



Swedish Civil
Contingencies
Agency

MSB Research Agenda 2024–2028

Research for a safer society

MSB Research Agenda 2024–2028: Research for a safer society

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Introduction

With its cohesive and cross-sectoral responsibility, MSB has an important role as a central funder of non-military security research. In an uncertain world of war, climate change, social disruption and factual relativism, there is a great need for knowledge grounded in research. For that reason, we have chosen to review our work with research funding in order to better respond to identified needs and develop how we work with the utilisation of the knowledge produced. This Research Agenda describes how we intend to work with MSB's research funding in the coming years. The Research Agenda is supplemented by annual plans for research initiatives.

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June 2023

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Introduction

MSB's mission includes directing, commissioning and quality-assuring research, as well as communicating research results in order to prevent accidents and improve emergency preparedness and civil defence. The Research Agenda facilitates the implementation of MSB's research strategy¹ with the intention of producing in-demand, necessary and useful knowledge. The objective is to strengthen the ability to use scientific knowledge, as well as contacts between research and implementation, to meet current and future challenges in civil protection and preparedness.

The Research Agenda consists of three main parts:

1. A description of the societal challenges and research areas that will guide MSB's research initiatives in coming years.
2. An overview of the forms of funding that MSB has at its disposal for research initiatives.
3. An explanation of how MSB intends to work with prioritisation of annual research initiatives.

The Research Agenda is valid as of 2024 and will be updated every five years or as necessary. It forms the basis for MSB's annual operational planning.

Demand-driven and applied research

Societal developments are constantly creating new security challenges that require continuous knowledge development. Research plays an important role in this process by providing new perspectives and insights and improving decision bases and the development of emergency-management procedures. Research results can also help improve the identification of threats and risks in the future.

MSB supports applied research using a systematic needs inventory. In order for knowledge to have an impact and be useful in society, it must be based on society's identified needs and challenges and be useful for concerned stakeholders. At the same time, such knowledge must build on existing knowledge in the relevant areas. The objective is to base planning, decision-making and working methods more firmly on scientific knowledge, thereby enhancing the capabilities of concerned stakeholders.

¹ MSB. *Investering i kunskap för ett säkrare samhälle. MSB:s strategi för forskning och utveckling*, MSB1388. (MSB, 2019).

Effective utilisation

MSB funds research to produce applicable results, which in turn can contribute to impact. In its work with research funding, MSB places great emphasis on utilisation and enabling research to be useful. For research results, the target audience includes diverse stakeholders across the emergency management system, from public authorities, municipalities and regions to the non-profit and private sectors.

An array of long- and short-term effects can be expected, ranging from the development of new methods to the future adoption of new values. A deeper understanding of a subject or new knowledge building in an unexplored area may also come about. The link between research and higher education is significant, as the skills necessary for the development of civil preparedness should be based on proven experience and science. Network effects can be created when researchers and practitioners meet, in the form of improved understanding of each other's realities and approaches. Professional stakeholders become better at receiving, while researchers become better at communicating research results.

Effects can also come in the form of policy impact, e.g., emergency preparedness stakeholders receive evidence-based knowledge for analyses, guidelines, decision-making, etc. In other cases, results are more professionally oriented, with new or improved methods, approaches or products in emergency prevention and preparedness. There are also spin-off effects when research continues in development and innovation projects, nationally or internationally.

This effect can often be long-term, as when research results are integrated into different types of training programmes and exercises, which in turn can have an effect in the form of changed insights, new approaches and, not least, increased competence. At the same time, the research-utilisation objective requires that the target audience possesses the ability to integrate and manage the results in their own work.

Needs inventory

The development of a new research agenda is based on a process of inventorying, analysing and prioritising knowledge and research needs. The model for identifying research needs covers the *research front* (research needs), the *state of society* (challenges and risks) and *stakeholder reality* (dialogue with MSB's substantive activities and external target audience).

The inventory of knowledge needs is based on input from:

- MSB Scientific Council: research needs and relevant publications.²
- A survey of knowledge needs by MSB departments: focus on the day-to-day challenges, opportunities and needs of MSB's target audience vis-à-vis knowledge development, as well as relevant reports and publications.
- Dialogue and workshops with external stakeholders.
- Strategic documents, investigations and orientations.
- Up-to-date research reports and knowledge reviews.

From strategy to research investments

The *research strategy* sets the direction for research activities by identifying intentions, objectives and guiding principles for MSB's research funding.

The *research agenda* describes *ten research areas* identified through inventory and analysis of knowledge needs within MSB and in dialog with other stakeholders.

The research areas form the basis for future *research initiatives, such as calls for proposals and research orders*, which MSB decides on annually in the context of its operational planning. Research needs are actively matched with the appropriate *form of funding* to achieve the right impact for the research.

The annual *plan for research initiatives* and calls for proposals are published at www.msb.se/forskning and in MSB's other digital channels and newsletters.

Applications received are scrutinised on the basis of need, relevance and scientific quality, but in some cases other criteria as well. This is followed by the *decision and launch of* granted research investments.

² MSB's Scientific Council for research issues consists of eight external participants and has an advisory role in the MSB's research activities. <https://www.msb.se/sv/om-msb/forskning/uppdrag-ny-kunskap/sa-gar-forskningen-till/>.

Gender mainstreaming

Research supports gender equality and diversity efforts within emergency preparedness, civil defence and prevention by providing theoretical concepts and concrete examples of how inequalities are expressed and can be counteracted. Norm-critical perspectives are important to ensure that the prevention and management of societal disruptions, accidents and crises considers the diverse needs for protection that different social groups may have. Gender mainstreaming tools must permeate the development of the emergency-management system and civil defence to achieve societal resilience objectives.³

Research is a newly prioritised focus area in MSB's new gender mainstreaming strategy.⁴ The overall objective is to integrate the gender-equality efforts throughout the cycle from needs assessment and orientation of research investments through practical application. This includes the objectives of:

- ensuring that the allocation of research funding is objective and gender-neutral,
- including a norm-critical perspective in calls for proposals, assessment criteria and follow-up of research where applicable,
- increasing awareness and application of research results with a gender equality and gender perspective in the Agency and among MSB's target audience, and
- integrating gender perspectives in MSB's external research communication.

³ MSB. *Inriktning för det fortsatta arbetet med jämställdhetsintegrering för åren 2022–2025. Redovisning av regeringsuppdrag, inriktning för det fortsatta arbetet med jämställdhetsintegrering för åren 2022–2025.* Ref. no. MSB 2021-09250 (MSB:2021).

⁴ Since 2017, the MSB has a Gender mainstreaming strategy (*Strategi för jämställdhetsintegrering*, Ref. no. MSB 2017-10480). The strategy aims to delineate, coordinate and identify areas for development. A revised strategy will be developed in 2023.

Civil protection and preparedness research in a changing world

Society faces multiple and complex threats and risks, placing increased demands on preparedness and the management of different types of societal disruptions and events in parallel. Preparedness and civil resilience must, in the future, address a wide range of threats, from accidents and natural disasters to preparedness for war.⁵ In the long term as well as the short term, research can provide strategic knowledge to meet current and future societal challenges in the field.

Russia's annexation of Crimea in 2014, and the invasion of Ukraine in 2022, have contributed to an acute deterioration of Sweden's security situation. Simultaneously, other geopolitical changes are occurring, including the emergence of authoritarian regimes, increased polarisation of the global economy and isolationism.⁶ The COVID-19 pandemic continues to severely strain the healthcare systems and economies of many countries by limiting global production and supply flows. Climate change increases the risk of more widespread and frequent natural disasters, extreme weather events and societal disruptions, requiring measures to adapt on the local and national levels.⁷ Risks across the threat spectrum are exacerbated by climate change, for example concerning food and water supply or disruption and interruption of critical infrastructure due to natural disasters. Climate change, in the form of droughts, floods or fires around the world, impacts Sweden's security of supply preparedness and can give rise to new conflicts or security risks, generating a need for humanitarian initiatives.⁸

⁵ MSB. *Strengthening civil preparedness Based on the Swedish Civil Contingencies Agency (MSB) National Risk and Capability Assessment 2021* MSB1866 (MSB: 2021).

⁶ Roszbach, Niklas H. "Hoten mot väst och transatlantiska relationers framtid" i: *FOI Strategisk utblick 9 Framtida hot*. (Stockholm: Swedish Defence Research Agency).

⁷ MSB. *Strengthening civil preparedness Based on the Swedish Civil Contingencies Agency (MSB) National Risk and Capability Assessment 2021* MSB1866 (MSB: 2021).

⁸ The Swedish National Expert Council for Climate Adaptation The Swedish National Expert Council's First Report for Climate Adaptation 2022.; MSB. *Samhällsskydd och beredskap i ett förändrat klimat – MSB:s handlingsplan för 2022–2026 (revised 2023)*. MSB1933 (MSB:2022).

Demographic changes and shifting urbanisation trends following the restructuring of the economy and the labour market are changing the conditions for preventing and managing accidents and crises. The population is ageing, which means, for example, that the group of especially vulnerable people is growing.⁹ Vast urban environments place new demands on crisis management and security of supply preparedness, e.g., in response to pandemics or floods. Rapid digitalisation and technological developments drive the development of vulnerabilities to cyber incidents as well as opportunities for innovation in the field of security. Potential threats and conflicts play out in a grey area between war and peace, where various influence campaigns and cyber-attacks are directed also at civilian targets.¹⁰

In addition to external threats, the threat environment includes internal threats in the form of challenges to democratic values and principles. So-called asymmetric threats enable foreign powers as well as domestic actors to create divisions in society through information warfare, organised crime and acts of violence. These threats are underpinned by increasing social and political polarisation and exclusion. Trust in authorities, public actors and citizens tends to be challenged from day to day, as well as during crises, affecting the preparedness and resilience of society.¹¹

The preparedness system is undergoing extensive development and construction that places great demands on capacity and knowledge building, experience feedback and learning. But building this capacity takes time. Research serves an important role in building knowledge and endeavouring to achieve MSB's vision: "A safer society in a changing world".¹² The work on adapting society to a changing climate is clearly linked to the Sustainable Development Goals and the work on the Sendai Framework for Disaster Risk Reduction. The EU and Sweden have the intention of being global leaders in the implementation of the Agenda 2030, and research and knowledge development are central to achieving the sustainability goals and solving current societal challenges.¹³

The societal challenges in the field of civil protection and preparedness are complex. Three interlinked areas are described below: *comprehensive preparedness*, *prevention* and *secure digitalisation*.¹⁴ They provide context for the description of the identified research areas in the following section.

⁹ MSB. *Inriktning av nationell strategi för stärkt brandskydd genom stöd till enskilda. Underlagsrapport*. MSB1687 (MSB: 2021).

¹⁰ Strindberg, Anders och Svensson, Erik. "Att bemöta hoten mot samhällets grundprinciper". I: *FOI Strategisk utblick 9 Framtida hot*. (Stockholm: Swedish Defence Research Agency).

¹¹ Rätty, Riitta, Kindvall Göran och Ödlund, Ann. "Perspektiv på framtida militära hot" I: *FOI Strategisk utblick 9 Framtida hot*. (Stockholm: Swedish Defence Research Agency).

¹² MSB. *MSB 2030 – Långsiktig verksamhetsinriktning. Revised edition 2022*. MSB S 00836. (MSB: 2022)

¹³ SOU 2019:13. *Agenda 2030 och Sverige: Världens utmaning – världens möjlighet*.

¹⁴ These areas reflect the MSB's long-term operational orientation *MSB 2030*.

Comprehensive preparedness

The changed international situation places new demands on Sweden's strategy and capacity to manage a state of heightened alert or even war, bringing to the fore the planning and reconstruction of civil defence as an aspect of total defence. MSB's mission is to strengthen *civil preparedness*, which includes both emergency preparedness and civil defence in comprehensive preparedness. Armed attack, considered as the ultimate crisis, is the dimensioning event for emergency preparedness planning, and it requires a balance between civil and military defence.¹⁵ The reconstruction of civil defence is being carried out with a strong dependence on actors outside of Sweden, e.g., in terms of security of supply preparedness, which involves both access to food and energy and the use of resources, creating new challenges and opportunities that are reinforced by a changing climate.¹⁶

Transitioning civil preparedness for the full spectrum, from crisis to war, covers a wide range of societal challenges. The development of civil preparedness requires a holistic approach, from the system level to the role of the individual in the preparedness system. From a system perspective, new forms of collaboration are required that include military as well as civilian stakeholders, from the level of public authorities to that of municipalities, as well as voluntary organisations, the private sector and civil society. Issues related to the division of responsibilities, management and coordination in civil defence are therefore central, as is the need for gender-equality and equal-treatment perspectives. Developments occur rapidly, requiring prioritisation, decision-making and efficiency.

The Swedish Defence Commission notes that, for a long time, research has focused on emergency preparedness, contributing to knowledge gaps regarding how society's conditions and objectives differ between a peacetime crisis and a heightened state of alert or war.¹⁷ Research must support the development of civil preparedness through knowledge-based decision-making and forward-looking analyses and assessments. Developments also require international collaboration and comparative case studies and outlooks. Future Swedish membership in the NATO defensive alliance will place new demands on capabilities to strengthen civil resilience. Synergies between civilian and military research and development should be pursued wherever this is relevant and mutually beneficial for civil and military defence, as well as within the framework of total defence.¹⁸

¹⁵ *The Swedish civil preparedness system*. www.msb.se. Retrieved 24/01/2023.

¹⁶ The Swedish National Expert Council for Climate Adaptation The Swedish National Expert Council's First Report for Climate Adaptation 2022.

¹⁷ Ministry of Defence. *Motståndskraft. Inriktningen av totalförsvaret och utformningen av det civila försvaret 2021–2025*.

¹⁸ Government Bill 2020/21:30 *Totalförsvaret 2021–2025*.

Prevention

Continued knowledge development is needed to support efforts to reduce the incidence and consequences of fires and other accidents under the Swedish Civil Protection Act (LSO).¹⁹ Such accidents include all types of events, from relatively straightforward road accidents to major disasters and wars, and both conscious and unconscious acts. This involves preventing accidents as well as improving rescue operations capabilities. Research, learning and innovation are prioritised areas in the work on the national strategy for strengthening fire protection in order to achieve the objectives of ensuring that no one is killed or seriously injured by fire, as well as limiting property and environmental damage.²⁰ Ongoing climate change entails new conditions and rules for achieving these objectives, including an increased risk of natural disasters and requirements for climate adaptation measures. New technologies and digital developments create opportunities to, e.g., prevent accidents and monitor and support on-site operational work in real time. At the same time, they create risks in the form of digital security vulnerabilities in the communication and information management of stakeholders.

Previous research highlights the need to take action to reduce the impact of climate change on society, in the form of climate adaptation. The extent and speed of climate change is difficult to predict, requiring robust decision-support methods that take into account uncertainties and vulnerabilities as well as the need for flexible solutions in spatial planning. Such decision-support methods can also be used to implement adaptations to other types of threats and risks, e.g., in contingency planning.²¹ Research in the field of climate adaptation can help shift the focus from problems to solutions, and from planning to implementing preventive measures. In its national climate adaptation work, MSB prioritises knowledge development in several different natural disaster areas, including landslides, floods, forest and vegetation fires and risks associated with high temperatures.²²

Climate adaptation also involves new societal risks, both in spatial planning and in the transition to a fossil-free society. By 2045, Sweden is to have net-zero greenhouse gas emission, and to thereafter achieve negative emissions. This societal transition requires the use of new fossil-free fuels and energy carriers, as well as electrification. The energy sector is evolving rapidly, and research can contribute both technologies and scientifically-based risk analyses to prevent accidents with new regulatory frameworks and the application of regulations. Increases in the production and use of batteries are contributing to new environmental and health risks during fire and rescue operations. Hydrogen is being deployed and transported in close proximity to homes, schools and workplaces, posing storage challenges and risks of leakage and explosion.²³ Any expansion of nuclear power plants or new nuclear reactor types will place increased demands on knowledge regarding the development of Swedish preparedness.

¹⁹ Swedish Code of Statutes 2021:1141. *Civil Protection Act (2003:778)*.

²⁰ MSB. *Inriktning av nationell strategi för stärkt brandskydd genom stöd till enskilda. Underlagsrapport*. MSB1687 (MSB: 2021).

²¹ MSB. *Robusta beslutsstödsmetoder för klimatanpassning. Ett sätt att planera för den som inte behöver veta "var linjen går"*. MSB1845 (MSB: 2021).

²² Prioritisation is based on climate and vulnerability analysis. *High-priority areas*: landslides and erosion, floods that threaten communities, infrastructure and businesses, and forest and vegetation fires. *Somewhat prioritised areas*: High temperatures that pose risks to human and animal health and well-being, water supply shortages for individuals, agriculture and industry, storms, risks in a climate-adapted Sweden. *Samhällsskydd och beredskap i ett förändrat klimat – MSB:s handlingsplan för 2022–2026 (Revised 2023)*, (MSB: 2022).

²³ Swedish Energy Agency *Förslag till Sveriges nationella strategi för vätgas, elektrobränslen och ammoniak*. ER 2021:34 (Swedish Energy Agency: 2021).

Secure digitalisation

The potential value in the continued digitalisation of the private sector, and society at large, is great. As both internal and external efficiency improves, ongoing digitalisation has become strategically important for Sweden's competitiveness as well as efficient public services. However, security investments in digitalisation have not kept pace with investments in value creation, and this gap is growing. The positive aspects of society's digital transformation risk becoming negative consequences, if societal stakeholders fail to protect information assets and systems.

Digitalisation increases vulnerabilities to different types of crime and disruption. Such crimes can be committed by antagonists, but disruption of essential public services can also occur due to lack of technical skills, outdated systems, lack of security culture and compliance, etc. For these reasons, information and cyber security are increasingly relevant. Information security means protecting valuable information so that it meets the requirements of availability, accuracy and confidentiality. Cyber security is a broad term for the tools, methods and techniques that organisations use to protect systems and data from cyber incidents.

Sweden must both better protect itself against adverse incidents and improve its readiness to restore systems and services after a disruption. Both public and private actors need to improve their ability to prevent, detect and respond to incidents that have a wide range of causes. This involves, in part, preparing certain practices for necessary measures, as well as prevention, and both aspects require competences. In light of the above, there is a need for competence to strengthen information and cyber security.

Information and cyber security is a moving target, constantly evolving. Technologies such as AI, blockchain, cloud services, etc., are being developed for new asset classes, and these can be used for malicious purposes as well as for enhanced protection and preparedness. Organisations are outsourcing activities and interconnecting systems, which increases vulnerability. It is therefore essential that the public and private sectors both continuously invest in strengthening security and preparedness in the digital domain. Yesterday's technologies are often insufficient to meet new types of threats.

Research areas

In light of the societal challenges described above, the following section describes ten research areas guiding MSB's research initiatives for the period 2024–2028. Knowledge needs span the entire field of civil protection and preparedness and are presented under three headings: comprehensive preparedness, prevention and secure digitalisation.

The research areas provide a basis for MSB's future research initiatives, e.g., in the form of annual research calls or commissioned research. For each research area, different examples of identified knowledge needs are described. These have been identified by the research activities' needs inventory and analysis process (see Introduction). The research areas provide a broad and multi-faceted array of needs and can be likened to a buffet rather than a list of prioritised knowledge needs. Every year, the work of specifying knowledge needs and prioritising concrete research initiatives continues. Not all of the identified knowledge needs will be met by MSB's research activities during the 2024–2028 period of the Research Agenda.

Some general perspectives and challenges permeate all of the research areas. These include, e.g., the impact of climate change, the development of emerging and enabling technologies²⁴, cyber and information security and digitalisation, and gender and equality perspectives. These perspectives are not described in detail under all headings but are exemplified in the knowledge needs.

The research areas are described with a varied level of abstraction, reflecting differences in the current state of knowledge and research. Some areas, such as those related to civil defence, are undergoing expansive development and are less detailed, while areas with an established knowledge base allow the knowledge needs to be concretised and delineated.

²⁴E.g., artificial intelligence, quantum technology, biotechnology and materials technology.

1. Comprehensive preparedness

1a. System development in civil preparedness

Civil defence is undergoing rapid development. To ensure efficiency and effectiveness, development must be coordinated with crisis management and in line with military defence. Research can provide a systemic perspective on the development of civil preparedness, involving public, private and non-profit actors as well as citizens. This work requires new methods and tools for situational awareness, monitoring and analysis, and evaluation of comprehensive civil defence capabilities. Lessons and experiences from the war in Ukraine must be taken into account in knowledge building, in addition to the new capability requirements of a future NATO membership.

In this field, broad and wide knowledge needs with a systemic perspective exist. These include the need for:

- Knowledge about the differences and similarities between peacetime crisis preparedness and wartime preparedness to guide society's planning and preparedness based on knowledge requirements and capabilities, logics and needs for stakeholder collaboration, as well as different local and regional conditions. Among other aspects, new knowledge should be produced to support preparedness considerations in spatial planning.
- Development of new risk-management methods and data, such as adaptive risk management to support the Swedish emergency management system. How can more continuous risk management - through situational awareness, analysis and adaptation - strengthen resilience and improve decision-making processes in critical infrastructure and functions?
- Knowledge about how military and civilian alignment, coordination and management can be harmonised at different levels, such as local, regional and national.
- Development and testing of methods and strategies for management, collaboration and decision-making between stakeholders in the civil defence system. For example, research in simulated and experimental management environments, methods for information sharing, and knowledge of how trust and social networks can be maintained to support collaboration.
- Knowledge of the possibilities and limitations of technical and digital solutions for collaborative working methods, based on protective security, information sharing and information security requirements.
- Knowledge about a modern society's needs and requirements for civil defence, for example based on building structures and materials, access to and use of shelters, evacuation planning, and protection of cultural heritage in total defence planning.

- Development and testing of methods to create more secure and robust command centres through research in the areas of CBRN, electromagnetic threats, power supply and sensors.
- Knowledge that develops administrative preparedness, which includes both regulatory and organisational preparedness. Issues of interest include the organisation, responsibilities and regulatory framework of the Swedish administration in the event of crisis and war.

1b. Civil society, population preparedness and the will to defend

Civil society consists of non-profit associations, religious communities, voluntary defence organisations, foundations and cooperative associations which, together with the preparedness of individuals, form an important part of overall civil preparedness.

In this area, more knowledge is needed in the following areas, among others:

- The importance of civil society before, during and after a crisis or war situation. What are the prerequisites, conditions and opportunities for stakeholders to participate in civil defence? How can civil society engagement be harnessed in a crisis or war? Case studies from the war in Ukraine can provide examples of how military and civilian capabilities are affected by civil society support.
- Knowledge about the population's commitment and will to defend, including any differences in willingness if operations are voluntary or compulsory. How is willingness affected by family situation, demographic aspects, etc.?
- Further knowledge and methods to reduce the gap between actual and expected self-preparedness. This includes a focus on geographical and demographic aspects, as well as methods for developing the work of reaching, supporting and engaging people to strengthen their self-preparedness.
- Research on social stratification and inequalities that risk being deepened and cemented with the build-up of civil preparedness. How can perspectives on power be integrated to support prioritisation, allocation and planning of resources, by public authorities and other stakeholders, before and during a crisis or war? What is an 'inclusive civil defence', and how can this be realised?

1c. Risk and crisis communication across the threat spectrum

Communicating known threats and risks is important so that individuals and society can prepare for and minimise the consequences of accidents, crises or wars. Risk and crisis communication must be fast, open, accurate and coordinated between different authorities. Messages and communication methods must also be adapted to reach all members of society. Digitalisation and the development of social media bring opportunities as well as challenges to this process, where the quest for transparency and participation must be balanced against the risks of influence campaigns and confidentiality.

More knowledge is needed in this area, for example regarding:

- Development of effective methods for risk and crisis communication before and during the outbreak of war.
- Development of targeted risk and crisis communication for a heterogeneous population. How can authorities and other stakeholders communicate threats so that they are taken seriously over time, and increase resilience and will to defend among the public?
- The importance of public trust in risk and crisis communication. How can trust be built up, maintained and rebuilt to counter polarisation and safeguard freedom of expression? How do past crisis-communication efforts by authorities and other stakeholders affect co-operation and trust in the future?
- Knowledge of potentially conflicting objectives and trade-offs between openness and confidentiality in the risk and crisis communication of authorities and municipalities. How are transparency requirements managed with respect to confidentiality and increased security requirements?
- More knowledge regarding the impact of interactivity in social media. E.g., considering social media use for advocacy, impact on democratic rights, management of social media tone. Who are the users, how do they participate and how do they perceive and transmit the information?

1d. Security of supply preparedness: national and international supply chains

Security of supply preparedness entails the ability, during crisis or war, to provide the population with the goods and services necessary for survival, as well as ensuring the functionality of critical infrastructure. This includes the need to involve the private sector to a greater extent and to consider the national and international supply chains that affect Swedish security of supply preparedness.²⁵ Climate change reinforces the challenges of ensuring security of supply preparedness by creating new vulnerabilities nationally and new security risks globally. But climate change can also give rise to new opportunities, such as a longer growing season and conditions for growing crops not currently suitable for Swedish weather.

In order to strengthen security of supply preparedness, knowledge development is needed in the following areas, among others:

- Greater knowledge of the interdependencies and vulnerabilities of service- and product-based supply chains (digital/physical, national/international). What challenges and implications exist for maintaining critical sectors and preventing accidents, such as water and food supply, Seveso-III establishments²⁶, energy supply and information systems?
- Development of methods and modelling of supply analysis showing flows in different sectors, how key goods can be identified and secured, as well as how circular solutions can be used to increase recycling and reuse. What intersectoral domino effects and dependencies need to be addressed? Systems analysis of climate-related risks to security of supply preparedness and transnational interdependencies, with a focus on physical security and land use, water security and food security.
- Knowledge about the conditions and variations in supply issues between rural and urban areas and the role of self-sufficiency in security of supply preparedness. Which groups are particularly vulnerable/exposed, e.g., in terms of access to medicines and food, and how can such differences be levelled out?
- Knowledge about the development of economic defence, including financial support to ensure production and emergency stocks. What might the emergency stocks of the society of tomorrow include, and how can they be joined with modern logistics flows and markets?
- Understanding the contribution and role of the private sector in total defence. How can the public sector enable and incentivise companies to invest in preparedness and to be able to deliver in the event of a state of heightened alert or war? What legal frameworks and applications are needed?
- Knowledge about how the security of supply preparedness in the primary sector is impacted by a nuclear accident or detonation, including areas covered by chemical warfare agents.

²⁵Government Bill 2020/21:30 *Totalförsvaret 2021-2025*

²⁶ Seveso-III establishments include, for example, fuels, energy, pharmaceuticals, chemicals. This includes challenges related to ensuring the operation of Seveso-III establishments during grave crisis or war to prevent serious chemical accidents with severe consequences for people and the environment.

2. Prevention

2a. Fire safety and prevention in sustainable and digitalised societies

In the area of fire safety, further research is needed into residential fires, with a focus on strengthening preventive measures and developing the fire-protection needs of groups at particular risk (e.g., elderly, or disabled people). Fire-protection issues have clear links to the Sustainable Development Goals of the Agenda 2030, for example through the goals of developing safe housing and protecting cultural heritage, as well as related to effects from the societal transition and adaptation necessary to achieve environmental and climate goals.

Examples of knowledge needs:

- Development of effective methods for analysing the environmental impact of fires. Which types of firefighting operations have the least environmental impact? What is the environmental impact of fires involving hazardous substances?
- Greater knowledge about the socio-economic impact of fires. For example, the extent of property damage due to residential fires, direct and indirect costs of fires in public services, personal injury costs and quality-of-life impairments due to fires.
- Research into fire safety in cultural heritage sites and the conflicts that can arise in relation to the goal of preserving cultural heritage.
- Testing and development of materials and design methods to increase the resilience and fire resistance of buildings. The development of new and recycled building materials and the increasing use of timber construction place new demands on resistance to fire and collapse.
- Need for knowledge regarding the risks associated with flammable-goods management in the context of a warming climate.
- Knowledge regarding risks in the development of new energy carriers and energy storage methods. For example, the need for risk analyses of fire behaviour and guidelines for the installation and design of battery storage.

Digitalisation and technological developments are creating the potential for new, research-based technologies to improve fire safety through, e.g., the use of sensor technology and AI, "smart materials" in clothing and mattresses, and the Internet of Things. The use of artificial intelligence in this area is very limited, and there is great potential to develop automation technologies with the aim of predicting events, or sequences of events, and preventing accidents.

In the area of accident prevention, research is needed regarding both suicide and drowning prevention in the work of municipalities and emergency services, both in the development of physical impediments/measures and in competence and training programmes. This includes knowledge building and experience feedback in collaboration with various stakeholders by analysing incidents, evaluating interventions and the effects of measures.

2b. Response and rescue operations for prevention and civil preparedness

Today's first responders face numerous new challenges, risks and conditions in their work, which requires continued knowledge development. Research can aid the development of emergency-response capabilities as well as identifying ways to improve the physical and psychosocial working environment with the objective of minimising risk, contributing to a sustainable workforce and achieving gender equality and diversity goals.

More knowledge is needed in this area, for example regarding:

- Development of methods and technologies, risks and management of fires and accidents with new materials and energy carriers, development of protective equipment and equitable tools for emergency services personnel. What are the opportunities and limitations of digital technologies and AI in the implementation of rescue operations, more effective management and evaluation/learning?
- Organisation, staffing and management of the emergency services for civil protection. What is required for emergency services to fulfil their mission during wartime? This includes issues such as planning and determining the range of human resources and skills supplies, as well as the development of capabilities during a state of heightened alert. Prioritising and decision-making based on the needs of modern civil protection must be studied, as well as complementary studies, experiences and lessons from wars and other disasters.
- Greater knowledge regarding CBRNE detection, decontamination and clearance, focusing on the protection of first responders and the ability to decontaminate personnel and the environment. The ability of public authorities with emergency responsibility to coordinate in the event of a large-scale incident must be further developed. Knowledge is also needed regarding UXO (unexploded ordnance) management in the work and responsibilities of emergency services during a state of heightened alert.
- Research with a gender and diversity perspective into the working environment, staffing and community relations of emergency services. These include inclusion and exclusion processes, working conditions and career paths that affect the ability to recruit and retain staff.
- The significance and impact of interaction between professional, volunteer and semi-professional actors during emergency response and rescue operations, both on-site and in the development of civil preparedness.

2c. Climate change risks and consequences: natural disasters and extreme weather events

The research and development funded by MSB in the area of natural disasters will contribute to accident prevention and support the work of emergency services and crisis management.²⁷ Knowledge needs are identified in the following areas, among others:

- More knowledge regarding the effect of climate change on the occurrence of natural disasters and their impact on society.
- Understanding the effect of climate risks on infrastructure, critical infrastructure and business continuity management.
- Knowledge about the socio-economic costs of natural disasters and weather events, such as direct and indirect costs and damage data.
- Continued research in the area of forest fires, focusing on methods/models for fire risk and detection in a changing climate, tactics, extinguishing and rescue efforts in extreme fire events, such as forest fires that create their own weather systems and "mega fires" (intense vegetation fires) that are difficult to extinguish.
- Development of risk analyses and methods to address natural disasters and climate adaptation in cities and communities. What risks can be identified and what adaptation measures are needed?
- Increased knowledge about cascade effects and compounding disasters. Links between different types of risks and natural disasters in the context of climate change need to be studied, including in relation to particularly vulnerable groups in society, such as the elderly and children.
- Development of new risk-management methods and data. What opportunities and barriers can be identified in the use of GIS and AI to support vulnerability analysis, risk management and climate adaptation? Research can support the development of methodologies in municipal risk-management and climate adaptation work.

²⁷ MSB. *Samhällsskydd och beredskap i ett förändrat klimat – MSB:s handlingsplan för 2022–2026 (reviderad 2023)*, (MSB: 2022).

2d. Risks related to climate change mitigation and adaptation

The societal transition to meet sustainability and climate goals may entail unforeseen risks. Research can provide knowledge about how society can identify and manage such risks, as well as how the risks can affect the resilience of society, the environment, human health and civil protection and preparedness.

The electrification of society and the establishment of battery factories and hydrogen plants require knowledge of risk and safety aspects to prevent and address potential accidents.

Knowledge needs are identified in the following areas, among others:

- Knowledge about the overall risks of large battery systems, risks of damaged batteries and transport of obsolete batteries.
- Development of risk analyses for existing and emerging hydrogen technologies, such as different types of hydrogen storage²⁸ and transport.²⁹
- Risk communication related to different parts of the hydrogen community, including issues related to community planning and acceptance of hydrogen deployment.

Ongoing climate adaptations may present challenges and risks of maladaptation due to the protective measures taken. Is a climate-adapted society really resilient and robust? How might societal transition generate conflicting objectives, where security issues are set against environmental/climate objectives? Examples of knowledge needs include:

- Knowledge of sector-specific needs and maladaptation risks in areas such as agriculture, water and energy.
- Understanding which risks should be considered from an economic, social and ecological perspective, and how risk assessment and evaluation of climate adaptation measures should be carried out.
- Knowledge about how the energy system transition affects redundancy in the energy supply of critical infrastructure.
- Knowledge about potentially conflicting objectives and synergies between national/local interests in climate adaptation work, as well as links to social justice issues.

²⁸ Compressed hydrogen (GH₂), liquid hydrogen (LH₂), rock cavern/underground storage, hybrid storage.

²⁹ MEG containers, LH₂ containers, pipes, pipelines.

3. Secure digitalisation

3a. A resilient digitalised society

While technological developments and digitalisation have moved quickly, information and cyber security have not kept pace. This gap is widening, requiring increased knowledge and research in this area. Identified knowledge needs include, for example:

- Research that contributes to resilience to denial-of-service attacks (DDoS), through the use of experience feedback, based on known attacks, with stakeholders at societal level to prevent future failures. Possible focuses could be pure technological research or targeting different segments, such as 5G or broadband and general internet.
- Developing methodologies and guidelines for security auditing of code and software for dissemination and use in critical infrastructure.
- Knowledge about digital supply chains with a focus on critical infrastructure, as well as the development of cybersecurity logistics measures.
- Understanding the way that different societal actors obtain and act on the information and support provided by MSB's CERT-SE³⁰ in relation to other sources of information and support in their respective organisations. There is also a need to benchmark Sweden's national CERTs against equivalent functions in the EU.
- Knowledge about the security flaws of hard certificates stored in boxes, SIM cards or bank cards. What are the opportunities and risks of storage compared to soft certificates?
- Knowledge about best practices for systematic information-security management. In particular, in order for best practice should be put in a historical, forward-looking, and organisational context.
- Increased understanding of how information-security requirements can be addressed in an agile development process to ensure compliance with relevant regulations.
- Knowledge about the impact that systematic information-security work has on the information security of an organisation, in particular the impact of certifications (e.g., ISO 90000 or ISO 27000).

³⁰ CERT-SE is Sweden's national CSIRT (Computer Security Incident Response Team) tasked with supporting society in managing and preventing IT incidents. The team is operates within MSB.

3b. Secure and interference-free communication

Communication is essential to society's preparedness for and response during a state of heightened alert. Increased use of electronic equipment across all levels of societal actors' radio-based communications. Research can provide knowledge regarding risks and measures for interference-free communication in, e.g., the following areas:

- Knowledge about changes to the noise floor and methods for long-term measurement and monitoring of radiating equipment (solar cells, chargers, electric roads, etc.).
- Development of systems for detection and triangulation of antagonistically disruptive and destructive radio transmissions to enhance preparedness measures.

Digital communication also contributes to new challenges in the use of data streams and data storage, including the known risks of cloud computing. Open data has been called the new raw material of our age, and the Government is committed to making government data available, at the same time that such data may be sensitive³¹. Examples of knowledge needs:

- Knowledge about the security challenges related to open data and its use by public and private organisations, e.g., to strengthen service innovation.
- The importance and implications of digital sovereignty in data storage. In terms of availability and confidentiality, what are the risks of more geographically controlled data flows and storage methods?

³¹ Swedish Code of Statutes: 2022:818. *Lag om den offentliga sektorns tillgängliggörande av data.*

MSB research funding forms

Research is funded, managed and carried out in different ways. We refer to these different ways as forms of funding. In coming years, MSB intends to expand the portfolio of alternative funding forms.

Table 1 below shows the forms of funding and their characteristics. Each form of funding has several attributes that make it unique, such as how it is managed and monitored and the permissible costs. Depending on how MSB chooses to design the funding form for a particular investment, expected results and impacts can be adjusted. Overall, the "toolbox" shown in Table 1 creates a diverse collection of funding forms for MSB to deploy for knowledge development and other types of outcomes and impacts MSB seeks to bring about.

Table 1. Funding forms for period 2024– 2028

Funding form	Project duration (approx.)	Description/purpose	Results/impacts
Research Project	1–5 years	Researchers develop knowledge within a given theme.	Research of an identified area, challenge or need. Dissemination to implementers.
Postdoc	1.5–2 years	A career grant for recently graduated researchers to deepen their research and acquire qualifications and contacts.	Knowledge development requested by MSB. For new graduates.
Planning Grants	1–3 months	Time for researchers to prepare applications for research projects.	Applications for, and strengthened Swedish participation in all international research programmes in particular.
Research Environment	+/- 4+4 years	Create added value through collaborations in a research group larger than a regular project.	Deeper and broader knowledge development. Permanent knowledge node.
Graduate School	5–10 years	To mobilise for more PhDs and knowledge development in a specific subject/societal challenge.	Broader and deeper knowledge, often on a specific theme. Competence boost for private and public sector organisations.
Mobility Grant	6–12 months	Enables personnel mobility and knowledge exchange between different activities/ organisations.	Developed relationships, different organisation benefits, insights into common challenges and opportunities.
Research & Societal Benefit	1–2 years	Targeting MSB-funded projects for utilisation.	Research-based knowledge is utilised through, for example, the development of training courses, manuals, etc.
Research/ Knowledge Reviews	–	Review, "state-of-the-art" description of a particular area of knowledge. Shows the knowledge frontier and gaps.	Improved precision in research planning and strengthened expertise in MSB's various activities.

Funding form	Project duration	Description/purpose	Results/impacts
Programme Collaborations	–	To support activities that in turn support research relevant to the MSB at national or international level.	Established stakeholder acting in MSB's interests, and a long-term approach to a particular issue/area.
Ongoing Evaluation	6 months–2 years	Association with researchers/research, monitor and research events/issues in the field of civil protection and preparedness.	Research-based knowledge about an event in MSB's activities or area of responsibility.
Research Project	1–5 years	Researchers develop knowledge within a given theme.	Research of an identified area, challenge or need. Dissemination to implementers.

During an acute societal disruption, when there is reason to initiate research to investigate the ongoing disruption, deviations from the regular work process may be needed, and MSB can initiate research projects that are variants of funding forms. For example, MSB initiated short-term research projects in response to the COVID-19 pandemic and the war in Ukraine to enable society to learn lessons ground in the scientific process. Research is long-term, but, in the case of societal disruptions, there can be great value in collecting empirical data during a crisis. Below is a more detailed description of the funding forms from Table 1.

Research Project

When MSB seeks specialised knowledge development within a specific theme that responds to a societal challenge and knowledge need, individual Research Projects are a suitable form of funding. The research is carried out by a single researcher or several researchers in collaboration.

Project duration can be between 1 and 5 years, with shorter projects more suitable for more applied projects and longer projects for more specialised knowledge development. During longer projects, a doctoral student may be employed. Research Projects involve a project monitor from MSB and an external reference group. The reference group must consist of researchers, MSB project monitors and potential users of the project results. The main purpose of the reference group is to contribute knowledge and perspectives from each group member's area of expertise as well as helping ensure that the project's results reach the target audiences. The group's role is advisory.

Postdoc

For recently graduated researchers seeking to specialise in their research, create new contacts and develop new knowledge requested by MSB, MSB offers the Postdoc career grant. The aim is to give junior researchers the opportunity to establish themselves as independent researchers in Sweden. The grant also promotes research in MSB's area of civil protection and preparedness. The grant consists mainly of a wage grant for 1.5-2 years. A project monitor from MSB is attached to the research project to provide support and capitalise on the knowledge developed.

Planning Grants

MSB wants to encourage the research community in Sweden to actively participate in international research collaborations such as Horizon Europe, within NATO and research projects within the framework of Sweden's bilateral research agreements with the US and Canada, agreements for which MSB is the Swedish representative. A Planning Grant is a small investment for forming a project consortium and writing an application. The focus of the project under planning must be clearly within the area of civil protection and preparedness. The project proposal must be directly linked to a call under, e.g., Horizon Europe, Cluster 3: Civil Security for Society or a bilateral agreement as mentioned above.

Research Environment

A Research Environment creates the conditions for added value from collaborations in a larger grouping than individual Research Projects permit. A Research Environment aims to build up knowledge, often multidisciplinary, in an area of particular interest to MSB. Research Environments are guided by operational and communication plans, which are approved annually by a steering group. A reference group consists of researchers and potential users of the project results. The Research Environment has a director who is responsible for day-to-day operations.

A Research Environment can be constructed in many different ways in terms of its funding, duration, dissemination of knowledge, etc., depending on the need for knowledge and what is generally requested. Long-term Research Environments are evaluated over their lifetime. If the evaluation is positive and there is a continued need for knowledge, the Research Environment can be extended. The evaluation must be made in relation to the targets set in the agreement and operational plans.

Graduate School

According to the Swedish Higher Education Authority, the factors that generally characterise a graduate school are a clear organisation for doctoral education, enhanced supervision, collaboration between subjects and/or higher education institutions on courses and seminars, multidisciplinary and networks. A Graduate School is established to strengthen doctoral education in a particular subject. A Graduate School focuses on third-cycle education, and one intended effect is doctoral graduates who remain in academia or find a foothold in the public or private sector.

Depending on the focus and structure of a Graduate School, it can be run by a single higher education institution, several higher education institutions in collaboration or in collaboration with other public and private organisations. The latter option is preferable for Graduate Schools with externally employed doctoral students. A Graduate School is a relatively large financial commitment, and co-financing may be required.

Mobility Grant

This form of funding aims to increase researcher mobility. The support is given to individual researchers to create interfaces among higher education institutions and/or authorities, creating opportunities for research and utilisation.

Support is normally provided for 6-12 months for researchers to work at another higher education institution or government agency on issues relevant to MSB's area of activity. The support may also aim at transatlantic mobility in civil protection and preparedness research within the framework of Sweden's research agreement with the United States, administered by MSB and the US Department of Homeland Security (DHS).

Research & Societal Benefit

This form of funding is intended for MSB-funded research projects, in order to demonstrate, test and further develop research results. The aim is to contribute to utilisation of the results of research funded by MSB. The projects address societal challenges in MSB's areas of activity.

The expected outcome is the further development of research results, for example through the development of training modules, method books or models for exercises or other activities. This form of funding contributes to the desired effect of ensuring that increasing numbers of people benefit from research.

Research & Knowledge Reviews

Research & Knowledge Reviews are aimed at academic institutions/researchers, civil protection and preparedness practitioners and the interested public. The results are overviews of research and knowledge in identified and commissioned areas. These overviews show research tracks, trends, less-explored areas, or indicate research areas from MSB's perspective, etc., as needed.

The aim is to develop a basis for MSB's Research Agenda and planned calls for proposals to make research planning more precise, as well as being able to support the competence development, planning and development of preparedness agencies and other organisations.

Programme Collaborations

MSB cooperates with organisations for knowledge development in MSB's areas of activity. MSB refers to these collaborative projects as Programme Collaborations. It is a way for the Agency to achieve broader societal collaboration in MSB's issues.

Ongoing Evaluation

Ongoing Evaluation is a research-based ongoing analysis or interpretation of a project or process within an organisation, company or government agency. Ongoing Evaluation can report back after the study has been completed or provide continuous feedback to the organisation. The object of study should be an event or occurrence in the field of civil protection and preparedness.

Ongoing Evaluation can aim both at developing new research-based knowledge, what we usually mean by research, and at conducting an ongoing and instructive evaluation.

Process for prioritising research initiatives

MSB initiates research in accordance with the current Research Agenda and based on current research areas.

Initiation of research

MSB funds and monitors research according to established standards in the field. Firstly, research initiatives are put up for competition. This means that applicants compete for research funding, and that MSB chooses to fund the applications that best meet the set criteria. Competitive funding is based on the assumption that it results in better research and contributes to equal treatment. The assessment of applications is based on two dimensions:

- **Relevance and need:** an assessment of the application's relevance in relation to the call for proposals as well as the societal need for the research proposed in the application. This part is primarily assessed by experts at MSB.
- **Scientific quality:** an assessment of scientific quality, carried out by external scientific experts in the area of the application.

Most funding forms use the above two dimensions to assess and rank applications.

MSB can also choose to fund research directly, i.e., without an open call or competition. This procedure is used when MSB sees a need to build the research capacity of a single actor, to test a new type of funding form, due to urgency or security concerns, or for some other reason. However, whether the research initiative should be opened to competition is always examined first.

MSB is continuously working to concretise the knowledge needs of the Research Agenda and is happy to receive suggestions regarding how these knowledge needs can be further specified and translated into suitable research initiatives. MSB does not initiate research directly upon request, but proposals received are added as a basis for the prioritisation of research initiatives.

International research collaborations

Research needs in civil protection and preparedness that are identified by MSB from a national perspective may also be of relevance to other countries and create opportunities for international research collaboration. MSB is involved in several established international research collaborations.

Sweden and the United States has an Agreement on Cooperation in Science and Technology for Homeland Security Matters. The agreement is managed by MSB and the Directorate for Science and Technology (S&T) of the Department of Homeland Security (DHS).

Collaboration is based on problem areas of shared interest. In terms of prioritization, the Knowledge needs presented in MSB's Research Agenda constitute an important basis for Swedish potential projects. Similarly, research needs to be aligned with interests on the US side.

MSB has also been assigned by the Government to serve as expert in Horizon Europe Cluster 3: Civil Security for Society and as a national contact point. These roles allow MSB to influence the direction of priorities within Cluster 3. MSB also supports Swedish researchers in finding and applying for funding from Horizon Europe.

Prioritisation and decisions

The research areas of this Research Agenda guide prioritisation and decision-making with regard to future research activities. The prioritisation process matches research needs with relevant funding forms to assess the objectives and impact of potential initiatives. This may involve, for example, contributing specialised knowledge in a designated area, strengthening academia in a particular science, developing Sweden's international relations in an academic field, etc.

Which proposed research initiatives receive prioritisation each year depends, among other things, on current societal priorities, national and international political strategies and objectives, strengthening the competence of the crisis and preparedness system and other criteria.

The prioritisation and selection of research initiatives is done on an annual basis. The annual plan for research initiatives is published at www.msb.se/forskning.

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