TITA

REGIONAL MOBILISATION
AROUND ESS AND MAX IV

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ESS MAX IV in Southern Sweden–TITA

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TITA

Regional mobilisation around ESS and MAX IV

Final report

Foreword

Well, what a journey we've been on together! All the meetings, discussions, presentations, study visits and analyses have served to bring us quite some way forward and to deepen our understanding of the challenges and possibilities that ESS and MAX IV present for our region.

TITA has been the means of our acquiring an enormous wealth of knowledge that we can use as a launch pad for future work. Not only do we now know *what* needs to be done but also *how* to go about the task of seeing our entire region harnessing the spin-off effects from ESS and MAX IV. We have ever so slightly opened the door to the future and glimpsed a host of possibilities that can follow in the wake of these establishments. Now it is simply a question of daring to take the step over the threshold and invest in concrete initiatives!

During the course of the project, we have gained a much greater understanding of the diversity of activities and the work that is necessary for us to leverage the maximum effect from the research facilities. We have a better understanding of the needs of the researcher and of the importance of society in seeing facilities such as these achieving their full potential. We have seen how urban planning in its broadest sense influences every part of the work.

TITA has been characterised by a cross-sectoral approach, both in terms of levels, sectors and organisations. This cross-cutting approach needs to continue in the long-term work. We have created a working process where it is not only possible for everyone to make a contribution, but where this is also necessary if we are to achieve success in the initiatives that TITA has identified. Every one of us has a responsibility – nothing happens of its own accord.

Thank you to everyone who has been on this journey and contributed knowledge and commitment. I look forward to taking the next step together with you and laying hold of this unique opportunity for growth and development in our region. The journey has just begun!

Pia Kinhult

CHAIR OF REGION SKÅNE'S REGIONAL EXECUTIVE COMMITTEE AND CHAIR OF THE POLITICAL STEERING GROUP TITA

Summary

TITA's overarching task has been to investigate how Skåne and Blekinge can maximise the public benefit of the research facilities ESS and MAX IV being established in the city of Lund in southern Sweden. The expectations on what these internationally unique facilities might mean in terms of growth effects and dynamic societal development are great. So identifying both the possibilities and challenges associated with this is of the utmost importance. This final report represents a summary of the principal results and conclusions from TITA's nine sub-projects and project-wide activities carried out during the years 2010–2012. More detailed information on specific issues may be found in the final reports of the individual sub-projects and in background reports.

TITA's overall results indicate a strong potential for Skåne and Blekinge to derive great public benefit from the establishment of ESS and MAX IV. The construction and future operation of the facilities will alone provide industry in the region with the opportunity for substantial business and transfer of technology. In a broader perspective, there is potential for even greater regional benefit since the facilities may result in additional spin-off effects in terms of an enhanced climate for innovation, increased business competitiveness and a dynamic research community. This is likely to be accompanied by new business start-ups and an increased influx of people with sought-after and attractive qualifications. The Öresund Region's brand as an international meeting point for materials research will become stronger. The establishment of ESS and MAX IV also gives the region a unique opportunity to use the facilities as a catalyst for public initiatives that would still need to be carried out, but that would benefit from a greater scale and more rapid implementation. This relates to everything from infrastructure investments to issues of competence supply.

But nothing in the scenario above is going to happen of its own accord. On the contrary, a diverse range of initiatives from a large number of stakeholders will be necessary for the region and the nation to take advantage of the possibilities arising from the establishment of ESS and MAX IV. The greatest challenges that TITA has identified are the need for long-term initiatives, strong commitment and leadership combined with continuing collaboration long after the conclusion of TITA.

Among the immediate needs identified by TITA are:

- The need to build strong links between industry, academia and the facilities and to create support functions for both the supply to and the industrial use of ESS and MAX IV.
- The necessity of investments in schools that lead to an increased interest in choosing education pathways within science and technology.
- The need for an open innovation arena in materials science to create a strong innovation environment around the facilities, providing the readiness and speed required for the region to be an effective recipient of new ideas and activities.
- The necessity of stepping up housing construction and transport infrastructure investments in order to increase accessibility to ESS and MAX IV from the entire region.
- The need to develop in hostmanship and to make the region internationally attractive to people and companies by, for example, ensuring the availability of international schools and a variety of housing.

Through TITA, the region's stakeholders have acquired both knowledge and models for collaboration. The project's results underscore the initiatives that are required for both region and nation to derive the greatest possible effect from ESS and MAX IV. It is now high time to take action, putting these insights to work and continuing to build on the foundations that have been laid.

In order to guide, gather and inspire TITA's partnership to continued work and regional mobilisation around the research facilities, five strategies have been developed.

To ensure spin-off effects throughout the region, there will be a need to:

- Enhance the competitiveness and innovative capacity of the business sector
- Build a region strong in education
- Create dynamic research environments
- Increase accessibility throughout the region
- Develop the international attractiveness of the region

A vision of the future: Science Village and Brunnshög. Illustration: Cobe.

Contents

1.

Background

TITA

– a unique project

The years 2010–2012 saw Region Skåne collaborating with 42 other public-sector stakeholders in Skåne and Blekinge on the project "ESS MAX IV in Southern Sweden – TITA". The Swedish acronym stands for Growth and Innovation (TI) and Accessibility and Attractiveness (TA). The project is co-financed by the EU and addresses the issue of how stakeholders in the region can maximise the public benefit and harness spin-off effects from the establishment of ESS and MAX IV. Never before have Skåne and Blekinge seen this kind of mobilisation and collaboration between so many local and regional stakeholders within the framework of a joint project. The regional mobilisation achieved in connection with the establishment of the facilities is unprecedented both nationally and internationally. But the incentive for TITA is also unique.

The research facilities European Spallation Source (ESS) and MAX IV are among the single greatest scientific investments in Swedish history. The facilities are being built to become world leaders in their fields with, as yet, unparalleled performance. The expectations on what these multi-billion investments will mean in terms of research breakthroughs within the life sciences and materials science are great. And so are the expectations on what it will mean in the form of dynamic growth effects for the region surrounding the facilities.

Of the approximately SEK 18 billion that ESS and MAX IV will cost to build, Sweden's contribution is around 8 billion. MAX IV is expected to become operational in 2015 and ESS in 2019. Through their ownership (MAX IV), hosting (ESS) and significant level of financing, Sweden and the region have a particular responsibility for harnessing both the knowledge output and the public benefit in the best possible way. Thus, the research community, industry and Sweden's public sector face major challenges. The necessity of long-term commitment and collaboration in combination with a battery of initiatives in the most diverse of areas was already clear in the pilot study that preceded TITA and which resulted in the final report "The ESS in Lund – its effects on regional development"[1].

1/ *The ESS in Lund – its effects on regional development* (PWC 2009).

The experiences and results from TITA have confirmed this and provided a more nuanced picture.

TITA's overarching purpose

- To enhance the region's accessibility and attractiveness so as to enable the maximum effect on employment arising from the establishment of ESS and MAX IV.
- To produce in-depth analyses of how various stakeholders can harness the growth effects of ESS and MAX IV.
- To disseminate information and knowledge for raising awareness about the significance of ESS and MAX IV and the need for measures to harness opportunities for growth.
- To create a regional cooperation arena with a focus on conditions for innovation and development around ESS and MAX IV.

Project goals

- A regional cooperation arena shall be established for the long-term work of exploiting conditions for innovation and development around ESS and MAX IV.
- A strategy and action plan shall be produced addressing what should be done in Skåne/Blekinge as a means of creating international competitiveness.
- The work on the innovation investment that is in part being made in cooperation between higher education, Region Skåne and the business sector shall be integrated with the cooperation on ESS and MAX IV.
- Arenas shall be created for regional, national and international cooperation on ESS and MAX IV in order to harness synergies.

Desired long-term effects

- Enhanced accessibility and attractiveness of the region, creating more employment opportunities and business start-ups as a result of ESS and MAX IV.
- A strong innovation structure in the region, creating employment and growth as a result of ESS and MAX IV.
- An increased awareness and understanding in the project's target groups of the significance of ESS and MAX IV and the need for measures to harness the opportunities for growth.

Target group

TITA's primary target group has been the municipalities and business sector of Skåne and Blekinge as well as government agencies (including universities/colleges), Region Skåne and Region Blekinge.

Partners and co-financiers

TITA has had a total budget of SEK 47.3 million. The co-financiers are Region Skåne, all the municipalities of Skåne, Lund University, Invest in Skåne, ESS AB, Malmö University, the County Administrative Board of Skåne, Kristianstad University, Region Blekinge, the Swedish University of Agricultural Sciences, Blekinge Institute of Technology and the European Regional Development Fund (ERDF).

Project organisation

TITA has consisted of two overarching projects – TI and TA – in turn divided into six and three different projects respectively. Organisationally and operationally, TI and TA have had the same overall project management, so this division has not had any practical significance for the nine sub-projects. A project secretariat, with an operational project manager, project secretary and communications officer, has worked with the coordination and unity of TITA. Each sub-project has had a sub-project director and a sub-project manager.

For overarching issues, there has been a project management group, a strategic working group and a political steering group. In addition, a special committee has managed major investments and procurements during the course of the project.

Throughout the project period, researchers have been assigned to monitoring and evaluating the progress of the project. Through an ongoing dialogue with the project management and project group, these researchers have contributed to continuous learning and effective project implementation.

Each sub-project has had a working group attached to it, with participants from the partner organisations. The organisation and function of the working groups have been different in the various sub-projects.

Working method

In its nine sub-projects and the overarching project, TITA has performed case studies and analyses, made international comparisons and compiled research overviews. The work has resulted in a large knowledge base, which is presented in a series of reports and substantial information materials.

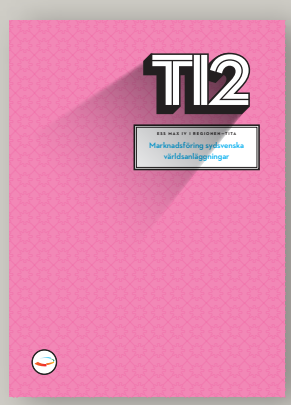
All this has been posted continuously on the project website www.essmax4tita.se, and in this way knowledge has been disseminated to interested parties both inside and outside TITA's partnership. The website has also regularly published articles and films where results and activities from TITA's various parts have been described in an easily accessible manner.

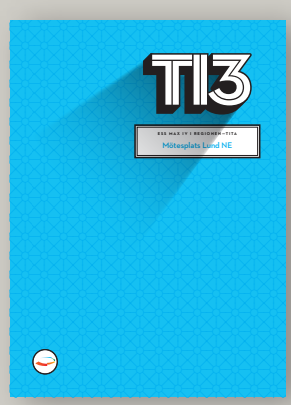
In addition to the sub-projects' various meetings, workshops and other activities, there have been project-wide events with invitations to all the parties involved in TITA. The purpose of these was to disseminate information on the results of the project and to promote mobilisation of the entire partnership.

Each sub-project has summarised its results and conclusions in its own closing sub-project report. It is these nine reports, in combination with other investigative materials, experiences from the project period, input from the partnership, political steering group, strategic working group and external strategy consultants and researchers following the project, that form the basis for the results and conclusions presented in this final report.

TI + TA = 9

TITA is a unique project, not only in terms of the great number of participants, but also in its breadth. In order to create clarity in the various intermediate goals, the project was divided into nine sub-projects.





TI 1 – Relocation support

The purpose of this sub-project is to lay the foundations for a positive reception of companies and labour so that they wish to stay or return, which increases the region's attractiveness. A web portal, www.movingtosouthernsweden.com, has been created as a means of directing companies and private persons to the right information when exploring a move to the region. Interviews with international researchers and companies have also been conducted under the sub-project, with the aim of gaining an understanding of their needs. Analyses of how other regions and cities work with relocation support for international companies and private persons have also been performed.

The sub-project has established that relocation support needs to be smoother and authorities' procedures must be made more efficient. In order to be an attractive residential municipality, it is crucial that it allows children to live and study in different municipalities. Initiatives must also be taken to improve the opportunities of accompanying parties to gain employment.

TI 2 – Marketing

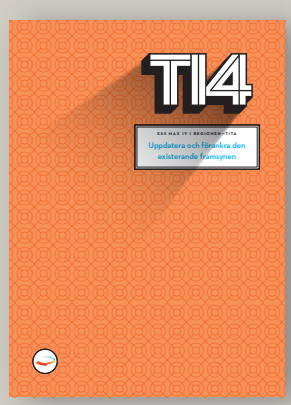
The purpose of this sub-project is to amplify the positive societal effects of ESS and MAX IV by marketing the region and the facilities to large international companies, institutions and subcontractors. Coordinated marketing materials have been produced and a large number of marketing activities have been carried out, primarily targeting international companies that may have an interest in establishing themselves in the region or creating partnerships with actors here.

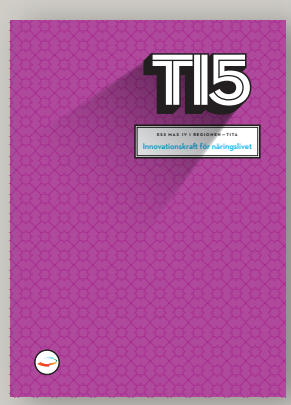
The sub-project establishes that a future function that links primarily large international technology companies with subcontractors in Skåne and Blekinge has the potential to be of great significance to trade and industry in the region.

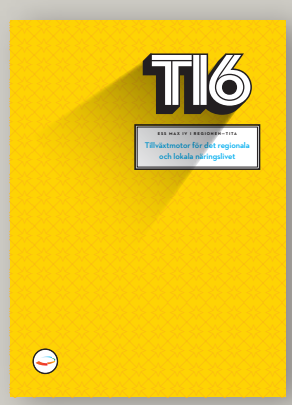
TI 3 – Meeting Point - Lund NE

The purpose of this sub-project is to identify success factors for the optimal development of Lund NE/Brunnshög into a regional and international meeting point. Lund NE/Brunnshög is the area in which ESS and MAX IV will be situated. This sub-project has produced an extensive knowledge base on meeting points that has provided various regional actors with tools to create innovative meeting points for ESS and MAX IV. The sub-project has also conducted a pilot study that contains the concept and financing for a science centre between the research facilities. Concrete proposals for a number of meeting points in the vicinity of the research facilities have also been drawn up.

This sub-project has established that the benefits of a successful culture of meeting around the research facilities is of the highest importance. Recommendations point to active work that promotes the meeting of researchers and those outside the facilities. If visiting researchers return home and speak of southern Sweden as an inspiring place, the word will spread, something which can produce spin-off effects throughout the region.







TI 4 – Foresight

The purpose of this sub-project is to update and root the foresight that was previously implemented with respect to regional effects of the establishment of ESS and MAX IV. The primary form of foresight has been through Foresight get-togethers where participants through reflection and dialogue have identified development opportunities, both within long-term development themes or innovation areas and in the form of concrete activities. The project has also updated and developed the vision *Society for Science – Science for Society*, which is the basis of the forthcoming work for regional mobilisation around the research facilities.

The sub-project has established that new forms of long-term work with vision and foresight are required. The lessons learned about systemic foresight work can be used as a basis for establishing foresight as a tool for regional development and be used in all areas that need to increase their readiness for change and optimise cooperation between various actors. In order to take advantage of the common development potential between various actors, it must be possible to share and discuss visions and information on an ongoing basis. The sub-project has produced a prototype for a web community in order to test the ways in which web-based communication can be used in the foresight work.

TI 5 – ESS and MAX IV as an innovation catalyst for trade and industry

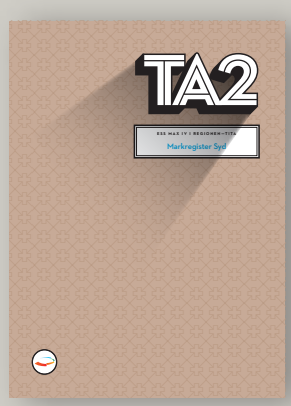
The purpose of this sub-project is to strengthen the region's innovative capacity by creating new arenas and optimising existing ones, and identifying ambassadors, heroes and leaders in the public sector, research and industry in order to highlight other open innovation arenas (former clusters) and other areas of innovation surrounding the opportunities afforded by the facilities. The sub-project has also contributed to raising materials science on the region's political agenda.

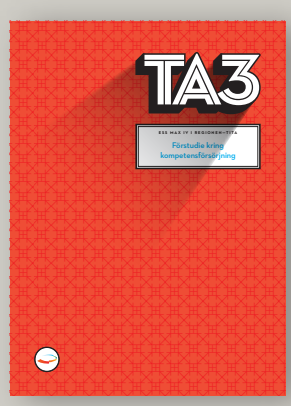
The sub-project has established that an open innovation arena in materials science will work as a complement to the research environment surrounding the facilities and that it is therefore important that it is international, neutral and inclusive. The conclusion is that the arena is both necessary and desirable in order for industry and society to gain the full effect associated with the establishment of ESS and MAX IV. For this reason, an open innovation arena in materials science has been initiated and a steering group created.

TI 6 – ESS and MAX IV, a growth factor for local and regional businesses

The purpose of this sub-project is to help the establishment of the facilities to act as a growth factor for businesses in Skåne and Blekinge. This has been achieved by creating good conditions for a closer association between the establishments of ESS and MAX IV and local and regional businesses. The sub-project recommends the required initiatives to be brought together into a support function for suppliers. It has also produced a concrete proposal – an "Industrial platform for suppliers". It is proposed that the platform initially continue the work with ESS and MAX IV, to then go on to provide information about business opportunities at other international research facilities and in other large public investments in or near the region.

The sub-project has established that there is a need for extensive information initiatives and initiatives to raise the level of competence in the region. It has also identified that these must be carried out in a structured manner with long-term ambitions. The sub-project also highlights a great potential for work in the transfer of technology and knowledge in the encounter between the facilities and companies.





TA1 – Urban planning and transport infrastructure

The purpose of this sub-project is to gain an in-depth understanding of how the region, by means of effective urban planning, can lay the foundations for and benefit from the positive effects expected from the establishment of the research facilities. Strategic urban planning plays a decisive role in this work and, according to the sub-project, needs to be enhanced on several levels. The public-sector stakeholders must be more proactive, driven and innovative in their planning.

The sub-project has established that a great number of initiatives are required, both from municipalities and other actors (private and public), if the region is to take advantage of the spin-off effects of ESS and MAX IV. Key factors, such as good access to fast communications, attractive residential environments and functioning public services, can be crucial to the region's capacity to attract new residents. An important condition for the whole of Skåne to benefit from a dynamic development is for the region to be perceived as attractive, tolerant and safe.

TA2 – Land availability register

The purpose of this sub-project is to optimise the visibility of land in southern Sweden for interested parties both in Sweden and abroad, which will in turn lead to more investments in the region. For this reason, a digital land availability register has been developed that contains information about vacant land that is available for business start-ups and housing. Apart from the web solution that has been developed, the sub-project has further developed contact networks within, between and outside the municipalities and Region Skåne/Invest in Skåne.

The sub-project has established that it is important for as many municipalities as possible to participate in the continued development of the land availability register and for the database to be kept up-to-date so as to take full advantage of its potential.

TA3 – Pilot study for competence supply needs

The purpose of this sub-project is to investigate the kind of competence that will be in demand during the construction, instrumentation and subsequent operation of ESS and MAX IV, as well as the skills that need to be improved in order to promote the innovation work and transfer of technology between the facilities and industry. The primary focus of the project has been to obtain knowledge and experience internationally. With this knowledge, the project has also proposed appropriate measures with respect to the proportions of study programmes and research, as well as strategic initiatives to strengthen the link between industry, academia and research facilities.

The sub-project has established that the matter of education and competence supply is central and that long-term planning, clear leadership and broad collaboration are essential if the region is to take advantage of potential growth effects from the establishment of ESS and MAX IV. Four important areas of initiatives have been identified; long-term initiatives for competence development and education initiatives at universities, investments in technology and science at an early stage of schooling, support functions for industry and functions for industry-related research. Integrating the research facilities with the education systems will create new opportunities for research breakthroughs, technological development and spin-off effects into industry.

A vision for the future

A guiding light for the work to create a region that is able to harness the potential effects of the establishment of ESS and MAX IV is the vision *Society for Science – Science for Society*. The underlying idea behind the first part of the vision – *Society for Science* – is that society must create effective conditions for the research and effective conditions for exploiting the potential in the establishment and operation of the facilities. The second part of the vision – *Science for Society* – is in turn indicative of the responsibility that the researchers have for making the research capable of application. That it is not only a question of understanding how the world is structured, but also of using this knowledge to help to change it.

The vision clearly points to the importance of ESS and MAX IV – that their establishment can lead to long-term effects in many areas of society. It is inclusive and inviting. Everyone may contribute, no one need stand outside. And it points especially to the interaction between society and research – science does not stand outside society and vice versa.

The vision was already formulated in the preparatory work for the TITA study.[2] The process of updating the vision has placed a particular focus on communicating the breadth of the influence that will arise from the establishment of ESS and MAX IV. Furthermore, the roles of various stakeholders in the region have been clarified. How are they affected by the realisation of the vision and how can they contribute to this? In this way, ownership of the vision has been broadened. It has been of crucial significance to formulate the vision in such a way that it creates pride among residents with respect to the region's new position.

The overarching vision has been made tangible in five themes:

- Competitive business community
- Well-educated population
- Dynamic research environment
- An accessible region
- An attractive region

Where the vision text mentions the word region, it refers to the region surrounding ESS and MAX IV, and not to administrative divisions. The geographical borders, depending on the context, might encompass Skåne/Blekinge, southern Sweden, the Öresund Region and the southern Baltic region.

The vision is a long-term one and evokes an image twenty years ahead. For each theme, strategies have been developed in the medium term (5–10 years) and proposals for initiatives have been developed in the short term (1–2 years). This will ensure a link between long-term goals and immediate action. The vision document is organic and will change over time as part of a consistent work of foresight.[3]

2/ *The ESS in Lund – its effects on regional development* (PWC 2009).

3/ *Uppdatera och förankra den existerande framsynen (Foresight)* (Final Report TI4).

SOCIETY FOR SCIENCE SCIENCE FOR SOCIETY

In the year 2030, the region around ESS and MAX IV is one of the most influential respected knowledge regions in the world; it enjoys research and educational excellence. One of the region's strengths is the diversity of venues and forums where science and society meet; this has led to an innovative social climate. With its competitive business community, well-educated population, dynamic research environments, accessibility and attractiveness the region is internationally recognised for its successes. It is also renowned for its unique far-sightedness as well as the innovative and practical methods of encouraging the various stakeholders and sectors of society to collaborate. Residents are proud that they play and have played a key role in this development and help spread the word about the opportunities and possibilities created by a dynamic society where people can live, study, work and run a business. This is an area where science and society work together to create new knowledge and economic growth, and advance the quality of life.

Competitive business community

Companies in the region are internationally competitive and believe they have a competitive advantage in being situated in the vicinity of ESS and MAX IV. All leading companies are now situated here, both as users of and suppliers to advanced research facilities. The establishment of ESS and MAX IV has also been a powerful tool in creating Europe's most innovative region. Entrepreneurship has a place here and is facilitated in all sectors.

Well-educated population

The region has an internationally prominent education system – from primary school to postgraduate education. ESS and MAX IV help to inspire young people to conduct research in all areas of science. Together with the region's international profile, this makes it easy to recruit competent personnel in everything from research to the service industry.

Dynamic research environment

ESS and MAX IV are the base for research that can be awarded the Nobel Prize. New achievements and research breakthroughs are occurring on a regular basis. Actors in the public, private and non-profit sectors that want to develop their activities can benefit from being situated in a region of knowledge. The dialogue between researchers and other actors is characterised by openness and mutual benefit.

An accessible region

The region is welcoming and easily accessible, with attractive living environments, well-developed transport systems and an effective housing market. Here, the majority of people are close to work, services and recreation. Urban planning is characterised by a sustainable mindset, versatility and innovation. A distinguishing characteristic is dynamic collaboration between public-sector stakeholders.

An attractive region

The region is known internationally as an attractive region of knowledge, innovation and growth. Relocation support for companies, employees and students moving to the region is world-leading. The residents perceive the region they live in as high-tech, with an international profile that they feel part of and are proud of.

2.

What are ESS and MAX IV?

ESS and MAX IV

– similar, yet different

ESS and MAX IV are often said to be similar and complementary research facilities and, to be sure, the collocation of ESS and MAX IV is significant. But to avoid a confusion of terms, it is important to understand what types of facility these are and how they differ – both from each other and from other similar facilities.

MAX IV is a synchrotron light source facility and ESS is a neutron source, that is, a facility for neutron-based research. Somewhat simplified, one can say that in terms of engineering design they share many similarities, they are similar in function and their areas of use are similar and complementary. In both facilities, particle accelerators are central. But neither ESS nor MAX IV use particle accelerators for particle physics, as does CERN in Switzerland, for example. There, powerful particle accelerators are used to collide elementary particles at high speeds in order to study their structure. This is a means of investigating the innermost units of matter, attempting to understand, among other things, how the world was formed after the "Big Bang". This is completely different to the research that is being planned for MAX IV and ESS and that is conducted at other synchrotron light sources and neutron sources around the world. In contrast to the internationally most renowned research facility, CERN's Large Hadron Collider, that has the task of proving a single theory, facilities such as ESS and MAX IV can be used in a variety of disciplines (probably in more disciplines than they are used today) and industries, such as pharmaceuticals, automotive, aerospace and packaging.

Both synchrotron light sources and neutron research facilities are user facilities whose primary task is to provide high-quality experimental equipment for the scientific community. Access to the facilities and their equipment, known as experiment time, is usually free of charge, provided that the experiment time is sought on a competitive basis and that the results are published, that is, without any charge for researchers at universities and colleges.

For commercial use, the facility requires payment. In a few cases, this is achieved by users financing their own instruments at the facility. The scientific community places high demands on user facilities not only to provide advanced equipment, but also a support organisation that makes it possible for visiting research teams to efficiently exploit the experiment time they are allocated.

A vision of the future: ESS and MAX IV. Illustration: ESS.

The support organisation includes researchers and technicians that are specialists both in the equipment and the research. An operational organisation is also needed to ensure that the facility and all the equipment is maintained in good condition. A user administration to manage the scheduling of experiment time, necessary contacts between users and the facility's own specialists, as well as the handling of tests and safety, is also a necessary function.

MAX IV is a further development of today's MAX-lab, building on the experience of research using synchrotron light that over the years has been established in Lund and at several other Swedish universities. MAX-lab is already a well-established and internationally competitive research facility.

Unlike MAX IV, ESS is a European project with a historically smaller user base in the Swedish scientific community. European researchers have, with marginal Swedish involvement, long been viewed as world leaders in the field of neutron scattering, not least through the reactor facility ILL (Institut Laue-Langevin) in Grenoble and ISIS outside Oxford, an accelerator-based neutron source like ESS.

The only possible way to build a world-class facility in Europe is through cooperation between European actors in academia, industry and the central government/public sector. Thereby Skåne, and above all Lund, will in the design, construction and operation of ESS and MAX IV constitute a focal point for world-leading expertise in two future-oriented fields of research.

European Spallation Source (ESS)

ESS is a planned multi-disciplinary research centre based on the world's most powerful neutron source. Here, researchers from all over the world will travel in order to study a plethora of materials, ranging from plastics and proteins to medicines and molecules, with a view to understanding their structure and function. The facility will be the world's foremost for research using neutrons – a technology used for advanced analyses in various research areas.

The technology is based on neutrons as a tool for analysing materials at the molecular level. Hydrogen nuclei, protons, are accelerated in a just under 600-metre long accelerator, in which they almost reach the speed of light. At the end of the accelerator, the protons hit a tungsten target that then throws off neutrons. It is this that is the spallation process.

The neutrons are led through pipes to experiment stations. Research with neutrons can be compared to a large microscope in which neutrons are used instead of light to "see" the materials. The target material used becomes radioactive, but is kept in a closed safety mechanism.

ESS will be about 30 times better than similar facilities and will open up new research possibilities in areas such as biology, chemistry, archaeology, medicine, the environment and climate, energy, transport and engineering. Research in these fields has so far resulted in, for example, new materials solutions in mobile telephony, foodstuffs, vehicle parts and medical devices.

JOINT EUROPEAN PROJECT

ESS is a European research project. Today ESS is a state-owned company under the ownership of the host countries Sweden and Denmark, but 17 nations are partnering in the ESS cooperation: Sweden, Denmark, Spain, Czech Republic, Estonia, France, Germany, Hungary, Iceland, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Switzerland, United Kingdom.

From 2012 to 2025, work will be in progress on the design and construction of ESS, as well as planning for the future organisational form. The technical design is being developed through the collaboration of 200–300 researchers in around 60 partner laboratories all over the world. In 2012, planning for the scientific strategy and the instruments to be built also takes place. The chief negotiators from Sweden and Denmark are in talks with the other 15 partner countries about their specific contributions to the construction cost and about what these contributions shall consist of, for example in the form of technical equipment.

2013 will see the start of the design work, which in part involves detailed engineering, prototyping, procurements and preparation of the land on which it is planned that ESS will be built. In connection with this, ESS will also commence an extensive recruitment initiative.

Construction is planned to begin in 2014, with ESS being expected to be completed in 2019 and fully operational in 2025. The total construction cost for ESS is around SEK 15 billion (at 2008 prices), of which Sweden is contributing 35 per cent. Operating costs are estimated to be around SEK 1 billion per year.[4]

MAX IV

MAX IV is a planned synchrotron light laboratory of internationally unique performance that will pave the way for new advances in a number of research

4/ Read more: www.europeanspallationsource.se

A vision of the future: MAX IV. Illustration: FOJAB arkitekter.

fields, such as materials science, the life sciences, nanotechnology, energy, climate and environmental science. MAX IV is Sweden's biggest ever infrastructure project within research.

MAX-lab in Lund is a Swedish national laboratory where research using synchrotron light has been conducted since the mid-1980s. MAX stands for Microtron Accelerator for X-rays. Today, the laboratory consists of the facilities MAX I, II and III. These three accelerators have slightly different specialisations and have been built up over time. The naming is chronological, and MAX II is the largest accelerator. MAX-lab has over 800 users annually, with just under half from Sweden and the rest from all over the world. MAX IV is a much larger and more advanced version that is expected to be one of the world's foremost synchrotron light facilities. The activities currently conducted at today's MAX-lab will be transferred to MAX IV.

Synchrotron light is electromagnetic energy. It is created when electrons, accelerated up to near the speed of light, are forced to deflect from their path. When this happens, the electrons lose energy, which is emitted in the form of light. The light is led in a vacuum through beamlines to experiment stations where it is used to study the structure of various materials, how different processes in the materials take place and to identify the chemical states of various materials. The process itself and the acceleration take place in what are known as storage rings. The electrons are shot from an electron gun, and strong magnets bend their trajectory.

All larger industrialised nations have invested in this type of facility. Users can be found in physics, chemistry, biology, medicine, technology, palaeontology, geoscience and environmental science.

NATIONAL FACILITY

MAX IV is estimated to cost about SEK 3 billion to build. It is jointly owned by Lund University, the Swedish Research Council, VINNOVA and Region Skåne. Lund University serves as the national host for the facility. Operating costs are expected to amount to approximately SEK 300 million per year. The principal financier of the first seven beamlines at MAX IV is the Knut and Alice Wallenberg Foundation. It is providing 400 million of a total of SEK 560 million. The remaining 160 million will come from 12 univer-

sities and colleges in Sweden, of which Lund University and Uppsala University are the largest financiers. The next stage of the beamline expansion will see the involvement of other countries and industry. Cooperation with regard to beamline financing has already been established with Finland and Estonia, and there is interest from countries including Denmark, Poland and Norway. One beamline costs about SEK 80 million. Construction of MAX IV has been in progress since November 2010, and the facility is expected to reach completion in 2015.

It is Fastighets AB ML4[5] that is erecting the buildings for MAX IV and that will own them. ML4 will in turn lease the property to Lund University, which is the host university for the national research facility MAX IV. Lund University and ML4 have signed an agreement on a 25-year lease on the entire MAX IV facility and on the forms for its construction. It has been calculated that Lund University will pay about SEK 100 million per year in rent to ML4.[6]

Who works at ESS and MAX IV?

In 2012, ESS and MAX IV are in full swing with the recruitment of personnel for their organisations. Recruitment is expected to continue until the facilities are fully operational, in 2025 and 2017 respectively. There is a demand for administrative personnel, technicians and researchers. Research positions will be filled from around the world, while administrative personnel and technicians will generally be recruited locally. When the facilities are fully operational, it is estimated that about 450 people will be permanently employed at ESS and about 250 at MAX IV. ESS will to a greater extent than MAX IV recruit personnel from outside Sweden for scientific and specialised technical services. The reason for this is primarily limited access to specialists and that most specialists have to be recruited from other laboratories around the world. Together, the facilities are expected to have at most a few hundred international experts in their employment. In addition to this permanent staffing, it is calculated that each year about 4 000–5 000 people will come to ESS and MAX IV to carry out experiments at the facilities. These users will generally stay from a few days up to a week or so.

5/ Fastighets AB ML4 is owned by the companies Peab and Wihlborgs.

6/ Read more: www.maxlab.lu.se

Seeing the greatness of small things

TITA has studied around ten national and international research facilities around the world. The following is a brief presentation of some of the laboratories and facilities included in the case studies.

PHOTO: CERN/JEAN-CLAUDE RIFFLARD

CERN

Organisation européenne de recherche nucléaire – European Organisation for Nuclear Research (CERN) is an international organisation that since 1954 has worked on coordinating resources in the field of particle research. CERN is situated on the border between Switzerland and France and currently has 21 member states. CERN has around 2 500 employees (full-time, per year), and almost 10 000 visiting researchers every year.

PHOTO: BROOKHAVEN NATIONAL LABORATORY

BNL

Brookhaven National Laboratory (BNL) in New York, USA, was established in 1947 and today consists primarily of two large instruments: The Relativistic Heavy Ion Collider and the National Synchrotron Light Source. Together, these instruments facilitate broad research in areas such as nuclear physics, materials science, biomedicine and energy research. In 2009, more than 3 000 researchers from universities, companies and authorities/institutes used these facilities.

PHOTO: CANADIAN LIGHT SOURCE INC

CLS

The Canadian Light Source (CLS) is Canada's national facility for research with synchrotron light. It is situated in the town of Saskatoon and was opened in 2004. CLS has the explicit objective that 25 per cent of the beam time of each individual beamline shall be made available to industrial users at a charge.

PHOTO: A. PETRICOLA, AIR ISERER, ESRF

ESRF and ILL

Grenoble, France is home to the neutron research facility Institut Laue-Langevin (ILL), established in 1967, and the synchrotron light facility, the European Synchrotron Radiation Facility (ESRF), established in 1988. ESRF is today the most powerful synchrotron light source in Europe and is co-financed by 19 member states. Over 600 people are employed at the facility and around 6 000 researchers from 45 countries work at the facility each year. ILL is a reactor-based neutron source which is visited by 1 500 researchers from over 40 countries every year.

PHOTO: OAK RIDGE NATIONAL LABORATORY

ORNL

Oak Ridge National Laboratory (ORNL) in Oak Ridge was established in 1943 and is today one of the largest laboratories in the USA. ORNL is considered to be a world leader in neutron research, high-performance computers, energy research, advanced materials, complex biological systems and national security. The laboratory has over 4 000 employees, and around 2 000 students and 3 000 researchers visit the facility each year. ORNL is home to the Spallation Neutron Source (SNS), established in 2006.

PHOTO: DIAMOND LIGHT SOURCE LTD

ISIS and Diamond

The neutron research facility ISIS and the synchrotron light facility, Diamond Light Source, are situated at the Rutherford Appleton Laboratory (RAL) outside Oxford, United Kingdom. ISIS became operational in 1985 and Diamond more recently, in 2007. At Diamond there is active collaboration with the local schools with the aim of generating interest in the research taking place at the facility. On a national level, Diamond works with national education authorities in order to develop a competence development programme for teachers.

PHOTO: PAUL SCHERRER INSTITUTE

PSI

The Paul Scherrer Institute (PSI) in Villigen, Switzerland, is a multidisciplinary research centre that runs the spallation neutron source SINQ, the synchrotron light facility SLS and the muon source SμS. In a few years, the x-ray laser SwissFEL will also become operational. Researchers from other research institutes, universities and industrial enterprises can apply for time at all of these facilities in order to carry out investigations into, e.g., materials research or structural biology. PSI's researchers run an ambitious research programme in the areas of matter and materials, energy and environment, and health.

3.

Results

Great new business opportunities

– competitiveness and innovative capacity linked to ESS and MAX IV

There are great opportunities to make ESS and MAX IV a growth factor for industry both regionally and nationally. The key to dynamic business effects and maximum public benefit lies in how well the region has succeeded in creating the conditions necessary for the facilities to operate in symbiosis with the surrounding society. It is all a matter of putting a structure in place that makes it possible for the region to deliver the goods and services that the facilities need so that they in turn can generate an extraordinary increase in value for the region and Sweden as a whole. These goods and services might be for the facilities directly and also for activities arising on account of the facilities. Growth does not happen of its own accord, and all the sub-projects that have looked more closely at business links with ESS and MAX IV come via different routes to the same conclusion. Long-term, goal-oriented and proactive initiatives will be necessary in a number of areas, from multiple stakeholders – individually and in collaboration – if the establishment of the facilities is to become a growth factor and innovation catalyst for trade and industry. International case studies within TITA confirm this conclusion.[7] If the region continues on the path it has taken and seeks joint collaboration on the issue, a number of barriers for industry's links to this type of research infrastructure can be removed. Then ESS and MAX IV can become a springboard for powerful, long-term development of technology and knowledge and for a more conducive innovative climate. TITA has identified the need for, and in part initiated and developed, three powerful tools/platforms for this work:

- Industrial platform – supplier support for industry
- Industrial platform – support function for industrial applications
- Open innovation arena in materials science

7/ *Affärsmöjligheter i spåren av ESS och MAX IV (Business opportunities in the wake of ESS and MAX IV)* (Report produced within TITA – TI6).


Speedglas
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ROLTFRIA
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Suppliers and users – a matter of perspective

The establishment of ESS and MAX IV represents the single greatest investments in research infrastructure in Sweden. These will very probably contribute to new research breakthroughs in the life sciences and materials science. They are expected to make the Öresund Region a European hub for world-leading research in a variety of areas. The facilities also create new opportunities for companies in the region, which may become either suppliers to, or users of, the facilities. However, for both of these perspectives, there may be barriers that will need to be overcome. Public-sector initiatives are therefore needed both to increase the regional companies' ability to do business with the facilities and to enhance the industrial use of the facilities themselves.

Supplier – only the beginning ...

Suppliers to ESS and MAX IV denote companies that can supply goods and services to the facilities. This relates to everything from the construction of the actual facilities and supplying them with services to being able to develop technology and instruments in cooperation with the researchers. The profits for the companies present in delivering goods and services to these kinds of research facilities go far higher than the purely financial and far beyond any individual deal. The technical innovations developed during construction and operation may in fact represent a massive enhancement of skills at the supplying companies. They learn new technologies that can be applied to other areas. The companies supplying technologically advanced goods and services to research facilities such as ESS and MAX IV also generally experience improved competitiveness. They also testify to how this has opened up new markets for the company as a supplier and partner, both within and outside of research infrastructure.[8]
At present, there are about 40 synchrotron light facilities in the world. So the companies that acquire experience and skills in working with research facilities, through MAX IV for example, are treated to a veritable smorgasbord of new opportunities. New research facilities are being built and existing facilities need maintenance, so there is always a market where specialised companies have the opportunity to supply goods and services.

Furthermore, of course, ESS and MAX IV in themselves constitute a future market since besides requiring maintenance and other services, they will be constantly updated and improved. The need for goods and services continues as the facilities make the transition to the operational phase. It is therefore important to perform long-term work to boost regional business opportunities to supply goods and services already during the construction phase so as to have a good starting point for future deliveries later on.

Who will win the deals?

The way in as a supplier to ESS and MAX IV is either through companies themselves submitting tenders or by becoming subcontractors to a contractor or to the companies that win specific procurements or framework agreements. It may be true that companies in Skåne and Blekinge in some respects enjoy the advantage of proximity. But this is also true of companies in our neighbouring countries. Several neighbours have long been doing strategic work on these issues in order to regain what they have invested in common research infrastructure. Since 2012, Denmark has been home to the Big Science Secretariat, whose purpose is to support Danish technology companies with strategic intelligence, contacts and assistance to enable them to be suppliers to the research facilities in which Denmark invests. In Sweden this readiness is weaker. According to the Swedish Research Council, Sweden is one of the European countries that has the worst showing when it comes to participating in and winning procurements for the construction of common research infrastructure.[9] Surveys and studies within TITA confirm this picture.[10] In addition to the fact that many companies are simply not even aware that there are opportunities for the company to be suppliers to these types of facilities, lack of knowledge of how procurements take place is an obstacle in itself. Another obstacle is the shortage of experience in supplying to research infrastructure and so also the lack of references. Companies' unfamiliarity with creating consortiums and lack of experience in working with other companies, with the aim of jointly offering sufficient expertise and resources to win a major procurement, also places them at a disadvantage.

An effect of the European cooperation on ESS is that part of the member states' financing contribu-

8/ One example is a study among suppliers for the construction of the TESLA Test Facility at DESY in Hamburg, in which 82 per cent state that DESY is an important reference client, and more than half are able to sell developed products elsewhere.

9/ *The Swedish Research Council's Guide to Infrastructures 2012*, Swedish Research Council Report Series 2011:8.

10/ *Affärsmöjligheter i spåren av ESS och MAX IV (Business opportunities in the wake of ESS and MAX IV)* (Report produced within TITA – T16).

What does in-kind mean?

In-kind denotes the member states' payment for their portion of the investment budget for a research facility by means of goods and services rather than cash. This procedure will apply at ESS, but not MAX IV, which is a nationally financed research facility. The hosting of a large research facility is assumed to provide such large advantages for regional and national industry that it is believed to require compensation mechanisms for other participating countries. How great the proportion of a co-financed facility that is procured via in-kind contributions will depend on many aspects of what is considered best for the project as a whole, and an assessment is always made based on scientific, technological, administrative and political considerations.

tion will consist of pre-built components and instruments – rather than money. The system is called *in-kind*. These goods and services, representing approximately half of the investment cost, will not be subject to procurement on the open market. But even when it comes to this type of supplying, Swedish and regional companies have the opportunity to come in as subcontractors in the second or third tier.

Support function paid off

Within TITA, active attempts have been made to reverse this trend and to increase the regional companies' awareness of the potential of ESS and MAX IV through various types of information initiatives. The companies that participated have represented a wide range of industries – from construction and engineering to retail and hotels. The project has also worked actively with skills enhancement initiatives in order to increase the ability of companies to participate in procurements of supply services. Educational initiatives have been made to increase knowledge about everything from the procurement process to concrete information on the types of supplies that will be needed in the future. The companies have also received support in monitoring forthcoming procurements.[11]

The initiatives have paid off. One clear result came in spring 2012 when 17 of the 20 companies that qualified as suppliers within mechanical manufacturing for MAX IV came from Skåne and Blekinge.[12] A number of the companies that have signed agreements with MAX IV have, as an effect of this, already received inquiries from other international research facilities regarding their ability and willingness to supply them.

Through TITA, Skåne and Blekinge have also had the opportunity to broaden their monitoring of procurements to include other types of research facilities that Sweden co-finances. In accordance with the principles of in-kind, this gives Swedish companies precedence with respect to signing agreements. The Swedish Research Council, which coordinates this work nationally, has provided the project with relevant inquiries from other facilities. The project has then matched these inquiries against companies in the region, thus opening their eyes to new business opportunities.

Industrial platform – supplier support for industry

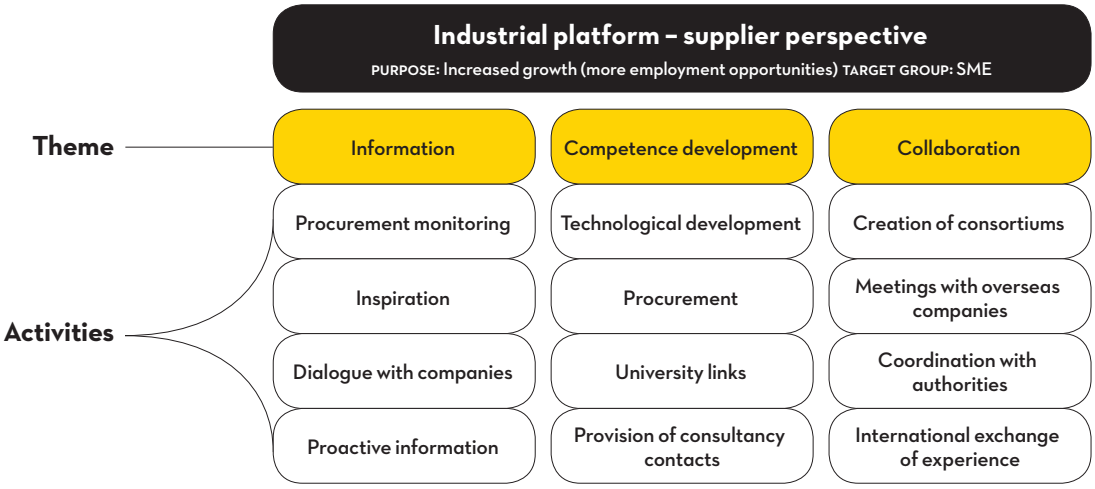
Now the region and Sweden as a whole are at a crossroads and face an important strategic question. Should not Swedish companies receive the same support in monitoring procurements and issues related to international research infrastructure as their competitors receive in their home countries? How should such support be designed, financed and operated?

Based on international experience and the results generated within TITA, it is the project's assessment that it is imperative to create a support function for the business sector as an effective interface between industry, academia and research facilities. An industrial platform for suppliers is necessary if the region is to be enabled, to any greater extent, to take advantage of the establishment of ESS and MAX IV. The support function should be seen as a long-term investment with a view to strengthening the international competitiveness of the companies and increasing growth.

> "Before the meeting, it didn't seem very likely that we would be able to submit a quote to CERN, but now it's actually something we will consider if the right need arises. I fear, however, that most of the kind of manufacturing we offer falls below the threshold amounts, which makes it difficult to find out about the contract possibilities."
>
> *Reflection made by a business leader in Skåne following a meeting arranged between CERN and companies in the region in March 2012.*

11/ *Tillväxtmotor för det regionala och lokala näringslivet (Growth factor for local and regional businesses)* (Final Report TI6).

12/ The companies have signed framework agreements with MAX IV, which means that they have the opportunity to bid for future procurements in this area.



The platform rests on three pillars:

1. Information and knowledge dissemination
2. Competence development
3. Collaboration

The initiative areas have been identified on the basis of the companies' needs and on where an industrial platform can make a difference on the way towards business deals. In the long term, it is proposed that the platform should also provide information about business opportunities at other international research facilities and other major public investments in the region and its vicinity. The target group of the industrial platform is small and medium-sized companies from a broad variety of industries, from technology to the service sector. Support is needed both for supplying that is directly related to research facilities such as ESS and MAX IV and for seeing possibilities in more indirect links to major investments.

1. INFORMATION AND KNOWLEDGE DISSEMINATION

Information and knowledge dissemination is a cornerstone of the industrial platform. Current information and knowledge-building about research infrastructure, supplying, etc., are a prerequisite for the platform to be a resource for industry. The purpose is to simplify and clarify existing information and above all make it available, information that in many cases is relatively complex at heart. One part of this is, for example, to monitor procurements at the research facilities and inform companies about them.

2. COMPETENCE DEVELOPMENT

Initiatives are needed to strengthen and develop the companies' skills in identified areas. The areas may have bearing on the various technologies, but might also apply to procurement issues, for example. The common denominator is that they should increase the opportunities for companies to benefit from major investments.

3. COLLABORATION

Major investments require the creation of consortiums and major actors need subcontractors in order to deliver. International companies investing in the region may have need of subcontractors, which in this way will be easy to contact. This can be done, for example, by developing a digital meeting point on the web-

site www.tillvaxtmotor.se. The industrial platform is uniquely placed to facilitate these processes and meetings by means of the specific knowledge that is pooled. Collaboration on several levels must be the basis for all work with the platform.

Increased industrial use

Large-scale research infrastructure and other laboratory environments represent a large potential market to which companies can supply technology and services. The transfer of technology and knowledge follows in the wake of increased exchange between research facilities and the regional business sector. From a regional growth perspective, the question of the industrial use of the facilities is of central importance.

Traditionally, research facilities had a low industrial use, but there now seems to have been a certain shift in favour of applied research as a result of increased political pressure on the innovation perspective. Case studies of international research facilities that have been carried out within TITA confirm this picture.[13] New facilities, however, such as Soleil in France, the Canadian Light Source in Canada and the Diamond Light Source in the United Kingdom, have had a stronger industrial focus from the outset. In concrete terms, this will mean, for example, allocating a certain percentage of beam time to industry, establishing industry committees and initiating the construction of industrially relevant infrastructure. There are also active efforts to attract new industrial users to the facility and provide them with support.

Industrial platform for user support

From a regional perspective, the relationship mapped between increased industrial use and regional growth effects is reason enough for the region and the nation to develop a long-term action plan for how industry can be connected to ESS and MAX IV. Numerous examples and inspiration with respect to the work are available from the facilities that TITA has studied.[14] The analyses from these studies underscore that this is not a task that can wait, but should be initiated immediately. Parallel to this, high-quality service functions for industrial cooperation must be built up around the facilities.

An important perspective on the question of industrial use is thus the availability of functions that in the future can offer services to companies and research teams at ESS and MAX IV. The international case studies clearly demonstrate that a prerequisite for a greater industrial use is the existence of competitive services related to this use. Internationally, industrial users are attracted to the facilities that can offer the best service. The results of TITA show that it is unfavourable to assume a passive market-driven approach where industry itself is expected to push for the use of ESS and MAX IV. One proposal is to try to build a research institute that has strong roots in industry and is financed by a broad partnership. An interesting area of activity for this institute might be to host an industrial testing laboratory using the same model that is now being planned in Denmark. The Technical University of Denmark is planning a test centre where companies can perform trials and experiments on a small scale to see if a larger, more expensive experiment at ESS or MAX IV might be of interest and how this should then be designed. In this way, more Danish companies will be able to become better prepared for large-scale experiments at ESS and MAX IV in the future.

SUPPORT FUNCTIONS IMPORTANT

The question is urgent, but needs to be investigated in more detail. Taking the initiative to a particular function/institute for industrial research linked to the facilities requires broad collaboration between agencies at the central government and regional levels. Such a task should preferably be initiated by the Ministry of Education and Research and the Ministry of Enterprise, Energy and Communications.

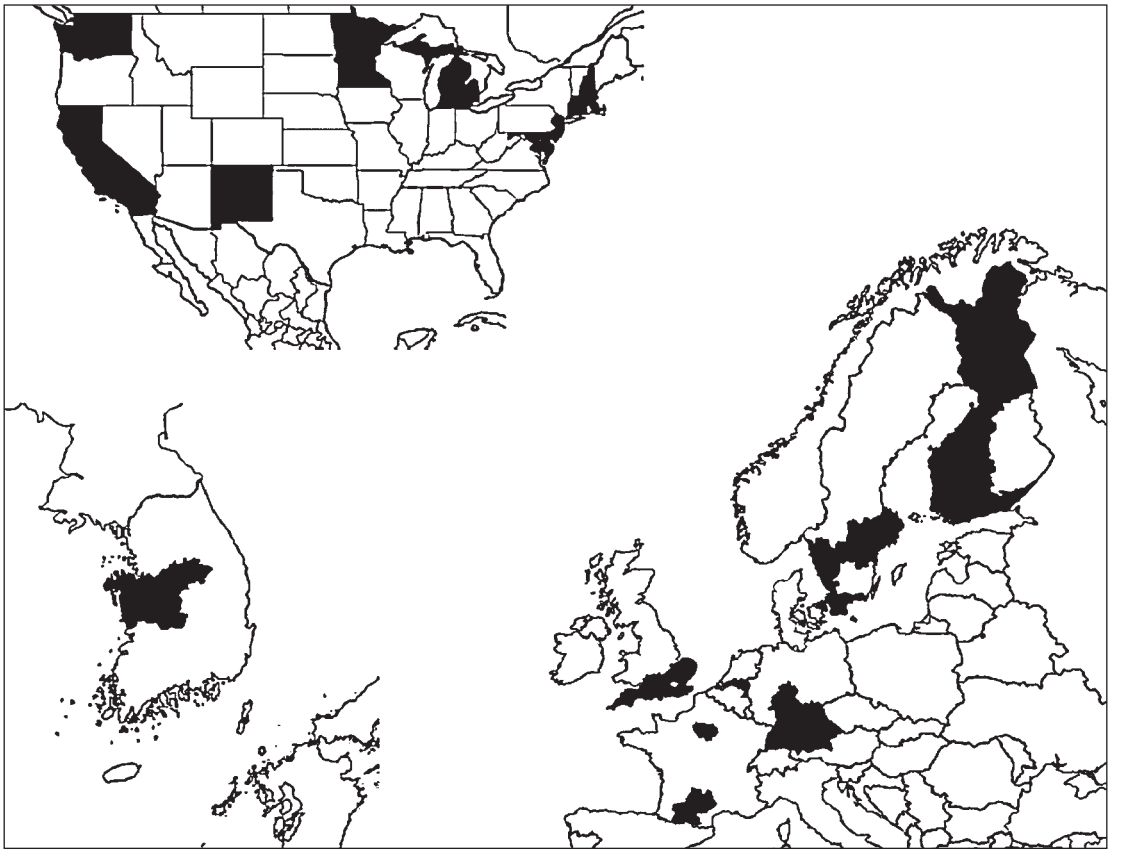
In the discussion on industrial use and the commercialisation of research at ESS and MAX IV, universities have a central role. The research community at Lund University will become more robust in a number of disciplines as a result of the establishment of ESS and MAX IV. Thereby, there is also an urgent need for support functions associated with higher education that will make it easier for researchers to commercialise their research results. The international case studies demonstrate that investments in spin-off companies are important for translating research results into commercialised products.

DECISIVE PREREQUISITES

There are several interesting international examples of how facilities have built up functions to provide companies with support in the implementation and interpretation of experiments and to assist compa-

[13]/ *Industrins framtida koppling till ESS och MAX IV – exempel på internationella och regionala initiativ (Industry's future links with ESS and MAX IV – examples of international and regional initiatives)* (Report produced within TITA – TA3, TI5, TI6).

[14]/ *Industrins framtida koppling till ESS och MAX IV – exempel på internationella och regionala initiativ (Industry's future links with ESS and MAX IV – examples of international and regional initiatives)* (Report produced within TITA – TA3, TI5, TI6).



Skåne belongs to an exclusive circle of the world's knowledge and technology hubs.
Source: OECD Territorial Reviews, Skåne, Sweden (2012).

nies in the commercialisation process. Furthermore, these support functions might, for example, assume responsibility for marketing the opportunities of research, initiating joint projects and working on issues related to intellectual property and market analysis.

An important conclusion of TITA is that without well-developed services, no greater industrial use will ever be achieved at ESS and MAX IV. But TITA's analyses also demonstrate that the initiatives mentioned so far are of no consequence if certain basic structural prerequisites are missing:

- Access to beam time at the facilities at competitive prices.
- Services for companies that want to conduct experiments.
- Support in the process of commercialising research results.
- Support to industry-related research projects.

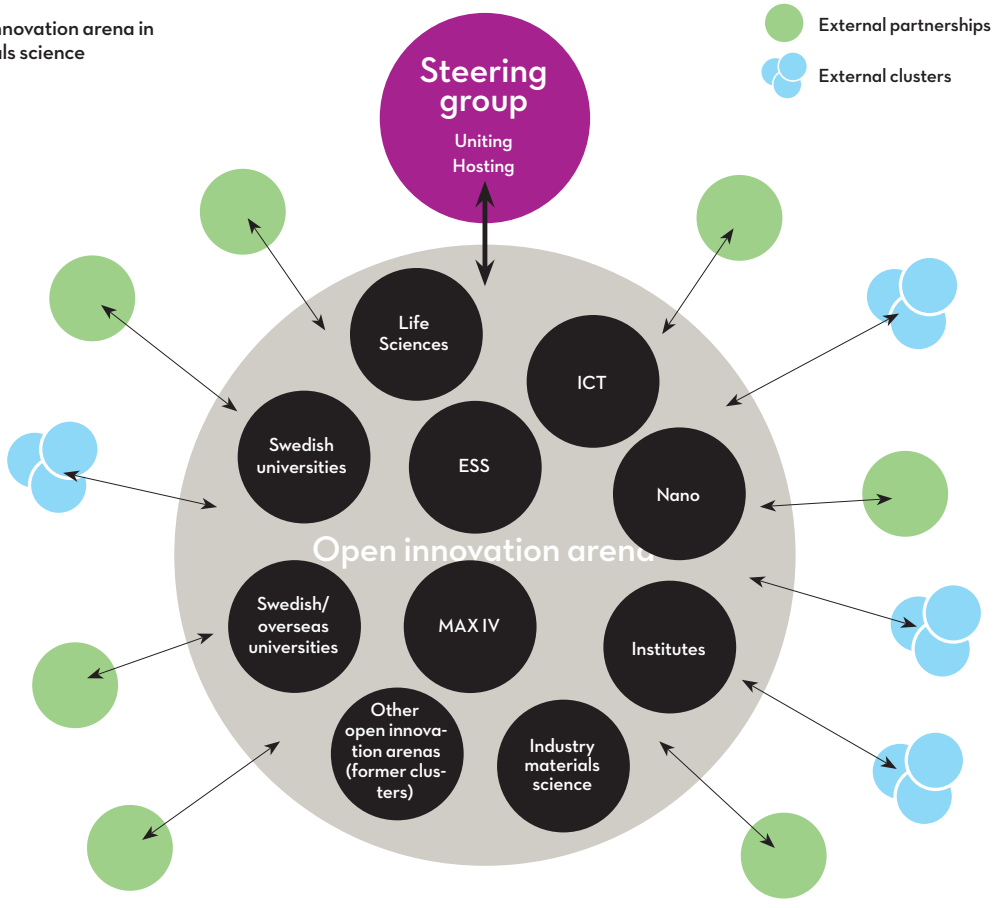
A readiness for ideas

The points of contact that ESS and MAX IV will have with the regional economy not only consist of the construction, operation and future use of the facilities, but also of the potential for innovation and development that this entails. Provided that there are sufficiently smart and stable support structures, industry and other suppliers will already be able to increase their innovation capacity during the work of establishing the facilities. Such support structures are also needed for the long-term creation of a strong innovation environment around the facilities. This is in turn a prerequisite for business and society deriving the maximum growth and benefit from ESS and MAX IV.

Innovation hotspot

When the facilities are commissioned, in 2015 and 2019 respectively, the Öresund Region will be met by a fantastic opportunity to become a world leader in materials science. Utilised properly, they can become

Open innovation arena in materials science



the power source or leverage to turn the Öresund Region into Europe's most innovative region. One of TITA's intermediate goals has been to clarify the need for a new regional cluster initiative for materials science. However, the results of the pilot study are such that this project does not recommend such an initiative. Based on the needs that have come to light, an open innovation arena in materials science is instead proposed. An investment of this kind would be an important tool for optimising the long-term establishment of business opportunities and growth around ESS and MAX IV related to materials science.[15]

Open innovation arena

An open innovation arena is a concept for interdisciplinary links between various fields, sectors and industries where the innovation process is central. The basic idea behind Open Innovation is that in a world where knowledge is widely dispersed, companies cannot solely rely on their own research and development departments, but may need to purchase or license processes or inventions (patents) from other companies (or from research institutes). In addition, in-house inventions and ideas that are not used in the company's business model are taken further for commercialisation outside the company, for example through licensing, spin-offs or joint ventures – i.e. through collaboration with other companies. Different actors can contribute various parts and values in a variety of configurations and forms in the chain between an idea and its end user.

An open innovation arena in materials science, coupled with the "Innovation Area Smart Materials", creates the context and the environments where innovation, development and future issues may find their true home. The innovation arena for materials science will hopefully become the setting where business, society and research can place their questions and challenges as a means of working jointly on solutions and innovation. The region's future attrac-

[15]/ *Innovationskraft för näringslivet (Innovation catalyst for trade and industry)* (Final Report TI5).

tiveness will largely depend on the success in bringing together a great many actors for joint action in a Penta Helix perspective. The ordinary coordination and collaboration must be developed and more actors feel involved. Not least the international business community will place new and complex demands on environments where challenges constitute the central and common starting point for the work.

Therefore, in order to create the readiness and speed required for the region to be an effective recipient of new activities and innovations, resolute initiatives and focused work for a strong innovation environment will be necessary. An open innovation arena in materials science is one aspect of this. Another is to be prepared to receive and look after the companies that are attracted by what the region has to offer, at the same time making it easier for future spin-off companies from ESS and MAX IV to establish themselves in the region.

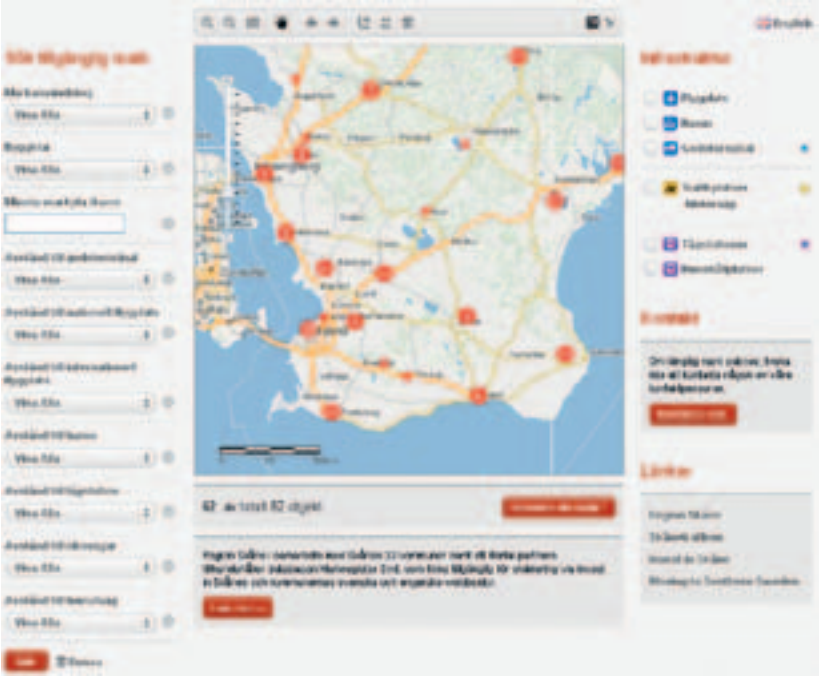
A readiness for companies – Land availability register

To facilitate relocations and start-ups, TITA has developed the web-based Land availability register. The register contains information on vacant land in the region that is available for business start-ups and housing construction for trade and industry. The background to this is that there has not previously existed a single, comprehensive tool that shows available land in southern Sweden. The Land availability register gathers the information in a single location in order to optimise the land's visibility to both domestic and overseas stakeholders. The Land availability register enables municipal and regional representatives to respond to a large number of queries, thereby also creating an interest, opening dialogue with municipalities and property owners and paving the way for continued curiosity about Skåne and Blekinge. Similar registers[16] have proved to have the desired effect both regionally and internationally.

A tool such as the Land availability register is particularly important for those investments in the region that are a direct consequence of the establishment of the facilities – such as housing, international schools, offices, hotel and conference facilities, restaurants and other service functions. In time, the tool will also be useful for harnessing the indirect effects and business start-ups that are expected to follow throughout the region due to the establishment of ESS and MAX IV.[17]

16/ For example HDB (Hamburg Database for Commercial Real Estate).

17/ *Markregister Syd (Land availability register)* (Final Report TA2).



User-friendliness was the focal point of the work to produce the Land availability register's external page. Clear menus with simple dropdown selections help users in their search for suitable land objects.

Competence supply

– education a prerequisite for growth

The issue of education and competence supply is central to the ability to harness positive effects due to the establishment of ESS and MAX IV. Education and competence initiatives are needed in order to build the facilities, to produce research results and to promote the long-term development of knowledge and technology in trade and industry.

There is a need for initiatives to integrate the research facilities with the higher education systems. This will provide the ability to create new and attractive programmes to bring students and young researchers to the region. This will create opportunities for research breakthroughs, technological development and spin-off effects into industry. In this way, the Swedish research community using synchrotron light and neutron scattering for research will become more robust in the long term.

International case studies demonstrate the importance of increasing the cooperation between the facilities and industry and of developing education programmes that promote the mobility of personnel between industry, academia and research facilities. Functions that promote industrial use at the facilities are important for transferring knowledge and technology to industry and for facilitating the creation of spin-off companies. In addition, a region with good access to highly skilled labour and technological competence attracts companies.

Furthermore, there is a need for long-term investments in technology and science in primary school. The future will see an increased demand for expertise in technology and science. International experience points to great potential for cooperation between research facilities and primary and secondary education arousing or intensifying the interest of schoolchildren. New ideas and knowledge are spread by people, and for this reason, education is crucial.

Troubling education projections

Experience from facilities similar to ESS and MAX IV shows that larger companies seldom locate to regions primarily because they intend to use the research facilities. Rather, it is almost always a matter of gaining access to world-leading expertise in various disciplines. Furthermore, industrial research at the facilities is usually conducted by former facility researchers that have crossed over to industry. If the expertise is not present in the region, there is also no reason for companies to establish themselves there.

In this respect, the education projections for Skåne are alarming.[18] Already now, the labour market demand for engineers, technicians, physicists and chemists is greater than the supply. And the projections indicate a growing gap. In order to strengthen technology companies in Skåne and also be able to attract new high-tech companies to Skåne and to provide both business and the facilities with the necessary competence, educational initiatives in specific areas will need to be stepped up. And that means educational initiatives at all levels, not only at the university level.

If the growth opportunities provided by ESS and MAX IV are to be exploited in earnest, long-term investments in education and competence supply are necessary. This places great demands on a number of actors – already in the present.

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[18] / *Utbildnings- och arbetsmarknadsprognos för Skåne – med sikte på 2020 (Education and labour market projection for Skåne – with a view to 2020)* (Region Skåne, 2012).


y = 2x² + 3x
(x+y)² = (y/2)²
≈ 3,1415

RISKED SHORTAGE OF TECHNOLOGICAL AND SCIENTIFIC EXPERTISE

In Skåne, the demand for labour with scientific and technological skills will increase at the same time as fewer and fewer young people are taking such study programmes. This is a dilemma that the region shares with most countries in the OECD area, a fact which does not make the problem any smaller – on the contrary. Increasing interest in an education within science and technology and later in engineering programmes is an important strategic challenge. The long-term growth and competitiveness of both Sweden and the region is dependent on the smooth functioning of competence supply to trade and industry.

The possibility of integrating ESS and MAX IV in the education system, and thus offering extremely attractive study programmes, will give the region a unique opportunity to arouse interest among younger pupils at school. This might involve demonstrating research in teaching situations, developing clear training programmes for teachers or making it possible for schools to demonstrate and explain both research and the facilities to pupils in primary and secondary education from an early age. However, this presupposes a well-developed cooperation between the research facilities and the education systems, and also cooperation with local and central government and the business sector. The key role played by municipalities in this matter cannot be stressed enough. An important task for the future is to create an infrastructure for linking teachers and schools with the research facilities.

Inspiring young people

The international case studies performed within TITA give a number of interesting examples of how other research facilities have engaged in educational initiatives that target primary and secondary schools. Allowing pupils at primary and secondary school to conduct their own research projects and practical experiments in connection to the facilities is one example.[19] Offering placements to younger students at upper secondary and university level in order to create a better understanding of operations is another.[20]

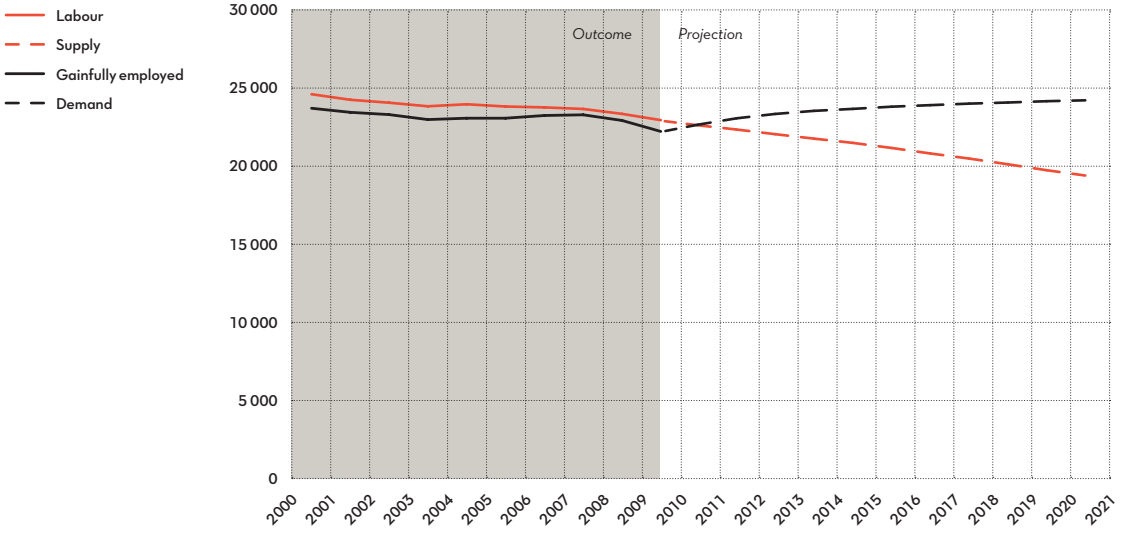
In Lund, the past few years have seen "Teacher's Days" at MAX-lab that aim to strengthen contacts between upper secondary school and the laboratory. For three days, teachers gain an insight into what is going on at MAX-lab. To some extent, pupils have also had the opportunity to conduct experiments at MAX-lab. TITA's evaluation is that these experiences

19/ In Villigen, Switzerland, pupils in years 1–9 may, for example, conduct various types of experiment at the facility through the iLAB laboratory. In 2010, iLAB, which is financed by a range of industrial and public-sector stakeholders, was visited by 180 school classes.

20/ Example taken from the Paul Scherrer Institute (PSI) in Switzerland.

Supply and demand of engineers in total in Skåne 2000–2020

Source: Education and labour market projection for Skåne – with a view to 2020, Region Skåne



should be built upon. A logical continuation would be to expand this activity and establish a resource centre dedicated to developing and maintaining links between the research facilities and schools. Teacher training programmes should also be encompassed by this work. It is crucial that municipalities get involved and create conditions for schools and teachers to participate in such initiatives. On the part of the region, the possibilities of obtaining central government support for such a venture should be investigated.[21]

There are also other initiatives that relate to this issue. There are municipalities in Skåne that are already actively working to intensify the interest in mathematics and technology among children and young people. Examples of initiatives in progress are municipal schools of engineering and programmes of further training for teachers such as MATENA and Snilleblixtarna (The Flashes of Genius). Another important initiative that involves municipalities, industry representatives and a series of regional public-sector actors is Teknikcollege Skåne, which aims to improve technology education from primary school through to university.

TITA's evaluation is that it will be extremely important for future work to promote these and new initiatives. Key actors for the future work besides municipalities are trade associations, such as Teknikföretagen that represents Swedish technology companies.

Science centre – a tool

The science centre that is planned for north-east Lund in connection to ESS and MAX IV may assume an important role in generating interest among pupils considering their future. The science centre, named XS, has the overarching objective of making its visitors interested in science and technology in general and the activities of ESS and MAX IV in particular. Linking educational and didactic activities to a science centre in order to popularise and disseminate knowledge, and also to serve as a support for schools and teachers, could open some very interesting possibilities. Also linking teacher training colleges to the centre would further strengthen this dissemination work.[22]

Integrating students

ESS and MAX IV combine to create new conditions for research, education and industrial use. Making the Swedish research community more robust within neutron and synchrotron light-based research, will require an efficient integration of the research facilities with the higher education systems. It is the higher education institutions themselves together with the research facilities that bear the primary responsibility, but the development of a clear plan of action on the issue is an urgent concern at the national level. Now as Sweden stands on the threshold of its greatest investment in research infrastructure, it is important that central government also plans for further investments in education and

21/ *Förstudie kring kompetensförsörjning (Pilot study for competence supply needs)* (Final Report TA3).

22/ *XS* (Report produced within TITA – TI3).

How fast does sound travel? At Vattenhallen science centre, LTH in Lund, children can get a hands-on feel for the appeal of technology and science.

competence supply. This is in order to create conditions for a good return on that investment. For this reason, TITA, in the same way as the Swedish Research Council, is calling for a long-term competence supply plan to demonstrate how the research facilities can best be integrated in the study programmes. Although there are already programmes at Lund University that are linked to the research facilities, they are in need of further development, at the same time as research and education programmes need to be developed that integrate the other universities and research institutes in Sweden. Joint education programmes with overseas universities should also be created. At PSI in Switzerland, for example, programmes have been developed that make it possible for researchers at the facilities to simultaneously hold teaching posts at universities. This makes it possible for students and postgraduates to have a more direct access to the research conducted at the facilities. The preconditions for gaining the participation of overseas researchers in programmes at the university should be improved.[23]

CRITICAL SUCCESS FACTOR

Lund University already offers important programmes in accelerator technology and accelerator physics where MAX-lab plays a central role. ESS has in turn developed a course in instrument design called Neutron Instrument Design School. Furthermore, the Faculty of Science has started a Bachelor's programme called Science with Photons and Neutrons (180 credits). It may be noted, however, that there is a need to develop these educational initiatives and that this is an important element of the work to create an active research and user community in key areas in Sweden. These investments need to be scaled up, and this will require a long-term strategy for how the research facilities can be integrated with the education systems. A critical success factor for strengthening the link between the research facilities and the education systems is for experiment time to be set aside for students, with beamlines and instruments dedicated to education purposes. An inspiring international example is CLS in Canada, which within the next few years will build a beamline – IDEAS – whose foremost purpose is to be available to industry and students in various education programmes.[24]

ENHANCED COLLABORATION IN EDUCATION

The competence supply to ESS and MAX IV is in no way regional, but is rather national and in many respects international. Therefore, it is important to strengthen collaboration between universities, both within Sweden and internationally. For example, the Ångström Laboratory in Uppsala will soon commence a development project on accelerator technology for ESS, financed by grants from the Ministry of Education and Research, ESS AB, the Knut and Alice Wallenberg Foundation and Uppsala University. Such resources will constitute key elements in the development of an optimal design for the most technologically advanced areas and will enhance the competence of this area in the long term.

There is a long tradition and strong research environments, especially in Lund and Uppsala, in the field of synchrotron light research. Within the field of neutron research, the Swedish user community is not as strong. An increased use of neutrons in the aforementioned disciplines therefore places new demands on the study programmes. The need for a new generation of researchers with skills of which there is a current shortage, but which are in strong demand by the market, is clear. In order to take advantage of the facility establishments in Lund, many universities and engineering faculties will need to be involved. Linköping University, Uppsala University, KTH Royal Institute of Technology and Chalmers are important components of the system that is responsible for the Swedish contribution to the future competence supply for ESS and MAX IV and its national user base.

Competence supply for industry

To increase the industrial use of ESS and MAX IV, there is a need for support functions that operate at the interface between industry and the research

[23]/ *Förstudie kring kompetensförsörjning (Pilot study for competence supply needs)* (Final Report TA3).

[24]/ *Industrins framtida koppling till ESS och MAX IV – exempel på internationella och regionala initiativ (Industry's future links with ESS and MAX IV – examples of international and regional initiatives)* (Report produced within TITA – TA3, TI5, TI6).

facilities. The industrial applications are still limited and the number of companies that have knowledge and experience in the use of these types of facilities is very low. Applications in materials research are largely supply-driven, something which necessitates proactive initiatives linked to industry.

It is becoming increasingly common for research facilities and research institutes internationally to develop programmes and strategies to raise industrial use. This requires strong service functions or research institutes with a clear mandate to assist industry in conducting and interpreting experiments since most companies do not themselves possess the necessary skills in-house. If the ambition is to promote greater industrial use, it will not be sufficient to rely on the ability of industry itself to approach advanced research facilities. Furthermore, there is a need for initiatives to develop the technological competence of small and medium-sized technology companies. This is a challenge if the aim is to establish longer value chains in the region in the form of production and supply between research-intensive companies and the wider economy.

Few companies in Skåne or the rest of Sweden currently have sufficient expertise to translate the knowledge that will be generated at ESS and MAX IV into commercial products. TITA therefore concludes that changing that situation will require active support to trade and industry, educational initiatives at various levels and long-term work with respect to competence supply.

Through various initiatives, it is possible to stimulate a greater exchange of personnel between facilities, academia and industry – and thus achieve a greater transfer of technology between them.

Examples of initiatives might be:

- To build up an infrastructure for support and service for user companies.
- To develop the competence of existing supplier companies.
- To offer support to researchers who visit the facilities.
- To develop research projects and education programmes of industrial relevance that link universities, industry and research facilities.

The Interreg project Cluster for Accelerator Technology (CATE) is a closely related example of proactive work to strengthen the ability of companies to supply goods and services to ESS and MAX IV in the field of technological and scientific equipment. The goal is that the future will see these being able to compete for supply deals both in Skåne and with other large-scale research infrastructure.[25]

Highly skilled labour – regional attractiveness

The establishment of research facilities tends to attract other research infrastructure. In Grenoble, for example, the concentration of research in the region has successively increased. The earlier decision to locate a research facility there has promoted the additional establishment of research institutes, laboratories, etc. in the region. The case studies also show a trend of the regional political level gradually gaining greater opportunities to influence national strategic research investments as a result of the facilities' establishment in the region.

Research facilities also attract world-leading research expertise that would otherwise be difficult to recruit to the region. All this creates a critical mass of unique technological competence that is also of interest to the business sector. In Villigen, Switzerland, it is the opportunity to gain access to the cutting-edge expertise of the region rather than the possibility of direct use of the research facilities that attracts companies or gets companies to remain. Similar thinking is highlighted by companies in Oxford, where the availability of skills is seen as the foremost advantage of being located in the region. In addition, there is a relatively large exchange of personnel between the research centres, universities and companies in Oxford.

The case studies also reveal that several regions have marketed themselves internationally, focusing on the research facilities with the aim of getting international companies to locate to the region. These initiatives appear to have yielded few results. Instead, it is a good supply of highly skilled labour and technological competence that is the primary way to attract companies.

[25]/ Read more about the project on www.cateproject.org

Dynamic meeting points

– for innovation and creativity

With the establishment of ESS and MAX IV, the region has the opportunity to both arouse and harness people's interest and involvement in issues in the area of technology and science. Today, the world also faces a number of major challenges that require considerable international and interdisciplinary collaboration. These Grand Challenges are found in areas such as the environment, energy and food supply, population growth and health. The need for arenas where various fields of science, and science and society, can meet has never been greater. The region's stakeholders now have the chance to create a European and global role model, an interactive arena that can meet these challenges and also provide inspiration to young people in their encounter with science and technology. An attractive science centre at the hub of the area around ESS and MAX IV will provide the prerequisites for Brunnshög to evolve both into a meeting point and a tourist destination of international calibre. An important precondition for achieving spin-off effects is that innovative environments are also established elsewhere in the region. The synergies of a diversity and distribution of meeting points throughout the region also make the whole greater than the sum of the individual meeting points.

Realising this historic opportunity will require long-term mobilisation and collaboration between all the region's stakeholders. The development of the area around the facilities should include the participation of national actors since this environment is crucial for the international attractiveness of the facilities. By thinking big, acting on a global perspective and harnessing synergies locally, regionally and nationally, Skåne and Blekinge have the opportunity to create a model of research communication that fosters involvement and commitment, with research and citizens in dual roles as both sender and receiver. The environments around the facilities must also be designed to attract research-intensive activities by, among other things, creating conditions for the establishment of research institutes and laboratories.

Research environment in collaboration with the surroundings

Places where researchers can meet and exchange experience in an informal way are invaluable for the development of science. Different researchers in the same field collaborate and develop new knowledge. Interdisciplinary meetings can lead to cross-fertilisation that gains practical significance. If the region's actors succeed in creating strong meeting points near the facilities, the chances will increase that the story of positive meetings will spread and lead to development in the entire region. Failure in this will dilute the story to one of outstanding research facilities in a field outside Lund where researchers flock to implement their projects, only to return straight home again.

The probability is high that the establishment of facilities will generate further establishment of research facilities and institutes in the future. The international case studies show that the regions and facilities that succeed in building effective environments have significantly greater chances of gaining such further establishment. The establishment of new institutes, laboratories, etc., in turn becomes an important element in the dynamic research environment that generates innovation and creativity. The collocation of the facilities and universities is a strength.

A vision of the future: Science Village. Illustration: White.

Lund University is one of the best academic environments to have ever been this close to facilities of this type at the time of their establishment.[26]

SYNERGIES MAKE THE WHOLE GREATER

The attractive meeting points will be a reason to remain in Skåne after completing work in order to relax and to build networks ahead of forthcoming research.

PPS (Project for Public Spaces) is a New York-based group that has inspired TITA through its concept "The power of ten". In short, the concept states that a single strong meeting point in a location is never enough, but that many meeting points are needed to create life in a place. Nor is one interesting district sufficient for an entire city to be perceived as attractive. And this line of thinking can also be applied to the next level, the city – a city becomes more attractive when surrounded by other attractive cities. In other words, fully developed, the power of ten means ten activities or functions at each meeting point, ten meeting points in a district, ten exciting districts in a city and ten attractive cities in a region, an exciting goal for an attractive and progressive region.[27]

A diversity and distribution of attractive environments thus strengthen each other and help to attract new residents to the region's towns and cities. By identifying, intensifying – and basing change on – the uniqueness of each city, interesting living environments and meeting points can be created to complement each other.

How to bring about creative and dynamic environments

Creative environments arise through meetings and where different cultures mix. This might involve meetings between people of completely different backgrounds or mobility between places and activities of completely different natures – environments that deviate from those in which we primarily find ourselves. These exchanges, where we go beyond the boundaries of the routine and the things we take for granted, are of fundamental importance for inspiration, stimulation and creativity.

Creative environments should be seen as places and institutes that attract people who possess unique skills in various areas – people with talent tend to seek out places where they can be inspired by others and where working conditions and financial conditions are the best. Opportunities to meet are fundamental to this, and if the exchange of information is limited, creativity is also inhibited.

The public sphere plays a decisive role in people's ability to meet. Research shows that meeting points are in turn dependent on routes of mobility and that meeting points often arise along them. This means that good meeting points and a future development of the area around ESS and MAX IV are both dependent on the links between central Lund, the surrounding districts and Brunnshög really functioning. This also means that public transport hubs around the region can be used to establish meeting points. [28]

What sorts of meeting points are researchers looking for?

TITA has conducted an interview study to find out what types of meeting points visiting researchers are looking for. The largest group of visiting researchers is that coming for a short period and whose needs are relatively similar and largely relate to the existence of basic facilities that are necessary to enable them to carry out their work. For visiting researchers who stay for a longer period, needs are more of an individual nature since there might then be time for hobbies and a life outside of work. Many of these also have family with them, leading to the need for completely different services, such as activities for children. The interview study finds that common meeting points that promote spontaneous meetings are important because they can counteract the sense of isolation. The plans for a mixed city in the area around the facilities, with leisure activities, accommodation, offices, laboratories, restaurants and other functions will help visiting researchers to become integrated in society. This will reduce the risk of the emergence of parallel communities, that is, where workers moving in are not integrated in the local community, something which has been observed in several of the international case study facilities. The result of the interview study demonstrates the importance of taking advantage of the uniqueness of the region. Many highlight green spaces, cycle paths, the genuine and small-scale, the proximity to everything, as unique and appealing. As a complement to the environment within the

[26]/ *Strategiska rekommendationer till Skåne-Blekinge inför etableringen av ESS och MAX IV (Strategic recommendations to Skåne-Blekinge prior to the establishment of ESS and MAX IV)* (Report produced within TITA).

[27]/ *Mötesplats Lund NE – kreativa mötesplatser och programmering av mötesplatser (Meeting point – Lund NE – creative meeting points and the programming of meeting points)* (Report produced within TITA – TI3).

[28]/ *Stadens möjligheter, platser och stråk (Possibilities of the city – places and thoroughfares)* (Report produced within TITA – TI3).

Lund NE/Brunnshög

The district planned for the 225-acre site between the research facilities is called Lund NE or Brunnshög. Brunnshög is planned to be a mixed city that will have room for science and innovation – but also for everyday life, housing, services and recreation. When the area is fully developed, in about 40 years, it is expected that around 40 000 people will live or work there. The vision for the district is that it will be a world-leading research and innovation environment in about 40 years. To achieve this vision, the district needs to be vibrant, stimulating and a demonstration project for sustainable urban development.

Science Village

Science Village is the name of the area between ESS and MAX IV. The vision for the Science Village is to become the world's best research and innovation environment and a showcase for Swedish sustainability planning. There is land reserved for all the support functions that may be needed in order for the research facilities to be successful, such as hotels, temporary accommodation for researchers, conference rooms, laboratories, offices, shops and restaurants. A large visitor's centre and science centre are also planned for this area.

Lund World Park

The large recreation area Lund World Park is being planned next to the new district Brunnshög. The goal of the park is to create a destination for the entire region that can be reached with good public transport. The park will offer everything from natural beauty and flower gardens to sports and opportunities for physical activity. It will promote spontaneous meetings between people with different experiences as well as the need of visiting researchers for nearby recreational opportunities.

A vision of the future: Brunnshög.
Illustration: Atkins.

research facilities, several respondents are looking for recreational opportunities in nature or in a park environment to be available in conjunction with the facilities.[29]

Planning for spontaneity

Green thoroughfares and parks in close proximity to the researchers' workplaces generate greater efficiency and better research results. The park that is planned close to the facilities, Lund World Park, will be able to offer such a green environment. By using trams to make the area accessible, it can also become an attraction and a meeting point for the entire region.

Spontaneous meetings between researchers at other research facilities primarily take place at common service facilities, such as canteens, cafés, fitness centres and parks. Opening up the area around ESS and MAX IV for meetings between more groups in society then becomes a natural step for increasing attractiveness.

More congresses to the region

ESS and MAX IV will themselves be world attractions and can generate numerous congresses and conferences. One of many spin-off effects of ESS and MAX IV is the opportunity to organise international congresses on the themes encompassed by the future cutting-edge research. TITA has investigated the possibilities of developing the region's congress activities in the wake of the facilities.[30] Malmö, Helsingborg and Kristianstad have, if we include the facility Malmö Live that is being built a stone's throw from Malmö Central Station, a good capacity for congresses and events. In contrast, the capacity level is lower in Lund, which at present lacks a specialised facility for larger congresses. Lund also has a shortage of hotel rooms. However, Lund Municipality is planning to build a congress facility in central Lund with a capacity of 800 to 1500 visitors. There are also plans for meeting opportunities at a future science centre adjacent to the facilities with a capacity of about 500 visitors.

An average congress attendee stays 3.9 nights at the place of the congress. The main reason for their coming to the region is to attend the conference and to meet other researchers, but sometimes they spend an additional day on exploring some other destination. The destination will then not be too far away because it is usually a case of day trips.

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[29] / *Kreativa mötesplatser Lund NE/Brunnshög – en intervjustudie bland kort- och långvariga användare av MAX-lab och andra forskningsanläggningar internationellt (Creative meeting points Lund NE/Brunnshög – an interview study of short- and long-term users of MAX-lab and other research facilities internationally)* (Report produced within TITA – TI3).

[30] / *Utveckling av kongressverksamhet i Skåne (Development of congress activities in Skåne)* (Report produced within TITA – TA1).

Science centre

XS – the hub of the future Brunnshög

Well-conceived physical planning helps meetings to arise. A science centre is exceptionally well placed to act as a third place, a meeting point that is not work and not home, where conversations and discussions can take place. This is demonstrated by the pilot study on a science centre produced within TITA. Besides exhibitions and conference rooms, the proposal presented for the science centre, with the name XS, also has neutral areas for spontaneous meetings, such as cafés and restaurants. This third room, which the pilot study refers to as the "Plaza", is located in the flow where people enter and exit XS. Here, the visitor encounters exciting architecture, lots of greenery and generous areas for planned and spontaneous meetings. It is easy to get here from both Brunnshög and central Lund for lunch, coffee, a meeting or to see that month's art installation or a lunchtime play.

ESS and MAX IV's visitor's centre is proposed to adjoin the science centre, and because of this, even more synergies may arise. However, at the same time, there also needs to be an understanding of, and plans for, the trends that characterise the area's scientific communication at the European and global levels. Citizens and society as a whole must be able to meet the researchers and exchange thoughts and ideas on the most important research challenges of today and tomorrow. This becomes particularly important when research and science today do not have the same self-evident authority as they once had.

Knowledge tourism is rapidly gaining ground, and a science centre can attract large groups of visitors to the region. According to the European Commission's Eurobarometer, no less than 15 per cent of the EU's population have visited a science centre or science museum in the past twelve months. This percentage is naturally not directly transferable to a single facility or region, but TITA's calculations estimate that because there are 3.7 million people within an hour's journey from Lund, almost 500 000 visitors a year is not an unreasonable figure.*

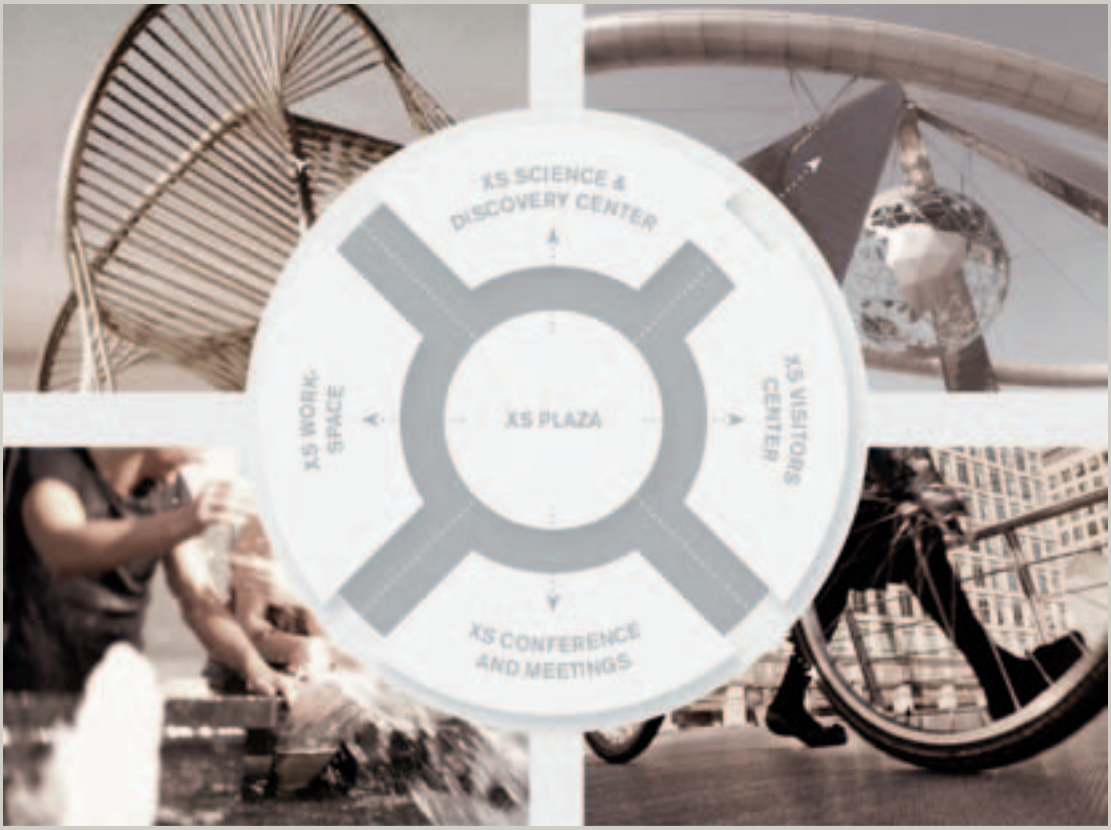
An inspiration to citizens, students and teachers

The growth in the number of science centres internationally should also be seen against the background of a declining interest in science and technology among young people all over the western world. Therefore, central government should also have an interest in supporting this kind of initiative since the secondary effects on research and education can be great. A science centre can inspire both students and teachers to new ideas and opportunities, serving as an educational hub for the whole region's teaching.

From a business perspective, involvement in the science centre has been a means of promoting interest and thereby facilitating the future competence supply. It is for these reasons that many large companies are founders, sponsors and partners of science centres around the world.

In other words, a science centre fills many different functions. It is a physical and a virtual point of intersection between research and the surrounding society. Researchers will be able to meet school classes, other researchers, tourists and people with an interest, and in this way, a science centre will be a place where knowledge is formed, developed and perhaps questioned, a place where science, culture and the humanities combine and where researchers and citizens together set the agenda for some of today's and tomorrow's most important research challenges.

*/ The pilot study is presented in full in *XS* (Report produced within TITA – TI3).



DESIGN: MAGNUS BERGSTRÖM

Science centre XS

XS, the planned science centre, is a place for innovation, people's inquisitiveness and a constructive dialogue. Achieving this will require flows of people from many places – and for many different reasons. The model developed in the pilot study identifies five sections:

- Visitor's Centre – a centre for visitors to ESS and MAX IV that is equipped to receive professional visitors, the general public and groups of school classes.
- Science & Discovery Centre – the main attraction that gives people the opportunity to touch, think about and understand the challenges, achievements and innovations of science. Exhibitions for international circulation will also be produced here.
- Conference & Meetings – facilities for congresses, conferences and meetings of varying size and calibre.
- Workspace – temporary and permanent workplaces for people and companies that want to be in the force field surrounding the research facilities.
- Plaza – the obvious and attractive meeting place in Science Village and Brunnshög – and also the heart of the science centre and its various flows. This is a living place that meets the new district's service needs, with restaurants, cafés, shops and inviting areas for spontaneous and planned meetings.

Smart urban planning

– brings the entire region spin-off effects from ESS and MAX IV

If the entire region is to benefit from the spin-off effects that the facilities may bring, a variety of initiatives from municipalities and other stakeholders, both private and public, will be necessary. All parties concerned will need to take a joint approach and work for the development of the region because the magnitude of the effects depends on how well municipalities, the region and other stakeholders succeed in together bringing about mobilisation around ESS and MAX IV. A key question is whether the municipalities, to a greater extent than today, can complement each other instead of competing. Such an approach will open up new opportunities for people, companies and municipalities. Awareness about what the establishment of ESS and MAX IV might result in must be spread, and the vision *Society for Science – Science for Society* must take root in the everyday lives of the region's residents. This approach must be present when the municipalities develop new comprehensive plans just as when Region Skåne plans for new bus routes. It is a matter of taking action with the realisation that the right thinking as regards housing construction and public transport hubs may even make places quite some way from ESS and MAX IV attractive residential municipalities when Skåne's population increases. The same applies to potential land for business development. In an innovative and dynamic growth region where many companies want to establish themselves, vacant sites quite some distance from the unique research facilities in Lund could turn out to be a bargain. It is simply a matter of perspective. And smart, innovative urban planning.

They are coming to Skåne ...

ESS and MAX IV will both directly and indirectly lead to Skåne gaining more and new residents. Who these people are and what expectations and needs they might have with respect to housing and public services have been mapped and analysed by TITA.[31] Those moving here as a direct effect of ESS and MAX IV are expected to have a relatively small impact on the region's labour and housing markets. These include those who are employed at the facilities, the users who are here for a limited period as well as those who in various ways provide supplies or services to the facilities. These are certainly key people for the function of the facilities, and so it is clearly of decisive significance that their needs are met in terms of flexible accommodation, international schools and related services. But what is the most interesting from a regional planning perspective and that has the greatest potential to contribute to growth and development in the region's municipalities is the indirect effects. This group includes, for example, students, tourists and congress attendees. It also includes all those who work in other areas that are growing thanks to the facilities, such as personnel in the public and private service sectors and in manufacturing companies. The people included in these indirect effects represent, in terms of numbers, the largest group. Being able to offer attractive and vibrant places, with attractive accommodation and good transport links, is an important success factor for attracting this group.

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[31]/ *Kreativa mötesplatser Lund NE/Brunnshög. En intervjustudie bland användare av MAX-lab och andra internationella forskningsanläggningar (Creative meeting points Lund NE/ Brunnshög. An interview study of MAX-lab and other international research facilities)* (Report produced within TITA – TI3).

The housing market's importance for growth

Skåne's population is growing rapidly, but housing construction has not kept pace with this population growth, something which has created a housing shortage in many municipalities. The goal of the regional development programme is housing construction of 5 000 homes per year in Skåne. But since this has only been achieved twice in the last ten years, the overall conclusion might be that housing construction has been too low.

With ESS and MAX IV comes a further increase in demand for housing, but the municipalities' ability to solve this alone is generally small. Initially, the increased pressure on the housing market will mainly be felt in the Malmö and Lund region, and will then spread to the rest of Skåne. This relates both to the direct displacement effects from Lund's and Malmö's housing markets, but also to a direct increase in demand for housing in the whole of Skåne due to a greater influx of people and spin-off effects of ESS and MAX IV:

- Increased demand for flexible accommodation, i.e. rental apartments, apartment hotels, rental houses, lodging opportunities and the opportunity to rent furnished accommodation.
- Increased need for student accommodation.

However, the interviews conducted by TITA with actors in the housing market demonstrate that only a few developers have ESS and MAX IV on the agenda. Many believe that the demand generated by the establishment of the facilities will have little significance and will be accommodated within the ordinary housing market. This is deeply troubling because TITA's studies point to the opposite being true. If the lack of housing is not to inhibit spin-off effects from the research facilities, there must be a readiness to satisfy the need for housing both with respect to numbers and to various types of accommodation and also in the right locations. The municipalities will not be able to resolve this situation alone. A broad base of support on housing market issues is needed. The mortgage cap, the uncertain economic situation and various forms of regulation are some of the factors that affect the level of housing construction. Furthermore, everything points to the increase of Lund's and Malmö's attractiveness as study locations for Swedish and overseas students and for visiting researchers. If students, and by extension the region, are not to be at the greatest disadvantage in the housing market, a greater production of student housing will be necessary.

EVERYTHING IS CONNECTED

The links between the issue of housing and the issue of competence supply are many and complex. But the basic problem is really quite simple and may be quickly outlined using a few examples; if students do not find good low-cost accommodation alternatives, they will seek out other study locations in other regions. If doctoral students and recent graduates are not able to find affordable family housing, they will move to places where the combination of career and family does work. If entrepreneurs and people with new business concepts do not see opportunities for themselves and their employees to find housing with good commuting alternatives, they will start their companies elsewhere. In this way, the region will be deprived of the broad base of highly skilled competence that is required to supply both facilities and the surrounding business sector with skilled labour. The critical mass of competence that will make the region attractive and innovative – the place to be – will not be achieved. The facilities are used, but the spin-off effects from research breakthroughs, innovations and competence transfer will settle elsewhere.

One of the conditions that makes a region attractive to new business start-ups is a good supply of skilled labour. But without a functioning housing market, it is difficult for the labour market to attract the right workers, and without an attractive labour market, housing becomes less attractive. A poorly functioning housing market inhibits growth in Skåne, and therefore housing construction must increase.[32]

Developing the attractiveness of smaller towns

To one degree or another, all municipalities in Skåne have the opportunity to benefit from the spin-off effects of the research facilities. This may relate to anything from increased migration and new business start-ups to a general boost to the tourism industry. The prerequisite for such a development is the creation of attractive and dynamic environments throughout the region by developing the urban environment around the stations and transfer points in the region.

One reason for overseas researchers to choose to stay longer than expected, or to seek out the facility in question, is that the region offers an attractive and

[32]/ *Effekter på bostadsbyggandet i Skåne till följd av ESS och MAX IV (Effects on housing construction in Skåne as a result of ESS and MAX IV)* (Report produced within TITA – TA1).

wide range of factors that provides quality of life. Towns outside Malmö and Lund, along public transport routes, provide good conditions for sustainable development and for attractive housing, workplaces and businesses. The scale of the positive effects depends entirely on how each of the municipalities manages to create attractive hubs of residential environments, workplaces, services, retail and good communications. If the municipalities are not actively doing anything to attract businesses and housing, the development will mainly stay in Lund and Malmö.

What do the municipalities need to do?

The regional infrastructure must be utilised and strong public transport routes must be created to link the towns. Developing and concentrating the urban environment around stations and public transport hubs will provide opportunities for attractive housing, workplaces and businesses. An attractive residential environment with good public transport will get more people to settle outside the Malmö-Lund area. A commuting time of 30 minutes is desirable, but up to one hour may be feasible. Workplaces, housing and services should therefore be located along good public transport routes. In order to attain a vital local development, the link to good public transport cannot be overstated, but there is a wide variety of strategies and tools that also help to create attractive, dynamic and sustainable environments.[33]

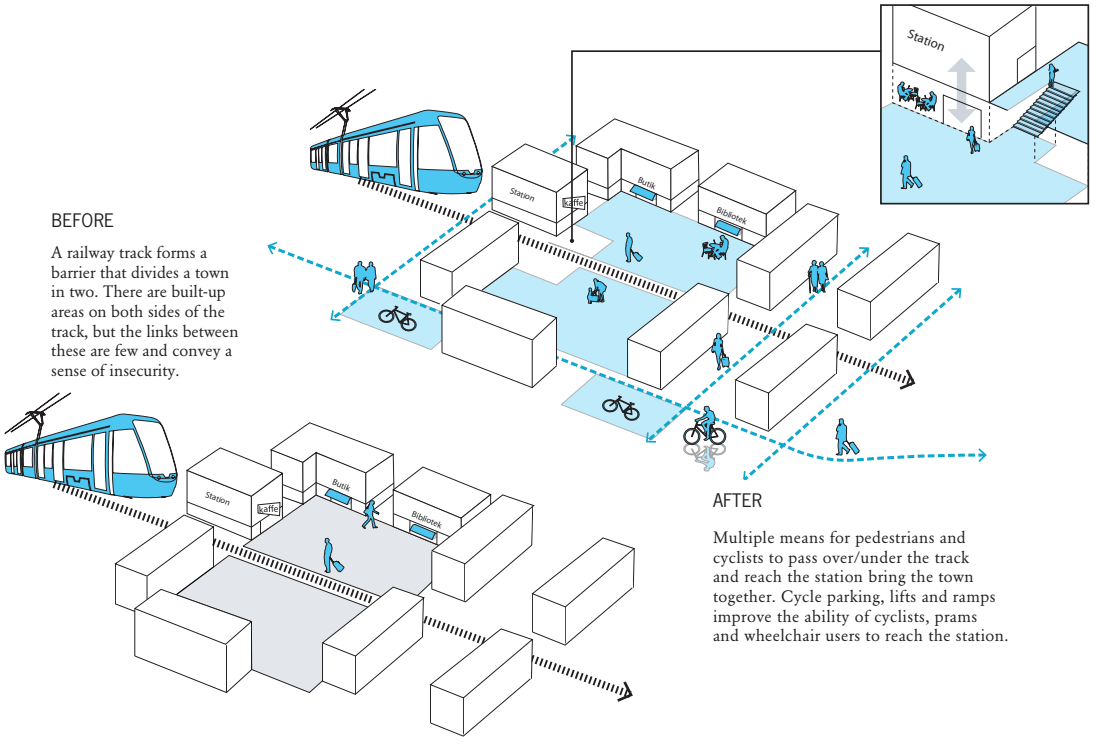
The municipalities must also adapt their plans to the target group they want to attract, such as families with children, students, young adults, visiting researchers or seniors. For example, access to good schools is decisive for where many families with children choose to live, as is access to good IT infrastructure.

It is very probable that researchers at facilities and universities will start new companies. This will increase the need for smaller workplaces such as

[33] *Livskraftiga orter – som en effekt av ESS och MAX IV (Vital and viable towns – as an effect of ESS and MAX IV)* (Report produced within TITA – TA1).

Making transfer points easy to reach

An easily accessible, safe and attractive transfer point is an important factor that may influence where people choose to live. The platforms need to be easy to reach from many directions both for pedestrians and wheelchair users. The barrier effects of a railway are reduced if there are several means of crossing it and if these means are placed in good positions in relation to the network of footways and cycle paths. Promote footways and cycle paths that make car use unnecessary.

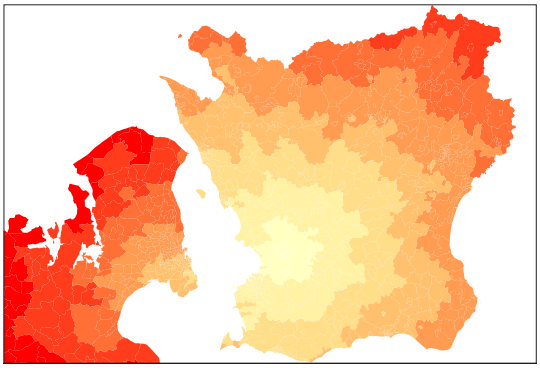


BEFORE

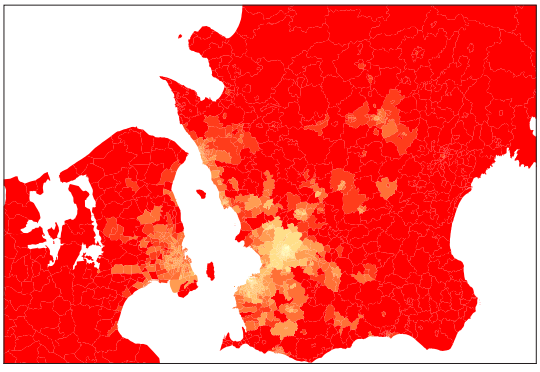
A railway track forms a barrier that divides a town in two. There are built-up areas on both sides of the track, but the links between these are few and convey a sense of insecurity.

AFTER

Multiple means for pedestrians and cyclists to pass over/under the track and reach the station bring the town together. Cycle parking, lifts and ramps improve the ability of cyclists, prams and wheelchair users to reach the station.



Journey time to Lund NE in 2030 by car.



Journey time to Lund NE in 2030 using public transport.

Journey time car and public transport Lund NE

-15
15 - 30
30 - 45
45 - 60
60 - 75
75 - 90
90 - 105
120-

business hotels and incubators. Old industrial buildings, preferably in central locations, or locations near transfer points, can function as inexpensive office space. Municipalities, either individually or in cooperation, can find a niche with specific sectors of trade and industry.

Investing in public transport

Accessibility to and from the facilities is important and a prerequisite for establishing a successful culture of meeting around the facilities and for encouraging meetings between researchers and citizens. The growth of research and development companies is currently concentrated in Lund. Nine out of ten employment opportunities in research and development are located in south-west Skåne. With ESS and MAX IV, it is very probable that this pattern of establishment will continue. For the effects of the facilities to benefit the whole of Skåne, it is important to make the whole of Skåne accessible, not only the facilities.

Today, accessibility by car is good in Skåne, and it is also good to ESS and MAX IV. Regardless from where in Skåne one starts, it is possible to reach Lund in no more than an hour and a half. However, public transport does not give the same level of accessibility. To improve accessibility to the research facilities, and to the whole of Skåne, major initiatives of both a short-term and long-term nature are necessary. This applies to both the frequency of services and shorter journey times.

Based on the results, a number of proposals for local, regional, inter-regional, national and international measures have been developed, including: [34]

- Public transport planning must continue to follow Tågstrategi 2037 (Rail Strategy 2037). When ESS and MAX IV are in place in 2020, accessibility to Lund NE and the facilities would be very good if the Rail Strategy were a reality.
- Public transport along the E22 motorway needs to be upgraded to superbuses on the route Malmö–Lund–Kristianstad.
- Bus connections to the airport at Sturup should be developed further, especially for Lund NE.
- High-quality public transport along the route Simrishamn–Tomelilla–Sjöbo–Veberöd–Dalby–Lund NE is needed to enhance the accessibility to Lund NE for south-east Skåne.

[34] / *Transportinfrastrukturen med ESS och MAX IV (Transport infrastructure with ESS and MAX IV)* (Report produced within TITA – TA1).

In Lund itself, the construction of the Lund Link, which will run from Lund Central Station via Skåne University Hospital and Ideon Science Park to Lund NE with ESS and MAX IV, is a fundamental prerequisite. The planned tram line will not only ensure high-quality public transport, but will also create opportunities for attractive hubs, with a high concentration of housing, service and personnel-intensive companies along the tram route. Furthermore, there is a need for a high-quality cycle path all the way from Lund Central Station to ESS at the far end of Lund NE. This in turn will also contribute to providing the hubs with life and security when the tram routes and cycle paths are joined together.

From Lund, it is 10 minutes to Malmö and 30 minutes to Copenhagen Airport, with a service frequency of 10 minutes morning and evening. This is a strength with respect to travel from other parts of Sweden and internationally. The new centre that Lund NE will become, a new international meeting point in Skåne, may eventually require additional public transport solutions to enhance accessibility nationally and internationally.

CLOSER TO HAMBURG

In 2020, the Fehmarnbelt Fixed Link will be completed, and the goal is to reduce journey times between Copenhagen and Hamburg to 2 hours. This may affect ESS and MAX IV in that the facilities might have collaboration with the research facilities in Hamburg. Connecting Norway, Sweden, Denmark and Germany by means of a high-speed train system would mean that rail on many routes would become an alternative to flying.

The need for comprehensive transport infrastructure investments in the region is great. The regional level of ambition and desire is high, but so far the Government's response has not matched the needs of southern Sweden. It is therefore of the utmost importance that Region Skåne works in cooperation with the municipalities to bring the national level into alignment with the region's ambitions for infrastructure, accessibility and growth.

Linking Norway, Sweden, Denmark and Germany by means of a high-speed train system means that journey times by train will become significantly shorter, and on these routes, rail will be an alternative to flying.

International schools – a decisive issue

When it comes to choosing a place of residence in connection with employment at ESS and MAX IV, the availability of international schools will be of great significance. Today, supply matches demand, but when ESS and MAX IV get started with their recruitment in earnest, the influx of international labour will increase – and with it probably the need for international schools. TITA's analyses suggest that it is primarily English-language primary and lower secondary schools that will be in demand, while demand for international preschools will be low. International schools will be needed especially in and around Lund and Malmö. It has emerged that the readiness to meet the expected demand is not sufficient in Skåne today. In addition, there are aspects related to international schools that make them different from the ordinary collaboration on schools issues across municipal boundaries. The readiness that the region must have is not only a question of supply matching demand, but also of deeper inter-municipal collaboration on international schools. Therefore, the region's stakeholders should regularly review the supply, highlighting and discussing the difficulties of different procedures and systems, and enable children and young people to live and study in different municipalities. There is also a need to safeguard a high standard of schools so that the region can compete with other regions that attract an international target group.[35]

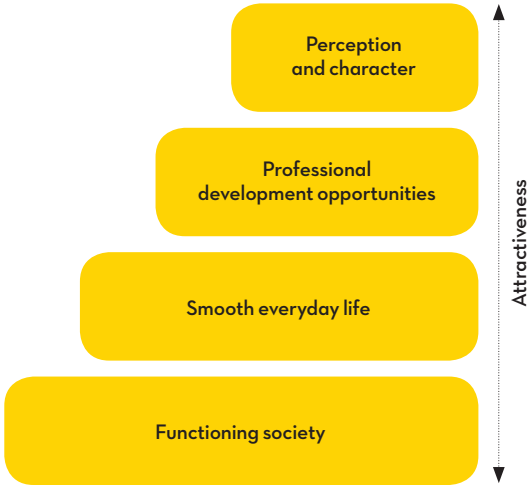
[35] *Analys av internationella skolor i Skåne och Blekinge (Analysis of international schools in Skåne and Blekinge)* (Report produced by Region Skåne in cooperation with TITA).

Municipalities that offer schooling according to an international curriculum must also follow the Swedish curriculum. This makes the establishment of international schools today more complicated. It is therefore important for the region's stakeholders to follow developments in the area of regulations at the national level. The complexity of international schools has been recognised at the national level in an inquiry that will submit a final report in May 2013.[36]

Diversity and tolerance

If a city or region is, from an international perspective, to be perceived as attractive, it must be characterised by diversity and tolerance. It must make room for everyone regardless of education, ethnicity, gender and age, and offer opportunities for meetings between residents from different backgrounds. One conclusion of the investigations undertaken within TITA is that the municipalities must create better conditions for associations and other arenas for meetings of various kinds. Furthermore, there is a need to develop good ideas, identify methods to capture new ideas and create attractive meeting points. Bringing together different activities in one place will make it easier for people to meet.

Within TITA, a model has been developed for the most important factors that determine the attractiveness of a town or city.[37] These are: a functioning society, a smooth everyday life, professional development opportunities, perception and character.



The attractiveness steps as produced by Triple E, Trivector and CaseLab.

The factors have been arranged as "attractiveness steps" or an "attractiveness hierarchy".

A functioning society comprises sub-factors such as security, functioning public services, tolerance, democracy and a low level of corruption.

A smooth everyday life presupposes integrated towns and cities, where residents are close to public transport hubs that allow easy travel to work, education, shops or meeting points.

Professional development opportunities are determined by the work and the career opportunities offered by the region.

Perception and character has a focus on a city's unique positive qualities. These are influenced, for example, by the accessibility of meeting points where new residents and visitors can come in contact with each other and with Swedish society. They are also influenced by the proximity to nature and recreation and by communications.

36/ The Ministry of Education and Research is currently conducting an inquiry into the causes of international schools not appearing to be established to the extent demanded, whether the municipalities should be the accountable authority for these and whether there is a need for European Schools in Sweden. The inquiry has been commissioned to propose amendments to statutes as may be required.

37/ *Attraktivitet och tolerans – en kunskapssammanställning och analys av hur attraktiviteten i Skåne kan ökas för att dra maximal nytta av ESS och MAX IV (Attractiveness and tolerance – a knowledge compilation and analysis of how the attractiveness of Skåne can be increased to gain the maximum benefit from ESS and MAX IV)* (Report produced within TITA – TA1).

A region of international renown

– the vision, marketing and relocation support

Awareness of what the establishment of ESS and MAX IV could mean for people, companies and societal functions throughout the region must be spread. Based on the vision developed under TITA, *Society for Science – Science for Society*, the opportunity exists for the creation of successful and effective communication which is founded on a firmly-rooted sense of regional identity and pride among its citizens. The main message is the region's story and all the opportunities that will arise here as a result of the establishment of ESS and MAX IV. Such a story has to be strong and reach well beyond Sweden's borders if it is to strengthen the region's image as a place for innovation; a region in which international cutting-edge expertise is found and to which companies, researchers and students wish to move. If the regional stakeholders are successful in communicating this story, the region surrounding ESS and MAX IV could attain international renown. In order to achieve this, consistent communication work is required, based on continued regional mobilisation even after the conclusion of TITA. Results from the international case studies demonstrate that the studied facilities had initially underestimated the extent and complexity of working with communication. It is therefore important from an early stage to build up a readiness and respect for the complexity of conducting a solid dialogue in this context.[38]

Highlighting uniqueness

Pointing out the advantages offered to people or companies establishing themselves in the region must be the guiding principle of the communication work. In order to stand out in international competition for people and companies, the story of the region needs to highlight its genuine uniqueness. The proximity to two internationally unique research facilities, in combination with a strong innovative climate, contributes to opportunities in the business sector and makes the region special, even in a global perspective. It is important to clarify for specific sectors how research at ESS and MAX IV can offer a solid contribution to advanced solutions and the development of new products. The fact that the facilities are situated in the middle of a metropolitan area with several towns in close proximity is a strength. The proximity to Copenhagen, a capital of international renown, makes the region feel bigger and increases its attractiveness. Copenhagen Airport (Kastrup) provides international accessibility, and regular public transport to Malmö and Lund is an additional strength. There is strength in the fact that the story is based on combinations. For example, those choosing to establish themselves here have access to both cutting-edge expertise in the academic city of Lund and to the quick-footed entrepreneurs in young, street-smart Malmö. From central Malmö, a mere 30-minute train ride can transport you either to idyllic countryside or the internationally characterised capital of Copenhagen.

In the international studies, regional branding and increased visibility have often proven to be an untapped resource created by the establishment of facilities similar to ESS and MAX IV. With target-oriented measures in the construction and operation phase, this will likely see a significant boost.

The best of both worlds

During the project, TITA has in its marketing of the region chosen to build upon the "best of both worlds" concept that is already used to market Skåne. One example is to show how both Skåne and Blekinge offer quality of life and relaxation as innovative and stimulating environments for entrepreneurs and companies. The message is that in Skåne, fantastic business and career opportunities can be combined with a high quality of life.

Who are the target groups?

The message and the creation of the brand are aimed just as much at the local population as at those the region wishes to attract. Committed citizens spread and endorse the image of a strong and progressive region, both nationally and internationally. When many people speak of a place or a region, there is more interest in it and the top talent and the largest companies are attracted to it. In order to strengthen the region's image and facilitate regional mobilisation, an updated and developed vision, *Society for Science – Science for Society*, has been developed within TITA. It is especially important to highlight the fact that all of the region's residents have much to gain from the establishment of ESS and MAX IV, irre-

[38] *Strategiska rekommendationer till Skåne-Blekinge inför etableringen av ESS och MAX IV (Strategic recommendations to Skåne-Blekinge prior to the establishment of ESS and MAX IV)* (Report produced within TITA).

spective of whether they live within close proximity of the facilities. The results from work on the vision indicate a clear need for new approaches to visions and foresight in the region. By establishing foresight as a regional process, a new tool can be created and used in all areas in which readiness for change needs to increase and the cooperation between all actors needs to be optimised.[39]

Today there is a great need for communication on a national level, as many of the issues identified by TITA have a national dimension. The regional stakeholders should continue to conduct a dialogue with national actors and endeavour to develop a national strategy for maximisation of public benefit arising from the establishment of ESS and MAX IV. It should be a matter of what readiness Sweden should have in areas such as materials research, competence supply, support for domestic companies and potential user companies.

COMPANIES AND RESEARCHERS

International companies with long planning horizons are an interesting target group for communication concerning the prospect of the region as a place of establishment. Another target group is the institutions, universities and research institutes across the world that would be likely to have an interest in establishing themselves in the region on the basis of the facilities. The scientific community also requires information on both the facilities and the research infrastructure surrounding them. Communication with researchers who can use the facilities is best managed directly by the facilities themselves.

Research-intensive companies in the life sciences, cleantech and ICT (Information and Communication Technology) sectors, as well as the food and packaging industry, stand to benefit greatly from ESS and MAX IV.[40] Potential subcontractors are another important target group. They require both information and support in order to fully understand the requirements of each facility in terms of products and services. Here, actors outside of the facilities, such as Region Skåne, municipalities and institutions that promote innovation, have important roles in the dissemination of knowledge about the related opportunities.

New tools for communication

If someone wishes to move to the region, regardless of whether it is a company or an individual, there is a great need of information and support. The information must be clear, easily accessible and in one place. It must also be easy to make contact with different bodies – and it must be clear which bodies the interested party needs to contact. The initial contact must be smooth so that the region is perceived as an attractive prospect. TITA has taken this into consideration and looked at different solutions that simplify and increase the efficiency of communication with various target groups. The Land availability register, Next and the portal Moving to southern Sweden are digital tools developed by TITA.

Land availability register

The Land availability register contains information on vacant land in Skåne's municipalities that is available for business start-ups and housing construction. The information is gathered in one location in order to optimise the visibility of the land in southern Sweden to interested parties both nationally and internationally and thereby attract more investment in the region. Part of the thinking behind the approach is that interested parties from abroad that are looking for a site on which to build their company are not really concerned about municipal boundaries. By simply advertising all land in Skåne and Blekinge available for this purpose, the region as a whole gains a large marketing advantage. Among the target groups, companies stand out (local, regional, national and international), but also developers, first-time investors and public sector organisations. Establishment consultants are also considered to have an interest in the Land availability register.

Next – a virtual community

The knowledge bank built up within and around TITA must continue to be made available to the region's actors, and foundations must be laid for continued discussion with all concerned parties.

There are already ideas concerning joint communication work based on transparency and dialogue between the actors. One prototype, the virtual community Next, has been developed within TITA. Next facilitates storage of, information on and searches for material associated with the region and ESS and MAX IV. Where required, it also allows communication to be narrowed both geographically (e.g. Next Skåne, Next Lund) and thematically (e.g. Science, Society, Culture) by means of a common database. Next has the capacity to become a common communication platform for interactive dialogue on every-

[39]/ *Uppdatera och förankra den etablerade framsynen (Foresight)* (Final Report TI4).

[40]/ Some examples of expected fields of application that can be communicated to these target groups are to improve knowledge of how human DNA functions in living cells, how the body can better tolerate new medical implants, how modes of transport can be made more efficient and require less energy, how batteries can be improved and better ways of conserving valuable works of art.

thing happening in the region, both for actors in the region and those outside of it.

Next is also a tool for future vision work, where the visions of different actors can be published and initiate a cross-fertilisation in a way that strengthens the overall vision of *Society for Science – Science for Society*.[41]

How do we welcome international competence?

The establishment of ESS and MAX IV will attract a large number of international researchers and other cutting-edge expertise to the region. It is as important for ESS and MAX IV as it is for the region that southern Sweden, as well as the rest of the country, is perceived as an attractive place to live and work in. During the interviews conducted by TITA with employers that recruit qualified personnel internationally and with representatives from ESS and MAX IV, a number of strengths and weaknesses have been highlighted. The strengths include Sweden's open working culture, high living standards and public security. Advantages associated with the welfare system that is paid for with tax money, such as generous parental leave, free schooling, subsidised health and medical care, are also effective signals in the recruitment process, though they are most relevant for those employed on a local contract. Problems that can arise when recruiting qualified personnel from abroad include a lack of international schools, difficulties for accompanying partners to find employment and shortage of housing. This is concerning as the researchers at equivalent facilities abroad and at MAX-lab in Lund are within the relatively young age group of 30–40. As a rule, they are accustomed to an international labour market and often work on temporary contracts. The temporary contract and the fact that the employees' families often move with them place demands on accommodation, international schools, childcare and other social services. The possibility of an attractive residential environment is also a competitive advantage that international researchers will take into account when deciding where to accept a position. Researchers use English as their working language, which means an

41/ *Att uppdatera och förankra den existerande framsynen (Foresight)* (Final Report TI4).

NEXT community
www.nextcommunity.org

increased demand for information in English from municipalities and authorities.[42]

Moving to southern Sweden

The results from the surveys carried out within TITA in order to illustrate international researchers' need for information and support clearly point to the regional need for better relocation support. Relocation support should not be aimed solely at researchers at ESS and MAX IV; the overseas workforce at international companies in the region is also an important target group.

One of the intermediate goals of TITA is to build a web portal that provides guidance and helps international researchers and companies to find relevant information when establishing themselves in the region. The aim is not to create new information, but rather to gather all existing information spread across different websites and portals. The result of TITA's work is the digital platform www.movingtosouthernsweden.com. The portal gathers information from all levels; from national authorities such as the Swedish Tax Agency, the Swedish Migration Board and the Swedish Social Insurance Agency, via the regional level with information about health and medical care, the locations of international schools and the regional networks that are available, down to the individual municipalities which are responsible for everything from accommodation to schooling and childcare.

Interviews conducted by TITA have also revealed a demand for a physical relocation support to which people and companies from abroad can turn to receive help in one and the same place with administrative processes for various authorities, etc. A closer cooperation and dialogue between the actors concerned when a person moves to the region from abroad would speed up the move/establishment process. This relocation support could offer the following services:

- Assistance when applying for a personal identity number
  – The Swedish Tax Agency
- Information on matters of social insurance
  – The Swedish Social Insurance Agency
- Jobseeker assistance for accompanying parties
  – The Swedish Public Employment Service
- Guidance on how to obtain a residence or work permit
  – The Swedish Migration Board

The International Citizen Service (ICS) in Denmark is an interesting example of how such a relocation support organisation can be built and run.

[42]/ *Mottagarorganisation Syd (Relocation support)* (Final Report TI1).

The aim of the web portal www.movingtosouthernsweden.com is not to create new information, but to gather all the information that is currently spread over various websites and portals.

Regional mobilisation around ESS and MAX IV

– crucial to success

Experiences from other facilities and analyses conducted within TITA clearly establish the need for regional collaboration in order to achieve greater societal effects.[43] Experiences during the course of the project reveal that TITA has made a significant contribution to the regional mobilisation. The approach – to unite in cross-sectoral collaboration on a common issue with a problem-solving mindset – has helped to increase collaboration between various stakeholders in the region. An important factor is the long-term planning adopted by the region's stakeholders when deciding to initiate the mobilisation process long before the facilities are due to be complete. This proactive mindset, whereby establishment is discussed as a future prospect, as well as the broad approach, have also contributed to the emergence of new issues and cooperations. During the course of the project, TITA has been a platform for cooperation with clear tasks. The actors working within TITA have for example conducted a continuous dialogue with ESS and MAX IV concerning their needs. Through TITA, the local and regional actors have also had a common information channel to national actors.

TITA has not been a project solely for public-sector stakeholders. The business sector has been involved in different phases to varying degrees. The initiatives have focused on both the opportunities for existing businesses and the long-term work to lay the foundations for innovation in new and existing companies by means of increased collaboration. The open innovation arena developed within TITA will facilitate collaboration between public-sector organisations and the business sector.

A prerequisite for long-term activity is that the venues for dialogue and collaboration between actors also remain in place in the future. If the work within TITA is to be the beginning of a long-term development process, it is necessary that the results are implemented and that working forms are developed among the actors. Region Skåne has been a central actor in the work of regional development surrounding the establishment of ESS and MAX IV. The participants are now voicing expectations that the work conducted within TITA will carry on in some form and that Region Skåne, as a linking entity, will continue to create arenas for discussion and meetings between the region's stakeholders.

An important result that has been achieved concerns the increasing competence in the region as a whole in participating in and running large development and mobilisation projects that have the potential to benefit the region in the future. It is important to take advantage of this result and integrate the experiences gained in the region's organisations so that they can be used in future projects.

[43]/ *Strategiska rekommendationer till Skåne och Blekinge inför etableringen av ESS och MAX IV (Strategic recommendations to Skåne-Blekinge prior to the establishment of ESS and MAX IV)* (Report produced within TITA).


Centrum
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2013 ESS MAX IV i regionen–TITA
Region Skåne i samarbete med alla kommuner i Skåne, Lunds universitet, Invest in Skåne, ESS AB, Malmö högskola, Länsstyrelsen i Skåne län, Högskolan Kristianstad, Region Blekinge, SLU Alnarp och Blekinge Tekniska Högskola.
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4.

Conclusions

Effects on the region's economy

In Skåne and Blekinge, there are high expectations that ESS and MAX IV will produce great spin-off effects in the region. From international field studies conducted within TITA, two things are clear:

1. These types of facility generate many effects in the regional economy, but they are not always the expected ones.
2. Deliberate attempts to benefit from the facilities in the development of the region's economy are a relatively new approach and have come about at around the same time[44] at all facilities, irrespective of how long each facility has existed. This makes it more difficult to study the effects afterwards, as these have not been documented in terms of effects. A similar problem exists where unexpected effects are concerned. These are not mentioned to as great an extent by the persons, or in the sources, questioned in the field studies.

The most important effects that the research facilities can have on the regional economy are: [45]

- Direct effects on the labour market
- Multiplier effects on the labour market
- Human capital effects
- Externalities
- Attractiveness

[44]/ The past 5–15 years.

[45]/ *Strategiska rekommendationer till Skåne och Blekinge inför etableringen av ESS och MAX IV (Strategic recommendations to Skåne-Blekinge prior to the establishment of ESS and MAX IV)* (Report produced within TITA).

Effects on the labour market

A very clear and direct effect is that new jobs are created in the short term at research facilities. Direct effects will emerge when the facilities are built, personnel recruited and acquisitions made by the facilities. Thereafter, a number of indirect effects will also come about. To estimate these effects, it is common to employ a method by which the 'multiplier effects' are quantified. If a large investment is made in a company or a region, the investment itself will lead to a number of purchases in other sectors. An example of this kind of positive effect on the labour market is the consumption of goods and services by employees at the facilities. In the same way, the facilities' acquisitions from subcontractors contribute to increased consumption, which in turn generates employment opportunities. In addition, the multiplier includes positive effects in the third tier, that is purchases made by persons who have gained employment through second-tier purchases.

For each person employed directly at a facility, a special model can be used to calculate how many job opportunities the employment in turn generates in the rest of the economy. At a number of different research facilities in other countries, attempts have been made to calculate the indirect employment effects using this method. A comparison of these calculations reveals that the size of the multiplier effect can vary significantly from one region to another. These large differences are a result of different assumptions in the models, and a general conclusion is that it is very difficult to predict the regional multiplier effects that ESS and MAX IV will give rise to.[46] Furthermore, there are a number of difficulties with the method (leakage[47], etc.), and the results should therefore be used with caution when calculating the increase in the region's need for accommodation, daycare places and similar. It is more important to focus on possible long-term effects in the form of adjustment towards a more research and knowledge-based industry, as well as an increase in regional competitiveness.

Both multiplier effects and direct effects constitute just a fraction of the total impact on the regional economy arising as a result of research facilities of this nature. Similar labour market effects could be achieved with considerably less costly infrastructure projects and activities. The real value of a research facility of this kind being established in a region, from a regional economic perspective, lies in the long-term effects on the region's knowledge infrastructure. It is a matter of human capital effects, externalities and attractiveness; factors which are not easily quantified.

Human capital effects

Facilities of this nature increase the competence of the regional workforce, which strengthens the region's long-term competitiveness in the global knowledge economy. As researchers work with advanced instruments and experiments over long periods of time, these individuals build up a specialised knowledge. This increases the attractiveness of both the facility and the region, as well as their competitiveness. TITA's case studies also reveal that it is often former researchers and technicians from the research facilities that, having crossed over to industry, carry out experiments for individual companies at the facilities.

One effect on human capital with a clear link to the region's international competitiveness is the educating of the next generation's knowledge workers. Proximity to world-class facilities of this type can, if properly utilised, help to raise young people's interest in science and technology. At other facilities, there are extensive activities aimed at using the facilities for everything from primary school teaching to graduate schools. Ambitious programmes aimed at increasing access to beamlines and instruments are a strategic factor in attracting young, competent researchers and engineers to the region. The international case studies also provide interesting examples of how industry has been enlisted in joint development and education projects from an early stage. The connection between the education systems and the research facilities is a decisive factor in:

- Long-term competence supply for the research facilities
- Knowledge development – transfer to industrial users
- Attracting young researchers and engineering students to the region

In studies of the university's effects on the regional economy, it is clear that graduating students constitute the single largest contribution to regional and national competitiveness.

46/ Assumptions concerning which multipliers ESS and MAX IV could give rise to are made in *Strategiska rekommendationer till Skåne-Blekinge inför etableringen av ESS och MAX IV* (*Strategic recommendations to Skåne-Blekinge prior to the establishment of ESS and MAX IV*) (Report produced within TITA).

47/ 'Leakage' means that the models are not able to calculate whether the effects are felt within the region or outside of it.

Externalities

As knowledge has a tendency to "spill over" from bearers of knowledge to other people and companies, human capital effects are sometimes passed on from those working at the facilities to individuals who have never set foot there; i.e., dissemination of knowledge occurs over a longer period of time. In economic terms, this phenomenon is called 'externalities'. The term signifies that an activity leads to benefits for a third party, without the latter having actively participated in or contributed to it. At the facilities studied, externalities of this nature, together with human capital effects, constitute the greatest effects generated in the business sector.

Externalities tend to be amplified if the companies are collocated. It may for example be a matter of human capital spreading between companies when specialised workers change jobs. Collocation in a regional innovation environment or cluster also appears to be an important factor in the emergence of externalities between different (yet related) sectors. Technological developments within the mobile phone industry, for example, could lead to the opening of new markets for the music industry. It is reasonable to assume that the externalities generated by research at ESS and MAX IV will affect companies localised in the direct vicinity of the research facilities to a greater extent than those not located there.

Attractiveness

Few regions can even dream of attaining to the stardom and the strong attraction that places such as Hollywood or Silicon Valley have for people and companies. But even for regions with research facilities, the 'Greta Garbo effect' can be a force to reckon with.

All the case studies reveal that large international companies have established units close to the studied facilities. But while these have often initiated concrete partnerships with the facility in question, this does not appear to have been decisive for the actual establishment of the facility. In fact, there is a lot to suggest that on the part of the company, there are more long-term expectations for being close to the facility and that this proximity in itself will create advantages for the company. This leads to a kind of self-reinforcing, agglomeration effect or clustering. The more similar or related companies and researchers establish themselves in this environment, the more the positive externalities and expectations with respect to these will increase. Once clusters of this type have reached critical mass, the Greta Garbo effect is created; that is, the cluster attracts the foremost talent, both in the form of people and companies, from across the world. This is a direct result of expectations of the positive effect that the location will have on their company. But they may also be driven to relocate out of fear of being left on the outside and thus unable to compete on the same terms as those situated within the cluster. The region surrounding ESS and MAX IV should therefore be an attractive location, not only to the companies that can benefit directly from the research at ESS and MAX IV, but also to subcontractors and related activities of various kinds. This includes conferences and similar "secondary" fields of application that the facilities might be expected to give rise to once operational.

The effects will not be automatic

However, field studies conducted by TITA reveal that some facilities, rather than being integrated with the surrounding community, are more like isolated islands. Some studies have indicated that high-tech companies are locating themselves around the research facilities, but that a great many of these are part of global production systems and have weaker links with the regional business community. This means that there is no simple causal connection between a strong, research-intensive sector and regional economic growth. In other European regions with similar research infrastructure, such as Oxford and Grenoble, it is difficult to see causal connections between business start-ups and the facilities' location in the region. This can also apply to regions with very strong regional innovation systems and considerably greater financing opportunities compared with Skåne/Blekinge. At the same time – and this is an important point – the facilities have been characterised by a weak focus on industrial users and the external transfer of technology, that is, fundamental research has been entirely dominant. No great efforts have been made to make connections between the facilities and different regional actors. It is here that Skåne and Blekinge, with TITA firing the starting signal, have the opportunity to create an open environment around the facilities from the ground up; one which in a new way integrates them with society, educational institutes and the business sector. At a number of new synchrotron light facilities such as the Canadian Light Source and the Diamond Light Source in Oxford, it is this very approach that has had an impact. It is thus in many ways a sign of the times that ESS and MAX IV are following this trend.

Opportunities and challenges

The establishment of these two internationally unique research facilities, ESS and MAX IV, in Lund entails great opportunities for Skåne and Blekinge. The construction and future running of the facilities alone give the regional business community the chance to win deals and orders totalling millions of kronor. And yet the really large gains for the region lie in a broader perspective. If we take a step back and analyse the spin-off effects that the establishment of the facilities could lead to in the long term, we would see it is a question of a strong innovative climate and increased competitiveness for the business sector, as well as the creation of a world-class region of knowledge. Probably accompanying this will be new business start-ups and an increased influx of people with sought-after and highly attractive skills. The Öresund Region's brand as an international meeting point for materials research will become stronger. A prerequisite for this scenario is that the region's actors play their cards well – and that they do it now!

Opportunities

Business opportunities for trade and industry

Opportunities to do business present themselves during both the construction and operational phases and concern both goods and services, to the facilities directly or to subcontractors and related activities. The supply of high-tech goods to research facilities such as ESS and MAX IV often leads to increased competitiveness for the companies and the opportunity to enter new markets. A number of other investments in the form of housing construction, offices, hotels and conference facilities, tourism, restaurants and other service functions will also be in demand as a direct effect of the establishment.

The transfer of technology and competence between industry and research

There is great growth potential in long-term spin-off effects that have their basis in the transfer of knowledge and technology which follows in the wake of increased exchange between research facilities and regional industry. This is a result of both the supply to the facilities and their use. The establishment of world-leading research facilities also leads to an increased influx of competence,

which in turn contributes to an increase in the exchange of knowledge as new companies are started near the facilities.

Increased innovative capacity in the region

The establishment itself improves the opportunity to turn the region into an international hub in the field of materials science with a focus on "global challenges". At this meeting point, different actors can unite to resolve the societal issues of the future related to materials science and work towards collective action and innovative thinking on a global level.

Increased interest in technological and scientific education

With the establishment of ESS and MAX IV, Skåne has been given a fantastic opportunity to increase interest in scientific and technological education pathways. By gathering representatives for primary and secondary school, teacher training, higher education, trade associations and the research facilities for common education and competence initiatives, the region can generate the regional competence base required for research, technology and production development and long-term competitiveness.

Increased competitiveness for the region's universities

By integrating higher education programmes with the research facilities, the quality and international attractiveness of these programmes increase. This will draw more students and researchers to the region, which in turn reinforces the Skåne and Blekinge brand as a strong region of knowledge. Where industry is involved in study programmes, there are exceptionally good opportunities for the transfer of technology between higher education, research facilities and industry.

Attracting more research-intensive activities to the region

The close proximity to the strong research environment at Lund University gives the region a great advantage in its work to create dynamic research environments close to the facilities. These in turn contribute to an improved innovative climate and exchange of knowledge between the research community and the surrounding society. These environments in themselves attract research and innovation-intensive activities that are required for disseminating knowledge and commercialising research results.

A chance to create a science centre of the highest international class

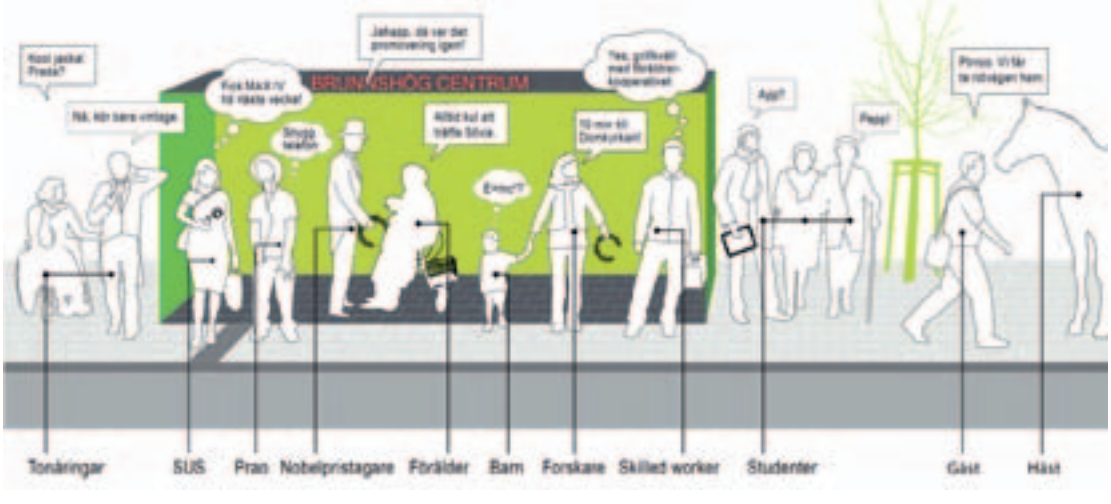
Southern Sweden has a historic opportunity to profile itself as a region of knowledge. A world-class science centre, which will become a meeting point of international calibre for the exchange of ideas and knowledge between researchers and the surrounding society, has the potential to attract visitors from all over the world. By linking pedagogical activity to the centre, it can contribute to popularising science and function as a support for the pedagogical work of schools and teachers.

Effective incentive for investments in infrastructure

The establishment of ESS and MAX IV is an excellent opportunity to upscale and start initiatives that together with the facilities will provide a boost for the entire region, the effects of which will still be felt for a long time to come. This applies primarily to public transport and housing construction in areas close to public transport. There is a great need for radical investments in transport infrastructure and an increase in housing construction. The regional ambition and willingness are high, but so far the Government has not met the needs of southern Sweden. An incredible opportunity has now emerged for Region Skåne, in cooperation with the municipalities, and with the hosting of two international research facilities as an argument, to apply pressure at the national level to match the region's ambitions in terms of infrastructure, accessibility and growth.

A chance for the municipalities to attract new residents and companies

With the right thinking on housing construction and public transport hubs, even places quite some way from ESS and MAX IV can become attractive residential municipalities when Skåne's population increases. The same applies to potential land for business development. In an international perspective, all localities within Skåne are close to ESS and MAX IV. By highlighting this in combination



with what is unique to each locality, new residents and companies can be drawn in. By creating a number of appealing thoroughfares and creative meeting points in all localities, they will complement each other and increase the attractiveness of the region.

Stronger regional brand

The establishment of the facilities will entail a greater international interest in the region and thereby a chance to strengthen the region's brand and highlight its qualities. The international story of the region helps to create an excitement around living and working here, both for current and future residents. This can in turn attract both labour and tourists to the region.

Challenges

If the opportunities are to lead to growth and employment, a joint mobilisation is required among the region's actors. In this work, TITA has identified a number of challenges for which preparations must be made.

Establishing a structure for future work

In order to implement the initiatives and strategies identified by TITA as necessary if the region is to take advantage of spin-off effects from ESS and MAX IV, structures must be established for the continued work. The challenge lies in creating a clear leadership, division of roles and responsibilities and in coordinating the agendas of the regional stakeholders.

There is an additional challenge in ensuring that the cross-sectoral collaboration which has characterised TITA does not fade away once the work with these issues becomes a part of the stakeholders' ordinary activities.

Maintaining long-term initiatives and commitment

Several of the initiatives proposed for taking advantage of the opportunities offered by ESS and MAX IV require long-term commitment. The strategies must be converted into long-term investments integrated in the activities of regional and local actors. The commitment and the networks that have been created through TITA must be developed. It is crucial to keep the development work relevant even when new issues become part of the agenda or project investments come to an end.

Communicating clearly and consistently

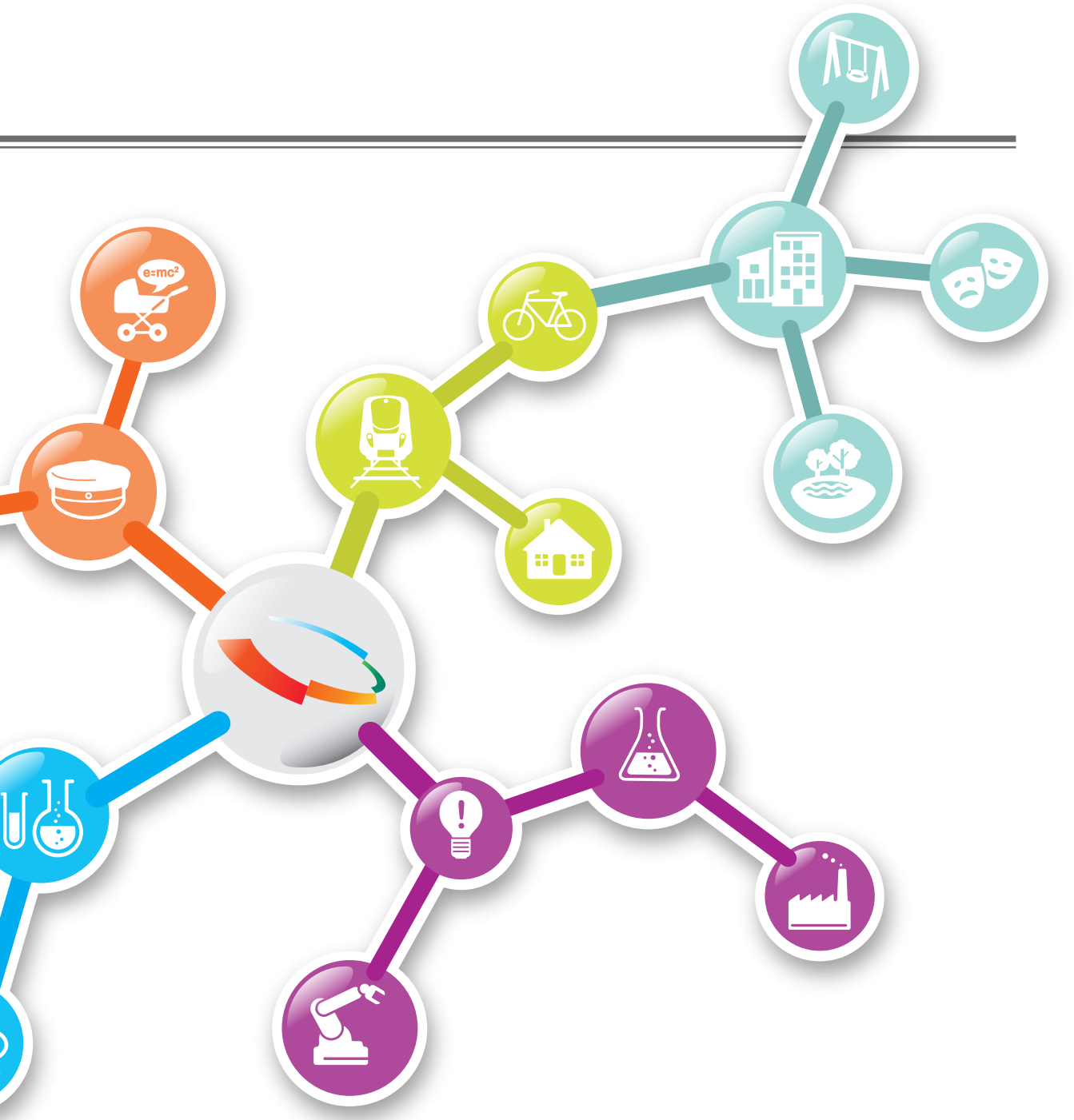
For the regional mobilisation surrounding ESS and MAX IV, steady communication on issues concerning collaboration is absolutely necessary. The challenge lies in finding forms and arenas for clear communication between regional stakeholders and with interested parties on the national and international levels. The complexity of conducting communication work in order to maintain and convey TITA's entire knowledge bank is not to be underestimated. A lack of communication between concerned actors can lead to a loss of driving force and negative public opinion.

Building readiness and flexibility for the unexpected

There must be a capacity to meet requirements for special solutions that do not have a place in the design of the current system. New needs that arise as a result of the new facilities are perhaps not in line with the traditional activities of the regional authority, municipalities and higher education institutions. It is a matter of putting the right actors on the right issues. The local and regional administration is to be alert. This ensures a continuous dialogue with relevant actors in order to identify obstacles or opportunities at an early stage.

5.

The TITA strategies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Based on the results of TITA, five strategies have been produced. These will serve as guidance for TITA's partnership in the development work surrounding ESS and MAX IV. The TITA strategies concern areas that have a direct connection with ESS and MAX IV. The strategies thereby complement other regional and municipal programmes and plans, such as the Regional Development Strategy. Together, they will contribute to achieving the vision *Society for Science – Science for Society*.

The strategies concern what needs to be done in the next 5–10 years. For each strategy, initiatives are proposed.

One of the primary tasks of all actors in the region working with planning issues and development work is to ensure that the establishment of the facilities and the results of the TITA strategies are integrated in local and regional plans, programmes and strategies. It is a matter of implementing knowledge in the ordinary activities. This will ensure the increase in the quality of these activities that will be necessary if the entire region is to benefit from the effects of ESS and MAX IV.

Many areas that TITA's partner organisations are working with continuously in their ordinary activities are also essential in order to optimise the public benefit of the new facilities. This includes a varied range of cultural and leisure activities, marketing of the region, tourism, etc. These areas are not part of the strategies, but are just as crucial to future growth, development and attractiveness.

The TITA strategies require regional mobilisation

Experiences from other facilities and analyses conducted within TITA clearly establish the need for regional collaboration in order to achieve greater societal effects. The region's stakeholders have begun generating commitment at an early stage compared with regions surrounding other research facilities, and this has given rise to a unique starting position. Now it is a matter of preserving the cross-sectoral approach to collaboration created by TITA. Mobilisation of this nature does not happen of its own accord; it must be planned, financed and communicated.

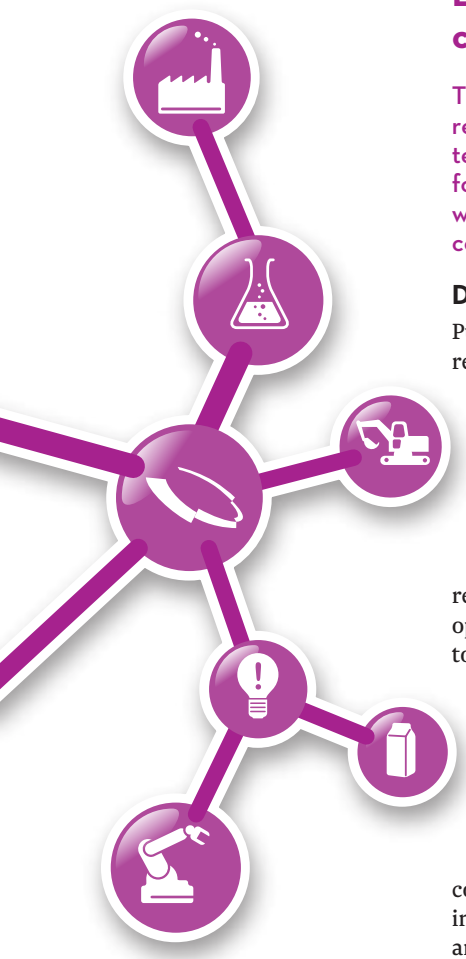
Structure for collaboration

In order to gain positive spin-off effects throughout the region, the entire partnership needs to work with the strategies via various types of initiative. The municipalities in particular have an important role to play in terms of the spin-off effects. But if the work with the TITA strategies is to be effective, overall coordination is required. This entails maintaining a holistic approach in the work and ensuring that it does not come to a halt, as well as further developing cross-sectoral cooperation and arenas for dialogue. For the municipalities' part, it can be crucial to continue to provide support and information in the future. An important factor is ensuring collaboration with national actors as well as with international actors such as Denmark and northern Germany.

Strategies for continued work

In order to take advantage of the opportunities presented by ESS and MAX IV and ensure spin-off effects throughout the region, there will be a need to:

1. Enhance the competitiveness and innovative capacity of the business sector
2. Build a region strong in education
3. Create dynamic research environments
4. Increase accessibility throughout the region
5. Develop the international attractiveness of the region



Enhancing the competitiveness and innovative capacity of the business sector

The region must develop support systems that increase the opportunity for regional businesses to serve, supply and use ESS and MAX IV. In a more long-term perspective, this means enhanced competitiveness and also opens up for an international market. An open innovation arena in materials science which fosters new ideas and businesses will further improve the region's competitiveness.

Description of the strategy

Publicly initiated support functions for industry will bridge the gap between research facilities, industry and academia. This will take full advantage of the potential in the establishment of the facilities and contributes greatly to enhancing the competitiveness of the business sector. This applies to the companies that are able to supply goods and services as well as to those that can use the facilities for industrial research. This also means new opportunities for those who wish to be an actor in the open innovation arena in materials science that is under development.

A support function will be created in order to increase opportunities for regional businesses to supply the facilities during both the construction and operational phases. This is a long-term work intended to help Swedish companies to monitor procurements, create consortiums and develop competence.

A support function is also required in order to increase the industrial use of the facilities. A function of this nature helps to increase interest in the region among national and international companies. The support facilitates contact between the facilities and industry and contributes to both greater competitiveness and an innovative knowledge climate in the region.

In order to further enhance the competitiveness of the business sector, an open innovation arena in materials science is under development. This complements the research agenda surrounding the facilities and creates a strong international innovation environment that has the potential to lead to business and growth. Resolute initiatives and focused work provide the readiness and speed required for the region to become an effective recipient of new activities and innovations.

Strategy coordination:

Region Skåne.

The strategy includes the following initiatives:

- To establish an industrial platform that provides support to suppliers of goods and services
- To investigate the need for an industrial platform that supports industrial use
- To further develop the open innovation arena in materials science

Key actors in the implementation:

All municipalities in Skåne and Blekinge, Region Skåne, Region Blekinge, all higher education institutions in the region, ESS, MAX IV, the Skåne Research and Innovation Council (FIRS), trade associations, the business sector.

Building a region strong in education

In order to build a region that is strong in education, a long-term competence supply plan surrounding ESS and MAX IV must be drawn up. The research facilities shall be integrated with the education systems on a higher education level through various initiatives. ESS and MAX IV shall also be used as leverage to raise interest in technological and scientific study programmes among young people.

Description of the strategy

The collaboration between facilities, academia and industry will generate internationally unique educational opportunities. ESS and MAX IV will also more generally be used as leverage to raise young people's interest in science and technology. The investments will come at an early stage of education and follow the pupils throughout their schooling. In order to maintain this interest and thereby allow more to choose this specialisation at secondary school and university level, an ongoing and collaborative commitment will be required from a number of key actors. The issue is relevant at primary, secondary school and university level as well as for practical professional competence. The work is supported by long-term education and competence supply plans.

By creating good and exciting education environments, public-sector stakeholders, such as universities and municipalities, endeavour to attract competence to the region for the long term. Similarly, exciting work placements with businesses in the region help to maintain interest among young people and retain competence in the region.

Strategy coordination:

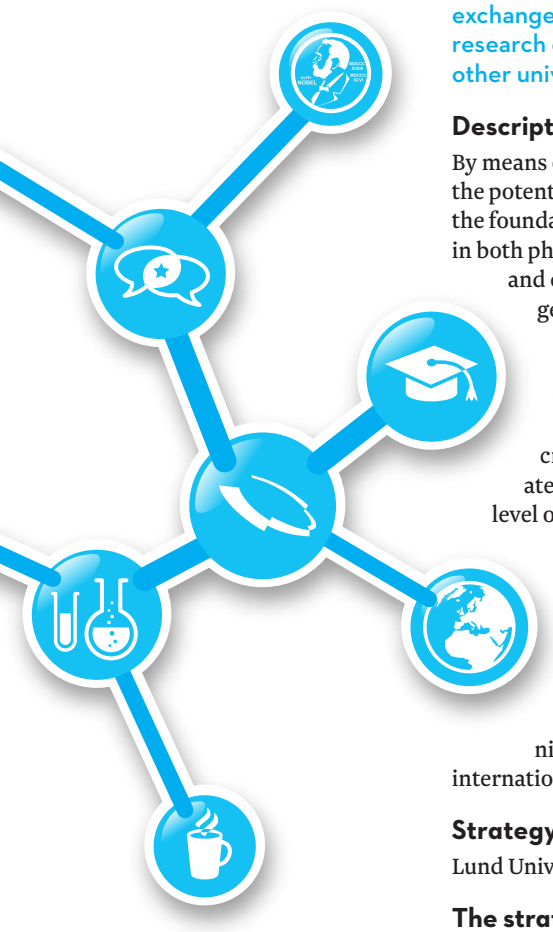
Region Skåne.

The strategy includes the following initiatives:

- To ensure that the facilities' presence in the region has a tangible effect in primary and secondary schools
- To strengthen the connection between the research facilities and the universities' education and research
- To strengthen the connection between the research facilities and higher vocational education
- To continuously analyse the need for competence supply in the region within technological and scientific areas

Key actors in the implementation:

All municipalities in Skåne and Blekinge, Region Skåne, Region Blekinge, Scania's Association of Local Authorities, all higher education institutions in the region, ESS, MAX IV, Kompetenssamverkan Skåne (a public-sector forum on competence issues), Teknikcollege, Teknikföretagen (trade association for Swedish technology companies), the Ministry of Education and Research.



Creating dynamic research environments

A variety of meeting points will be created in order to contribute to the exchange of knowledge and ideas across traditional boundaries. Dynamic research environments attract research-intensive activities, campuses from other universities, high-tech companies and laboratories to the region.

Description of the strategy

By means of deliberate, target-oriented investments in physical locations with the potential to generate meetings between people across traditional boundaries, the foundations are laid for successful innovation and research. This is reflected in both physical and social planning and is intended to facilitate spontaneous and creative meetings between researchers, the business sector and the general public.

The overarching purpose is to ensure that the research facilities are integrated with the surrounding community and that researchers have the best possible conditions for their research.

Knowledge about how dynamic and attractive environments are created is utilised in the physical planning of the environment immediately surrounding the research facilities. In order to contribute to a higher level of efficiency and become an environment for recreation and recovery, parks and other green environments will be created close to the research facilities.

Research facilities for users, researchers and innovators are being constructed in the surrounding environment, side by side with infrastructure such as a hotel for visiting researchers, restaurants, a library, conference facilities and a visitor's centre.

In this way, the area surrounding the facilities is given the opportunity to attract more research centres, campuses from other universities, international companies' R&D departments, high-tech companies and laboratories.

Strategy coordination:

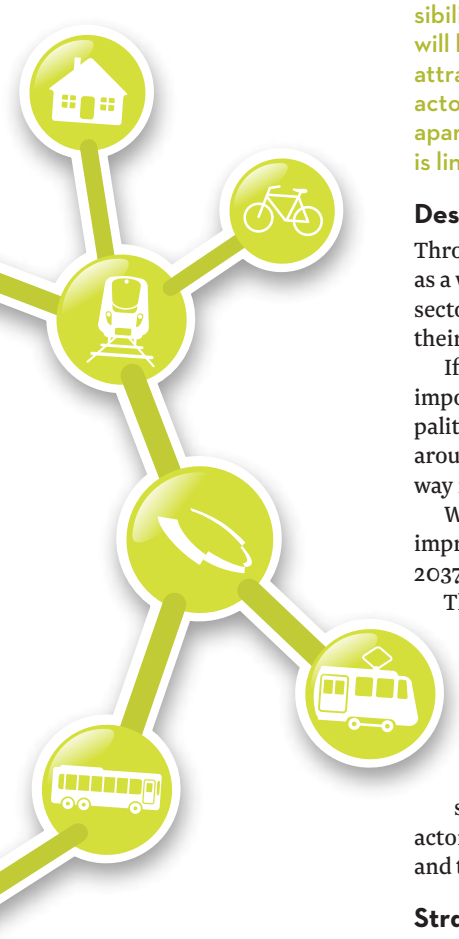
Lund University.

The strategy includes the following initiatives:

- To work to establish a science centre in Science Village
- To create meeting points in Lund North East
- To establish a creative environment that encourages meetings in the borderlands between research, the business sector/industry and society and thus attracts research-intensive activities, campuses from other universities, etc.
- To develop a strategy and action plan for the development of Science Village

Key actors in the implementation:

Region Skåne, Lund Municipality, Science Village Scandinavia AB, all higher education institutions in the region, ESS, MAX IV, the municipalities of Skåne, the Skåne Research and Innovation Council (FIRS).



Increasing accessibility throughout the region

Conscious prioritisation in urban planning issues will result in better accessibility, both regionally and internationally. Sites close to public transport will be planned for housing, workplaces, service and retail in order to create attractive urban environments. The municipalities shall work with other actors in order to get housing construction under way, primarily rental apartments. Public transport shall be developed so that the entire region is linked to ESS and MAX IV.

Description of the strategy

Through strategic urban planning, the foundations are laid to enable the region as a whole to benefit from the spin-off effects around ESS and MAX IV. Public-sector stakeholders need to become more proactive, driven and innovative in their planning.

If the region is to be able to compete for labour internationally, it is of great importance that the housing market is more effective and flexible. So that municipalities outside the Malmö/Lund region can benefit from the spin-off effects around ESS and MAX IV, it is important for housing construction to get under way in earnest in all parts of the region and with varied forms of tenure.

With a number of investments in public transport, accessibility in the region is improved. A fundamental piece of the puzzle is Tågstrategi 2037 (Rail Strategy 2037), which is complemented by investments in a superbus system and trams.

There will be a strong focus on the work to create attractive public transport hubs. These will become meeting points that facilitate concentrations of housing construction, incubators, service and personnel-intensive companies.

High-class public transport along the Lund Link not only connects Lund NE to Lund C, but interconnects the entire region. A development of public transport that brings the region together paves the way for a smooth everyday life, with opportunities for accommodation and business start-ups far beyond the immediate area of ESS and MAX IV. The region's actors will work together to increase the region's investments in infrastructure and to get the national level to recognise this as an important matter for Sweden.

Strategy coordination:

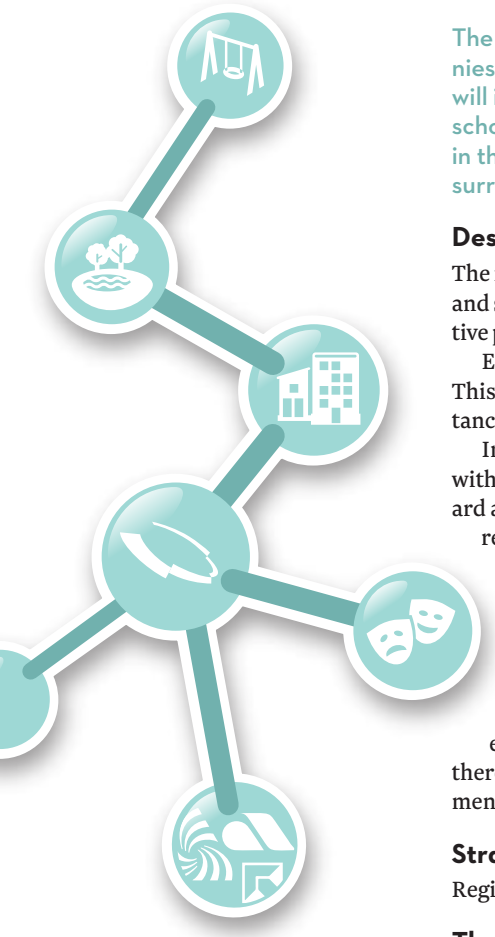
Region Skåne.

The strategy includes the following initiatives:

- To translate the knowledge base developed within TITA into the continued regional transport infrastructure process and the Structural Picture of Skåne
- To increase collaboration between region, municipality and central government in order to facilitate the realisation of Tågstrategi 2037 (Rail Strategy 2037)
- To work towards an extended public rail transport system along "Kunskapsstråket" [the Knowledge Lane]
- To investigate how the region's/Skåne's housing market functions as a whole and how it affects labour market mobility and growth
- To create increased accessibility in the region by means of high-class bus transport, known as a "superbus system"

Key actors in the implementation:

The municipalities of Skåne, Region Skåne, the County Administrative Board of Skåne, the Swedish Transport Administration, Boverket – The Swedish National Board of Housing, Building and Planning, Region Blekinge.



Developing the international attractiveness of the region

The region will provide world-class relocation support for workers, companies and students. The region's attractiveness for overseas competence will increase through effective relocation support, access to international schools and flexible forms of accommodation. In order to compete well in the global competition, the region's actors will collaborate on issues surrounding increased internationalisation.

Description of the strategy

The region will hold its own in the competition for international labour, companies and students. Through internationalisation, the region will become a more attractive prospect for international companies and individuals to live and work in.

Effective relocation support helps to strengthen the region's attractiveness. This support will facilitate the search for relevant information and provide assistance to accompanying parties with respect to employment, etc.

In order to attract the international target group that is expected in connection with the establishment of ESS and MAX IV, international schools of a high standard and more in-depth municipal collaboration on international schools are required.

The region must be prepared to meet the demand for flexible forms of accommodation for people coming as workers, visiting researchers at the facilities or as students, i.e., the opportunity to rent a house, furnished accommodation, a room, short-term lease, etc.

The opportunities of diversity shall be realised by means of active work towards increased tolerance in society so that regardless of gender, age and ethnicity, all will feel there is a place for them. A vital regional development therefore includes investments in local groups and associations and the establishment of meeting points that are accessible to everyone.

Strategy coordination:

Region Skåne.

The strategy includes the following initiatives:

- To initiate relocation support including forms of support for accompanying parties
- To run and develop www.movingtosouthernsweden.com
- To work towards a good level of access to international schools
- To pursue the issue of flexible forms of accommodation
- To run and develop the Land availability register
- To work to move the issue of international openness and tolerance from knowledge to action

Key actors in the implementation:

The municipalities of Skåne and Blekinge, Invest in Skåne, the County Administrative Board of Skåne, Region Skåne, Region Blekinge, Scania's Association of Local Authorities, Öresund Direkt Malmö, all higher education institutions in the region, Kompetenssamverkan Skåne (a public-sector forum on competence issues), the Swedish Public Employment Service, the Swedish Migration Board, the Swedish Tax Agency, the Swedish Social Insurance Agency, RÖK[48].

[48]/ Regional agreement for the County of Skåne concerning collaboration on the development of establishment for asylum seekers and other immigrants.

6.

References

Results and conclusions in this final report are underpinned by extensive documentation, which includes final reports of each sub-project and background reports. These reports present a review of conducted interviews, references and web pages used. This material is mainly in Swedish. All the reports produced within TITA are available on www.essmax4tita.se.

Final reports of the sub-projects

TI1 Mottagarorganisation Syd (Relocation support), Region Skåne, 2012

TI2 Marknadsföring sydsvenska världsanläggningar (Marketing), Region Skåne, 2012

TI3 Mötesplats Lund NE (Meeting point – Lund NE), Region Skåne, 2012

TI4 Uppdatera och förankra den existerande framsynen (Foresight), Region Skåne, 2012

TI5 ESS och MAX IV som innovationskraft för näringslivet (ESS and MAX IV as an innovation catalyst for trade and industry), Region Skåne, 2012

TI6 ESS och MAX IV som tillväxtmotor för det regionala och lokala näringslivet (ESS and MAX IV, a growth factor for local and regional businesses), Region Skåne, 2012

TA1 Samhällsplanering och transportinfrastruktur (Urban planning and transport infrastructure), Region Skåne, 2012

TA2 Markregister Syd (Land availability register), Region Skåne, 2012

TA3 Förstudie kring kompetensförsörjning, (Pilot study for competence supply needs), Region Skåne, 2012

Background reports, all produced within TITA

Achieving growth from ESS and MAX IV. The importance of strong links between ESS and MAX IV, education and industry. Short version, TA3, Oxford Research, 2012

Affärsmöjligheter i spåren av ESS och MAX IV (Business opportunities in the wake of ESS and MAX IV), Oxford Research, 2011

Affärsmöjligheter i spåren av ESS och MAX IV, kortversion (Business opportunities in the wake of ESS and MAX IV, short version), Oxford Research, 2012

Attraktivitet och tolerans – En kunskapssammanställning och analys av hur attraktiviteten i Skåne kan ökas för att dra maximal nytta av ESS och MAX IV (Attractiveness and tolerance – a knowledge compilation and analysis of how the attractiveness of Skåne can be increased to gain the maximum benefit from ESS and MAX IV), Urban Innovation Lab, Triple E AB, Trivector AB, CaseLab AB, 2012

coLAB CITY – a comparative study on research environments, Smog studio & PUSH Architecture, 2011

Effekter på bostadsbyggandet i Skåne till följd av ESS och MAX IV (Effects on housing construction in Skåne as a result of ESS and MAX IV), WSP, 2012

Förstudie kring ett framtida digitalt markregister (Pilot study on a future digital land availability register), WSP, 2011

Förstudie XS (Pilot study XS), Lund University and Agadem, 2012

Industrins framtida kopplingar till ESS och MAX IV – Exempel på internationella och regionala initiativ (Industry's future links with ESS and MAX IV – examples of international and regional initiatives), Oxford Research, 2012

Kreativa mötesplatser Lund NE/Brunnshög – en intervjustudie med användare av MAX-lab och andra forskningsanläggningar internationellt (Creative meeting points Lund NE/Brunnshög – an interview study of users of MAX-lab and other research facilities internationally), Oxford Research, 2012

Lathund för offentliga upphandlingar (A quick guide to public procurement), TITA in cooperation with Moll Wendén Advokatbyrå, 2012

Livskraftiga orter – som effekt av ESS och MAX IV (Vital and viable towns – as an effect of ESS and MAX IV), FOJAB arkitekter, 2012

Mötesplats Lund NE – Kreativa mötesplatser/Programmering av mötesplatser (Meeting point – Lund NE – Creative meeting points. Programming of meeting points), Sweco and Oxford, 2012

Resmöjligheter med kollektivtrafik i Lunds tätort till Lund NE (Travel options to Lund NE using public transport within Lund's population centre), Danielssondosk, 2012

Resmöjligheter med kollektivtrafik till Lund NE (Travel options to Lund NE using public transport), Danielssondosk, 2012

Stadens möjligheter, platser och stråk (Possibilities of the city – places and thoroughfares), Lund Municipality, 2012

Strategier ESS och MAX IV, delrapport 2 – Nulägesanalys, risker och utmaningar i Skåne/Blekinge (Strategies ESS and MAX IV, Sub-report 2 – Current situation analysis, risks and challenges in Skåne/Blekinge), Sweco, 2012

Strategiska rekommendationer till Skåne och Blekinge inför etableringen av ESS och MAX IV, delrapport 3 (Strategic recommendations to Skåne-Blekinge prior to the establishment of ESS and MAX IV, Sub-report 3), Sweco, 2012

Strategiunderlag ESS och MAX IV, delrapport 1 – Internationella fallstudier av 5 miljöer (Strategy basis ESS and MAX IV, Sub-report 1 – International case studies of 5 environments), Sweco, 2011

Tillväxt kommer inte av sig själv – vikten av starka kopplingar mellan ESS och MAX IV, utbildningssystemet och industrin (Achieving growth from ESS and MAX IV. The importance of strong links between ESS and MAX IV, education and industry), Oxford Research, 2012

Transportinfrastrukturen med ESS och MAX IV (Transport infrastructure with ESS and MAX IV), Tyréns, 2012

Utbildnings- och kompetensbehov i spåren av ESS och MAX IV – ett kunskapsunderlag (Education and competence needs in the wake of ESS and MAX IV – a knowledge base), Oxford Research, 2011

Utveckling av kongressverksamhet i Skåne (Development of congress activities in Skåne), Institute for organizational studies, 2012

Vem kommer till Skåne – som en effekt av ESS/MAX IV etableringen? (Who is coming to Skåne – as an effect of the establishment of ESS and MAX IV?), Tyréns, 2011

Other materials

In addition to sub-project reports and background reports, this final report has made explicit reference to some other materials. These are:

Analys av internationella skolor i Skåne och Blekinge (Analysis of international schools in Skåne and Blekinge), Sweco, 2012 (commissioned by Region Skåne)

The ESS in Lund – its effects on regional development, PWC, 2009 (commissioned by Region Skåne)

Utbildnings- och arbetsmarknadsprognos för Skåne – med sikte på 2020 (Education and labour market projection for Skåne – with a view to 2020), Region Skåne, 2012

The Swedish Research Council's Guide to Infrastructures 2012, Swedish Research Council Report Series 2011:8, Swedish Research Council, 2011