation, including cluster organisations, innovation environments and institutes. These will become important moving forward.

## GENDER AND THE SPECIALISATIONS

The export industries in Värmland are dominated by men along with their male values and codes. It is therefore crucial for Värmland to develop a labour market which is attractive to both women and men. If we do not, there is a risk that living and working in Värmland will not be attractive for younger women in particular. As younger women, more often than men in the same age group, have higher education qualifications, the region risks losing a valuable addition to the workforce. For this reason, one goal is to use smart specialisation to help development in a number of dynamic industries which, as a whole, will help create a balance in the labour market by creating jobs that appeal to both men and women.

The following reasoning has been applied in the devising of the smart specialisations:

### Value-creating Services

Parts of the service sector appeal to women. Servitisation enhances the appeal to women in male-dominated industries.

### Forest-based Bioeconomy

Male-dominated industries. Paper Province has worked on equality. Servitisation boosts appeal to women.

## Digitalisation of Welfare Services

Health and social care is a sector with a high number of female employees. By turning to men, the county council expands the recruitment base in order to meet the need for more nurses.

The IT industry is dominated by men. Compare, a cluster organisation, works on equality and ways of attracting women to the industry. For example, they have a network for women.

## Advanced Manufacturing and Complex Systems

Male-dominated industries. Steel and Manufacturing has worked with equality. Servitisation boosts the appeal to women.

## Nature, Culture and Place Based Digitalised Experiences

Many tourist-oriented companies are attractive to both women and men.

## System Solution with Photovoltaics

Male-dominated industries. An early initiative which has not yet prioritised gender equality. Servitisation boosts the appeal to women.

Servitisation may not be sufficient to attract women to male-dominated industries. Moreover, it would be necessary to review the education women tend to choose and adapt business accordingly. Various efforts are needed to mix the labour market vertically and horizontally, which also includes actions focusing on men.

## SPECIALISATIONS WITH CLUSTER ORGANISATIONS AND INNOVATION PLATTFORMS

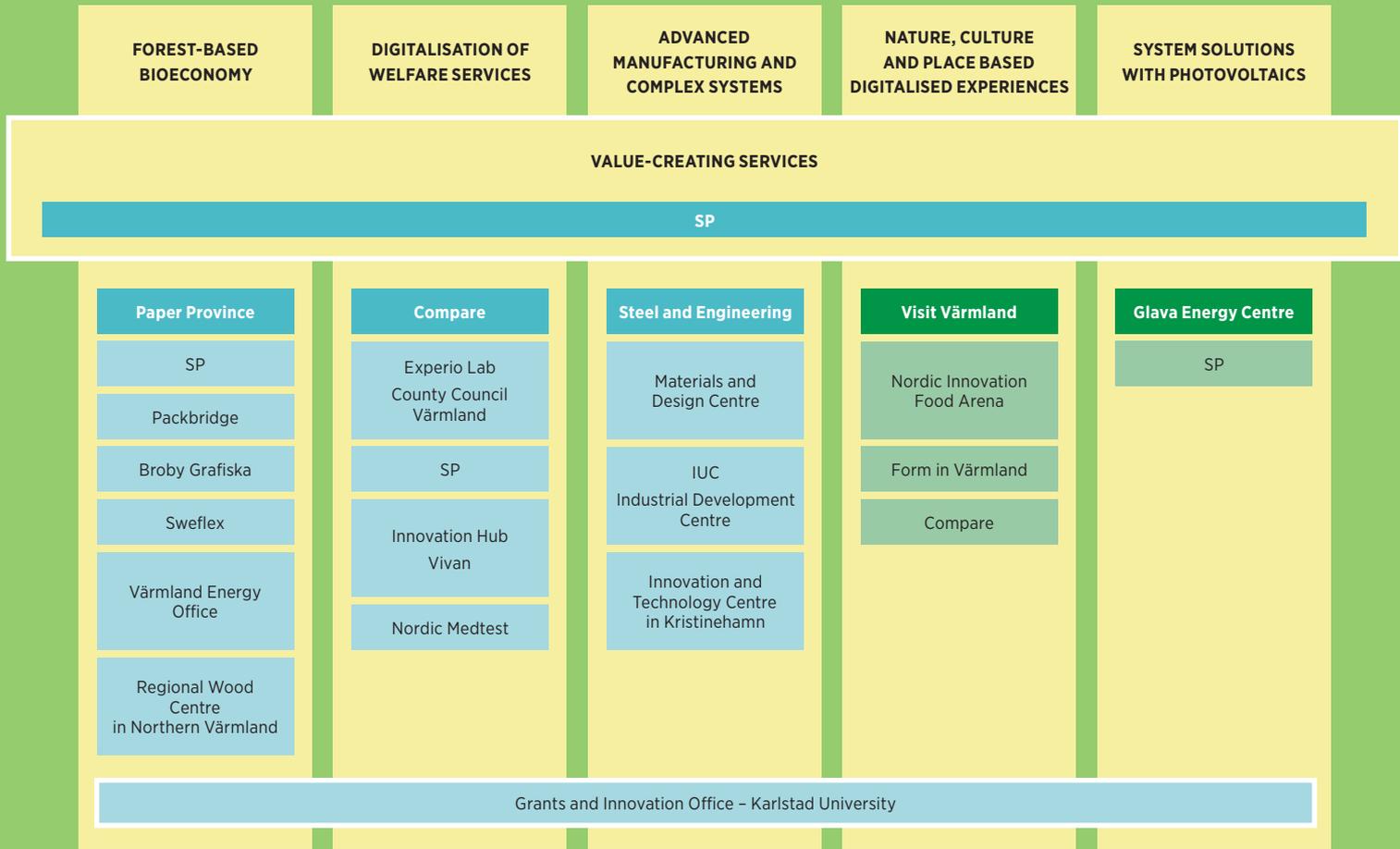


Figure 6. Smart specialisation in relation to cluster organisations, innovation platforms and institutes.

## SPECIALISATIONS WITH THE EXCELLENT, STRONG RESEARCH ENVIRONMENTS AT KARLSTAD UNIVERSITY

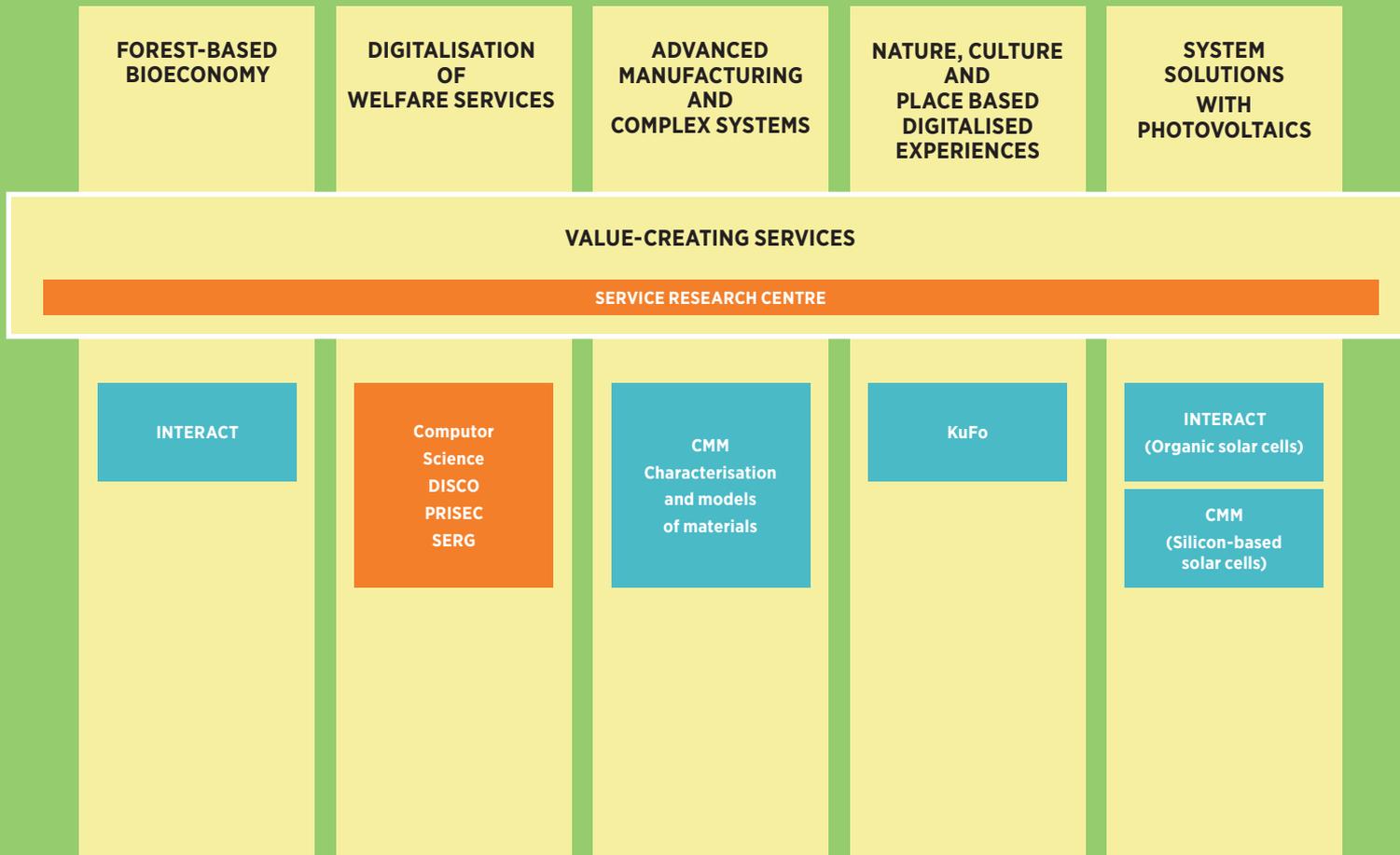


Figure 7. Smart specialisations in relation to excellent (orange) strong (blue) research environments at Karlstad University.

In 2014, Karlstad University prioritised its main research environments. Two earned the highest status as excellent research groups and three were considered strong research groups with the potential to become excellent within four years. These environments are included in the smart specialisations. There are also other research groups<sup>19</sup>, both formal and informal, as well as individual researchers who are associated with the specialisations, institutes, higher education institutions - Bergskolan and companies' R&I environments<sup>20</sup> with resources of significance to specialisations.

#### READING INSTRUCTION

The presentation of the smart specialisations follows the same set up.

Each specialisation is described by a headline and a piece of text in which the first sentence shall capture the core of the specialisation. After that, a vision is presented which describes the direction towards which the time horizon will be in 2025. This is followed by a description of The Road to the Vision. Those assets which render Värmland uniqueness are described under the heading Assets to Nurture and to Develop. This could involve core expertise and companies with world-class knowhow, critical mass and a diversity of actors, cultures and standards. We need to nurture these in Värmland and develop them to achieve our vision. Under the heading, We Also Need This to be Able to Achieve the Vision, there are a number of assets which may not be unique or world-class, but which contribute

to the development of the specialisation. These may need further development. The elements, which are missing, are also described here. These are elements that Värmland needs to build on or to find partners for in Sweden or Europe.

The actions listed here can be seen as examples. Not all of these are likely to be implemented and many of the proposals must undergo further study before they are introduced, while new ideas will crop up as well. The main purpose is for the proposals as a whole to provide a picture of what needs to be done.

When the word “we” is used hereinafter in this document, it means all of us working together who can transform the strategy into reality!



# I. VALUE-CREATING SERVICES<sup>21</sup>

Given the progress already made in Värmland within research related to service innovation, service design and servitisation, we continue to develop research and apply it to enhance the abilities of private and public actors to contribute to value creation for customers, users and society as a whole.

By working with the other areas of strength in the region, emphasis is placed on the value creation of the specialisations, generating innovation.

Servitisation is a development process aimed to gain new insights into users and how best to support their value-creation processes. This requires an overall perspective of the company or organisation and all the associated resources available.

Servitisation is the business and public organisations' long-term aim, striving towards enhanced customer values relying on a basic service approach. Factors which drive servitisation include competition, profitability, globalisation and deregulation. Servicifying a company means supporting its customer's core processes, thereby producing benefits such as increased customer awareness and need-determined innovations.

Service design involves personnel, users or customers working together to design services which create value in the everyday lives of the users. Design is a tool, and an approach, which enables solutions to be developed based on the users' ex-

pressed and latent needs, and it makes it possible to identify common problem formulations, challenges and objectives, as well as providing regional actors with the tools needed to be able to collaborate, create and devise appealing solutions.

Radically new services possess a transformational power to convert value chains. In this way, new services can transform traditional value chains and create value networks<sup>23</sup>.

This requires deep insights into the behaviour and values of the users, as well as the situations in which they live.

## VISION

We begin with the customer experience and work our way back toward the technology - not the other way around<sup>24</sup>. For Värmland, this entails placing the focus on value-creation processes for users, which serves as a compass for technological developments. This way, we become even smarter in devising and carrying out our specialisations.

## ABOUT THE VISION

Service design and servitisation have had a widespread impact in the business and public sectors in Värmland. Organisations from Värmland that are

tied to the region's specialisations become models both nationally and in Europe. The organisations create new values for users and for society, usually within traditional industries. This has also resulted in the fact that traditionally male-dominated industries are increasingly attracting more and more women.

Innovation Park in Karlstad has a reputation for service innovation and that reputation has served as a magnet for companies. Moreover, all four subsidiaries in the state-operated RISE group, Research Institutes of Sweden, have moved to Innovation Park and have operations within the services sector.

Karlstad University has been the leader in Sweden for many years in offering service design education.

We have experienced the power of service innovation through the transformation of a few value chains which has given rise to another business logic. In some cases, this has led to the introduction of newly manufactured products.

Businesses are starting up due to the dynamic service innovation environment that exists in the region.

## ROAD TO THE VISION

### Our unique assets to nurture and develop

- CTF - the Service Research Centre - is one of the world's leading research groups within

service research<sup>25</sup> and constitutes Värmland's preeminent asset within the sector of services.

- The SP service expert group in Karlstad forms part of SP, the Technical Research Institute of Sweden. Its main role is to transform scientific knowhow into reality, or in other words, develop support of servitisation as a business.
- Experio Lab<sup>26</sup>, part of the County Council in Värmland, is the national centre for patient-related service innovation.

### **We also need this to be able to achieve the vision**

Some examples:

#### *Research and innovation*

- Introduce or further develop applied service research together with the other specialisations.
- Continue to develop methods for joint production of service research with companies and public organisations.
- Increase cooperation between CTF and the SP service expert group.
- Involve Compare<sup>27</sup> companies with the aim of using ICT as a tool for service development.
- Increase cooperation and knowledge exchanges with other Swedish and international universities and institutes in the area of service research.
- Build a stronger level of collaboration with consulting firms, which specialise in service development and service design.
- Build collaboration outside of the region with actors who have progressed considerably



within the area of servitisation.

- Commit to winning (or becoming a part of the winning consortium) Vinnova's competition for strategic innovation within service innovation.

#### *Business development*

- Develop a service laboratory, such as Bioeconomy Service Innovation Lab, and others.
- Companies from Värmland should participate in R&I projects related to service innovation.
- Conduct a development project with companies related to servitisation and service innovation within various specialisations. There are

examples in Värmland in the areas of remote control, training/education, test operation and services for operating and maintenance.

- Develop companies within areas for knowledge-intensive business services.

#### *Public sector*

- Set up several organisations with similar work methods such as Experio Lab, or expand this operation to include more entities and areas.
- Use procurements so as to drive the development of services.

## II. FOREST-BASED BIOECONOMY

We demonstrate bioeconomy throughout Värmland through innovation and also by increasing the selection and demand for forest-based products and services. At the same time, we blaze a trail for converting to a fossil-free and sustainable society.

Our fundamental strength is a sustainable forest industry and high-quality raw materials. Forest industry processes and products are the spearhead of our industries. They include cellulose fibre-based packaging materials, tissue paper technology and a knowledge- supporting consulting sector which, together, have the expertise and capacity for industrialising and automating processes for value creation from wood.

The advances in packaging, coatings and barriers, printing technology, energy efficiency, purification technology, pulp technology, cellulose derivatives, separation and processing technologies, regional development and service research are our main areas of strength within academic research linked to bioeconomy. This provides a good base for achieving alternative fibre-based products and increased value-added from both existing products and processes from secondary streams.

This is possible due to the fact that Värmland has a world-leading cluster within pulp and paper technology - Paper Province - which gathers together business, research, education and the

community for value creation with a forest-based bioeconomy as a common ground.

### VISION

With a more than 150-year-long history within paper manufacturing, we conceive creative meetings between tradition and renewal and show the way using bio-based innovations originating from the forest to foster a fossil-free and sustainable society.

### ABOUT THE VISION

Värmland is a large-scale demonstrator, to which people from all over Europe and the rest of the world come to learn about and witness the achievements possible when society, business, academia and the citizensry, women, men, girls and boys, come together for a common vision. This vision is for a sustainable development based on the region's main areas of strength and identity - a forest-based bioeconomy.

It shall be possible to come to Värmland to learn how to develop an innovation system based on clusters. Research efforts, international networks and collaborations, strategic business start-up efforts, innovation processes, investments, industrial applications, system solutions, innovation-driven public

procurements and a rich variation of innovations are all interesting objects for study visits and demonstrations. This is where examples of how society switches over to a sustainable development built on a forest-based bioeconomy and on the forest's ecosystem services, should be showcased. We also want this to lead to strategic collaborations with European partners.

We expect to witness a number of innovations and larger investments which will increase the value added for both existing products as well as for secondary production streams.

By opening up and involving more industries, more women have been drawn to a sector which traditionally is male-dominated and masculine-coded.

Karlstad University is a leader in Europe within one or two research areas central to a bioeconomy. The university is renowned as a leading institute within interdisciplinary research with an emphasis on bioeconomy, and it participates in projects within Horizon 2020, even as a leading partner in some cases.

Värmland boasts a rich diversity of research efforts, innovations processes, industrial applications, systems solutions, investments (including PPP solutions<sup>28</sup>) and product or service innovations.

More than 100 member companies pay a total



of SEK 3 million annually in membership and service fees to Paper Province. Companies also help finance R&I projects together with Karlstad University and institutes to a total of SEK 20 million every year.

The educational courses linked to bioeconomy

are attractive to students from Sweden and the rest of the world.

We have also seen a greater commitment and participation among the region's population in activities, which contribute to the transition to a sustain-

able society. The primary example is that interest in the broader perspective of a circular economy is firmly rooted in Värmland.

## ROAD TO THE VISION

### Assets to nurture and to develop

- Major access to raw materials with long fibres.
- World-leading companies within paper technology.
- Paper Province as a powerful cluster engine and unifying player of the businesses and owner of the Vinnväxt initiative.
- Diversity, size and density of actors within the pulp and paper technology sector.
- Leading edge expertise within cellulose fibre-based packaging materials.
- Manufacturing and development of tissue machines.
- Sustainable processes for fibre-based products.
- Effective purification and utilisation of secondary streams within wood component-based processes.
- Access to world-class service research through CTF and SP.
- Infrastructure for handling raw materials on a large scale.
- The industry as a powerful user - advancing developments within energy and resource efficiency.
- Excellent opportunities for testing new ideas within the industry.
- Company R&I environments such as Bille-rudKorsnäs Pack Lab and Box Lab, BTG Pulp & Paper Sensors AB, Stora Enso Research, Valmet Fibre plus Valmet Tissue Research and Development Center.



- Excellent access to competent development personnel.

**We also need this to be able to achieve the vision**

Some examples:

*Research and innovation*

- Gather and clarify the research already existing linked to forest-based bioeconomy, and develop another line of research which can be used to reinforce the impact and growth potential of a bioeconomy further.
- Develop the institute sector in the region with a connection to bioeconomy and services.
- Establish and develop training courses and research projects at Karlstad University in order to stimulate knowledge development and innovation within bioeconomy.
- Develop bioeconomy as a cutting edge area for Inova and Innovation Park.
- Build up a well-developed technological pilot environment with the right infrastructure for upscaling innovations.
- Strong user and customer perspective in the development work through the establishment of a service-design-focused bioeconomy laboratory in close collaboration with the pilot environment.
- Develop knowledge on forest ecosystem services for implementation in business and in society.
- Develop research related to how it is possible within bioeconomical efforts to include and take advantage of expertise and perspectives

from regional players in a quadruple helix spectrum. In other words from both women and men and within the organised civil society.

*Business development*

- Supplement with investments in connection with existing large-scale bioeconomy operations such as paper mills, sawmills and district heating facilities to achieve different types and degrees of industrial symbiosis.
- Develop mills as environments for innovation and new start-ups.
- Use the knowledge of industrial plants already available in Värmland for testing new technologies.
- Strong involvement in networking and policy development related to bioeconomy in Sweden and Europe.
- Organise marketing and a “receiving apparatus” for technical visits and educational tourism within forest-based bioeconomy.
- Further develop the companies gender equality efforts.

*Public sector*

- Region Värmland is increasing its commitment to bioeconomy and circular economy in the EU arena<sup>29</sup> and for policy development in these areas in Sweden and in the EU.
- Procurement of goods and services which stimulate development in bioeconomy in Värmland
- Invest in bio-based systems for fuels and energy, recovery and recycling.
- Increase knowledge about bioeconomy and

circular economy in the region.

- Work actively to set up start-ups and investments in the bioeconomy sector.
- Promote Värmland as a bioeconomy region with a forest base.
- Support the build-up of research capacity and development of education in bioeconomy.
- Work to gain improvements in both soft and hard infrastructures for a forest-based bioeconomy in the region.
- Develop methods for transition, everything from regional planning to driving a more process-oriented development strategy for converting to a bioeconomy.
- Take responsibility at an overall level for initiating, coordinating and gaining continuity in the transition to this development through knowledge and research development, which takes advantage of all types of players in the region.

# III. DIGITALISATION OF WELFARE SERVICES

We are developing and testing welfare services in actual environments with users: women, men, girls and boys as co-creators to provide varying types of solutions, many of which are digital.

The public sector is an important user and procurer of these processes. This results in better and more effective care, education and other social services and ultimately happier, more competent and healthier citizens.

Companies will have access to real development and testing environments where Nordic Medtest and Experio Lab are examples of strong centres for expertise within the area. Add to this a strong ICT cluster which brings together businesses and a university at the leading edges within computer science and service research.

For researchers, we offer a multi-disciplinary scientific environment permitting the gathering of unique data in which nursing, school development, IT and service development welcome patients, students, residents and society in the development of an entirely new value creation processes.

## VISION

A welfare sector for co-creating citizens with a well-developed and safe IT environment as a base where the focus is on the human aspect, and the individual's benefit from new value-creating processes.

## ABOUT THE VISION

The percentage of satisfied patients, woman and men, young and old is higher in Värmland than in the rest of Sweden thanks to the fact that we are so skilled at understanding the expressed and unexpressed needs of patients and also due to our ability to adapt the services. In addition, healthcare costs per patient are developing more positively in Värmland than in the other counties in Sweden. This is probably because we succeeded in making patients and their relatives co-producers of the care process and also because we developed digital tools which have resulted in better services needing less staff resources.

With its base in Värmland, Nordic Medtest has developed into the obvious centre for expertise in quality enhancing measures in Swedish e-health. Partly as the result of this we ensure that start-ups are connected to healthcare ICT services. In addition, a number of Värmland ICT companies have products within the health care sector, but also within the schools. This has brought male and female-dominated industries together. This results in the meeting of different viewpoints and better patient understanding.

Actors within the ICT cluster are becoming more and more coordinated as a result of which more than 100 companies pay SEK 3 million a year in

membership and service fees to the cluster organisation Compare.

By focusing research on digitalisation in schools, the use of ICT as an educational tool as well as tool for communication and ICT as an administrative support has grown in the region's schools. This is beginning to become apparent in students results.

The County Council's brand in Värmland is now more associated with innovation to the same degree as it is with the delivery of health and nursing care, which in turn has boosted the attractiveness of the Värmland County Council both as an employer and as a partner. One effect of this is that more men with health care training and/or education have applied for work to the County Council in Värmland.

Another interesting development is that women in the healthcare sector are receiving IT training and some of them are in fact switching industries.

Karlstad University has clear interdisciplinary connections between research and education involving areas such as healthcare, culture, teacher training, ICT and services. New interdisciplinary approaches linked to the specialisations have demonstrated increased external financing for research within the concerned research areas.

On the whole we see a number of benefits:

- Companies - better businesses (access to authentic problems and problem solutions)

- Public services - more effective and better
- Research - unique data
- Society - reduced costs
- Patients - healthier faster
- Students - better learning
- Citizens - better social services

## ROAD TO THE VISION

### Our unique assets to nurture and to develop

- An ICT cluster with experience in consolidating power for companies for new business opportunities.
- Expertise within the service design methodology (SP).
- Service design within the healthcare sector (Experio Lab).
- Access to healthcare environments (Experio Lab, County Council in Värmland).
- Expertise related to testing of IT systems.
- Established testing environments for healthcare IT systems (Nordic Medtest).
- IT related security research, mainly personal integrity and transparency (computer science at Karlstad University).
- Research within IT communication performance for applications of distance (computer science at Karlstad University).
- Service research (CTF at Karlstad University).
- Knowledge of how to conduct research and testing in real environments (CTF).
- Research within transformation through services (CTF).
- Well-developed municipal IT environment with

cooperation throughout Värmland.

### We also need this to be able to achieve the vision

Some examples:

#### Research and innovation

- Further expansion of collaboration between researchers within healthcare, education and teaching, culture, services and IT.
- Develop value-creation processes, which involve understanding the values which are important for users (and other interested parties). These values will become the basis for determining what needs to be renewed.
- Initially conduct studies, identify research topics within e-health connected to Nordic Medtest<sup>30</sup> and build a network within this area.
- Develop healthcare and nursing research at Karlstad University and at the Värmland County Council.
- Develop research and digitalisation in schools, closely linked to teacher training at Karlstad University.

#### Business development

- Spread and apply knowledge on interdisciplinary research methods surrounding patients as co-producers of care processes, often with the assistance of design companies
- Build up a test bed within the public sector in order to be able to test and implement new solutions quickly (Public Service Innovation Lab).
- The Compare ICT cluster develops its position as a coordinator and driving force behind the co-creation of new ICT-based social services.
- Increase the business exchange with Norway

within ICT-based healthcare services in order to meet a strong market which with high demands.

- Pilot activities aimed at procurement entities to enable pre-commercial procurement within healthcare.
- Develop testing and demonstration efforts in schools.

#### Public sector

- Further coordinate the Värmland County Council regular development activities with Experio Lab, Innovation Hub Vivan and Nordic Medtest.
- Continue to develop and implement e-health.
- Develop the roles for women and men who use healthcare and their potential to become more of a co-producer in the healthcare processes.
- Coordinate gender integration with the development of services.
- Develop the system of care levels in order to distribute healthcare resources in a more efficient manner.
- Develop cross-border care coordination and cooperation between different care providers.
- Establish a Public Service Innovation Laboratory aimed towards healthcare services and related services.
- In the long run, to broaden the content in the Public Service Innovation Laboratory concept to include other municipal sectors.
- Develop pre-commercial procurement within the healthcare sector.
- Work on the digitalisation of schools.

# IV. ADVANCED MANUFACTURING AND COMPLEX SYSTEMS

We develop and offer energy and resource-efficient systems solutions and components for, primarily, heavy vehicles, the forest industry and within renewable energy, energy efficiency and hydrodynamics.

For companies, we offer membership in a cluster organisation, an open climate of collaboration in which we help each other with problem solutions, development of composite systems and service offers. We support companies in the introduction of advanced manufacturing methods and other key enabling technologies<sup>31</sup> which are relevant for existing production. Companies have access to an open development environment. Standard questions for discussions include high-performance steel, such as tool steel as well as the manufacturing of tools and components of this type of steel and the integration of different systems in the products.

For researchers we offer a multi-scientific environment led by material science (characterisation and modelling of material) and service research. We also offer a strong network with an international business community and society.

The specialisation contributes to decreased emissions of greenhouse gases, less use of non-renewable materials through the development of renewable energy, increased energy efficiency in industrial processes and a reduction in the use of materials.

Through collaboration with Paper Province, there is a special emphasis on products and services in the bioeconomy sector. The regional commitment to photovoltaics also generates new opportunities for innovative engineering products<sup>32</sup>.

## VISION

Värmland is an established partner in the movement for the industrial renaissance in Europe where we contribute with leading edge knowhow in advanced steel, advanced manufacturing, complex systems and servitisation.

## ABOUT THE VISION

As a result of Värmland's extensive tradition in the steel and engineering industries and the impressive reputation the industry has in the region, reindustrialisation is not needed. Värmland can operate from a level and position of strength. There is the potential to revitalise industry by increasing servitisation and introducing Key Enabling Technologies, which are in line with the policy calling for new industrialisation, but also to increase innovation capabilities through collaboration between companies, and between companies and researchers. This is why organisations such as Steel and Engineering are active

and well respected within the Vanguard Initiative and in other national and international networks.

The new structure of the innovation support system within what used to be the domains of Steel and Engineering and IUC Wermland is highly appreciated by the companies.

Steel and Engineering has expanded its role resulting in 100 member companies now pay SEK 3 million annually in memberships and service fees.

Method development for cluster and corporate development is conducted in cooperation with other regions in Europe. In this regard, Steel and Engineering contribute with their many years of experience working with gender researchers to turn a male-dominated industry into one that is more attractive to women, and how to draw from the experiences and perspectives of men and women in order to achieve greater innovation. For example, a commitment to placing women in leadership positions has resulted in a multitude of women in managerial positions and on company boards.

The research group, Characterisation and Modelling of Materials, CMM, at Karlstad University, has been named an "excellent" environment, thus further strengthening its group.

The research group focused on transformation through servitisation within CTF is three times

larger than 2015 and has a number of research projects together with engineering companies in Värmland.

Research at the Bergskolan, LTU (Luleå University of Technology) in metallurgy has undergone additional growth and it is felt to be strong.

Companies are co-financing R&I projects together with Karlstad University, Bergskolan LTU and the institutes with an annual SEK 20 million.

New constellations have been formed between businesses with common value propositions to customers. A number of them are based on complex technical systems and a large input of services.

By 2025, Värmland will have more international manufacturing companies with 50 to 250 employees.

## ROAD TO THE VISION

### Assets to nurture and develop

- Manufacturing of systems, products and components within the areas of tissue, paper and pulp, hydroelectric power, ship propulsion, heavy vehicles, defence, and to a certain extent, oil/gas and solar energy.
- Production of tool steel, as well as the manufacturing of tools and components of tool steel, for such things as vehicles and wind power turbines.
- Cutting edge expertise within materials technology (high performance steel), applied fluid mechanics (hydroelectric power and propellers).
- Research on steel fatigue<sup>33</sup>.



- Service research
- Companies' R&I environments<sup>34</sup> such as: Bae Systems<sup>35</sup>, Böhler Uddeholm Precision Strip AB, CCI Valve Technology AB, Norma Precision AB, Outokumpu Degerfors AB, Rolls-Royce AB, Somas AB, Swedev AB, Thermia Värmepumpar AB, Uddeholm Tooling AB, UMV Coating System AB, Valmet Tissue Research and Development Center, Volvo CE AB, Westmatic AB and Scana Steel Björneborg AB

**We also need this to be able to achieve the vision**

Some examples:

*Research and innovation*

- Increase involvement in the national strategic innovation agenda for renewal within Metallic materials.
- Develop current research within the research group CMM, Characterisation and Modelling of Materials<sup>36</sup> at Karlstad University.
- At Bergskolan, develop materials science within metallic materials, metallurgy / foundry technology and processing.
- Develop current research within production technology at Karlstad University.
- Initiate research related to complex and integrated systems.
- Strengthen cooperation with leading Swedish research institutes, primarily Swerea and SP, in the case of advanced manufacturing and introduction of Key Enabling Technologies<sup>37</sup>.
- Further develop research and development within servitisation in order to devise new

business models.

*Business development*

- Increase the use of advanced materials and manufacturing technologies.
- Automated manufacturing primarily for short runs.
- Machining (of advanced materials).
- Handle short runs and many types of materials, or advanced materials.
- New manufacturing methods, for example additive manufacturing<sup>38</sup>.
- Reduction of the use of energy and materials in manufacturing processes.
- Sensor integration
- Coating and surface treatment.
- Introduction of other Key Enabling Technologies (see footnote 34).
- Invest in new industries, joint development of offers which are based on customer needs and on our capacity to design complex systems with associated services.
- Based on the above measures, develop a system for suppliers of components (manufacturing companies) and knowledge (engineering companies) which together develop applications (paper machines, wheel loaders, propellers, howitzers etc.) with integrated mechanics, electronics and hydraulics/pneumatics with the OEM companies<sup>39</sup> who are at the top of the value chain. The aim is for Värmland to be able to deliver more competitive and innovative products and sometimes even new products in the form of complex systems in

which qualified services can also be included. This should be possible for companies in new industries such as green tech etc.

- Reinforce collaboration with similar or complementary clusters.
- Develop support for the servitisation of companies.
- Develop a systematic work process for mapping of expertise in companies and research groups
- Support digitalisation and automation of small and medium sized companies.
- Develop offerings within offshore oil and gas technology as well as wind and wave energy from individual components to services and systems solutions.
- Increase collaboration with Norwegian actors.

*Other*

- In cooperation between triple helix players in Värmland, embark into European initiatives for new industrialisation, such as the Vanguard Initiative.
- Develop industrial education programmes at Karlstad University, matching the focus of the smart specialisation.
- Add gender expertise.

# V. NATURE, CULTURE AND PLACE BASED DIGITALISED EXPERIENCIES

We visualise knowledge, stories and natural values of places using digital technology and media in order to create unique experiences for visitors.

Värmland possesses a rich diversity of more-or-less utilised opportunities for outstanding experiences. We have an alive cultural legacy in music, art, handicrafts, historic Finnish culture and storytelling traditions. Värmland's nature offers features such as clean water, biological diversity, many climate zones and activities such as hiking, cycling, canoeing and boating as well as an unexplored unique inland sea<sup>40</sup>. The region organises events profiling tourist destinations focused on culture and nature and also an increasingly varied offer of local food and dishes. The Industry with its Värmland clusters is yet another area to experience.

The right conditions exist for Värmland to grow and develop as an innovative test environment due to a high level of trust and spirit of cooperation. Many people are willing to open their environments up to research, testing and development. This also creates conditions for integrating various offerings with each other.

Using digital technology, we can enhance the experiences and also make it possible to save, share

and spread them. In order to develop technology and services, we must take advantage of the benefits of research in cultural geography, media/communications, computer science and services. We should also take advantage of the institutes in the region, as well as the ICT companies in the Compare cluster and in particular companies in the hospitality industry and groups within the public sector who own and manage tourist destinations.

## VISION

Enhanced nature and cultural experiences for people visiting Värmland using digital technology and media.

## ABOUT THE VISION

People visiting Värmland, women, men, girls and boys, can experience more of the places they visit through digital technology. The spread of these experiences digitally will provide even better marketing for tourist attractions in Värmland.

Visitors will encounter an innovative and sustainable growing hospitality industry which is working on a long-term basis from an environmental, economic and social perspective.

Results from measurements of customer satisfaction and awareness of tourist destinations indicate that all these different measures have produced the desired effect.

Certain tourist destinations have undergone such an upswing that they have caught the eyes of investors.

A number of tourism and ICT companies have products within the area.

By enhancing and renewing visitor experiences of places of both natural and cultural value, we create attractive places with a greater appeal and quality of life. Companies in the hospitality industry benefit from an increase in business opportunities and profitability, which in turn generates more local jobs, especially for young people.

Research on the hospitality industry conducted at Karlstad University is clearly profiled and well known throughout Sweden and also within its strong international network. Visit Värmland has a cooperation agreement with Karlstad University

and the goal is to expand the number of companies which benefit from and are involved in the research.

Thanks to conscious gender-equality efforts, the ICT industry has been enriched with women who have expertise in the hospitality industry and with men from the ICT industry who implement the digital technology.

## ROAD TO THE VISION

### Assets to nurture and develop

We have identified a number of cutting edge assets which we intend to nurture and develop; at the same time, we shall facilitate cooperation and collaboration with other assets in order to enhance value creation:

- Large arenas/infrastructure for nature tourism such as hiking trails, cycling trails, service facilities in connection to Lake Vänern
- Nature, clean water, Right of Public Access in combination with proximity to the European continent
- A living cultural heritage: music, art, handicrafts, Finnish culture and storytelling traditions all connected to the region's cultural and creative industries, which feature breadth, depth and expert skill.
- Expertise in forestry and paper linked to research and also to other strong clusters
- Proximity to Norway
- Computer science
- Service research
- Geomedia research
- ICT education

- Practical knowledge of service design
- Knowledge of how to conduct research and testing in real environments (CTF)
- Expertise within research and development of ICT services
- The profile-creating<sup>41</sup> events and companies
- The cluster organisations Visit Värmland, Nifa and Compare and their collaboration
- Well-developed municipal ICT environment with cooperation throughout Värmland
- Broadband build out and the 4G network,

### We also need this to be able to achieve the vision

Some examples:

#### Research and development

- Coordinate<sup>42</sup>, clarify, develop and profile research at Karlstad University regarding the hospitality industry/tourism in line with the specialisation.
- Develop cooperation between students in, for instance, tourism science and computer science.
- Use events as a basis on which to create more products, and bolster business meetings and develop several congressional and conference activities.
- Support research at Karlstad University connected to the hospitality industry with a profile which is unifying (research) and strategic (business) and which matches the specialisation.
- Develop research which is conducted in actual environments with visitors, both women and men. Where experiences are created and servi-

ces are performed.

- Strengthen the cooperation with other research environments within the hospitality industry such as Etour at the Mid Sweden University in Östersund, Linnaeus University and more.
- Strengthen the cooperation with other research environments in Europe within the hospitality industry, for example by profiling nature tourism and outdoor life, but also within an augmented reality.

#### Business development

- Develop collaboration with different clusters and industries in order to stimulate innovation in accordance with the specialisation, mainly with Compare and Visit Värmland.
- Participate actively in innovative research projects which are in line with the specialisation.
- Work actively, both in the short term and in the long term, using various methods to tie member companies closer to academia.
- Integrate the Nifa food network in order to develop locally produced food and food which is part of the cultural experience of visitors.
- Integrate the design network Form i Värmland, Region Värmland's Cultural Centre and creative and cultural industries in order to develop new experiences for visitors.
- Develop and apply service design methodology and collaborative methods for innovation that involve researchers, businesses and visitors.
- Develop the hospitality industry within learning-based tourism and technical visits in coo-

peration with other Värmland clusters, suitable companies, organisations and researchers.

- Develop value-creation processes, which involve understanding the values which are important for users (and other interested parties). These values will then form the basis for determining what needs to be renewed.
- Develop new markets for the hospitality indu-

stry and increase the number of visitors and turnover during the low season.

*Other*

- Conduct a system analysis of the innovation systems of the hospitality industry with an emphasis on the experiences of the visitor.
- Nurture and develop the Tourism programme at Karlstad University and engage leading re-

searchers in the teaching of and meeting with students in the programme.

- Educate and inspire hospitality companies to give them the ability and motivation to get involved in research projects.
- Develop sites for visitor experiences which are owned or managed by public organisations.

## VI. SYSTEMS SOLUTIONS WITH PHOTOVOLTAICS

We contribute to renewable power for more people in the world and solutions for having our own control over the production of electric power.

The specialisation helps to reduce emissions of greenhouse gases as we develop and offer solutions for the production of electric energy from photovoltaics. One example is a photovoltaic system for the rapid electrification of rural areas throughout the world.

For companies, we offer an attractive test and development environment for generation and storage of photovoltaics, smart electrical networks and small-scale systems solutions involving photovoltaic technology. Companies established in the region

belong to a Norwegian-Swedish innovation system for photovoltaics.

For researchers we offer an interdisciplinary environment with cutting edge within materials science and service research as well as a strong network with the business community and society.

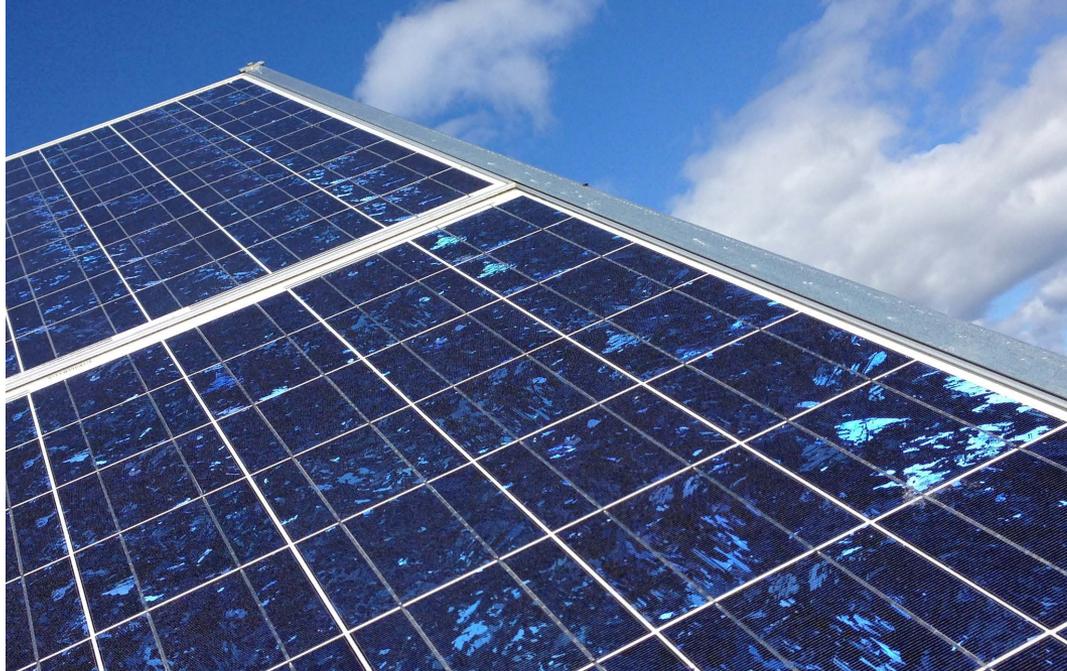
**VISION**

Värmland is a strong part of a European leading trans-regional, Norwegian-Swedish innovation system for solar power.

**ABOUT THE VISION**

Glava Energy Centre is recognised as a Värmland cluster in the Värmlandsmodellen 2.0 cluster strategy and is an internationally renowned arena for solar power. As a part of the positive development of the industry, a Norwegian-Swedish cluster related to solar power and its applications has developed with a strong presence of both Norwegian and Swedish actors.

Glava Energy Centre and Värmland are attractive meeting points both nationally and internationally for creating dialogue, holding seminars, workshops and conducting R&D, as well as for investments in solar power.



Karlstad University has developed as a research hub in the field of photovoltaics and received a great deal of visibility in Sweden. Research has tripled as a result of the university's success in a couple of photovoltaic projects in Horizon 2020.

The collaboration in and development of solar technology has been successfully introduced and research and industry are strongly intertwined.

The solar power sector has not developed along gender-segregated lines as the contributions of both men and women have been taken into consideration at an early stage.

One hundred innovation projects have produced 10 new companies with a total of 300 employees

and SEK 300 million in annual turnover with a 10% of profitability. One success story tells how it has been possible, by studying men and women in countries which lack electrification in rural areas, to develop services and products which have gained great widespread distribution once solar power facilities have been installed.

Värmland is in a good position in the field of photovoltaics and has a total installed output of 10 MW.

### ROAD TO THE VISION

#### Assets to nurture and develop

We have identified a number of assets which we

intend to nurture and develop at the same time as which we shall facilitate the collaboration and coordination between them in order to increase value creation.

- Materials research on polymer-based solar cells.
- Materials research on silicon-based solar cells.
- The Glava Energy Centre (GEC) - a company-driven organisation for renewable energy and an energy system with the emphasis on photovoltaics.
- Facility for outdoor testing of photovoltaic technology in cold climates (the Nordic region's largest test park for solar energy systems and unique for tests in cold climates).
- Demonstration facility for direct current.
- High technological industrial production of solar modules (the only one in the Nordic countries).
- Industrial expertise in the region which is applied within the industry.
- Expertise within control and regulation technology in business
- Industrial knowhow of heat pumps
- Strong technological consulting industry.
- Presence of global entities and entrepreneurs in the region.
- An arena for venture capital investors.
- Comprehensive integration of Norwegian and internationally operating players.
- Arvika solar cell park.
- Centre for service research
- The Karlstad Municipality brand is associated

with the sun.

### **We also need this to be able to achieve the vision**

Some examples:

#### *Research and development*

- Further develop the ability and conditions for externally financed research from the national and EU levels.
- Develop R&D for niche solar cell modules.
- Develop research on control and regulation technology at Karlstad University
- Develop interdisciplinary research methods
- Develop student cooperation within solar power, such as through giving assignments to interdisciplinary student research teams.
- Business development
- Establish Glava Energy Centre in a Brussels-based network for the photovoltaic industry and research. Collaborate with other innovation environments in Europe etc.
- Develop the Glava Energy Centre to a so-called a Värmland cluster<sup>43</sup>.
- Set up projects which integrate new actors in solar power development, for example technical consultants, heat pump manufacturers, control and regulation companies.
- Service development around photovoltaics systems.
- Develop processes in order to take the step from prototype/demo facility to industrialisation and the creation of new jobs.

#### *Other*

- Develop cooperation with Norway with the emphasis on Solklyngen in Akershus.

- Efforts focused on attracting companies and investment to Värmland.
- Involve more actors in the initiative.
- Take advantage of innovation and pre-commercial procurement.
- Lobby for long-term policies for photovoltaics

nationally and in the EU.

- Develop procedures as to how new industries can make use of the contributions of women and men at an early stage and thereby help reduce the number of gender-segregated labour markets in Värmland.

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## THE INNOVATION SUPPORT SYSTEM

The overall innovation support system in Värmland plays a central role for the development of smart specialisations.

By innovation support systems we mean actors with public financing who offer support to innovators, entrepreneurs and (new) businesses. The term innovation system is a broader concept. Innovation systems are individuals and organisations within research, business and public-sector operations who, in coordination, develop ideas for creating added value through the development of new products, services, processes or applications. Innovation

systems also constitute the structures designed to boost the flow of ideas and to stimulate the process of transforming ideas into innovations.

Today, Värmland has a well-functioning innovation support system. However, there is a clear potential for development. We need to see an increased flow of ideas and more ideas with high potential. In order to be able to handle more ideas, those ideas must be dealt with in a faster way and tested at an early stage against the market's requirements so that they can either be rejected or further developed.

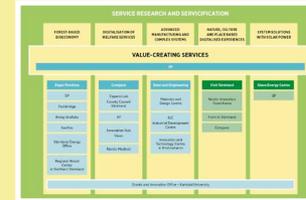
## ACADEMIC INNOVATION AND ENTREPRENEURSHIP

|  |           |
|--|-----------|
| Karlstad University                              |           |
| Grants an Innovation Office, Karlstad University |           |
| SP   | Drivhuset |
| Bergsskolan, Luleå<br>University of Technology   |           |

## INNOVATION PARK INCUBATOR

|                             |
|-----------------------------|
| Innovation Park in Karlstad |
| Inova                       |

## SPECIALISATIONS WITH CLUSTER ORGANISATIONS PLUS INNOVATION PLATFORMS



See figure 6, page 17.

## NICHE ACTORS

|                    |                                   |                                     |                           |                       |                                       |                    |                           |
|--------------------|-----------------------------------|-------------------------------------|---------------------------|-----------------------|---------------------------------------|--------------------|---------------------------|
| Communicare        | Nyföretagarcentrum                | Rookie To Whiz<br>Study Association | IFS Almi                  | Hushållningsällskapet | Närverket                             | Swedish Tax Agency | Arbetsförmedlingen        |
| Ung företagssamhet | Business Värmland                 | Grensetjensten                      | Enterprise Europe Network | IUC Wermland          | Network for Women's<br>Enterprise     | Företagsakuten     | Lantbrukarnas Riksförbund |
| Framtidsfrön       | Culture Centre<br>Region Värmland | Business Sweden                     | Almi Invest               | Värmlandskooperativen | Swedish Academy<br>of Board Directors | LO                 | Unionen                   |

## REGIONAL GENERAL ACTORS

|                 |  |                      |                         |                     |  |  |
|-----------------|--|----------------------|-------------------------|---------------------|--|--|
| Region Värmland | County Administrative<br>Board of Värmland | Almi Företagspartner | Värmland County Council | Chamber of Commerce | Confederation<br>of Swedish Enterprise | Swedish Federation<br>of Business Owners |
|-----------------|--|----------------------|-------------------------|---------------------|--|--|

## MUNICIPAL BUSINESS ORGANISATIONS

|   |   |                        |                       |                    |  |  |  |
|---|---|------------------------|-----------------------|--------------------|--|--|--|
| Arvika Municipality<br>Arvika Business Centre | Eda Municipality                                    | Filipstad Municipality | Forshaga Municipality | Grums Municipality | Hagfors Municipality<br>Uvån Business Centre | Hammarö Municipality                           | Karlstad Municipality<br>Tillväxtcentrum |
| Kil Municipality                              | Näringslivsamverkan in<br>Kristinehamn Municipality | Munkfors Municipality  | Storfors Municipality | Sunne Municipality | Säffle Municipality                          | Torsby Municipality<br>Torsby Development Inc. | Ärjäng Municipality                      |

## COMPANY SERVICES

|       |                                    |             |         |                 |                       |                      |                       |
|-------|------------------------------------|-------------|---------|-----------------|-----------------------|----------------------|-----------------------|
| Banks | Business angel<br>Risk capitalists | Accountants | Lawyers | Patent agencies | Design and prototypes | Advertising agencies | Technical consultants |
|-------|------------------------------------|-------------|---------|-----------------|-----------------------|----------------------|-----------------------|

The system should cover all of Värmland. Even local, specialised innovation platforms should be able to play a role throughout the entire region. The concentration of research, knowledge-intensive buisnes and support present in Karlstad, should thereby be able to benefit the entire region.

A education system, which has a well-integrated working approach that stimulates student creativity and entrepreneurial abilities has a long-term impact on the climate for innovation.

A special plan of action needs to be developed for the overall innovation support system.

The aim should be to develop a leading innovation system focused on value-creation through smart specialisations and entrepreneurial discovery process.

To ensure that there is no repetition of efforts which are common for the different specialisations, we list them below with examples of efforts for development of the overall innovation support system and the innovation system.

Examples of these efforts:

#### *Research and innovation*

- Develop a concept for an academy for industry-related research and education at Karlstad University.

- Strengthen the connection and collaboration between researchers and companies.
- Develop multi-, inter- and transdisciplinary research methods, in other words, methods where areas of research intersect and are integrated to varying degrees with each other and where research is conducted in close collaboration with civil society and business.
- Develop support and activities for companies so they over time will become better equipped/skilled to participate in research-related innovation processes. Activities can for instance be: cooperation projects with students, efforts to employ engineers, development projects together with the university and institutes, forms for creating inspiration for boosting cooperation between academia and the corporate world.
- Strengthen cooperation with other research environments in Europe which, can add value to the specialisations.
- Establish and develop education courses and research projects at Karlstad University for stimulating development of knowledge and innovation.
- Continue to develop working methods with multi-discipline project groups among students.
- Develop the institutional sector in the region, primarily with a connection to services.
- Develop effective tools, iterative processes, in other words repeated and feedback processes for innovation.

- Develop the flow of commercially viable ideas and research results.
- Take initiatives to find strong entrepreneurs, both women and men, who can bring ideas to the market.

#### *Business development*

- Strengthen new businesses and spin-offs from large corporations.
- Strengthen the connection and collaboration between researchers and companies and stimulate companies to become involved in R&I projects, such as Horizon 2020.
- Create new value chains and corporate collaboration.
- Work to ensure that existing, strong value chains meet other value chains in innovation processes and stimulate to create cross connections.
- Develop support for the servitisation of companies.
- Develop the work of expertise mapping so that it will have systemic importance, in other words, make it possible to discern patterns between different companies (and researchers) in order to be able to form new constellations and new offers etc.
- Larger companies open (more or less) their development opportunities with the aim of boosting their own pace of development through open innovation.
- Companies share patents and ideas which do not compete with their own operations and have a generous attitude to personnel mobility

Figure 8 (left). Buisness and innovation support system.

in order to benefit innovation.

- Develop processes in order to take the step from prototype/demo facility to industrialisation and the creation of new jobs.
- Work to increase access to competent venture capital.

#### *Public sector*

- Develop Innovation Park in Karlstad as a node in the system.
- Develop an innovation support system independent of distance.
- Apply service design methodology in a number of situations to include issues related to customer needs and the market at an early stage in the innovation processes.
- Further train consultants in the system.
- Gender-mainstream the support system for new businesses.
- Develop arenas for collaboration. Invest in equality and integration.
- Boost international collaboration in order to learn from other regions.
- Invest in exports to enhance innovation capacity.
- Develop our ability to finance innovation projects with the assistance of regional, national and EU funds. This applies to the university, research institutes, business and the public sector.
- Connect the region's areas of strength and the actors involved to other strong players within Sweden and the EU.
- Promote Värmland's smart specialisations.

- Develop methods to advance from regional planning to running a more process-oriented strategic development work.
- Develop pre-commercial procurement for innovation and for related activities in order to develop the own operations and to stimulate innovation in Värmland's businesses.
- Work strategically with start-ups and investments connected to the specialisations.
- Drive influencing campaigns nationally and in the EU to facilitate the development of Värmland's specialisations.
- Develop entrepreneurial learning in schools.
- Special thematic efforts focused on young people with a connection to various specialisations.

#### *Common*

- Highlight Värmland as a test and demo region with strong niches within, for example, bioeconomy, ICT systems for healthcare and solar power in cold climates.
- Develop networks to combat gender segregation.
- The Innovation support system shall offer equal opportunities for women and men to create innovation.

### **SIGNS SHOWING WE ARE MOVING IN THE DESIRED DIRECTION**

#### Examples:

- A number of companies from Värmland are participating in Horizon 2020, in some cases together with Karlstad University or the research institutes in Värmland.

ch institutes in Värmland.

- Innovation Park has multiplied its facility space.
- In a cluster measurement done on behalf of Region Värmland, the member companies place high importance on all gaps/bridges: company-company, company-researcher, company-education, company-capital, company-public sector, company-cluster (clusters other than their own) and company-global market. Primarily, the company-researcher bridge is well -trafficked and companies also feel they benefit of the proximity to research.
- High traffic at Verksamst Värmland, in particular in those sections, providing support in innovation processes.
- The support system for companies and innovation is gender-aware as a result of business advise desk undergoing a quality assurance check in this field.
- The number and proportion of women and people with foreign backgrounds is growing among innovators.
- Companies from other parts of Sweden and Europe with profiles matching the areas of strength in Värmland, relocate to Värmland.
- A school which promotes the curiosity of children and then develops it into an entrepreneurial attitude as the children grows up.

# POLICY MIX / ACTION PLANS

## Policy Mix

The fifth step in the RIS3 process is the implementation. Initially, this relies on developing proposals for a cohesive mix of measures for the various specialisations and for the innovation system as a whole. This also includes designing processes and groups to implement and realise the strategy, by ensuring we move in the right direction.

At this stage, the goal is to develop the ability to act at a tactical level relying on visions and strategies based on well-designed action plans. In other words, to constantly act quickly but in a coordinated manner. All the players concerned must participate in shaping the action plans. This is a matter of coordinating all actions being taken towards the achievement of the common objectives.

While developing VRIS3 we noted that information was lacking in some areas such as sufficient detailed information and analyses on the various specialisations needed to shape well-designed action plans. It would therefore be valuable to supplement this with more data, enabling analyses of the innovations systems in the different specialisations. This is subsequently to design action plans for the respective specialisations and one for the innovation support system as a whole.

## VARIOUS ROLES OF THE PUBLIC SECTOR FOR INNOVATION

Innovation in the public sector has not been singled out in the strategy as a specific area of specialisation. However, the municipalities and county council already have roles in several of the specialisations. Moreover, innovation in the public sector is an area which can and should be undergoing further development. There are several reasons for the public sector to get involved in innovation. This can entail boosting the rate of growth in the municipalities and the region, developing operations and creating value for residents. In many cases, the municipalities and county council including their public companies, joint political boards and municipal cooperation authorities, Region Värmland as well as national government agencies present in the region, play a range of roles for innovation, for example:

- Support employee innovation
- Request innovations that can both be applied in the own organisation and also become products on a market.
- Develop own innovations for one's own operation and which in certain cases can spin out.
- Public enterprises can also develop to become innovation-driven organisations.
- Public organisations can participate and develop the innovation support system in

various ways. This primarily relates to Region Värmland.

## HOW VRIS3 REINFORCES AND CLARIFIES THE VÄRMLAND STRATEGY AND OTHER STRATEGIES AND ACTION PLANS

In order to achieve regional development, efforts are required in a number of areas. Developments in different areas are, to varying extents, interdependent, and often even mutually dependent. For Värmland to develop in accordance with the objectives set out in VRIS3, initiatives must thus be introduced in other programme areas. This is why the work includes developing a suitable policy mix by reviewing and describing the consequences for the four prioritised areas and thirteen steps in the Värmland strategy. However, this also applies to other associated measures, strategies and greater initiatives, efforts and projects<sup>44</sup>.

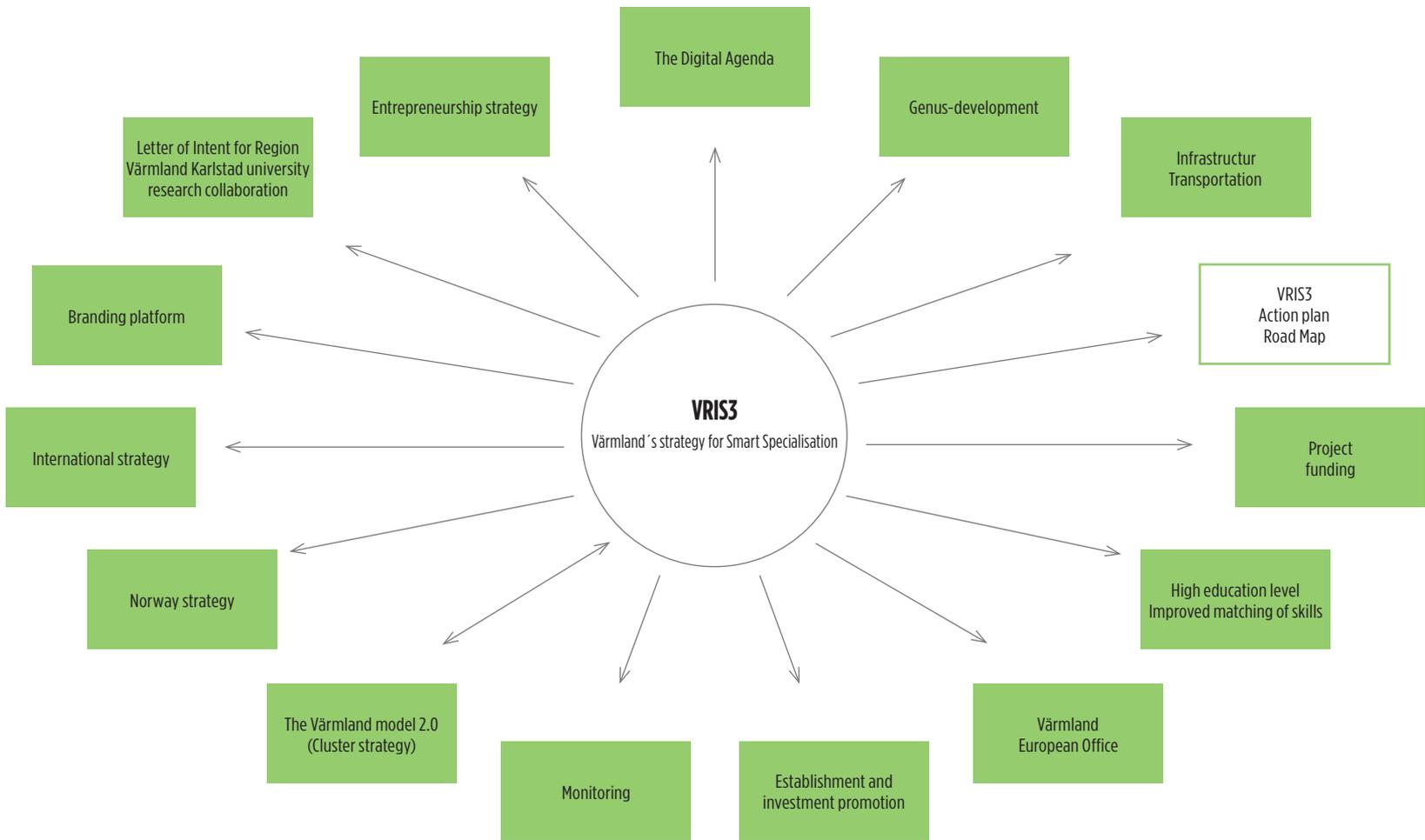


Figure 9. Examples of steps in the Värmland strategy such as strategies, plans, larger initiatives and efforts in which Region Värmland plays a leading or strong supporting role and which are affected by the prioritisations in VRIS3.

# MONITORING

## Monitoring

The task in smart specialisation involves using existing assets in the region to develop global competitiveness within specific areas.

This is, in other words, a conversion process or transformation which needs to be stimulated. These efforts therefore need to build on existing assets, and be innovative and experimental so that structures are transformed and institutional conditions are changed in order to achieve the goals.

Follow up provides support for those who execute the action plans and involve monitoring the progress of the implementation and conducting evaluations as to whether the efforts meet the strategic objectives.

The task of evaluation should be aimed at analysing and evaluating change processes and mechanisms, looking particularly at how these affect innovation. It should also provide the necessary information for introducing re-prioritisations in the strategy.

The learning provides feedback for the follow up and evaluation work for everyone involved in the execution of the programme. In this way, learning becomes a part of the steering of the strategy.

Using evidence-based evaluations is a resource-demanding approach and a challenge for the

body responsible for regional development - Region Värmland - with its relatively limited resources.

Examples of efforts which, contribute to evaluation, follow-up and learning:

- In the beginning of the process, Värmland participated in activities organised by the S3 platforms in Seville, where the comparable regions studied each other and provided feedback.
- The Värmland strategy has set out 33 objectives for development in the region. Of these, objectives 12 and 13 have the highest relevance for VRIS3: 12. Private business investments in research and development shall increase to the same level as the rest of the country (not including the large urban regions). 13. Increased innovation power so that Värmland approaches the country's average (not including the large urban regions).
- The cluster strategy, Värmland Model 2.0, includes an evaluation plan in which the industry's economic development is measured and where companies' executives are asked to assess the impact of the cluster's efforts on their operation. The part which deals with investments in research and benefits for companies is also of particular relevance for VRIS3.
- The collaboration between Karlstad University and Region Värmland within the scope of

VRIS3 will undergo follow up and evaluation.

- Larger projects with financing from structural funds will include follow-up research from a gender perspective.
- The government authorities, Swedish Agency for Economic and Regional Growth, Growth Analysis and Vinnova will conduct evaluations.
- A straightforward method which should be used is self-evaluation.
- The actions plans for the specialisations further clarify how follow up, evaluation and learning will proceed. In order for the different specialisations to be able to be evaluated effectively, the action plans shall be designed based on a programme logic: Resources, Activities - Outcome/Direct results - Results/effects - Long-term effects.

# FINANCING

VRIS3 can be financed in a number of different ways. The European Regional Development Fund (ERDF) and to a certain extent the European Social Fund (ESF) for North Central Sweden are key sources of financing together with national funding for regional development, municipal and county contributions as well as a new feature in this programme period: private co-financing. In addition, there are opportunities to receive co-financing from other national and European funds and programmes<sup>45</sup>.

A list of a selection of financiers, funds and programmes is given below:

- European Regional Development Fund – National Programme
- European Regional Development Fund (ERDF) – North Central Sweden
- European Social Fund – North Central Sweden
- Rural Development Programme
- Interreg Sweden - Norway
- North Sea Region Programme
- Baltic Sea Region Programme
- BSR-Stars
- Interreg Europe
- COSME

- Horizon 2020
- Swedish Energy Agency
- KK Foundation
- Swedish Agency for Economic and Regional Growth
- Vinnova



# TERMS AND ABBREVIATIONS

We have provided explanations below of the common terms and abbreviations used in this context. The list does not pretend to be a complete terminology list but only to provide assistance in understanding the text in the strategy. These explanations are taken from Wikipedia, the Swedish National Encyclopaedia (Nationalencyklopedin) and from the websites of the concerned organisations.

**Baltic Sea Programme** is a transnational programme between 11 countries. The overarching vision for the programme is to turn the Baltic Sea region into an attractive region for people to live, work and invest.

**Bioeconomy** or bio-based economy relates to an economy based on biological materials and not on fossil-based material.

**BSR-Stars** programme is intended to strengthen the competitiveness and the economic growth of the Baltic Sea region. This by promoting cross-border links between specialised research and innovation nodes, leading to strategic alliances which can meet joint “societal challenges” in different areas, such as health, energy, sustainable transportation and digital business and services.

**Cellulose** is the most important constituent of cell walls in all plants and is the most common organic substance in nature. Cellulose, in more or less natural mixtures with other polysaccharides and lignin, is a raw material found in the production of, for example, paper.

**Cellulose derivatives** are products obtained through chemical modifications of cellulose.

**Circular economy** is a concept describing economic models in a company, society or an organisation which highlights business opportunities in which a circular rather than linear processes is used, which up until now have been the most prevalent. A circular economy is inspired by nature’s cycle. The ultimate aim is for waste to be eliminated as such and instead become a raw material. Products are thus designed so that they are easy to recycle. Biological materials and other material are designed so that they can be re-used, recycled, composted, or to enable energy recovery.

**COSME**, Competitiveness of Enterprises and Small and Medium-sized Enterprises, is the EU’s competitiveness programme for 2014 - 2020. The programme is intended to provide support and assistance for small and medium-sized enterprises.

**CSR** stands for Corporate Social Responsibility, which means a company’s responsibilities to society with regard to social, ethical and environmental matters.

**EDP**, Entrepreneurial Discovery Process. A central part of a smart specialisation strategy (RIS3) is the demand on an “entrepreneurial-driven” distribution of public funds. This means that compared to previous growth policies, the priorities should be the result of an entrepreneurial discovery process (EDP) through which entrepreneurial actors from the public and private sectors (which means companies, research organisations, universities and society) are always guiding in the distribution of public funds.

**EAFRD**, European Agricultural Fund for Rural Development

**Entrepreneurship** entails the ability to identify opportunities and generate resources to take advantage of these opportunities. There is long-standing criticism of the individual-focused perspective where conditions such as networks, culture and teamwork instead is highlighted as the central factors explaining successful entrepreneurship.

**ERDF**, European Regional Development Fund.

**ESF**, European Social Fund is EU's most important tool for creating more and better jobs in Europe. The objective in this case is to reduce the differences in welfare and living standards between the EU's member countries.

**Cluster** or a business cluster is a geographically separate environment within which companies in similar industries, in competition and in collaboration, produce a "special" end product.

**Cluster organisations** or cluster initiatives are established in order to add value and to enhance the effects of existing clusters by operating a development organisation around them.

**Equality** is a political objective as decided by the Swedish government and parliament which entails ensuring that women and men have the same power to shape society as well as their own lives. In this document gender signifies the biological and legal gender categories, man and woman.

**Gender** describes the beliefs, norms and common assumptions (implicit rules) about women and men, femininity and masculinity. By taking a gender perspective, based on the statistics related to gender distribution, it is possible to describe the consequences that decisions will have for the living conditions for women and men. This is based on the standpoint that beliefs and assumptions about women and men are created by both society and culture. Therefore, it is possible to change attitude

patterns towards gender issues. By taking a gender equality perspective, it is possible to generate proposals for ways to change attitudes towards gender. From this standpoint, it is important to focus not only on equality policy objective, but also show how to work to achieve improved equality by including both women and men in generating economic growth.<sup>46</sup>

**Gender mainstreaming**, a term coined by the United Nations in 1997, describes the incorporation of the gender equality perspective into the work of government agencies at all levels. The idea is that gender equality is not a separate, isolated issue but a continual process. To create equality, the concept of equality must be taken into account when resources are distributed, norms are created and decisions are taken.

In Sweden, gender mainstreaming is seen as the main strategy for achieving targets within equality policy. The portal [www.includegender.org](http://www.includegender.org) was created in 2009 to help this process, providing simple tools to make gender mainstreaming easier in practice.

In 2011, the Swedish Government decided to strengthen efforts within equality, creating a national platform to further gender mainstreaming at the municipal, regional and national levels.

The Swedish government strategy aims at achieving an equal society. Basically this strategy entails incorporating an equality perspective in all decision making at all levels and at every step in the process by those elements who normally participate

in the decision making process. Since the EU also utilises gender mainstreaming this will be applicable throughout the EU.

**Gender statistics** means dividing statistics up between women and men. In order to determine which growth strategies which are the most successful, gender statistics are required. Dividing up all statistics by gender is necessary to be able to conduct work with gender mainstreaming which means also examining the needs of women and men and examining how resources are distributed.

**Horizon 2020** EU's framework programme for research and innovation.

**Hydrodynamics** is a branch of physics that involves the study of fluid motion. Applying it involves the study of vessel buoyancy, and water turbulence around, for example, a ship's hull or in pipes.

**Innovation** is, briefly, the entrepreneurial process which generates an idea of value. Here, the definition developed by the OECD is used: "The introduction or execution of a new or substantially improved item, service or process, new marketing methods or new way to organise a business, work organisation or external relationships."

**Innovation support system** consists of the publicly funded actors who offer support to innovators, entrepreneurs and (new) businesses.

**Innovation system** refers to the network of individuals and organisations within research, business and public enterprises in which new technologies and knowhow are produced, distributed and used and the structures designed to increase the flow of ideas as well as to stimulate the process to transform ideas into added value.

**Interreg Europe** is an interregional programme aiming to support interregional collaboration amongst all EU Member States, as well as Norway and Switzerland. The purpose is for selected partnerships to formulate political steps, strategies and actions which support their regional growth agendas, through an exchange of experiences and joint development work,.

**Interreg Sweden-Norway** is an EU programme for cross-border collaborations which should contribute to growth in boundary regions.

**KET, Key Enabling Technologies** comprises nanotechnology, advanced materials, advanced manufacturing and processing (production technology) as well as biotechnology.

**North Sea Programme** is a trans-national collaboration programme encompassing seven countries. The overarching objective of the programme is to make the North Sea region a better region in which to live and invest in. Companies, institutions, public administrations, non-federal organisations and others receive assistance in making their expertise

available, exchanging experiences and collaborating in order to develop solutions for problems shared by organisations throughout the region.

**OECD**, Organisation for Economic Co-operation and Development is an international organisation for exchange of ideas and experiences within areas which have an impact on economic development between industrial countries with democracies and market economies, mainly in the 34 (OECD) member states.

**PPP**, Public Private Partnership is a form of public procurement in which a private company or consortium is given the task of financing, building and, for a longer period of time, operating a public utility, generally a hospital, motorway or other infra-structural investment. In other words, not only is the actual construction handed over to a private company but also the financing and operation as well.

**Quadruple helix** involves an expansion of previous regional innovation systems (RIS) which largely were based on a triple helix, or a collaboration between academia, government agencies and business. The Quadruple Helix also includes civil society.

**Ral** stands for Research and Innovation.

**Reglab** is a forum for learning about regional development. It brings together regions, government agencies, researchers and others to learn more. The participants run joint development projects, deepen their regional analyses and learn from one another.

Reglab was launched in 2010 by 10 regions, Vinnova, Tillväxtverket and SKL, on an initiative from Region Värmland and others. At present<sup>47</sup> Reglab has 24 members, of which 21 are regions or counties.

**RIS3**, Research and Innovation Strategies for Smart Specialisation.

**Rural Development Programme** is designed to improve profitable and vital companies, active farmers and lead to modern rural development. The Rural Development Programme includes corporate support, project support, environmental investments, environmental remuneration, remuneration for ecological production, compensation support, animal welfare compensation, as well as locally run development. All support and remuneration is financed jointly by Sweden and the EU.

**S3** Strategies for Smart Specialisation.

**Secondary streams** are residual products formed in the production of the main product. Coming from pulp and paper mills, this could include, for example, lignin, black liquor, and tall oil, while from sawmills we get sawdust.

**Societal challenges** We have chosen to define societal challenges in accordance with EU's Horizon 2020 research programme:

- Health, demographic changes and well-being.
- Food security, sustainable agriculture and forestry, marine and maritime shipping and

inland water research and bioeconomy.

- Secure, clean and efficient energy.
- Smart, green and integrated transport.
- Climate action, environment, resource efficiency and raw materials.
- Europe in a changing world - inclusive, innovative and reflective society.
- Safe societies - protecting freedom and security in Europe and for its citizens.

**Simpler Method** is a means of measuring how economically competitive a region is and compare it with a company's or an industry's position relative to its competitors and follow developments over a period of time. It is possible to measure the effectiveness of an entire region, industry or a company.

**Smart specialisation** refers to a regional policy designed to contribute to smart, sustainable and inclusive growth throughout Europe. This shall happen through a regional mobilisation behind the most promising areas for innovation, entrepreneurship and growth taking into account regional levels of expertise and resources relative to the rest of the world and the current trends.

**Services** refer to customer or user value-creation processes.

**Service design** involves personnel, users or customers working together to design services which create value in the everyday lives of the users. Design is a tool, and an approach, which enables

solutions to be developed based on the users' expressed and latent needs, and it makes it possible to pose common problem formulations, challenges and objectives, as well as giving us the tools needed to be able to collaborate, create and devise appealing solutions.

Radical new services possess a transformational power to convert value chains. In this way, new services can transform traditional value chains and create a value network. This requires deep insights into the behaviour and values of the users, as well as the situation in which they live.

**Servitisation**<sup>48</sup> is a development process aimed to gain new insights both into users and into how best to support their value-creation processes. This requires an overall perspective of the company or organisation and all the associated resources available. This represents the long-term efforts on the part of business and public sector organisations to enhance customer values by taking a basic service friendly approach. Factors which drive servitisation include competition, profitability, globalisation and deregulation. Servicifying your company means supporting your customer's core processes which produces benefits such as increased customer awareness and need-determined innovations.

**Tissue paper** is a type of paper which is primarily used for hygienic purposes and includes toilet paper, paper towel, paper wipes, paper napkins and similar.

**Tissue machines** are machines use for the production of tissue paper.

**Triple Helix** refers to the close collaboration between the public sector, business/industry and academia in which joint learning is the central factor and thereby also communication. This can best be described as a goal-oriented and un-bureaucratic collaboration between companies, government agencies and researchers where it is possible quickly to create, test and realise new ideas. (The name Triple Helix stems from the DNA spirals)

# ENDNOTES

1. See the list of people who have worked with VRSI3 in Appendix 1.
2. Inclusive in this context means there is equality, where gender equality is one of several variables in the pursuit of inclusive and sustainable growth.
3. European Regional Development Fund.
4. European collaboration across national borders.
5. European Social Fund.
6. European Agricultural Fund for Rural Development.
7. Competitiveness of Enterprises and Small and Medium-sized Enterprises.
8. EU framework programme for research and innovation.
9. Moreover, advantageously add external, European resources and by connecting us into global value chains.
10. See the section on societal challenges page 11.
11. Refer to "Det lönar sig (It is worth it)" by Franzén, Lärkeryd etc.
12. The Seville Platform has an RIS3 guide for a process in these six stages.
13. Reglabs Innovationsindex 2013, The European Commission's Regional Innovation Scoreboard 2014, Service Innovation Scoreboard 2014, EU's Innovation Scoreboard, Global Innovation Index and the World Bank's Innovation rank.
14. Värmland's regional growth agreement: Business oriented work for Värmlandian growth power.
15. Supporting the Contribution of Higher Education Institutions to Regional Development.
16. Värmland – ett skönare liv, see [www.regionvarmland.se](http://www.regionvarmland.se).
17. Analyses are presented in the appendices: Värmlands syntes näringsliv, Omvärldsanalys i relation till styrkeområden i Värmland, and the Simpler analyses Starka branscher i Värmland, Utökad analys KIBS och besöksnäringen and Livsmedelsindustrin special.
18. See analysis model in Appendix 1.
19. See Appendix 1 for other research groups.
20. See each respective specialisation for the companies' R&I environments.
21. Services refer to customer or user value-creation processes
22. Servitisation can be considered a soft enabler for many companies enabling them to boost their competitive strength. To be compared with the Key Enabling Technologies as set out by the EU Commission (nanotechnology, advanced materials, advanced manufacturing and processing (production technology) and biotechnology).
23. A value network entails a more complex collaboration in order to create values than what a value chain constitutes where a collaboration functions more like a relay race. See, for example <http://cio.idg.se/2.1782/1.449059/fran-vardekedjor-till-varde-netverk>
24. Steve Jobs
25. This is confirmed by the fact that about four years ago, CTF was ranked among the top five research groups in the world in the areas of service research and customer-driven service development.
26. Owned by Landstinget i Värmland and operated in partnership with SP ETx Kompetensgrupp services.
27. ICT Cluster in Värmland since year 2000.
28. PPP: Private Public Partnership - partnership between business and the public sector. The terms is often used in connection with financing of larger projects. In this case even the EU should be considered to be a part of the public sector. See also Terms and abbreviations.
29. For example, European Regions for Innovation in Agriculture, Food and Forestry (ERIAFF), European Regions Research and Innovation Network (ERRIN), Biobased Industries Joint Undertaking, Vanguard Initiative – Pilot Bioeconomy och European Bioeconomy Alliance.
30. See Appendix 1 for a few examples.
31. Key Enabling Technologies (KET): nanotechnology, advanced materials and advanced manufacturing and processing (production technology), and biotechnology.
32. See smart specialisation System Solutions with Photo Voltaics
33. Relies on a method for measuring purity in steel

- where the steel is exposed to a billion fatigue cycles.
34. Has allocated resources to run product development and process development of own products.
  35. Has operations in Karlskoga which are located slightly outside the region. However, still located so close to Värmland that it is part of our labour market region.
  36. Encompasses materials technology, materials physics, mechanics of materials and manufacturing technology.
  37. KET: Nanotechnology, advanced materials, advanced manufacturing and processing (production technology) and biotechnology.
  38. 3-D printing.
  39. Brand owners who often operate on a global market.
  40. Lake Vänern, the largest lake in the EU.
  41. For example, 2015): Rally Sweden, Timmerflottarna, Branäs, Karlstad CCC, Sandgrund Lars Lerin Art Gallery, Västanåteater, Wermland Opera, Vänern, Sliperiet.
  42. Research on tourism for example, outdoor life, experiences, cultural sciences, media, CSR issues, gender and services
  43. In accordance with the criteria in the Värmland Model 2.0 cluster strategy.
  44. See Appendix 1 for a summary of the other strategies and measures that should apply.
  45. To see a thematised compilation, see Appendix 1 Plus
  46. Fakta fakta i korthet No. 7 • 2014 at regionvrmland.se
  47. The definitions are partly derived from: How Värmland can become a winner in growth of equality - a current situation analysis - facts in brief No. 4 2012 Region Värmland
  48. Spring 2015.
  49. Servitisation can be considered a soft enabler for many companies enabling them to boost their competitive strength. To be compared with the Key Enabling Technologies as set out by the EU Commission (nanotechnology, advanced materials, advanced manufacturing and processing (production technology) and biotechnology).



This is Värmland's Research and Innovation Strategy for Smart Specialisation 2015-2020.

The strategy shall serve as a tool for sustainable and inclusive development and growth in Värmland. The aim is for the strategy to be a concern for all key groups in Värmland that work with innovation within Värmland's specified areas of specialisation, as well as for actors elsewhere in Sweden, in Europe and globally.



[regionvarmland.se](http://regionvarmland.se)