

Report 2015:18 ENG

Swedish Work Environment Research 2017–2027

Input to the Government's Research Policy



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Preface

This document is based on a report written by the Swedish Work Environment Authority as commissioned by the Government. The report was submitted to the Government on 16 November 2015 (A2015/1410/ARM). The commission consisted of submitting analyses as supporting documentation to the Ministry of Employment in preparation for the Government Research Policy Bill 2017. According to the Directive, the report should show how *the need for and access to research-based knowledge has developed as well as an assessment of the future need for research-based knowledge*. It should also be future-oriented with a ten-year perspective, as and from 2017, and employ a comparative, international perspective with regard to gender equality and gender. Furthermore, the Directive stipulates that the report should contain *a description of any collaboration with other agencies, including research financiers, universities, industry, municipalities, county councils and other sectors of society with regard to research-based knowledge*.

The future supply of knowledge is a prerequisite for the Swedish Work Environment Authority to be able to engage in evidence-based inspection and for other actors to be able to implement effective work environment initiatives. The report aims to highlight issues regarding the current and future supply of knowledge within the field of work environment. Based on the knowledge needs presently found and those that may arise in the future – how should research-based knowledge be generated, organised, financed and communicated?

We would like to thank all the people who contributed their time and ideas in the preparation of the report. Special thanks goes to Professor Olle Persson at Umeå University who conducted the bibliometric analysis, all the participants who came to Stockholm to attend the hearings on 31 August and 1 September, and the employees of the Swedish Work Environment Authority and various organisations in Denmark, Finland, Norway and the Netherlands who allowed themselves to be interviewed.

It is our hope that the general public will also benefit from and display interest in the report.

Ann Ponton Klevestedt
Head of Unit, Statistics and Analysis

Introduction

The document was written in 2015 by Senior Analyst Carin Håkansta at the Swedish Work Environment Authority. It consists of five sections:

1. *The development of Swedish work environment research.* This section describes how, in the past, work environment research experienced strong growth through investments in research institutes and research funding. It also provides a quick rundown of how the focus of research has developed as well as bibliometric data comparing Swedish work environment research with that of other countries over time, measured by the frequency with which research is published and cited. Historical data is based on literature, while information on the focus of research comes from two hearings that the Swedish Work Environment Authority organised with researchers, the social partners, research financiers and brokers of knowledge. The bibliometric study was prepared by Professor Olle Persson, Umeå University.
2. *Need for and access to research-based knowledge.* This section presents the Swedish Work Environment Authority's knowledge needs and needs identified by researchers, the social partners and other stakeholders. It also presents how the Swedish Work Environment Authority and other stakeholders contribute to the provision of research-based knowledge. This section is based on information from interviews with employees at the Swedish Work Environment Authority and on the hearings already described.
3. *Collaboration between the Swedish Work Environment Authority's collaboration and other organisations.* This section is based on information from interviews with employees of the Swedish Work Environment Authority.
4. *International comparison.* This section places the need for and access to research-based knowledge in Sweden in an international perspective by comparing them to selected Northern European countries. The information is based on interviews and literature gathered during field trips to Denmark, Finland, Norway and the Netherlands.
5. *Conclusions and discussion.* This section presents conclusions and a discussion of the results as well as proposals that the Ministry of Employment might wish to submit for the forthcoming research bill.

1. Development and position of work environment research

This section describes how and why research institutes and public funding of work environment research have developed over time; how the research focus has changed; and how Swedish work environment research holds up in an international comparison.

Institutional development

The 1970s and 1980s saw a marked increase in work environment research in Sweden. Work environment issues received political attention and the government invested in the expansion of the field by allocating earmarked research funds and by setting up research institutes (Håkansta, 2014). Figure 1 shows how, in the 1970s, a special fund for research and education on work environment was created – the Swedish Workers Protection Fund [Arbetarskyddsfonden] (later called the Swedish Work Environment Fund [Arbetsmiljöfonden]). In the 1970s, the Work Environment Institute [Arbetsmiljöinstitutet] also received a significant increase in resources and a new institute was created, initially with a focus on co-determination issues. In 1995 the Work Environment Fund was transformed into a research council (RALF), while the two research institutes were merged to create the Swedish National Institute for Working Life [Arbetslivsinstitutet]. After the merger, a gradual shift in focus took place at government level from work environment to labour market and work organisation issues. This focus shift explains why much of the traditional work environment research was moved out of the National Institute for Working Life to various universities.

Figure 1. Public research institutes and research financiers of relevance to working life research 1938–2015

Year	Research institutes	Research financiers
1938	Work Environment Institute ¹	
1972		Swedish Workers Protection Fund/ Swedish Work Environment Fund
1977		Swedish Centre for Working Life
1995	Swedish National Institute for Working Life (NIWL)	Swedish Council for Work Life Research (RALF)
2001		Research Council for Working Life and Social Science (FAS)/ Sweden's innovation agency (VINNOVA)
2007		Swedish Research Council for Health, Working Life and Welfare (Forte)
2015		

Aside from the structural shift in research funding, there was also a shift from the sector principle which previously guided Swedish research policy. According to this principle, the usefulness of research in each sector would determine the direction of research funding, which in the work environment area's case meant significant influence from the Ministry of Employment. The difference between FAS and the former financiers of working life research is that in most cases the researchers themselves determine the direction of research, and that the selection to a greater extent is based on scientific quality rather than societal benefit. A consequence of the weakening of the sector principle is that it has become more difficult for applied research to compete for government research funding from FAS/Forte (ibid.). Vinnova does not focus on work environment, but rather on organisational issues and innovations. Another factor that makes it difficult for work environment researchers to seek funding from Vinnova is that funding must be sought in cooperation with industry (Rolfer et al, 2012; SOU 2011: 60). The reduction in government funding to applied work environment research has been compensated to some extent by AFA Insurance, which has boosted its funding of research since the turn of the millennium.

1 During this period, work environment research was conducted in four different organisations: 1938–1965 at a department of the *Swedish Public Health Institute*, 1966–1971 at the *Institute of Occupational Medicine*, 1972–1986 at a department of the *Swedish Board for Workers' Protection*, 1987–1994 at the *Work Environment Institute*.

The focus of work environment research

The focus of work environment research has been characterised by changes in working life, not least the transition from an industrial and agrarian economy to a society increasingly dominated by the service sector. New technology and IT has resulted in rapid changes to working life, and it is increasingly difficult for research to keep up. Sustainability, gender equality and aging are issues that have been topical for many decades, but the emphasis has shifted over the years. Focus of research has shifted from areas such as ergonomics and load, chemical hazards and behavioural aspects to mental illness and stress. Furthermore, research has gone from primarily measuring and identifying correlations between exposure and disease, to looking closer at risk assessments. The human-technology-organisation perspective has been extended to include the importance of feeling good at work. Another change is that the attention of work organisation research has shifted from the organisational level to the individual level and the individual's responsibility. When it comes to laws and regulations, knowledge needs have shifted from the national level to the EU level.

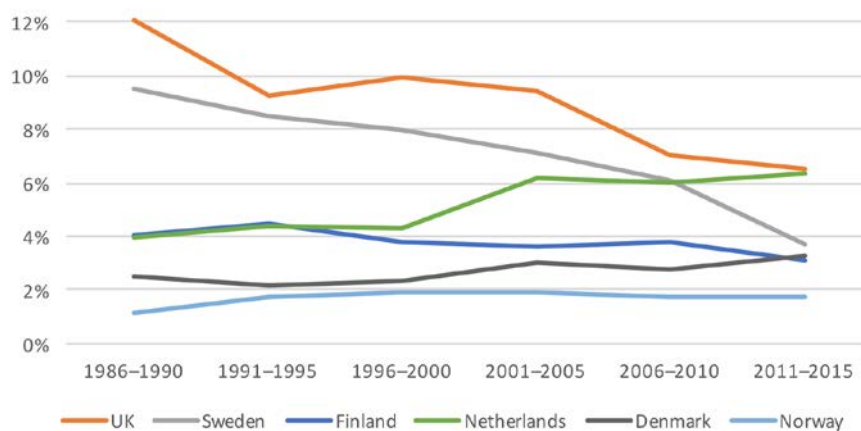
Many of the focus shifts mentioned above took place in the 1990s. First, a severe recession occurred that caused unemployment and restructuring. Then came the IT revolution and the gradual emergence of flexible "work without boundaries". Towards the end of the decade, consequences of a toughening working climate led to higher levels of sick leave and the phenomenon of burnout. Today, research is still pursued on many of these issues, including the balance between work and leisure. Migration and a rising sickness rate among women, mainly caused by mental health problems and musculoskeletal disorders, are other topical issues.

The position of Swedish work environment research in an international comparison

The Swedish Work Environment Authority conducted a bibliometric study in 2015 which can be read in its entirety in Appendix 2. The aim of the study was to assess how often Swedish work environment researchers are published, cited and collaborate in scientific journals over time and in an international comparison. The results show a dramatic decline for Sweden, both in absolute figures and in its share of global production. In absolute figures, Swedish researchers ranked

third in the world after the USA and Great Britain during the years 1986–1990. In the period 2011–2015, Sweden’s ranking had dropped to eighth place in the world. Figure 2 illustrates how the Danish and Dutch work environment researchers have become more productive since the 1980s, while the Norwegian and Finnish researchers have remained at roughly the same level. The Swedish share of global production fell from 9.5 per cent during 1986–1990 to 3.7 per cent during 2011–2015.

Figure 2. Relative share of researchers from Scandinavia, the Netherlands and the UK published in 10 selected work environment and ergonomics journals 1986-2015²



In a bibliometric study of work organisation research (Forte, 2015: p.20), Forte interprets the stagnation in the number of articles from 2009 as a possible delayed effect of the National Institute for Working Life’s closure in 2007. With regards to work environment research, the institute’s closure probably did not have as great an influence on the development since much work environment research had been moved out of the institute to universities and colleges before the closure of the institute. However, a partial explanation for the decline could be the availability of earmarked state funding for research. During 1986–1995, when Swedish work environment research benefited from stable and generous funding through the Swedish Work Environment Fund, the country was at the international forefront in terms of number of publications, share of global production and citation rate. Since 2001, when the funding for working life research decreased and was distributed between Vinnova and FAS (now Forte),

2 A fractional calculation of international co-authored articles and overviews has been employed here. Countries’ names have been accepted several times, which gives the best representation of countries’ contribution. Note that the data for 2015 is not complete because the search was made in May 2015.

there has been a clear downward trend in both the number of articles published and the relative share of global production.

Summary

The Swedish Government made significant investments in work environment research in the 1970s and 1980s, which led to the expansion and strengthening of this research. Since the 1990s, the area has received decreasing levels of earmarked research funds, a decline which was accentuated by the reorganisation of the research financiers in 2001 and the closure of the National Institute for Working Life in 2007. There has been a shift in focus from traditional work environment research to research on the labour market and psychosocial and organisational factors. Swedish research policy has changed from following the sector principle, according to which the usefulness of each sector determines the focus of research, to allowing the researchers themselves steering the direction of research and research being assessed more on the basis of scientific quality than on societal benefit of the research. The direction of work environment research has changed in step with the world of work. While the focus of work organisation research has tended to shift from the organisational to the individual level and to the individual's responsibility for health and work environment, the focus of research on occupational exposures has shifted from a dominance of research on physical exposures to increased focus on psychological exposures. The position of Swedish work environment research is still strong compared to many countries, but bibliometric data shows a dramatic decline in the number of articles published since the 1980s, when Sweden was in the top of the international ranking.

2. Need for and access to research-based knowledge

This section describes the needs of the Swedish Work Environment Authority and other stakeholders for research-based knowledge, and how those stakeholders meet these needs. It is based on information from interviews with a selected group of employees at the Swedish Work Environment Authority; on a survey that the Swedish Work Environment Authority commissioned of its research reviews (Swedish Work Environment Authority, 2015); and on two hearings that the Swedish Work Environment Authority organised with researchers, research financiers, the social partners and other users and brokers of knowledge.

The Swedish Work Environment Authority's knowledge needs

At the Swedish Work Environment Authority, it is perceived that the need for research-based knowledge is growing in step with a rising level of knowledge in society and increasing demands for evidence-based governance. Stakeholders impose higher quality requirements on information issued from the Swedish Work Environment Authority and controversial issues more often require scientific evidence for successful argumentation.

One of the knowledge needs is method development. Firstly, modern and efficient regulatory methods adapted to today's working life are required to establish a solid grounding that can endure scrutiny in any litigation, and also to achieve a long-lasting and desired effect. An example of a regulatory area that could benefit from improved methods is the area of working time. Secondly, robust methods are needed for statistics gathering and impact measurement in order to plan, implement and monitor strategic decisions.

At the national level, the Swedish Work Environment Authority is relatively well-equipped with knowledge on chemical health risks, psychosocial work environment issues, ergonomics and physical hazards such as noise, lighting and ionizing fields. However, there

is a lack of knowledge within more system-wide areas, such as the issue of gender, specific risk groups, businesses that deliberately cheat with work environment rules, the accident area - including risk perception, how to create effective communication among stakeholders, and how best to steer and manage work environment efforts (for example, through systematic work environment management). The kind of knowledge required encompasses both what the work environment looks like today and why it looks like it does - for example how come women seem to suffer more often from work-related illness than men. Another area where more knowledge would be beneficial is the area of market surveillance, where the Swedish Work Environment Authority wants to put more pressure on manufacturers to develop products that are not harmful to users after prolonged use.

At the international level, the Swedish Work Environment Authority requires expertise to meet the requirements imposed, particularly from the EU. This involves, for example, participating in evaluations and surveys organised at the European level. It is also about being able to utilise knowledge generated at the international level in the Swedish Work Environment Authority's strategic work, and communicating this knowledge to society. Another operational area with knowledge needs is standardisation efforts at the national, EU and international level. In this context, the Swedish Work Environment Authority collaborates with the social partners and manufacturers in technical committees and regulatory bodies. In the past, Swedish researchers contributed actively with research-based knowledge to the standardisation efforts. Nowadays, expertise is primarily obtained from other countries such as Germany and Canada.

In sum, the Swedish Work Environment Authority requires research-based knowledge within various areas in order to develop evidence-based practice. Knowledge is needed to design and implement the supervision of regulations, to improve and make supervisory activities more efficient, to better contribute to and utilise international knowledge and to strengthen work related to statistics and analysis.

Availability of knowledge within the Swedish Work Environment Authority

The Swedish Work Environment Authority's internal need for knowledge has been filled in various ways over the years. From

1972, when the Institute of Occupational Medicine moved into the then National Board of Workers Protection (*Arbetarskyddsstyrelsen*), research was a part of the labour inspectorate. When research subsequently moved out of the inspectorate (to the Work Environment Institute 1987-1994 and to the National Institute for Working Life 1995-2007), close collaboration was maintained between the researchers at the institute and the labour inspectorate. The institute contributed expertise in the regulatory work of the labour inspection through teaching and learning materials for the inspectors.

There is no strategy for how the Swedish Work Environment Authority is to work with research based knowledge. What exists is a commission from the Government to build up a “knowledge function” within the labour inspectorate. There is a national action plan but there is no government-wide strategy for work environment knowledge. As a consequence of this lack of coordination, work environment-oriented government commissions have been given to the SBU [Swedish Agency for Health Technology Assessment and Assessment of Social Services], Försäkringskassan [the Swedish Social Insurance Agency] and Forte without any required coordination with the Swedish Work Environment Authority. At the same time, the Swedish Work Environment Authority has been asked to produce research reviews and issue calls for proposals for research funding without any required coordination with other government agencies such as Forte.

The closure of the National Institute for Working Life made it more difficult for the Swedish Work Environment Authority’s employees to find knowledge, especially for new employees who had no established network of contacts with researchers. The fact that Swedish research is fragmented among different universities and institutes further curtails the Authority’s possibilities of acquiring research-based knowledge. Finding the information required is perceived as complicated and time consuming. At the Regulations Department there are contact points with Swedish and international research through activities related to standardisation and directives, but there is no comprehensive knowledge strategy. Rather, there are different traditions and cultures between different units, for example, the area of medicine maintains a closer relationship to research than the area of technology does.

The economic cutbacks that impacted the Swedish Work Environment Authority in 2007 meant that the Regulations Department was reduced to half the number of staff it had before. This has resulted in a reduction of time for contact between the staff and researcher

networks and reference groups. However, great efforts have been made to recruit academics, and about a quarter of the Regulations Department currently consists of people with an academic degree at a licentiate or doctoral level. Another effect of the cutbacks was that the cooperation agreements that previously existed between the occupational health clinics and the Swedish Work Environment Authority's regional inspection office were nullified. Now, cooperation takes place with medical experts from the clinics on an ad hoc basis, but would need to be re-formalised for greater effectiveness.

The International Affairs Department comes into contact with knowledge developed at the international level (in particular the International Labour Organisation ILO; and the International Social Security Association ISSA), the European level (notably the European Foundation for the Improvement of Living and Working Conditions EUROFOUND; and the European Agency for Safety and Health at Work EU OSHA) and at the Nordic level (the Nordic Council of Ministers' Working Environment Committee). However, because of the large scope of international duties, it is not possible to assimilate this knowledge in a correct way, either inwardly in the Swedish Work Environment Authority's strategic work or outwardly to the general public.

One of the closer links to research-based knowledge at the Swedish Work Environment Authority is through its role in administering criteria documentation. This administration moved to the agency from Karolinska Institutet in 2014. Expert groups for the development of criteria documentation can be found at the Swedish and Nordic level as well as at the EU level. The role of the secretariat is to gather research groups to address issues concerning chemical exposure, such as harmfulness and threshold values. Criteria documents are used by the Swedish Work Environment Authority and occupational health clinics in, for example, occupational injury investigations. Within the context of this work, the Swedish Work Environment Authority funds two professors at Karolinska Institutet in their work as Chair of the Nordic and Swedish Criteria Group respectively. At present, a review and reorganisation of the Swedish criteria activities is underway.

The Swedish Work Environment Authority has another connection to research-based knowledge through the administration of analysis of statistics. Among other things, it contributes to the European and international work environment statistics. The development of research reviews since 2010 has also increased the points of contact

between the Swedish Work Environment Authority and the research community as a whole (more on this below).

Knowledge sharing outside the Swedish Work Environment Authority

The Swedish Work Environment Authority has a role in satisfying external needs for knowledge directly through, for example, criteria documents and research reviews, and indirectly, through regulatory and labour inspection activities. When collaboration functions well, it is perceived that the Swedish Work Environment Authority creates a bridge between research and practice, expressed in the use of research in communication, regulations and campaigns. The collaboration with researchers in the initiative “women’s work environment” in 2014 was highly appreciated by inspectors as they were able to refer to research in their arguments.

As commissioned by the Government, the Swedish Work Environment Authority has in recent years built up a “national function for the knowledge area of work environment and working life”. The core of this function is made up of the publication of more than fifty research reviews since 2010. Each research review summarises the current state of knowledge within a particular area. The knowledge function also organises seminars where the reports are presented, and in 2014, a “knowledge conference” on sustainable working life was organised in cooperation with the Swedish Social Insurance Agency (Försäkringskassan). In 2015 the Swedish Work Environment Authority conducted an evaluation of the research reviews. The evaluation was based on a survey that rendered 522 questionnaire responses, including employees at the Swedish Work Environment Authority (315 responses) and external stakeholders (207 responses), in addition to 20 in-depth interviews. The results of this survey showed that almost all respondents appreciate the research reviews and seminars. The research reviews were considered above all useful for skill development, training, as reference material and to support supervision during inspections (Swedish Work Environment Authority, 2015).

Knowledge needs according to other stakeholders

The two hearings with researchers, users and brokers of work environment knowledge were permeated by two themes: an increasingly

changing working life and the need to develop a *sustainable working life*. The participants discussed in particular the impact of globalisation and new technology on the work's content and conditions, and how the demographic changes, especially the aging population and increased immigration, affect work and health.

Knowledge needs related to globalisation include questions related to the migrant workforce: where it is, what it does and how it is treated. A related question is how initiatives promoting systematic work environment management should be implemented in workplaces with employees who neither speak Swedish nor have knowledge of Swedish laws and regulations. Regulation and supervision also need to be adapted to function in complex and often international ownership structures. Yet another question is how a workforce with foreign origins is to be integrated in the Swedish labour market without being subjected to worse working conditions and discrimination – which ultimately contributes to increasing social inequality. In addition, knowledge is needed on the division of responsibilities between countries regarding the promotion of better work environment in relation to fragmented and international chains of production. In order for trade and industry to take more responsibility for the work environment, research is needed that illustrates the benefits of a good work environment.

New technology leads to increased knowledge needs regarding problems and opportunities in the design and implementation of new technology, such as nanotechnology, e-health and the transition to green production. There is also a need to determine the exposure doses for workers, and how different exposures interact with each other. Another need is to establish how organisations and employees are to cope with organisational change and skills development, with consideration given to the gender perspective and special regard given to workers with diminished cognitive or physical capacity, such as people with disabilities and the elderly.

To create a more sustainable working life requires more knowledge of how the physical and organisational work environment should be adapted to the needs of the elderly. This may include lighting, sound, office design, etc. in the physical work environment, and, in terms of the organisational work environment, it may involve older people's need for recovery, how they react to stress and how their knowledge and experience can be utilised. As the elderly more often suffer from chronic illnesses, knowledge is also required on how treating them affect working life, for example how medical treatments interact with workplace exposures. Furthermore, know-

ledge is needed on how different systems at the work organisation level and societal level should be designed to facilitate an extended working life for elderly people.

A sustainable working life also requires knowledge on how to create a good organisational work environment. This knowledge is lacking especially with regard to small and medium-sized enterprises and in how to counteract work-related suicide, discrimination, bullying and harassment in these workplaces. Knowledge is also needed on the reasons for why more women than men suffer from stress-related mental illness and on how broader changes in society affect working life, for example unstable forms of employment. Issues related to ill health include how occupational health services can work preventatively and how regulations and practices regarding support and the return to work can best be designed so that employers, occupational health services, The Swedish Social Insurance Agency (Försäkringskassan) and other actors improve the rehabilitation and job adaptation of those on sick leave. There is also a need for knowledge on how leadership and employeeship can be developed so that the work environment becomes a central issue. It was pointed out that future leaders need to acquire knowledge on work environment issues already during their training.

Organisation and specification of research-based knowledge

A recurring theme was the complexity of working life issues in a working life characterised by increasingly rapid changes and ever more blurred boundaries between work and leisure. In order for research to contribute to a healthy and sustainable working life, many wanted to see *increased usefulness, interdisciplinarity and sustainability*. It was also felt that research must become more agile and dynamic in order to quickly solve work environment problems arising in the future. Both researchers and users suggested that proactive, workplace-adjacent, application-oriented and solution-focused research could contribute to increased utilisation of research. To achieve this goal, emphasis was placed on the importance of collaboration between researchers and others work environment actors, such as companies and occupational health services. Many felt that the current research policy does not favour applied work environment research and that this field needs earmarked research grants for that purpose. In order to solve the complex issues in working life, it was suggested

that collaboration between different academic fields should be intensified and that there should be more emphasis on the development of scientific theories and methods. To understand the relationship between individual, organisation and society, it was suggested that researchers expand their horizon and involve several different perspectives, and that analyses be conducted at several levels. Finally, to create a resilient knowledge base and preparedness for future unknown work environment risks, it was suggested that broader and more long-term research investments be made and that measurements and monitoring of the work environment should receive more attention. Better data on exposures in the workplace was considered important in order to monitor progress over time and detect changes at an early stage.

To organise future initiatives in the area, it was suggested that there ought to be more research funding for applied research in the work environment area. The social partners would like to have a more central role in decision-making on research in order to increase its usefulness, for example through a committee charged with research prioritisations being established under the Government. Another proposal from the social partners, one which others also agreed on, was for the establishment of a national knowledge centre. The social partners wish for such a centre to act as a contact between research and the social partners, and they emphasise that this centre should not be located at the Swedish Work Environment Authority in order to avoid the risk of influence by the Government's political agenda. The purpose of a national knowledge centre is firstly to gather Swedish working life research, and secondly to act as the Swedish contact point for foreign research institutes and international work environment organisations. It was considered to entail high symbolic value to have an actor that promotes national interests.

As regards research funding, dissatisfaction was expressed, both with the Government and with the research councils. To reinvigorate investments, there was a proposal for increased collaboration on working life research between the Ministry of Employment, Ministry of Health and Social Affairs, Ministry of Education and Research and the Ministry of Enterprise and Innovation, as well as increased activity from the Ministry of Employment in pushing work environment research forward. Participants criticised both Forte, which was considered to have drifted too far from the working life issues, and Vinnova. Vinnova was felt to pay too little attention to working life issues. In addition, Vinnova requires co-financing, which makes it difficult for many researchers to apply for funds from there. Some

participants wished for a new research council which would take working life issues seriously and support interdisciplinary and applied research in this area. To promote stability and sustainability in research, it was also proposed to finance longer term funding initiatives – preferably six-year support. It was also suggested that investments be made in services to support new generations of researchers, which are needed to maintain excellence in research in the future.

Summary

The Swedish Work Environment Authority needs knowledge in order to develop methods, maintain the expertise that already exists and to build up competence in matters where knowledge is lacking.

This may, for example, be about how to prevent gender-related inequality in health. Better opportunities to gather knowledge from the outside are also needed, both from the Swedish research community and organisations at the EU level, to enable the Authority to develop evidence-based practice. The availability of research-based knowledge declined sharply after 2007, as the Swedish Work Environment Authority's budget was reduced and the National Institute for Working Life was closed down. Since then, contact between the Swedish Work Environment Authority and research is primarily through the production of research reviews since 2010, and the administration of criteria documents, which moved to the Swedish Work Environment Authority from Karolinska Institute in 2014. The Swedish Work Environment Authority's efforts to disseminate knowledge are pursued in part through regulatory and labour inspection activities, and partly through research reviews and criteria documents.

Stakeholders outside the Swedish Work Environment Authority see many future needs for research-based knowledge related to rapidly changing working life and the need for a sustainable working life. Increasing migration leads to knowledge needs regarding how Sweden can create a good working environment for workers with a foreign background. Changes in the labour market lead to needs for new knowledge regarding how promotion and regulation of the work environment should be adapted to new company structures and forms of employment. A more sustainable working life requires knowledge on the growing mental ill-health among young people and women, how the workplace can be adapted so that the elderly can continue working longer, and how new technology

should be developed and used, while maintaining a good work environment. In order to prepare for the unpredictable work environment of the future, the stakeholders felt that future knowledge needs to rest on research that is dynamic and agile while at the same time being resilient and taking a long-term perspective. To increase the utilisation of research, the stakeholders pointed out a need for investments to strengthen interdisciplinary and applied work environment research. It was also suggested that more systematic measurements of exposures in the workplace be taken in order to identify trends and detect changes. To strengthen the research field's scientific level, it was proposed that investments be made in research that applies several levels of analysis and methods and that earmarked research grants be offered for longer periods of time, for example six years instead of three years, as is now usually the case.

At the Swedish Work Environment Authority and among other stakeholders, it was felt that research-based knowledge needs a coordinating body, for example a national knowledge centre. First and foremost, such a centre would act as a national contact point for international organisations and as a coordinating body between researchers and knowledge users in Sweden. Also expressed was a desire for better coordination of work environment knowledge at the government level between ministries and between the ministries and the government agencies – including the Swedish Work Environment Authority.

3. Collaboration between the Swedish Work Environment Authority and other organisations

The commission to the Swedish Work Environment Authority stipulates that this report should contain *a description of any collaboration with other agencies, including research financiers, universities, industry, municipalities, county councils and other sectors of society with regard to research-based knowledge*. This section provides a brief overview of this collaboration.

The advisory board of the Swedish Work Environment Authority's includes three researchers from different disciplines and universities in addition to representatives from the social partners. The Swedish Work Environment Authority also has a large number of cooperation agreements and joint projects with other agencies where research is sometimes involved. One example is the Market Surveillance Council which collaborates with 18 other agencies. The official statistics³ function has a User Council which includes researchers. Researchers in the User Council and other researchers linked to the organisation provide, for example, advice on the design of surveys and the development of indicators when necessary. On the chemical side, representatives of the Authority sit on the Board of the Institute of Environmental Medicine (IMM) and the Toxicological Council. The Authority is also involved in various collaborations with the Swedish Chemicals Agency. However, despite those collaborations, the Authority perceives little effect because focus is almost exclusively on the external environment and not on work environment. A collaboration that the Authority is planning to resume is a network with the heads of the country's occupational health clinics, so as to capture current trends in the work environment.

In the development of research reviews, ad hoc reference groups are sometimes formed with the social partners. Furthermore, some of the Authority's employees participate in reference groups with links to research, for example, at AFA Insurance and IVL Swedish Environmental Research Institute. In the area of standardisation, the Authority collaborates with the social partners and other organisations. Sometimes the Authority also participates in applications for research grants from financiers, such as Vinnova, but without any co-funding.

3 Official statistics on occupational injuries and work environment

4. Sweden in an international perspective

This section summarises information that was gathered in Norway, Finland, Denmark and the Netherlands from May to September 2015. Appendix 3 contains a more detailed report about each country.

All four countries have a national strategy for work environment policy involving long-term investments in research-based knowledge. However, they differ in terms of structure and division of responsibilities between different organisations. The three Scandinavian countries have institutes solely dedicated to work environment and working life research. In the Netherlands, the absence of such an institute is compensated for by a team at the Ministry that spearheads the national work environment efforts.

Similar to Sweden, the social partners play an important role in these countries' work environment policy. The social partners participate in steering groups and working groups, at the ministries, in institutes and at the research financiers. In the Netherlands, the social partners are members of the Social and Economic Council of the Netherlands (SER), which engages in regular dialogue with the Government on labour market and work environment issues.

The labour inspection authorities in all the four countries contribute to and use, in different ways, research-based knowledge. Furthermore, in each country the government requires the labour inspection authorities and institutes to collaborate with researchers at the countries' universities. Many of the research institutes contribute, in the same way as the Swedish National Institute for Working Life used to in Sweden, to the training of inspectors, to method development for oversight and impact measurement, and to support the development of regulation. There are also a number of collaborations between the labour inspection authorities and the institutes around statistics and data collection. One of the differences between the countries is how their labour inspection authorities are organised. The Danish labour inspection authority is located in the capital, the Finnish labour inspection operation is spread across the country in regional offices and the Norwegian and Dutch labour inspection bodies have been placed in a city other than the capital. It seems that the physical proximity

between the Danish labour inspection authority and the research institute positively impacts the cooperation between these. The Dutch work environment inspectorate has been merged with two other workplace-related inspection authorities, which probably has contributed to streamlining but also to an arduous reorganisation and a potential risk that work environment issues end up taking a backseat to other regulatory issues.

The knowledge that contributes to the implementation of work environment policy in the three Scandinavian countries is largely based on the applied work environment research conducted at the research institutes (see Table 1 below). In the Netherlands, the government commissions knowledge from various sources, in particular from the Netherlands Institute of Innovation, TNO, and the National Institute for Public Health and the Environment, RIVM.

Table 1. Institutes engaged in work environment research in Denmark, Finland, the Netherlands and Norway

Country	Name of work environment institute	Number of employees (approx.)	Annual budget (approx.)	Government subsidy % of total budget (approx.)
Denmark	National Research Centre for the Working Environment, NRCWE	170	DKK 120 million (SEK 151 million)	50 %
Finland	Finnish Institute of Occupational Health, FIOH	620	EUR 63.3 million (SEK 593 million)	53 %
The Netherlands	Netherlands Institute of Innovation, TNO (Work and Health Department)	100	EUR 16 million (SEK 150 million)	25 %
	National Institute for Public Health and the Environment, RIVM (Department for Safety)	40–50	EUR 3.8 million (SEK 35.6 million)	100 %
Norway	National Institute of Occupational Health [Statens Arbeidsmiljøinstitutt], STAMI	121	NOK 130 million (SEK 130 million)	80 %

Although the Scandinavian work environment institutes have a similar methodology for how knowledge needs are met, there are significant differences. These differences include the research areas in focus by the institutes as well as the kind of activities pursued. The Finnish institute is 4–5 times larger than the others and dominates both the generation and dissemination of work environment knowledge in the country to a greater extent than the institutes in Norway and Denmark do. In Norway, STAMI is supplemented with

social scientific research into working life from another institute (FAFO) and with research conducted in universities and colleges. In Denmark, the institute is similarly supplemented with research conducted at the universities.

Research funding in the Netherlands and Finland has undergone and is still undergoing, substantial cuts. Therefore, both the Dutch TNO and the Finnish Institute of Occupational Health have been forced to reduce their staff levels. The Dutch institute RIVM and the Norwegian Institute STAMI have full government funding, which gives them more long-term stability. In Denmark and Finland, the government guarantees only partial funding of the institutes, which puts pressure on the institutes to reduce costs and generate funding from, for example the EU and national research financiers. In contrast, Denmark and Finland have something not found in Norway and the Netherlands: a special fund for research by way of the Danish Work Environment Research Fund [Arbetsmiljøforskningsfond-en] and the Finnish Work Environment Fund. In Denmark, the fund is administered by the labour inspection authority, which contributes to the inflow of research-based knowledge at the authority. In Finland, the fund is an independent organisation. TNO's Work Environment Department is the institution that has the most uncertain situation, as the amount of guaranteed government funding is small and periodically renegotiated.

Time did not allow the examination of various stakeholders' knowledge needs in the four countries, so this part of the report only gives the priorities of the governments and institutes (see Table 2). A comparison between the three Scandinavian governments' priorities shows a clear connection with two current problems in society: increasing levels of sick leave and an aging population. The fact that mental and musculoskeletal disorders are resulting in absenteeism and an early exit from working life may explain why the focus is on those areas. The institutes also prioritise psychosocial and musculoskeletal factors but add "classic" risks, such as chemical and biological hazards and noise. This difference could be interpreted as the governments' priorities being reactions to current problems while the institutes are more proactive and future-oriented. The institutes want, for example, to work with new technologies and emerging work environment problems. One area that is particularly prioritised in Norway is "workplace criminality" (employers cheating with labour legislation in different ways), which is partly related to the labour market's internationalisation.

Table 2. Priority areas of research-based knowledge within the work environment field in Denmark, Finland, the Netherlands and Norway

Country	Government	Research institute
Denmark	<ul style="list-style-type: none"> • Workplace accidents • Psychological work environment • Musculoskeletal problems 	<ul style="list-style-type: none"> • Contribute to the objectives of the Government Strategy • Identify, do research on and manage future work environment risks • Contribute to knowledge and regulation within the psychosocial, biological, physical, chemical area, accidents and nanosafety
Finland	<ul style="list-style-type: none"> • Longer and healthy working life • Promote Finland's competitiveness and work • Extend the period of employability and increase the employment level 	<ul style="list-style-type: none"> • Occupational well-being in a changing working life • Prevention of work incapacity • Occupational health cooperation • Safety of new technologies • Occupational well-being in arctic conditions
The Netherlands ⁴	<ul style="list-style-type: none"> • Provide for a minimum level of labour law protection and support the social partners' own assuming of responsibility. The design of labour migration policy. • Promote good working conditions, especially "sustainable employability" (duurzame inzetbaarheid). • The development and enforcement of laws and regulations. • Implement the labour market policy in collaboration with the social partners. 	
Norway	<ul style="list-style-type: none"> • Criminality (what the Swedish Work Environment Authority calls "grey businesses") • Absence due to sick leave • How more people shall be encouraged to work longer 	<ul style="list-style-type: none"> • Psychosocial and organisational issues (including working hours and shift work) • Work-related musculoskeletal disorders • Chemical and biological working conditions • Noise

Dissemination of research-based knowledge belong to the main tasks of the Scandinavian institutes. The Finnish institute is probably, given its size and how it dominates the field in Finland, the most ambitious knowledge broker among them. The Knowledge Centre, run by the Danish research institute NRCWE for the purpose of conveying knowledge through popularising research results, is another interesting initiative. Most institutes also offer training to various stakeholder groups, including university students, occupational health services and labour inspectors. Knowledge dissemination from research financiers and institutes is also pursued through traditional channels such as newsletters and social media.

Norway and the Netherlands have in common that they both publish extensive and elaborate summaries of various types of work environment data. In both cases the reports are produced by researchers in order to ensure that the methods are scientific and that

⁴ Since there is no specific work environment institute in the Netherlands, only the Ministry's priorities are presented as described in the government budget for 2016.

appropriate data is provided. In Norway's "Faktaboka", statistics and other information are gathered to create a better picture of the work environment. It is prepared by the research institute STAMI and published as a report around every third year. It is also available in interactive, digital form. The Netherlands' "Arbobalans" is published every two years and is produced by the research institute TNO. In both cases, the reports are produced in cooperation with the inspection authorities and the central bureau of statistics. The reports serve as a basis in the strategic work undertaken by decision-makers in the government and parliament, the social partners and the labour inspection authorities. In addition, they contribute to a broad and well-informed public debate.

The gender perspective in research-based work environment knowledge is not especially prominent in any of the four countries. There is likely gender research being pursued with work environment relevance, but neither the governments nor institutes prioritise gender at present, except when they strive for gender balance in working groups and take into account differences between the sexes in statistics and scientific methods. Instead of gender, the interviewees in several countries mention that there is an increased focus on the work environment aspects of a workforce with foreign origins.

5. Conclusions and discussion

The purpose of this report was to present the need for and access to research-based knowledge within the Swedish Work Environment Authority's operational area prior to the forthcoming research bill.

The last research bill (Govt. Bill 2012/13:30, p. 163) states that *The labour market's functionality and the evolution of working life have major importance for society's development. It is therefore important that working life and work environment research is of a high quality and pursued to a sufficient extent. To achieve a high employment rate and longer participation in the workforce, research is needed on how to promote an inclusive, progressive and healthy working life with a good work environment, which does not prematurely exclude people due to injury and illness.*

This report shows that researchers, the social partners, the Swedish Work Environment Authority and various knowledge brokers agree that high quality research is needed. Furthermore, needs have been expressed that go beyond a high employment rate, longer participation in the workforce and a healthy working life. Stakeholders are also calling for research-based knowledge on the causes of the transformation of working life, such as migration, new technology and an aging population. It was noted that more research is needed on how, concretely, the work environment efforts are to be designed in order to solve problems that arise in an increasingly complex and changing world. At the Swedish Work Environment Authority, there is an increasing need for research-based knowledge that highlights new work environment problems and method development so as to establish effective prevention measures and supervisory control.

The bibliometric analysis conducted for this report shows that Swedish work environment research has undergone a dramatic slump during the past thirty years – from having been world-class to dropping to a lower level that is comparable to our neighbouring countries. As it takes a long time to build up an area of research, there are grounds for proposing long-term investments in work environment research in order to reverse the negative trend and rebuild the field. One could consider research programmes focused on urgent issues with longer timeframes than is usually the case, for example, six-year support.

What type of research should then be given priority? The com-

plexity, which according to this report characterises current and probably future working life, means that Sweden will require strong, broad and innovative research that is ideally grounded in a multi-disciplinary and international context. It should, as many of the stakeholders express in the report, also be focused on usefulness and innovation in the work environment. Since the closure of the National Institute for Working Life, it has become more difficult for a number of work environment actors – including the Swedish Work Environment Authority, the social partners and occupational health services – to meet their knowledge needs. Work environment research that is more geared towards application and easier access to research would strengthen both the Swedish Work Environment Authority's expertise in policy areas and its ability to implement and supervise compliance with laws and regulations.

Another aspect of knowledge raised in this report is the need to know what is going on in the work environment. This knowledge seems to be more developed in countries other than Sweden and is achieved by investing in national monitoring of the work environment and innovative ways to present data. Norway and the Netherlands have in recent years developed ways to collect and present work environment statistics in broader and more elaborate summaries and analyses of working life data, so as to improve the overview of trends and new problems. Such presentations are not only a good basis for the Government's priorities, they are also beneficial to researchers, the social partners and for information purposes to the broader public. In order to achieve work environment monitoring that provides a holistic picture and trends over time, long-sightedness is required as well as collaboration between government agencies and research groups to coordinate existing databases and to produce missing data.

Another factor identified in the report is that Sweden, unlike the other countries considered, lacks a national strategy for work environment knowledge. A strategy that guides investments in work environment research and its application creates a context and logic for the work in the countries studied. In Sweden today, research-related initiatives related to the work environment are carried out by different government organisations without much mutual information or consultation. Improved coordination between ministries and government organisations could contribute to synergy effects and greater impact. A national strategy for work environment knowledge, for example through the national action plan for work environment, could increase the benefits of research in work environment

questions at national level. Strategic priorities for the supply of knowledge within the area could eventually lead to beneficial links between the next action plan for the work environment, the Swedish Work Environment Authority's work towards a more evidence-based operation and the budget initiatives that will be included in the next research bill. A knowledge strategy for work environment could also contain cooperation agreements and concrete collaborative activities between relevant authorities and the research community. For the Swedish Work Environment Authority's part, this could, for example, mean that the cooperation agreements that previously existed between the regional offices and the occupational health clinics are restored and that the Swedish Work Environment Authority assumes a seat as representative on the governing board of Forte.

To further strengthen the coordination of the work environment efforts between agencies and ministries at the Government Offices, the Government could consider setting up periodic discussions between the responsible Directors-General of the relevant authorities.

Finally: a proposal that all stakeholders have put forward in this report, including several colleagues in neighbouring countries, is to establish some kind of coordinating actor to compensate for the void left by the Swedish National Institute for Working Life. This coordinating actor could, for example, be a national knowledge centre, such as that presented in a previous official report (SOU 2011:60). If a coordinating actor would be established, it would be natural that this actor would be responsible for the preparation and coordination of implementing the knowledge strategy as well as the coordination of work environment knowledge produced by different government organisations, such as the Swedish Work Environment Authority, Forte, the Swedish Social Insurance Agency (Försäkringskassan) and the Swedish Agency for Health Technology Assessment and Assessment of Social Services (SBU). The coordinating actor could also coordinate the monitoring of the work environment and the dissemination of data and statistics through various channels, including regular reviews. Finally, a coordinating actor could fill the need for an international node and contact point for international knowledge organisations and researchers.

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Appendix 1.

Participant lists from hearings on 31 August and 1 September

Hearing with users, financiers and knowledge brokers on 31 August 2015

Claes Larsson	Union for Professionals, SSR
Jan Johansson	Almega
Lennart Kriisa	Arbetarskydd
Charlotte Wåhlin	Arbets- och miljömedicinbloggen
Kerstin Wrisemo	Arbetsgivarföreningen KFO
Gunnar Sundqvist	Swedish Agency for Government Employers
Eva Berlin	Du & jobbet
Kristina Öberg	Feelgood
Anna-Karin Engvall	Forte
Ann Georgsson	Kommunal
Sten Gellerstedt	LO
Anna Nitzelius	Public Employees' Negotiation Council, OFR
Anders Stålsby	Central Government Social Partners' Council
Emma Cronberg	Swedish Police Union
Robert Jakobsson	Prevent
Carina Reidler	Previa
Ann Lundberg Westermark	PTK
Karin Fristedt	Saco
Charlotte Hall	SBU
Johan Karlsson	Seko
Ned Carter	Swedish Association of Local Authorities and Regions, SALAR
Lisa Markström	Suntarbetsliv
Håkan Forsberg	Swedish ESF Council
Peter Larsson	Swedish Municipal Workers' Union
Bodil Mellblom	Confederation of Swedish Enterprise
Björn Samuelson	Swedish Construction Federation
Peter Munck af Rosenschöld	Sveriges företagshälsor
Alicia Lycke	Swedish Medical Association
Ulrika Hagström	TCO
Malin Nilsson	Teknikföretagen
Helene Strauss	Telia Sonera
Mikael Dubois	Unionen

Hearing with researchers on 1 September 2015

Magnus Svartengren	Occupational and Environmental Medicine	Uppsala University Hospital
Svend Erik Mathiassen	Centre for Musculoskeletal Research	University of Gävle
Kerstin Persson Waye	Occupational and Environmental Medicine	University of Gothenburg
Helena Sandén	Occupational and Environmental Medicine	University of Gothenburg
Kristina Håkansson	Department of Sociology and Work Science	University of Gothenburg
Mattias Bengtsson	Department of Sociology and Work Science	University of Gothenburg
Ingmarie Andersson	Work Science	Dalarna University
Alexis Rydell	Work Science	Dalarna University
Margareta Oudhuis	Working Life and Welfare	University of Borås
Thomas Andersson	School of Business	University of Skövde
Christian Gadolin	School of Business	University of Skövde
Ann Bergman	Work Science	Karlstad University
Jonas Axelsson	Work Science	Karlstad University
Per Gustavsson	Unit of Occupational Medicine	Karolinska Institutet
Katarina Kjellberg	Unit of Occupational Medicine	Karolinska Institutet
Bo Melin	Department of Clinical Neuroscience	Karolinska Institutet
Jörgen Eklund	Ergonomics Unit	KTH Royal Institute of Technology
Tohr Nilsson	Occupational and Environmental Medicine	Västernorrland County Council
Stefan Ljunggren	Occupational and Environmental Medicine	Linköping University
Helen Karlsson	Occupational and Environmental Medicine	Linköping University
Christian Ståhl	Department of Medical and Health Sciences	Linköping University
Anna-Carin Fagerlind Ståhl	Department of Medical and Health Sciences	Linköping University
Jan Johansson	Human Work Science	Luleå University of Technology
Karolina Parding	Human Work Science	Luleå University of Technology
Mats Bogardh	Ergonomics and Aerosol Technology	Faculty of Engineering, LTH
Gudbjörg Erlingsdottir	Ergonomics and Aerosol Technology	Faculty of Engineering, LTH
Håkan Tinnerberg	Occupational and Environmental Medicine	Lund University
Catarina Nordander	Occupational and Environmental Medicine	Lund University
Roger Persson	Work and Organizational Psychology	Lund University
Calle Rosengren	Work and Organizational Psychology	Lund University
Maria Albin	Occupational and Environmental Medicine	Lund University
Petra Lindfors	Division of work and organizational psychology	Stockholm University
Susanna Toivanen	CHES, Centre for Health Equity Studies	Stockholm University
Martin Andersson	Department of Public Health and Clinical Medicine	Umeå University
Ingrid Liljelind	Occupational and Environmental Medicine	Umeå University
Håkan Westberg	Occupational and Environmental Medicine	Örebro University Hospital

Appendix 2. Bibliometric study

This appendix is based on a bibliometric study of Swedish work environment research that the Swedish Work Environment Authority carried out in 2015 and a similar study that Forte commissioned in 2015 on Swedish work organisation research (Forte, 2015). In both cases, data was produced by Professor Olle Persson, Umeå University.

The aim of the study was to assess how often Swedish work environment researchers are published, cited and collaborate in scientific journals over time and in an international comparison. It is an adaptation of the database *Web of Science* in the *Science Citation Index* for the purpose of estimating the quantitative and qualitative contribution from Swedish researchers in peer-reviewed articles. What distinguishes Forte's and the Swedish Work Environment Authority's study is the selection method of journals. The Forte study was based on 120 journals selected by an international panel of researchers in an iterative selection process involving journals within the field they have defined as work organisation research. The Swedish Work Environment Authority's study repeated a study that the Research Council for Working Life and Social Science (FAS) commissioned in 2006 in connection with an evaluation of Swedish work environment research (FAS 2006, 2007; SJWEH, 2007). In the study, an international evaluation panel selected ten journals from the Swedish National Institute for Working Life's database of publications from Swedish work environment researchers in 2001-2005⁵. The weakness of this method is that it only includes articles in English and that several key specialty areas are missing, such as noise, climatic and cancer research, which are mainly published in specialist journals. The strength is that it provides information on changes over time and differences between countries, which may contribute to new areas of inquiry and knowledge.

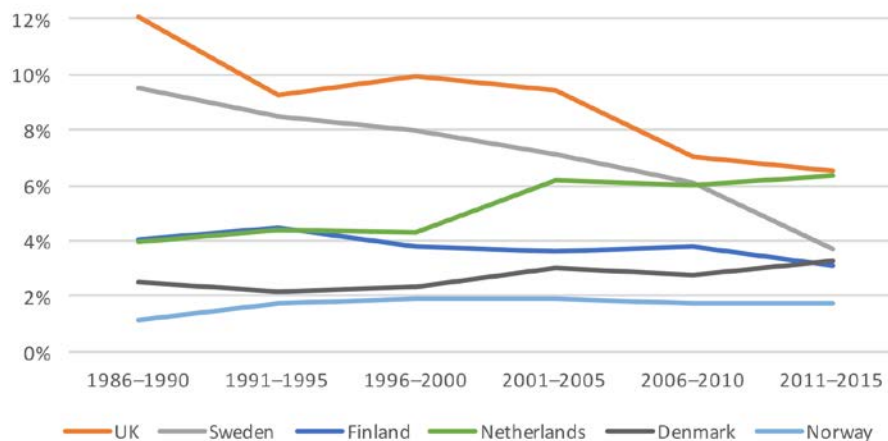
In 2006, the results showed that the research area, despite concerns

5 Of the 1,166 publications, 647 were in English and published in 215 scientific journals. As 36% of the publications were found in the ten journals with the highest *impact factor* (a measure of how often articles refer to a specific journal), the panel selected those ten to represent the entire area. The journals comprise those seven that had the highest impact factor within the category *Public, Environmental and Occupational Health* and the three that had the highest impact factor within the category *Industrial Engineering*.

about its weakening, still belonged to the best in the world in terms of the quantity of published articles in scientific journals and the number of citations in relation to the population. When the study was repeated, it turned out that this was no longer the case. Instead, there is a downward trend in Sweden, both in absolute figures as well as in its relative share of global production (see Figure 2). In absolute figures, Swedish researchers ranked third in the world after the USA and Great Britain in the period 1986–1990. In 2011–2015, Sweden’s ranking had dropped to eighth place in the world.

Figure 2 illustrates how the Danish and Dutch work environment researchers have become more productive since the 1980s, while the Norwegian and Finnish researchers have remained at roughly the same level. In contrast, the Swedish and British publication rate has declined. The Swedish share of global production fell from 9.5 per cent during 1986–1990 to 3.7 per cent during 2011–2015. Forte’s bibliometric study shows that Sweden’s share of global production within work organisation research during 2007–2013 came in at a comparable 4 per cent. Viewed over time, the examination of Swedish work organisation research shows a doubling of the number of articles from 2007 to 2009, followed thereafter by a stagnation.

Figure 2. Relative share of researchers from Scandinavia, the Netherlands and Great Britain published in 10 selected work environment and ergonomics journals 1986–2015⁶



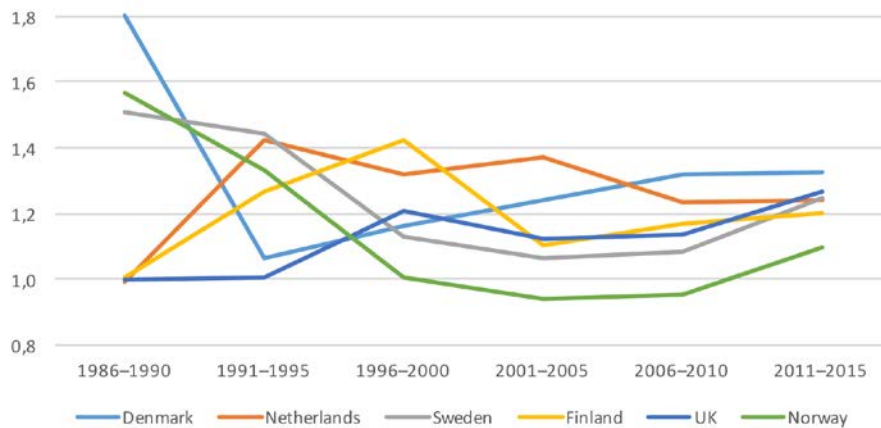
Since researchers in the world have increased in number and more and more scientific articles are being published, it is not surprising that a country’s relative share of the global production is falling.

⁶ A fractional calculation of international co-authored articles and overviews has been employed here. Countries’ names have been accepted several times, which gives the best representation of countries’ contribution. Note that the data for 2015 is not complete because the search was made in May 2015.

But it does not explain why Sweden and Great Britain's shares have dropped, while other European countries have remained at the same level or increased. The Forte report interprets the stagnation in the number of articles in 2009 as a possible delayed effect of the closure of the National Institute for Working Life in 2007 (Forte, 2015: 20). In terms of work environment research, the institute's closure probably did not have as great an influence on the development, as much of the research was moved out of the institute to universities and colleges before the closure was initiated. However, a partial explanation for the decline could be the availability of earmarked government funding for research. During 1986–1995, when Swedish work environment research benefited from stable and generous funding through the Swedish Work Environment Fund, the country was found at the international forefront in terms of number of publications, share of global production and citation rate. Since 2001, when the funding decreased and was distributed between Vinnova and FAS (now Forte), there has been a clear downward trend in both the number of articles published and the relative share of global production.

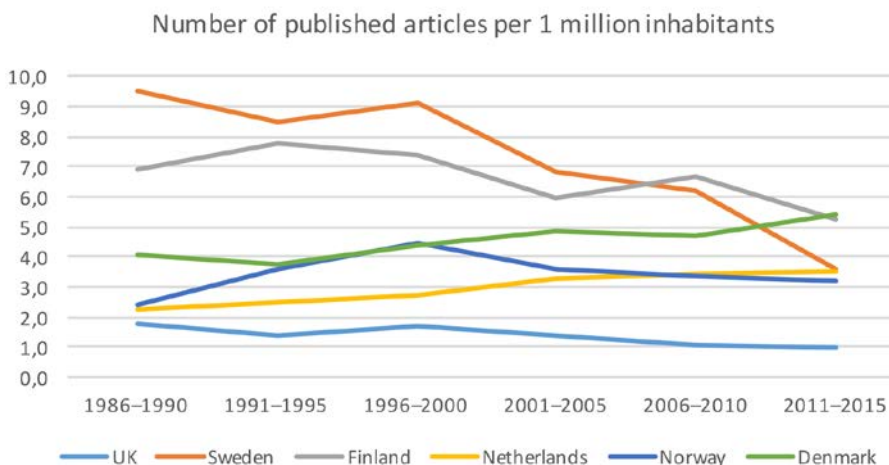
While the number of published articles and the country's share of publications in the world are usually used to measure productivity, citation rate is usually used for guidance of research impact. The study commissioned by the Swedish Work Environment Authority shows that Sweden, despite the reduction in the number of published articles, is in a relatively good position compared to other countries (see Figure 3). During the past five years, Sweden is in third place behind Denmark and Great Britain, and, despite a decline in the 1990s and early 2000s, the country is now well above the world average (as illustrated by the value 1 on the y-axis).

Figure 3. Relative citation rate⁷ for researchers from Sweden, Denmark, the Netherlands and Great Britain published in 10 selected work environment and ergonomics journals 1986–2015



Since Sweden is a relatively small country, compared to the USA for example, a calculation was also made of the proportion of articles published in relation to population size. As Figure 4 illustrates, the decline for Sweden’s work environment research in this case is also significant. After Denmark and Finland, which rank significantly higher than the other countries, Sweden is approximately on the same level as Norway and the Netherlands.

Figure 4. Relative share of global production for Scandinavia, the Netherlands and Great Britain in 10 selected work environment and ergonomics journals between 1986–2015⁸ in relation to population size

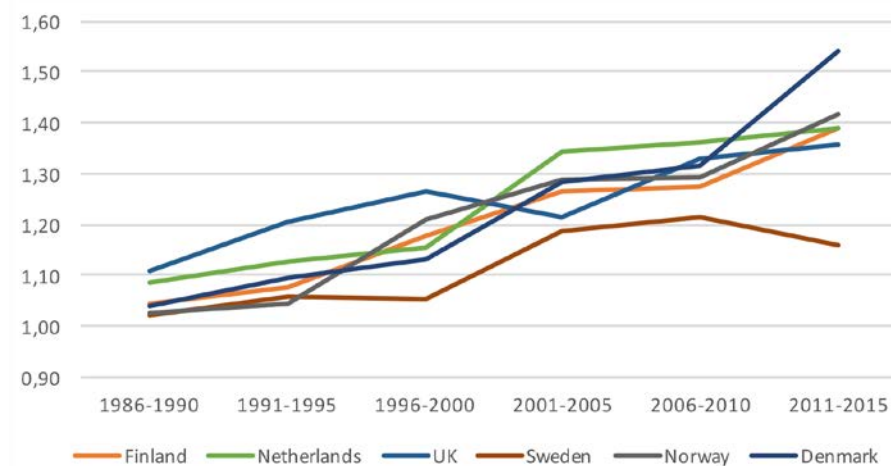


7 The relative citation rate divides the number of citations that an article gets in a given year compared with all articles from the same year of the same document type. A value of 1.00 corresponds to the world average, the value 1.20 means 20 per cent above the world average.

8 The calculations are based on population statistics from the OECD for the middle year of each five-year period.

In addition to the productivity and impact, the bibliometric study also examined the degree of international cooperation measured in co-authored articles between researchers of different nationalities. Figure 5 below illustrates how all countries have greatly increased their international co-authorship of scientific articles. This was also the case for Sweden until the turn of the millennium, after which the trend plateaued to then decline during the past five years. In this context it is worth noting that Forte’s evaluation panel criticized Swedish work organisation research for not collaborating with researchers in other countries to a sufficiently high degree, and that existing cooperation to a large extent is limited to the Scandinavian neighbour countries (Forte, 2015). The evaluation of Swedish work environment research (FAS, 2006: 31) also alluded to the fact that Swedish research cooperation occurs mainly within the Scandinavian region.

Figure 5. Rate of cooperation between researchers from Sweden and other countries published in 10 selected work environment and ergonomics journals 1986–2015⁹



⁹ A cooperation index divides whole calculations of articles by fractional calculations. The greater the difference, the greater is the international activity. The value 1.00 means that there is no international cooperation.

Appendix 3. Study of four northern European countries

This appendix is based on information that was gathered in Norway, Finland, Denmark and the Netherlands during field trips carried out in the period May–September 2015. A list of interviewees is found at the end of the appendix. There was no opportunity to perform a more in-depth analysis of the knowledge needs in these countries. Instead, the focus is on how the governments have proceeded in order to assess knowledge needs and the priorities that have been developed regarding research-based work environment knowledge. There is also a description of how selected players act to satisfy the knowledge needs.

Denmark

The information from Denmark was gathered in June 2015 through interviews with employees at the National Research Centre for the Working Environment (NRCWE), the supervisory body the Danish Working Environment Authority, and the employers' association the Confederation of Danish Employers.

Structure

Work environment issues fall under Denmark's equivalent of the Ministry of E-mployment (Beskæftigelsesministeriet). There are four agencies under the Ministry: the National Research Centre for the Working Environment (NRCWE), the Danish Working Environment Authority, the Public Employment Service and the National Board of Industrial Injuries in Denmark.

The NRCWE is located in Copenhagen, has 170 employees and was, up until 1997, part of the labour inspection authority. The research centre has three core tasks: research, dissemination of knowledge and training. The centre has close contacts with all occupational health clinics and universities in the country and many of the employees are adjunct professors at various universities.

The NRCWE Board includes representatives of the social partners, among others. In 2007 a special initiative was launched concerning dissemination of knowledge and the utilisation of research in the form of a special knowledge centre within the institute that comprised 18 employees (see Fact box 2). About half of the NRCWE's research resources come from external sources and around 30–35 per cent of its funding comes from the Danish Working Environment Research Fund.

Public research funding in Denmark was reformed in 2004. Since then it consists partly of funding to areas considered strategically important for the country and decided in the Danish Council for Strategic Research, partly by funding open for application to all researchers through the Danish Council for Independent Research. Due to there being a special fund for work environment, the NRCWE perceives it as difficult to obtain funds from other sources.

Similar to Finland, Denmark has a work environment fund that funds only work environment research: the Danish Working Environment Research Fund. The fund has a budget of DKK 118 million (SEK 148 million) for the years 2014-2015 and finances research projects, doctoral projects and postdoctoral projects, but also studies. The difference between the two funds is that the Finnish fund is independent from the government. The Danish fund is administered by the labour inspection authority and financed by the government through payroll taxes. The Danish fund is guided by the priority areas in the strategy document *En strategi for arbejdsmiljøindsatsen frem til 2020 [A strategy for the work environment area up until 2020]*.

The labour inspection authority is, as with the NRCWE, located in Copenhagen. One of the points of contact with research is the collaboration with the NRCWE, with which the labour inspection authority has a cooperation agreement, regular meetings and special theme days. Another point of contact is the Statistics and Analysis Department, which applies scientific methods in its work and collaborates with external researchers. The department has in recent years broadened its focus from its own statistics to also working with the development of data, evaluations, benchmarking analyses and economic impact calculations. A third point is that the labour inspection authority is responsible for the administration of the Danish Working Environment Research Fund, which provides a direct channel to the research world, something which is missing in the labour inspection organisations in the rest of Scandinavia. Like the NRCWE, the labour inspection authority also disseminates research-based knowledge.

Need for research-based knowledge

The needs of work environment knowledge in Denmark have been defined by several different actors in their strategies. A strategy that permeates both the NRCWE's and the labour inspection authority's strategies is the Ministry of Employment's 2020 strategy, which was signed by the five largest political parties in 2011: *A strategy for the work environment area up until 2020*. The strategy identifies three priority problem areas with measurable goals and 19 different initiatives to be implemented during the period in order to achieve the objectives (see Fact box 1). The strategy is based on a report produced by the Danish Working Environment Authority together with the NRCWE and the National Board of Industrial Injuries in Denmark. The report, *Fremtidens arbejdsmiljø 2020 [Work Environment of the Future 2020]*, provided a broad picture of future and contemporary working life, as well as proposals on focus areas and activities.

Fact box 1: The Danish work environment strategy up until 2020

Priority areas:

- Workplace accidents
- Psychological work environment
- Musculoskeletal risks

The goals include

- a 25 per cent reduction in the number of serious workplace accidents compared with the number of employees
- a 20 per cent reduction in the proportion of employees who are psychologically overstrained
- a 20 per cent reduction in the proportion of employees who experience musculoskeletal overstraining

The NRCWE' strategy (for 2014–2018) also has three goals:

1. for the centre's monitoring activities and research to contribute to achieving the three goals of the government strategy
2. identify, research and manage future work environment risks
3. for research to contribute to knowledge and regulation within the psychosocial, biological, physical, chemical area, and within accidents and nanosafety.

The Danish Working Environment Research Fund's strategy (for 2014–2015) builds on the government's 2020 strategy and also focuses on specific areas considered to have knowledge needs. The strategy identifies four areas: workplace accidents, psychological work environment, musculoskeletal work environment problems and "knowledge and action – funding in the area of work environ-

ment". Across all themes, the research, where relevant, shall highlight gender differences, ethnic background, age, young and new employees, temporary workers and vulnerable groups.

The labour inspection authority's strategy for 2014 indicated seven different performance goals, which reflect the goals established in the government's 2020 strategy. Several of these are measured with the assistance of the NRCWE.

Access to research-based knowledge

As already mentioned, the NRCWE previously constituted part of the labour inspection authority. In addition to the cooperation agreement between the two organisations, the NRCWE writes so-called white papers to the government on various priority themes, which also serves as support for supervision. The NRCWE also helps with impact measurements at the labour inspection authority. Around the year 2013, the labour inspection authority received signals from the government that they should focus more on evidence. A number of employers had successfully appealed the work environment rulings in court, and the government therefore called for stronger argumentation in the appeal process. Since then the labour inspectorate has worked to strengthen its analytical competence with, inter alia, registry analyses and randomised studies. During the autumn of 2015, a department for statistics and analysis is being established at the head office.

In addition to its support to the labour inspection authority, the NRCWE is engaged in dissemination of knowledge through a national centre for knowledge on the work environment: the Work Environment Knowledge Centre [*Videncenter for arbejdsmiljø*] (see Fact box 2). Of the 170 employees at NRCWE, 18 work at this centre. The centre's focus is to collect and disseminate work environment knowledge and to ensure that there is a national source of work environment knowledge. Target groups for the centre include managers and employees at Danish workplaces.

Fact box 2: Videncenter: A Danish knowledge centre for work environment issues

The Work Environment Knowledge Centre [Videncenter] works to provide private and public workplaces access to new knowledge and good tools that lead to a healthy and good working life. This is achieved through

- the web portal www.arbejdsmiljoviden.dk, where articles, tools, laws and regulations and practical examples are compiled
- the magazine *Arbejdsmiljø* [Work Environment] which is published 11 times per year
- the online store *Arbejdsmiljøbutikken* [Work Environment Store] where you can buy books, reports and guides
- the newsletter *Arbejdsmiljø* [Work Environment] which is released around once a week
- various campaigns that are specifically focused on one problem area, e.g., stress
- *Rejseholdet*, which is a mobile unit that visits workplaces, particularly in the public sector, in order to host thematic meetings on high-priority subjects

The Danish Working Environment Research Fund also works to achieve the increased mediation and utilisation of research, *inter alia*, through funding the theme *Knowledge and action – funding in the area of work environment*. This funding goes, for example, to research into the economic benefits and costs of work environment initiatives and research into what means are effective in influencing or creating conditions for work environment initiatives. The fund also disseminates research results in different ways. Firstly, it has an agreement with Videncenter which disseminates the research to organisations, the social partners and the broader public, and secondly, results are presented on the fund's website and during an annual conference.

Alongside the NRCWE and the labour inspection authority, the social partners also play a role in the dissemination of knowledge through sectoral activities, for example, a campaign for the cleaning industry.

The gender perspective

In Denmark there is no explicit focus on or holistic approach to gender. Women's work environment is included, however, as one of the problem areas prioritised. In autumn 2015, a conference was organised on women's work environment and working conditions from a historical perspective, inspired by it being 100 years ago that Danish women gained the right to vote.

Finland

The information from Finland was collected in August 2015 through interviews with employees of the Finnish Work Environment Fund, the Finnish Ministry of Social Affairs and Health, Tekes and the Finnish Institute of Occupational Health.

Structure

In Finland, the working life issues fall under two different ministries: the Ministry of Social Affairs and Health and the Ministry of Employment and the Economy. Work environment issues are addressed by the Ministry of Social Affairs and Health, where some sixty employees at the Department for Occupational Safety and Health work with different aspects of the working environment, including supervision. Unlike other Scandinavian countries, there is no central office for work environment oversight. Instead, the Ministry's Department for Occupational Safety and Health sign annual agreements with work programmes and strategies with the five regional labour inspection offices. Finnish work environment research is dominated by the large Finnish Institute of Occupational Health, which is one of the world's largest work environment institutes. The institute signs agreements with the Ministry of Social Affairs and Health each year regarding what they will do. Despite severe cuts in recent years, the institute still has around 650 employees in 2015. However, all the employees are not researchers; the institute also gives courses, provides information and offers a range of services, including to the occupational health services. The Finnish Institute of Occupational Health and the labour inspection authority should really cooperate, but in practice this only occurs in connection with the institute's regional activities. During the interviews with both the Ministry and institute, the interviewees expressed a desire for greater cooperation between the Finnish Institute of Occupational Health and the labour inspection authority.

Government research funding in the area of work environment is available in part as basic grants to the Finnish Institute of Occupational Health and the universities, and partly through the government research financiers Tekes and the Academy of Finland. Tekes supports innovation and development, and can be compared with the Swedish Vinnova. The organisation has a budget (for all areas, not just working life) of approximately EUR 500 million. The Academy of Finland funds basic research and can be compared with the

Swedish Research Council. An additional source of financing, which is very important for work environment research, is the Finnish Work Environment Fund. The organisation is independent of the state but is protected by Finnish law, which stipulates that 1.75 per cent of the compulsory accident insurance for private and municipal employers (about EUR 11 million or SEK 103 million per year) will go to the Work Environment Fund. The fund is also financed by the Centre for Occupational Safety, which engages in work environment education. The Work Environment Fund finances research, scholarships, development projects and more (approximately EUR 7 million or SEK 66 million per year). The research funds are distributed by a board consisting of the social partners.

The situation in Finland is characterised by the recession that has impacted the economy since the crisis in 2008. Savings have been made through forcing the entire public sector to reduce their staff, and by sharply reducing funding to research financiers, universities and institutes. Tekes' budget has decreased from EUR 600 million to EUR 500 million. The Finnish Institute of Occupational Health, which had over 700 employees a few years ago, is expected to be down to about 450 employees in a few years. At that point, the government grants to the Finnish Institute of Occupational Health will have decreased by close to 40 per cent from 2013.

In addition to savings, the Finnish government has introduced reforms for a more strategic research policy. Increased focus and control over Finnish research will, supposedly, lead to research being better utilised in decision-making and public operations. A strategic government programme is now being developed which, *inter alia*, is based on future studies and the development of indicators to measure the impact of research. Furthermore, different kinds of networks and collaborations are being encouraged between many institutes, universities/colleges and government agencies in order to reduce the fragmentation within research that has been noted by the government. As a result of a government decision in 2013, two new research instruments are now being introduced successively which are financed via a transfer of resources from the budgets of the institutes and research financiers. The first instrument, "strategic research funding", is administered by the Academy of Finland. The second instrument, "Investigation and research activities to support the decision-making of the Finnish Government", is administered by the Prime Minister's Office.

Need for research-based knowledge

Knowledge needs within the area of work environment are of interest to the government as well as to the research financiers and institutes. Therefore, there is a constant dialogue between these and other stakeholders in working life. The needs are then integrated into strategies developed by the government, ministries and the Finnish Institute of Occupational Health. Research funding organisations determine the needs prior to the launching of funding programmes.

The Prime Minister's Office, the Ministry of Social Affairs and Health and the Ministry of Employment and the Economy call in experts to form different working groups when new programmes, strategies and reforms are planned. Since the Finnish Institute of Occupational Health is the expert authority within the work environment area, it is very active in these processes. The Work Environment Fund and Tekes are also included in some of the working groups. The labour inspection authority contribute with statistics and observations which the inspectors enter into the computer system LISA. In the long term, the Ministry wants to pool the data currently available at the Finnish Institute of Occupational Health, Statistics Finland and the labour inspection authority in order to get a more comprehensive picture of the Finnish working environment.

The Work Environment Fund finances research through open calls, which means that the researchers themselves identify the issues they consider important. Decisions on funding are taken by the Board, consisting of the social partners, in accordance with the needs they identify in the workplace. One could therefore say that the needs are defined by both the researchers and the social partners. Tekes only announces thematic calls for research proposals preceded by intense discussions with various stakeholders, in particular researchers and companies. Some calls are directly linked to specific government initiatives.

The Finnish Institute of Occupational Health's orientation is guided partly by the needs defined by the government in different strategies and in the agreement with the institute, and partly by regular international evaluations. The latest evaluation, *Report of the International Evaluation of the Finnish Institute of Occupational Health* (Ministry of Social Affairs and Health, 2014), led to major changes in the operations and to the number of research departments being reduced from seven to five. Additionally, each research department determines their research focus through discussions with various stakeholders, for example, government agencies, businesses, HR experts, occupational health services staff, employees at the ministries, financiers and workers.

Knowledge needs defined in strategies and research programmes for the year 2015 are characterised in large part by two phenomena: the economic downturn and the aging population. The politicians want the Finnish population to work longer, and more.

The government's working life strategy, *Strategy for the development of working life up until 2020* [*Strategi för utveckling av arbetslivet fram till 2020*], aims for Finnish working life to be the best in Europe by 2020. One of the strategy's four areas of action is "Developing well-being in work and health".

One of the interim goals in the Ministry of Social Affairs and Health's strategy *Socially Sustainable Finland 2020* reads "Longer working careers through wellbeing at work". This goal is further developed in *Policies for the work environment and well-being at work until 2020* from the same ministry, in which there are also a number of measurable objectives. Desired changes in 2020 compared to 2010 are as follows:

- The number of occupational illnesses has decreased by 10 per cent
- The number of workplace accidents has decreased by 25 per cent
- Work-related and problematic load has decreased (perceived physical and mental load has reduced by 20 per cent)

The Finnish Institute of Occupational Health's strategy for 2015–2020 is also imbued with the importance of a sustainable working life despite changes. The focal points of the strategy are the following:

- Occupational well-being in a changing working life
- Prevention of work incapacity
- Occupational health cooperation

In addition, there are two special issues: the safety of new technologies and occupational well-being in arctic conditions.

Tekes has long been a major financier of Finnish innovation. Previous priorities have been technical products and process innovations. Nowadays, the main priorities are non-technical products such as services, design and corporate and workplace innovations. One of the activities run by Tekes is the programme *Liideri*, which is also included in the government's working life strategy. The programme aims to develop organisations by strengthening management, the employees' role in innovation and new ways of working. Due to the cuts of recent years, Tekes has changed focus from funding research in large, small and medium-sized enterprises, to focusing primarily on small and medium-sized businesses.

The new research funding instruments have not yet had the time

to yield any effects. A first call for the strategic research projects (around 15 six-year projects totalling about EUR 4 million) will be announced in 2015. Although the selected themes (technology, climate, social equality) are not very relevant to the work environment, the Finnish Institute of Occupational Health has applied for funding. In 2016, the focus will be more interesting as one of the four proposed themes is “Knowledge, know-how and the changing working life”. The second research funding instrument, with the purpose of supporting the decision making of the Prime Minister, has no theme with direct work environment relevance but the theme “Promotion of Finland’s competitiveness and labour” has the sub-theme “What are the most important measures to extend working lives and increase the employment level?”.

Besides the two new financing instruments designed by the previous government, the government that took office in March 2015 has proposed reforms that may affect the work environment area. The strategic programme presented in May 2015 covered three main objectives: create more jobs and increase competitiveness, reduce public spending and public debt, and implement structural reforms – particularly in the healthcare system. It is of relevance to the work environment area if changes in the health system also include the obligatory occupational health services and if a proposal to extend working hours will be implemented. One of the means that will be used to achieve the objectives is that the government and the ministries will start over twenty projects to support the implementation of the government’s reforms. Some of these may affect the area of working life.

Access to research-based knowledge

One of the channels for research-based work environment knowledge in Finland is education. The Centre for Occupational Safety provides information and offers courses on health and safety. The Finnish Institute of Occupational Health trains staff and experts within the field of occupational health and safety, occupational safety staff and people working within staff administration and production.

Another channel is the dissemination of research results. The Work Environment Fund disseminates information on the research it funds via the journal *Telma* and through newsletters. In addition, companies can apply for business support that partly funds a consultant to implement development initiatives. Tekes also disseminates infor-

mation on the research they fund through their website and newsletter, but lacks a systematic method of dissemination.

The government's new funding instruments have a clear focus on increased public benefit. The goal of one instrument, "Investigation and research activities to support the decision-making of the Finnish Government", is to improve government decision-making through a knowledge-based operations policy and a strategic holistic approach. The strategic research projects also have a clear focus on public benefit. The applications that are not considered to have relevance for society will be sifted out before the remaining applications go on to have their scientific quality reviewed. All projects must have a plan for interaction with society and the applicant consortium must span across different scientific disciplines, different types of organisations (e.g. universities and companies) and at least three different research groups.

The gender perspective

According to a law on gender equality in the public sector, different types of working groups must have an equal gender balance. In contexts where statistics are used, any differences between the sexes must always be accounted for. 15-20 years ago there was a clearer focus on the gender dimension, while the focus now is mainly on the work environment for workers with a foreign background.

The Netherlands

The information from the Netherlands was gathered in September 2015 through interviews with employees of the Ministry of Social Affairs and Employment (Het ministerie van Sociale Zaken en Werkgelegenheid), the research institute TNO, the National Institute for Public Health and the Environment, RIVM, and the Inspectorate SZW.

Structure

At the government level in the Netherlands, the Ministry of Social Affairs and Employment assumes the greatest responsibility for the area of work environment. The Ministry of Health, Welfare and Sport has some responsibility for the work environment area, but does not give it any priority. As in Finland, there is a fairly large

department at the Ministry working on laws and regulations as well as the planning of the national work environment efforts. However, due to the recession of recent years, with weaker public finances and a conscious strategy to reduce the government administration, the Ministry's budget has been halved since 2012, as has the number of employees. This means that the Ministry now commissions more knowledge and services from outside. The knowledge comes to the Ministry primarily through four channels:

- Netherlands Institute of Innovation, TNO
- National Institute for Public Health and the Environment, RIVM
- The Netherlands Standardization Institute, from which the Ministry hires expertise for standardisation collaborations, for example, under the EU's auspices
- The Health Council of the Netherlands (de Gezondheidsraad), which is an independent scientific advisory body to the government and parliament.

TNO was created in 1932 to promote the application of research at the government and enterprise level. The organisation is regulated through legislation, which makes it independent in relation to the government, universities and businesses. It can be likened to the Fraunhofer Institute in Germany, which also conducts applied research in close proximity to the business sector. TNO works primarily with developing innovations and finding solutions to problems in working life. They work closely with university research, as well as with companies. They also have a cooperation agreement with the Ministry and with RIVM (described in the next paragraph). TNO is a nationwide organisation with around 3,000 employees, of which about a hundred work at the Department of Prevention, Work & Health. Ten years ago the department was twice as big, but for various reasons it has reduced in size in recent years and has merged with the Department of Public Health. Together, the Department has an annual budget of around EUR 25 million, of which about 16 million goes to work and health. Of this budget, approximately a quarter comes from the Ministry, while the Department's other funds are applied for in competition with others, such as from the EU. One of the reasons why the Department has decreased in size is the government's reduced budget and their increasingly stringent conditions for continued funding. Another is the growing competition from private consulting firms that offer similar services. A third reason is the increasing competition for research funding at the EU level.

RIVM is a state institute that primarily conducts research on the

environment and public health but also, increasingly, on occupational exposures and safety issues. The safety issues are a relatively newly established area of responsibility, which previously in part fell to TNO. RIVM receives SEK 3.8 million per year from the government, divided into 15 different programmes that are broadly similar from year to year. The programmes deal with different aspects of chemical, biological and physical exposures and safety issues. The knowledge produced is used in national policies and also in an international context, for example, in collaboration with the OECD and in the work with the EU regulatory framework. At the national level, RIVM works vis-a-vis organisations that convey knowledge to the labour market, such as TNO and the inspectorate, and also directly to the business sector. Because RIVM collaborates both with universities and in international organisations, the organisation also receives a regular inflow of information on the research front and the needs identified in the country and internationally. However, the focus of the work is determined by the government.

The Dutch equivalent of the Swedish Work Environment Authority is called the Inspectorate SZW (an inspection authority for social and labour market issues). This organisation was formed in 2012 through a merger of three different inspectorates: the Labour Inspectorate, the Work and Income Inspectorate and the Social and Intelligence Investigation Service of the Ministry of Social Affairs and Employment. The purpose of the merger was to create a leaner and more efficient organisation. Two of the Inspectorate's seven directorates deal with work environment issues. The Directorate for Working Conditions supervises safety and health at work as well as working hours and rest time. The Directorate for Major Hazard Control supervises the safety and environment of workers in connection with hazardous substances. The Inspectorate works in programmes and themes developed through risk analyses. The activities are both reactive, through intervening where complaints come in, and preventive, through programmatic inspections. Aside from 230 inspectors (and 40 dealing with Major Hazard Control), there are about 40 employees working with the content of the operations. This involves guidelines, courses and meetings to support the inspectors, as well as that part of Arbobalans (see Fact box 3) that is based on random sampling done at different companies to highlight the prevention work performed by the employers. Research-based knowledge comes to the organisation through cooperation with TNO and RIVM and also through consultancy contracts.

Need for research-based knowledge

Conducting an inventory of the need for research-based knowledge is complex. The government is a tone-setting actor that, through announcing various subsidies for companies and organisations and appointing targeted commissions to various organisations, controls the generation of knowledge and the translation of knowledge into practice. The government's inventory of needs is based partly on the statistics and facts generated and partly on the needs arising from cooperation at the international and EU level. Another actor that influences work environment policy is SER, the Social and Economic Council of the Netherlands, consisting of representatives from the social partners. Proposals for new activities from SER are mentioned explicitly in the government budget. SER also has an important role in setting threshold limit values.

An important source in the Dutch needs inventory for the work environment area is "Arbobalans" (see Fact box 3), which is written by TNO on behalf of the Ministry every two years. Arbobalans describes the working conditions in the Netherlands, its health consequences and how companies implement work environment measures. The purpose of Arbobalans is for government decision-makers as well as businesses and industries to be able to themselves design work environment initiatives that lead to a healthy workforce.

The part of Arbobalans handled by the Inspectorate (AIB) also constitutes an important part of the Inspectorate's work planning. The plan drawn up for the years 2015-2018 is based on a risk analysis conducted in 2013 and 2014.

Fact box 3. Arbobalans: overview of health and work environment in the Netherlands

Based on various data sources, Arbobalans provides an overview of the quality of Dutch working life, worker health, the activities that are carried out to prevent work environment risks and the status of absenteeism due to sickness, occupational illnesses and workplace accidents. The latest overview, Arbobalans 2014, pays particular attention to the psychosocial workload and the growing group of self-employed. The information used to produce Arbobalans come primarily from the following sources:

- NWCS: the Netherlands Working Conditions Survey. The NWCS began in 2005, is conducted annually, and is equivalent to the Swedish Labour Force Survey (LFS). The survey includes responses from nearly 250,000 people and is conducted by TNO together with Statistics Netherlands.
- ZEA: the Employment Survey for Self-employed Workers. In 2012, the ZEA was sent out for the first time to 4,000 self-employed persons. It is similar to the NWCS in structure and will be distributed again in 2015. The survey is a collaboration between TNO and Statistics Netherlands.
- NEWS: Netherlands Employers Work Survey. The NEWS is carried out every two years and provides a picture of the employers' views on work environment measures. Approximately 5,500 Dutch companies and organisations with at least two active persons answer questions about their work environment efforts and their effects on business performance and absenteeism due to illness. The survey is conducted by TNO.
- AIB: Working conditions monitoring in companies. This study is carried out by the Inspectorate and takes two years to do. It is about the degree to which companies comply with the Working Environment Act, on exposure to occupational risks and corporate work environment initiatives.
- EBB: Labour Force Survey. This survey corresponds to Sweden's Labour Market Survey (AMU) and is conducted by Statistics Netherlands. In 2013, approximately 53,000 people participated.
- NBB: Statistics of non-natural causes of death. Statistics Netherlands collects statistics on fatal workplace accidents.

The Dutch government has not presented any clearly defined work environment strategy, but in the budget presented for labour market issues in 2016, four areas of focus are reflected in its commissions to TNO and RIVM as well as in the Inspectorate's work. These areas of focus are:

1. providing a minimum level of labour law protection, with an emphasis on the employers' and workers' own responsibility
2. promoting good working conditions in order to increase labour participation and productivity while reducing the level of absenteeism due to illness
3. the design of and compliance with laws and regulations, including the work of the Inspectorate
4. the government implementing its labour market policy in dialogue with the social partners.

The first area of focus also involves the formulation of labour migration policy. The fact that the government wants to transfer respon-

sibility to the labour market in various ways, pervades many of the current initiatives. In connection with the second focus area, “sustainable employability” (duurzame inzetbaarheid) is mentioned, which the government has launched to keep the workforce healthy and working longer into old age.

Five themes among the legislative changes that will be implemented next year have links to the four focus areas:

- Combatting different types of workplace criminality. This will be done by hindering the establishment of illegally operating businesses that do not pay minimum wages, by implementing the EU guidelines on combatting social dumping and by promoting better wages and working conditions among working migrants.
- Making more people to work longer. This will be done by making it easier for people who have received sickness benefits to work until an older age.
- Improving the quality of occupational health services.
- Improving the working conditions of the flexible workforce, i.e., people without a fixed contract or with a fixed contract without guaranteed working hours. In 2016, the focus is on improved terms for “payrollers”, i.e. people employed by a company other than that which they then work at. The fact that the bill addresses flexible forms of work is due to one-third of the employed workforce working in this way. The flexible work form which has grown rapidly in recent years is that of being self-employed.
- Combatting illegal activity in supply chains with an emphasis on self-regulation through information and solutions being disseminated between sectors.

To improve safety in Dutch workplaces, RIVM is collaborating with the Inspectorate. The inspectors collect information through workplace visits, interviews and the analysis of relevant documents, such as risk analyses. Due to the large number of work environment risks, this study is divided into two years.

Access to research-based knowledge

There is no single coherent source of research-based knowledge, but the government is actively working to disseminate knowledge to the general public in various ways. One example is Arbobalans which, aside from statistics, is also based on research developed by researchers at TNO. Another example is the database "Storybuilder" which RIVM has created in cooperation with the Inspectorate. The database contains detailed information on serious workplace accidents in various industries. By analysing the circumstances surrounding the accidents, RIVM has produced guidelines for the employers regarding what they should do to avoid accidents.

To promote the dissemination and access to knowledge, the government has ensured that the different organisations cooperate and that institutes actively cooperate with the universities. In this way, TNO has, for example, validated methods used by the Inspectorate. RIVM also cooperates with the Inspectorate through education and projects. In order to strengthen and control the area, the government has two financial instruments at its disposal: subsidies (EUR 2.8 million in 2016) and commissions (EUR 13.4 million in 2016). The subsidies are less about research and more about development projects. Businesses, trade associations and other organisations can apply for these funds. The overarching theme is to promote sustainable employability, i.e., getting people to work longer, and to promote self-regulation through good examples being disseminated and through cooperation between industries etc.

Clearer links to research-based knowledge are found among the commissions. Here too the focus is on self-regulation and sustainable employability, but in the annual programmes carried out with the different organisations, there are more specific links to research.

The gender perspective

There was no special focus on gender in the information gathered.

Norway

The information from Norway was collected in May 2015 through interviews with employees at the National Institute of Occupational Health (STAMI) and the Norwegian Ministry of Labour and Social Affairs.

Structure

In Norway, the same ministry, the Ministry of Labour and Social Affairs, is responsible for both working life and occupational health. Under this Ministry, there are two labour inspection authorities for the working environment: The Norwegian Labour Inspection Authority (with headquarters in Trondheim) and the Petroleum Safety Authority Norway (with headquarters in Stavanger), as well as the National Institute of Occupational Health (STAMI). Other key actors are the FAFO Research Foundation and the Research Council of Norway. STAMI has 121 employees and is a sector research institute focusing on work and health. Research forms the core of STAMI's activities. Other tasks include work environment monitoring (see Fact box 3), advisory services, studies and communication and education. STAMI is neutral and independent of the social partners and therefore does not pursue contract research. FAFO conducts contract research, has 80 employees and is one of Norway's largest environments for applied social science research. FAFO is a research institute and was originally founded by the Norwegian Confederation of Trade Unions LO. It was converted into a foundation in 1993. The Research Council of Norway is the only state research financier and thus the main actor within Norwegian public research funding.¹⁰

Need for research-based knowledge

The government's knowledge priorities are developed in a process involving the social partners, the labour inspection authorities and STAMI. All actors in the process submit supporting information to the government before decisions are made in the Storting (the supreme legislature of Norway) regarding priorities and budget. The fact book on work environment developments in various professions and industries which STAMI produces every three years (Fact box 3) is one of the most important compilations of supporting data in this process.

The Ministry has a large annual budget for sector research, of which NOK 138 million (SEK 138 million Swedish crowns) is going to the area of work environment in 2015. The research funds are distributed to research through three main channels: directly from the government to STAMI, through the Research Council of Norway or through the government's direct procurement of research in the form

¹⁰ Other financiers include the Norwegian Cancer Society, the National Association for Public Health's Council for Cardiovascular Disease, the Extra Foundation, and the employers' association NHO's Working Environment Fund.

of special commissions and official reports. Since STAMI applies for and receives research funding from the Research Council of Norway and also receives special commissions from the government, the Institute is financed from all three channels.

STAMI is currently establishing a new strategy in conjunction with the expiration of the current strategy (2006-2015). The priorities are being determined through evaluations of international research on work and health, and through meetings with the labour inspection authorities, the social partners and other relevant target groups. The Ministry, which is very proactive in work environment issues, also influences STAMI's direction. In addition, the Institute receives impulses through its various investigations, through the national monitoring of the work environment (see Fact box 3), through research projects and through its close contacts with the social partners, trade associations, occupational health services and more.

The priority areas in the Ministry of Labour and Social Affairs' budget for R&D for 2015 are as follows:

1. Welfare, working life and migration
2. Absenteeism due to illness, work and health
3. Health, environment, safety and petroleum.

In STAMI's strategy for 2006–2015, the following areas are highlighted:

- Exposures in working life: psychological, social and organisational work environment factors as well as issues relating to working hours, chemical and biological work environment factors, mechanical work environment factors (effects on the musculoskeletal system) and accidents.
- Mechanisms for work-related health effects: Biological, physiological, chemical and biochemical mechanisms, social mechanisms and individual sensitivity.
- Health effects: Musculoskeletal problems, respiratory diseases, effects on the central nervous system, cardiovascular diseases, cancer and mental health.

The following areas have been strengthened during the period: psychological, social and organisational work environment factors and musculoskeletal problems.

In 2014, STAMI gave most priority to research related to psychosocial and organisational issues (including working hours and shift work), work-related musculoskeletal disorders, and chemical and biological work environment conditions. The areas given high pri-

ority by the government in recent years include criminality (what the Swedish Work Environment Authority calls “grey businesses”), high absenteeism due to illness, and the question of how more people can be persuaded to work longer.

The Norwegian labour inspection organisation has undergone a reorganisation towards a more knowledge-based set-up. The Norwegian Labour Inspection Authority’s priorities are primarily based on the national monitoring system NOA (see Fact box 4) and the work being done by the Labour Inspection Authority’s Data and Analysis Department.

Fact box 4: National monitoring of work environment and health (NOA) and the “Fact book”

In 2006, the Ministry of Labour and Social Affairs commissioned STAMI to create a function that would interpret and disseminate in-demand and useful factual knowledge on working environment and health. The commission led to what is now called National monitoring of working environment and health (NOA). NOA’s main target groups are central agencies, labour inspection authorities and the social partners. The goal is to provide reliable factual information on work environment developments in Norway over time, as the basis for effective prevention work at the national and workplace levels. By agreeing on a common factual base of information, the government and the social partners can use this to identify priority areas. Data from NOA is available through an electronic tool online, where users can customise their own data withdrawals (www.noa.stami.no). In addition, a report is published every three years: Factbook on working environment and health [Faktabok om arbeidsmiljø og helse]. In 2015, NOA published the third factbook with a comprehensive picture of the working conditions in Norwegian working life. The factbooks highlight the main challenges in the working environment and provide a comprehensive picture of the status and trends within the field of working environment and health in Norway. The data sources included in the 2015 factbook are: The Norwegian counterparts to Sweden’s employment and work environment surveys, data on sick leave etc. from the Norwegian equivalent of Försäkringskassan, data on work-related deaths and illnesses from the various labour inspection authorities (including petroleum, aviation and shipping), data from the product register of hazardous chemicals from the Norwegian Environmental Agency, STAMI’s overview of occupational health investigations and data on work-related diagnoses from the Norwegian Patient Register and the Cancer Registry of Norway.

Access to research-based knowledge

The social partners are not as active in the dissemination of research-based knowledge but, on the other hand, have significant influence through their central role in the prioritisation processes at the government level, at STAMI, the labour inspection authorities and FAFO.

STAMI disseminates research-based knowledge through the website www.stami.no, through a newsletter, media contacts, lobbying, seminars, courses, fact sheets, an electronic project catalogue, a scientific publication (61 original articles in 2014 in peer reviewed journals) and a national library and information centre. STAMI is

also responsible for education in work environment at a masters and doctoral level, as well as the organisation of postdoctoral positions in cooperation with universities. In 2014 there were 17 doctoral students and 13 master's students at STAMI.

The labour inspection authority has an analysis department where researchers and experienced inspectors work. Unlike STAMI, their knowledge dissemination is not primarily focused on research-based knowledge but rather on occupational injury statistics and inspection-related documentation. The data presented in the monitoring system NOA is certainly not research, but it is compiled under the guidance of senior researchers using scientific methods. It is sometimes difficult to ascertain the boundaries between the responsibilities of STAMI and those of the labour inspection authority's analysis department.

FAFO also contributes to knowledge sharing through active and innovative dissemination and network building. For example, FAFO is working with the issue of social dumping.

The gender perspective

At STAMI, the biological differences between the sexes are taken into account in research and statistics, but there is no deeper gender analysis. The gender dimension also permeates the calls organised by the Research Council of Norway in accordance with its gender policy.

Interviews

Denmark

Inger Schaumburg	Director General	NRCWE
Nils Fallentin	Research Director	NRCWE
Glen Winzor		Director of Research Coordination
NRCWE		
Brian Knudsen	Chief Consultant	NRCWE
Niels Kofod		Chief Consultant Danish Working Environment Authority
Steffen Hyldborg Jensen	Head of Secretariat	Working Environment Advisory Center Danish Working Environment Authority
Palle Ørbæk	Consultant/physician	Danish Working Environment Authority
Jens Skovgaard Lauritsen	Chief Consultant	Confederation of Danish Employers

Finland

Kenneth Johansson	Managing Director	Finnish Work Environment Fund
Hannu Stålhammar	Senior Officer	Department for Occupational Safety and Health Ministry of Social Affairs and Health
Liisa Hakala	Director	Department for Occupational Safety and Health Ministry of Social Affairs and Health
Tuomo Alasoini	Director	Workplace Innovation and Development Tekes
Anna-Liisa Pasanen	Director	Finnish Institute of Occupational Health (FIOH)

The Netherlands

Joy Oh	Deputy Unit Head	Health and Safety Policy Directorate, Min. of Social Affairs and Employment
Paulien Bongers	Director	TNO, Healthy living
Jan Michiel Meeuwssen	Manager	TNO, Healthy living International affairs
Mathieu Rikken	Director	RIVM, Centrum Veiligheid (safety)
Jeroen Terwoerd	Specialist in occupational hygiene	Inspectorate SZW; Centre of Expertise

Norway

Pål Molander	Director General	National Institute of Occupational Health (STAMI)
Stein Knardahl	Department Director	National Institute of Occupational Health (STAMI)
Thorfrid Hansen	Department Director	Working Environment and Safety Department Ministry of Labour and Social Affairs

