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Climate Change Adaptation Plan of the Finnish Defence Administration

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Abstract

Despite climate change mitigation measures, however effective, the climate is changing and an ability to adapt is essential. Climate change will also have significant direct and indirect impacts on the defence administration. In addition to changing weather and climatic conditions, these impacts include the consequences of climate change mitigation, such as efforts to reduce emissions, a transition from fossil fuels to renewables, and spillover effects on the security environment. They will inevitably also have economic impacts. The Ministry of Defence's administrative branch also needs to manage climate risks and adapt operations to climate change in order to maintain the preconditions and capabilities for military defence in the future.

This Climate Change Adaptation Plan of the Finnish Defence Administration complements the National Climate Change Adaptation Plan and fulfils the defence administration's national and international commitments. The plan contains the goals for climate change adaptation in the defence administration and discusses identified needs for measures. While the target year for the proposed measures is 2030, the long-term aim in keeping with EU policy is at year 2050.

The goals of climate change adaptation in the Defence Administration are:

Climate-resilient and energy smart defence.

- **The defence administration is aware of the impacts affecting national defence capabilities, training, exercises and planning brought about by climate change and the energy transition.**
- **The defence administration understands the security impacts of climate change, both in the national and the international context, and recognises and is able to anticipate its role in the face of these impacts.**
- **The defence administration has the ability to manage known climate risks and actively identify and assess new risks.**
- **The defence administration is able to take advantage of the positive effects of climate change.**

A rough model was developed to assess the significance of exposure to climate change phenomena, vulnerabilities and risks. The assessment found that the phenomena brought about by a changing climate have large-scale and multidimensional impacts on the operations. The effects of increased precipitation, changing winter conditions, dramatic fluctuations in weather conditions, changes affecting the Baltic Sea and indirect health impacts emerged as key factors.

This plan contributes to responding to the goals as such. In addition, a need for several one-off or continuous measures in the following categories was identified:

1. Addressing climate change and its consequences in all activities and planning.
2. Adapting the operating environment to a changing climate.
3. Adapting to the energy transition and preparing for energy shortages.
4. Managing health risks.

The parties responsible for the detailed planning and implementation of the measures are the Defence Forces, the Ministry of Defence, the secretariat of the Security Committee or Defence Properties Finland.

Terms and definitions

Climate change

The climate changes over time due to both natural and anthropogenic factors. In most cases, climate change refers particularly to global warming caused by human activity.
Read more: https://www.climateguide.fi/what-is-climate-change/

Climate change mitigation

Climate change mitigation means curbing global warming and alleviating its effects. The most important way to curb global warming is reducing greenhouse gas emissions and building up carbon sinks and stores, an example of which is increasing tree growth in forests and the forested surface area. The consequences of climate change can be mitigated through preparedness and adaptation measures.
Read more: https://www.climateguide.fi/mitigation-of-climate-change/

Under the Climate Act, climate change mitigation means preventing the generation of anthropogenic greenhouse gas emissions and their entry to the atmosphere and other actions to mitigate or eliminate the impacts of climate change. (Climate Act 423/2022)

Climate change impact

Climate change impacts refer to phenomena caused by climate change and, among other things, changes in weather conditions, living environments and society. These impacts can be direct, including higher average temperatures and precipitation, as well as such extreme weather phenomena as wind and rain storms and heat waves. Indirect impacts may include forest fires caused by drought or frost heave resulting from uneven freezing of the soil. Indirect impacts may also form a multidimensional network of causal relationships. Crossborder effects refer to the consequences of fluctuations or changes in the climate manifested in Finland but actually caused by factors outside Finland's borders.
Read more: https://www.climateguide.fi/impacts-of-climate-change/

Climate risk

According to the Intergovernmental Panel on Climate Change (IPCC), a climate risk results from the interaction of hazard, exposure and vulnerability.

Climate change adaptation and preparedness

The aim of adaptation is to prevent or mitigate the negative impacts of fluctuations and changes affecting the climate and to benefit from their positive consequences. Adaptation may involve reacting to situations or anticipating them.

Under the Climate Act (423/2022), adaptation means measures taken to prepare for and adapt to climate change and its impacts, and measures that can be used to benefit from the impacts associated with climate change.

Preparedness means being prepared for possible unforeseen accidents, incidents, emergency conditions and crisis situations. Adaptation can be understood to include preparedness and other types of adaptation, such as modifying operations or structural solutions that anticipate future changes.

In this Adaptation Plan, the term adaptation refers to all measures aimed at managing and reducing the risks arising from the impacts of climate change, including raising awareness, monitoring, improving climate resilience, adapting to changes taking place in society as a result of climate change, preparing for incidents and emergencies and adapting the operations.

Climate resilience

According to the rationale (HE27/2022) of the Climate Act (423/2022), climate resilience refers to a conscious and proactive ability to operate flexibly in the face of changes in and incidents resulting from climate and weather, to recover from them, and to develop activities and preparedness after them. What links climate resilience to climate risk management is addressing climate risks when planning measures and solutions and making efforts to prevent and mitigate them. Climate resilience also includes reducing the vulnerability of sectors, people and nature and improving their adaptability.

Energy transition

FIn order to mitigate climate change and reduce greenhouse gases, society is globally transitioning from fossil fuels to renewables. This transition must take place rapidly in order to achieve adequate reductions in emissions, which is why it is also known as the energy transformation. The geopolitical security situation also increases the pressure to phase out dependence on fossil fuels.

Energy resilience

Energy resilience refers to reliable energy supply in all situations and circumstances. The concept covers acute situations, such as power cuts and emergency conditions, as well as the energy transition of society. In general, the term resilience means resilience to crisis, flexibility and recovery after incidents.

Climate security

Climate security refers to the impact of climate change on security, including such direct safety impacts as storms with their consequences (e.g. power outages) and spillover effects of deteriorating conditions and tensions between states in other parts of the world. Transitional effects (such as the energy transition) may also have an impact on security. These impacts are often linked and affect each other through complex causal relationships. Climate change tends to intensify military security threats. Consequently, climate change can cause or exacerbate security risks.

Transition risk

Transition risks refer to the security impacts of climate change mitigation measures and climate policy. For example, transition risks may relate to securing the raw materials required for the energy transition; geopolitical changes resulting from phasing out fossil production; use of energy policy as an instrument of power; exacerbating social confrontations within the state; and experiences of inequality resulting from climate policy. When introduced rapidly, more stringent mitigation policy may affect logistic systems and the operating conditions of national defence (Ministry of the Interior 2023).

Green transition

Green transition refers to a transition towards an ecologically sustainable economy and growth that is not based on overconsumption of natural resources and fossil fuels. Sustainable economy relies on low-carbon solutions that promote the circular economy and biodiversity. https://ym.fi/en/what-is-the-green-transition

1

Introduction

1.1 Basic premises

The key to reducing the risks posed by climate change is trying to mitigate the change by reducing greenhouse gas emissions. Climate change mitigation will become more challenging and the targets will be more ambitious if previous targets have not been met. However, climate change cannot be completely halted even with the best possible mitigation actions, and it will inevitably have consequences for the environment and society. The average temperature in Finland is believed to rise by about two to six degrees by the end of the century, depending on the global trend in the volume of greenhouse gas emissions (Government 2022b). Both nature and society's functions will be subjected to exceptionally rapid changes as the climate warms, and adaptation to the impacts of climate change will be necessary in all scenarios. In addition to mitigation measures, an efficient and effective climate strategy should include a versatile range of methods for identifying climate risks and adapting operations to the impacts of climate change, also in the administrative branch of the Ministry of Defence, ensuring that the preconditions and capabilities for military defence will be maintained in the future.

A report on climate change and its interfaces with the defence administration was prepared in 2008 (Ministry of Defence 2008), and the needs for climate change adaptation were examined in a thesis in 2014 (Heikkilä 2014). Since then, the defence administration has continued to review this theme in the Defence Forces' Energy and Climate Programmes, which have been updated every four years (in 2014, 2018 and 2022). The focus of the defence administration's energy and climate work has been on reducing greenhouse gas emissions and improving energy resilience. In addition, a need to address and investigate certain factors related to the impacts of climate change has been identified, for example in a project of the Government's analysis, assessment and research activities titled Climate change and Finland's security (Hakala E, et al. 2021). Actual adaptation plans have not been produced previously. The Defence Forces are able to and must adapt reactively to varying weather conditions as part of normal operations and the cycle of operational planning over time. Climate change has been identified in strategic planning as a factor with multidimensional effects. Management of the changes caused by climate change also needs to be systematically introduced into the defence administration's anticipation and strategic planning process over the long term. Especially when we talk about the multidimensional and cascading impacts or transitional effects of climate change, including the energy transition taking place as a consequence of the mitigation actions or spillover effects of the global and geopolitical impacts on the security situation, it is necessary to extend the time span from one year or a four-year period further into the future.

This Climate Change Adaptation Plan of the Finnish Defence Administration (PILMUS) was prepared by the Ministry of Defence in 2022–2023. The plan contains the defence administration's climate change adaptation goals and discusses the measures related to the goals identified as necessary. The plan complements the defence administration's long-term energy and climate work and promotes more concrete climate risk management. While this report presents policy outlines extending till 2030, the long-term targets of the EU's climate change adaptation strategy are set for 2050. It should be noted, however, that climate change, climate change adaptation and plan updates will also continue after this.

1.2 PILMUS project

The PILMUS project was completed by the Ministry of Defence in 2022–2023. Senior Specialist Terhi Svanström was recruited to carry out this task. The steering group members were Sara Kajander, Sami Heikkilä and Terhi Ylitalo from the Ministry of Defence and Teemu Pasanen from the Defence Forces.

The following objectives were set for the project:

- The climate risks affecting the operations of the Defence Forces and the positive impacts of climate change will have been identified.
- Climate risks and the adaptation needs ensuing from them will have been assessed.
- An action plan will have been prepared at a general level to underpin further planning.

An essential role in the project was played by a workshop held on 29 September 2022 and the discussions that complemented it, in which a wide range of observations, views and information was put forward by experts from the Ministry of Defence, the Defence Forces, Defence Properties Finland and Metsähallitus. The participants included experts in infrastructure, land use, logistics and equipment, environmental protection, occupational and service safety, medical service, operational and resource planning, as well as operations, training and exercises. This information made it possible to update existing knowledge of the impact of climate change on the defence administration, the current state of adaptation measures and future adaptation needs.

During the consultation round, statements on the draft plan were received from the Defence Command, Senate Properties and Defence Properties Finland, the Ministry of Agriculture and Forestry and the Ministry of Defence's National Defence Unit and Research Unit. The plan was approved on presentation by Esa Pulkkinen, Permanent Secretary of the Ministry of Defence, on 9 March 2023.

An update of the National Climate Change Adaptation Plan (Government 2022b) was prepared in parallel with the PILMUS project. The defence administration participated in the update and tapped the information obtained in the course of this project for the work on the defence administration's plan.

2

Regulatory background and cooperation

2.1 EU

European Green Deal
The European Green Deal is a package of policy initiatives aimed at guiding the EU towards a green transition, making it possible to achieve climate neutrality by 2050. The package includes the Fit for 55 package, which contains the necessary proposals for revising and updating EU legislation, enabling the EU to achieve the milestone of 55% emissions reduction by 2030.

European Climate Law
To implement the European Climate Law (Regulation (EU) 2021/1119), the Member States must adopt comprehensive national climate change adaptation plans. The Member States must adopt and implement national adaptation strategies and plans which take into account the EU Strategy on Adaptation to Climate Change.

EU Strategy on Adaptation to Climate Change
The EU Strategy on Adaptation to Climate Change (COM(2021) 82 final) aims to support Member States in developing national adaptation plans and solutions and systematically increasing climate-proofing. The long-term vision of the Strategy is that in 2050, the EU will be a climate-resilient society, fully adapted to the unavoidable impacts of climate change.

Key objectives include improving knowledge and managing uncertainty, supporting policy development at all levels and sectors, speeding up adaptation across the board and stepping up international action for climate resilience. It is not binding on the Member States. The EU Strategy on Adaptation to Climate Change stresses that adaptation is not solely a cost but an investment in a climate-resilient society. Among other things, the Strategy highlights investments in climate-proofing the infrastructure, and especially critical infrastructure, such as electricity supply networks.

Climate Change and Defence Roadmap
The roadmap presents concrete ways of boosting awareness of the impacts of climate change on crisis management, security and defence, developing military capabilities for responding to changing circumstances, and building strong international cooperation to address the challenges.

A Strategic Compass for Security and Defence

The EU Strategic Compass for Security and Defence notes that climate change will also impact our security landscape over the next decades and is a proven driver for instability and conflict around the globe.

The goal is that, by the end of 2023, Member States will develop national strategies to prepare the armed forces for climate change. By 2025, all CSDP missions and operations will have an environmental advisor and report on their environmental footprint.

2.2 Finland

Climate Act

The new Climate Act (423/2022) entered into force on 1 July 2022. Under section 10 of the Climate Act, the Government shall adopt a National Climate Change Adaptation Plan that promotes climate risk management and climate change resilience at least every second parliamentary term. The adaptation plan must include an up-to-date assessment of risks and vulnerabilities, assessment of the adaptation in individual administrative branches, and measures to achieve the adaptation targets and estimate of their effectiveness.

National Climate and Energy Strategy

The Government adopted an updated National Climate and Energy Strategy on 30 June 2022. The strategy is a comprehensive action plan for ensuring that Finland will be carbon neutral by 2035 and carbon negative soon after that as set out Prime Minister Marin's Government Programme. According to the Climate and Energy Strategy, risk management and adaptation related to the impacts and consequences of climate change are a key part of climate policy as a whole. To achieve a climate-resilient society, we must reduce emissions and prepare for the increasing impacts of the ongoing climate change.

National Climate Change Adaptation Plan

Finland's National Strategy for Adaptation to Climate Change was drawn up in 2005 (Ministry of Agriculture and Forestry 2005). The first National Climate Change Adaptation Plan was prepared in 2014 (Ministry of Agriculture and Forestry 2014). It was updated in 2022 as a Government report (Government 2022b). The aim of national adaptation planning is to strengthen systematic adaptation, in which the actors' responsibilities and roles are as clear as possible.

The vision of the National Climate Change Adaptation Plan for 2030 is to ensure long-term wellbeing and safety in a changing climate. The vision sets three more specific objectives, and more concrete goals and measures to be implemented by different parties have been defined to achieve these objectives. Drawing up action plans for specific administrative branches is one of its measures, to which the defence administration's Climate Change Adaptation Plan responds for its part.

> **Objective 1:** Actors in society have a strong willingness to adapt to climate change.
>
> **Objective 2:** Actors in society have effective means at their disposal to assess, prevent and manage the risks related to climate change affecting both nature and society.
>
> **Objective 3:** Actors in society have the ability to prevent, prepare for and manage climate change risks affecting both nature and society.

2.3 Adaptation planning of the defence administration's stakeholders

The defence administration has a number of partners and stakeholders who prepare for the changing climate and adapt to climate change to varying degrees. In this context, the most important stakeholders are Defence Properties Finland and Metsähallitus as owners of property and land.

Defence Properties Finland
In line with the Government's Premises Strategy, Senate Properties launched its climate change adaptation plan in 2022. The plan also covers the properties used by the defence administration and owned by Defence Properties Finland. As part of this plan, a flood risk map covering the entire property portfolio will be prepared.

Metsähallitus
Metsähallitus' Climate Programme includes measures aiming for climate change mitigation and adaptation. As climate change adaptation measures, the increasing risk of forest fires and wind damage will be taken into account in forest management. The negative impacts on biodiversity of climate change and emissions that drive eutrophication will be reduced by means of active ecological management. (Metsähallitus 2020)

2.4 Nato

NATO's Strategic Concept identifies climate change as a defining challenge of our time and a threat multiplier with a profound impact on Allied security. Climate change also affects the way NATO's armed forces operate. More frequent extreme weather events increase the vulnerability of infrastructure and equipment and put the forces under added stress. Various natural threats will multiply, and NATO will build up its capabilities for assistance missions related to them.

NATO aims to contribute to combating climate change by reducing greenhouse gas emissions, improving energy efficiency, investing in the transition to clean energy sources and leveraging green technologies, while ensuring military effectiveness. At the first High-Level Dialogue on Climate Change and Security held in connection with the Madrid Summit, Secretary General Stoltenberg announced NATO's ambition of cutting greenhouse gas emissions by 45% by 2030, down to net zero by 2050. However, this was not recorded in the Strategic Concept (NATO 2022) or in the Action Plan on Climate Change and Security. These goals are in line with the Finnish defence administration's objectives and planned measures.

The NATO Action Plan on Climate Change and Security was adopted in 2021, and the Climate Change and Security Impact Assessment was published in 2022. Producing this assessment was one of the actions listed in the Action Plan. A cooperation project known as Climate Change: Mitigation and Impact on NATO Platforms, which Finland will participate in, is about to be launched under the umbrella of NATO's Science and Technology Organization (STO).

The establishment of NATO Climate Change and Security Center of Excellence (CCASCOE) in Montreal, Canada has been prepared since 2022. Through the Center of Excellence, which is set to start operating in autumn 2023, both military actors and civilians will develop, enhance and share information on the security impacts of climate change.

NATO 2022 Strategic Concept

The principles of NATO's Strategic Concept published in 2022 include cross-cutting integration of climate change into all missions. The Concept recognises the fact that climate change will further complicate security, demographic, economic and political challenges. NATO will further develop the Alliance's ability to prepare for the effects of climate change and reinforce its cooperation with the European Union.

The concept also highlights the fact that NATO should become the leading international organisation when it comes to understanding and adapting to the impact of climate change on security. The Alliance will lead efforts to assess the impact of climate change on defence and security and address those challenges. NATO will also contribute to combating climate change by reducing greenhouse gas emissions, improving energy efficiency, investing in the transition to clean energy sources and leveraging green technologies, while ensuring military effectiveness and a credible deterrence and defence posture.

Climate Change and Security Action Plan 2021

NATO recognises that it has a role to play in a comprehensive response to climate change, in addition to which it has to take into account the impact of climate change on security to successfully fulfil its three core tasks of collective defence, crisis management, and cooperative security.

NATO's objective is to increase awareness of the impact of climate change on security, along with developing clear adaptation and mitigation measures, while ensuring a credible deterrence and defence posture and taking cost effectiveness into account.

The specific goals of the Action Plan are:

- Increasing Allied awareness by conducting an annual Climate Change and Security Impact Assessment (CCSIA).
- Adapting to climate change. NATO will incorporate climate change considerations into all aspects of its work, including its procurement practices and its partnership with industry.
- Contributing to the mitigation of climate change. The Alliance will develop a NATO mapping and analytical methodology of greenhouse gas emissions from military activities and installations. Furthermore, data on energy demand and consumption could inform Allies' investment decisions and operational planning.
- Enhancing outreach by strengthening exchanges with organizations that are active on climate change and security issues, and increasing dialogue with academia and industry.

Climate Change & Security Impact Assessment 2022

The Assessment found that climate change affects all regions assessed: Europe, North America, Middle East and North Africa. The consequences may be direct or indirect, including degradation of water supplies, reduced agricultural productivity or disruptions to supply chains. Competition over increasingly scarce resources is likely to exacerbate state fragility, fuel conflicts, and prompt migration, thus creating conditions which could be easily exploited by non-state armed groups. The wider impacts of climate change can also make peace and stability harder to sustain, particularly in countries with a narrow natural resource base.

At the strategic level, military effectiveness in carrying out NATO's core tasks remains primary in NATO's adaptation to the impact of climate change on security, and efforts to address greenhouse gas emissions. It should also be noted that the new security situation requires increased activity, which will increase fuel consumption and GHG emissions. On the other hand, the decisions taken to acquire new equipment offer an opportunity to build energy efficiency into capability design, reducing fuel and logistical requirements in future. Transition to "clean" technologies should take into account the importance of not creating new strategic dependencies relating to materials and similar. Interoperability should also be a priority as Allies adopt new technologies and alternative

energy. It should be noted that NATO's adaptation measures can have benefits also in the civilian sector. A strong demand signal from the military establishments that they are moving towards new and cleaner technologies and energy sources can stimulate industry to create the necessary solutions and materials.

Climate change causes disruptions to operations on land, at sea and in the air, with repercussions for training schedules. Climate change may also affect mission profiles as armed forces are increasingly being called on to perform humanitarian aid and disaster relief operations. This shift will require adaptations in training as well as specific capacities for these new roles. This will tie up more resources and needs to be factored into deterrence and defence considerations.

The strategy also notes that NATO depends on civilian society, which is why it is imperative for NATO and Allies to continue strengthening national and international resilience.

2.5 United Nations

Many United Nations organisations respond to the challenges of climate change and are active in its different areas.

The UN Environment Programme (UNEP) is the UN system's highest authority in environmental matters at both regional and global level. UNEP's mandate is to coordinate the development of environmental policy consensus by keeping the global environment under review and bringing emerging issues to the attention of governments and the international community for action.

Other UN organisations relevant to climate change include the World Meteorological Organisation (WMO), the UN Development Programme (UNDP) and the World Health Organisation (WHO). In addition, the Intergovernmental Panel on Climate Change (IPCC) was established by WMO and UNEP. IPCC is a scientific organisation that provides decision-makers and other parties interested in climate change with an objective source of information.

The United Nations Manual on Policies and Procedures concerning the Reimbursement and Control of Contingent-Owned Equipment of Troop/Police Contributors Participating in Peacekeeping Missions (COE Manual) is reviewed every three years, next in 2023. The policies take into account different environmental and climate conditions. They are complemented by the Environmental Policy of United Nations Field Missions.

3

Climate change in Finland

3.1 Analysis of impacts and risks

Different sources use different ways of structuring the impacts and risks of climate change. The most common structure is a division into direct and indirect climate impacts. Direct impacts include higher average temperatures and precipitation as well as such extreme weather events as wind and rain storms and heat waves. Indirect impacts may include a higher risk of forest fires caused by drought, or frost heave resulting from uneven freezing of the soil.

Impacts arising from climate policy measures and climate change mitigation, such as a transition from fossil fuels to renewable energy, can be regarded as transitional effects of climate change. (Erkamo et al. 2021; Ministry of the Interior 2023)

As they accumulate and concatenate, climate risks build up into chains that affect the economy, health and safety through different mechanisms. For example, drought or major floods can jeopardise food production and housing in a vulnerable area, consequently increasing fluctuations in global market prices and causing population movements, which can heighten tensions between and within states and exacerbate security risks. Impacts occurring outside a country's national borders are commonly referred to as crossborder effects, but they are similar in nature to indirect risks and typically affect industrial production chains but also health (pandemics) and security. The realisation of multiple risks often causes recurring and concatenated risks with unknown interactions. (Hildén et al. 2016; Berninger et al. 2021; Hakala et al. 2021)

See Figure 1 for a simplified model of the emergence, cascading and crossborder effects of climate change impacts. Phenomena occurring abroad may manifest themselves as impacts and risks in Finland. Transitional effects are impacts caused by climate change mitigation (such as the energy transition). In reality, the causal links can be much more complex.

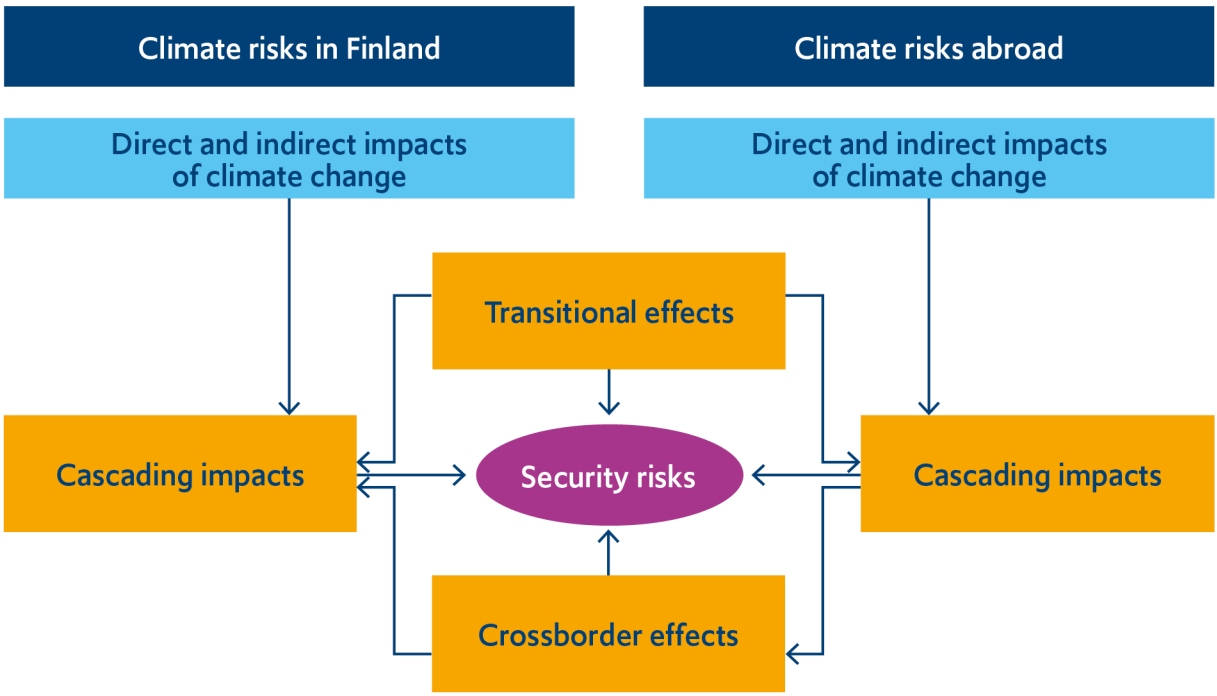


Figure 1. Climate change causes direct and indirect impacts, transitional effects and cross-border effects, which also result in security risks.

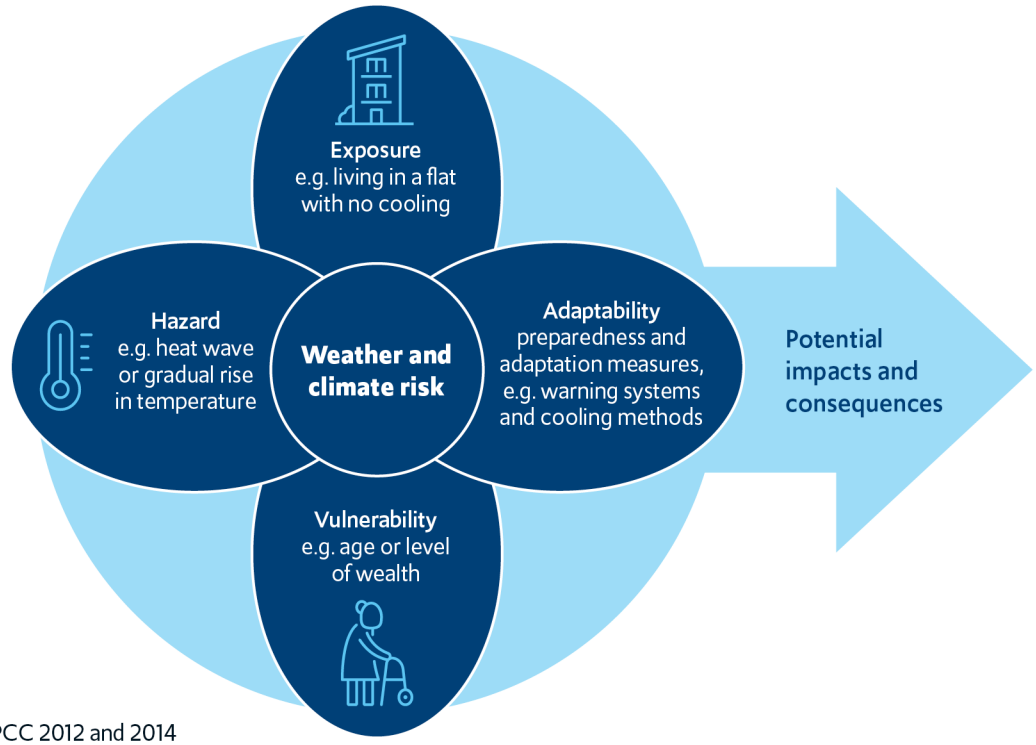
According to the National Climate Change Adaptation Plan and an adaptation of an IPCC definition, a climate risk is the sum of a hazard, exposure and vulnerability combined with adaptability (Government 2022b). The significance of a climate risk depends on to what extent an object or function is exposed to an impact of climate change and how vulnerable it is to the hazard in question (Figure 2). Exposure to a risk factor of climate change means an actor, function or operating environment that is either physically located within an impacted area (e.g. a flood risk area) or otherwise affected by a changing climate. Consequently, exposed objects may include a built environment with buildings, transport, telecommunications and energy infrastructure, nature and biodiversity, human health and safety, the economy, industry and logistics.

The hazards, exposure and vulnerability, and consequently also the magnitude of the risk, vary and change over time. This makes it possible to examine the realisation of weather and climate risks at the level of individuals, companies and society as a whole and from the perspective of the environment.

See Chapter 4.3 for an assessment of the defence administration's climate risks.

When a climate risk is realised, its consequences may be economic, social, health-related, political or military. Climate risks can be managed by identifying and monitoring them and, where necessary, reducing exposure (e.g. moving the object) or alleviating vulnerability (financial support and bolstering structures) to variable degrees.

Climate risks may emerge quickly, develop slowly, or be a combination of both. This stresses the multidimensional and long-term nature of risk management.



IPCC 2012 and 2014

Figure 2. Emergence of weather and climate risks (Government 2022)

3.2 How will the climate in Finland change?

The average temperature in Finland has already risen: in the most recent thirty-year period, or the statistical reference period 1991–2020, it was 0.6 degrees higher than the average temperature in the period 1981–2010. When compared to the period 1961–1990, the average temperature in Finland has already risen by about 1.3 degrees, and compared to the mid-19th century, it has risen by more than 2 degrees C. This is approx. twice as much as the average increase in global temperatures. (Government 2022)

Above all, climate change has affected winter conditions in Finland. The shortening of winters has led to reduced snow cover in the south. The period of permanent snow cover, which is the longest continuous period of snow cover in winter, has decreased in the southern and central parts of Finland by more than one month in 1991–2020 compared to 1961–1990. (Government 2022)

According to all scenarios of the Intergovernmental Panel on Climate Change (IPCC) report, it is likely that the milestone of 1.5 °C is likely to be exceeded in global warming by the early 2030s at the latest. The worst-case scenario is that the climate will subsequently warm approximately by another 3.5 degrees (+5 degrees C compared to the pre-industrial period) by the end of the century or, with effective mitigation measures, start decreasing and return to below 1.5 degrees towards the end of the century.

In all scenarios, Finland's climate will grow warmer and precipitation will increase. The temperature is rising more and faster than the global average in Finland. Precipitation is also expected to increase.

On average, winters in Finland are warming more than summers, but hot spells will become more common and bring increasingly high temperatures in the summer season. Changes in precipitation will also be greater in winter than in summer. While no changes

are expected in storms in the next few decades, long-term scenarios, in particular, contain a great deal of uncertainty. (Government 2022)

There will also be regional differences in the way climate change will manifest itself. The regional impacts can be described as follows (Hildén et al. 2022):

- All land, water and sea areas in Finland will be significantly and negatively affected by heat waves.
- The risks of drought and forest fires will increase, especially in the southern and western parts of the country.
- As autumn and winter temperatures continue to rise, precipitation will increasingly come as rain in the south and west. In the east and north, snow loads may continue to grow well into this century (2050). Annual fluctuations will be greater.
- Cloudy, wet and dark autumns and winters may become more common in the southern and western parts of the country.
- There may be unexpected coastal snow storms in years to come as sea ice declines. When the sea remains unfrozen for longer, violent coastal snowfall events may occur at certain wind directions and speeds, in which case cities may be hit by unexpectedly high volumes of snow, despite global warming. This will continue for the next 15 to 30 years.
- While the period of soil frost and frost depth will decrease in the southern and western parts of the country, frost heave may become a new challenge and start occurring in the middle of the winter rather than in spring.
- There will be little change in winds. The energy of wind may increase, at least in sea areas and in the southern and western parts of the country. Storms may grow stronger.
- There is already evidence of species moving further to the north and carrying vector-borne diseases with them.

The Defence Forces operate in all parts of Finland, which is why regional differences must be taken into account in adaptation measures. Climate change is being continuously monitored, and the adaptation needs are adjusted geographically and updated temporally.

Temperature

According to an overview produced by the Finnish Meteorological Institute based on the Fifth IPCC Assessment Report, the rise in temperatures in Finland will exceed the global average on all trajectories. Depending on the scenario used, the average estimates of this increase in Finland vary between approx. 2 and 6 °C by the end of the century compared to mean values in the period 1981–2010. Winter temperatures are expected to rise and the lowest sub-zero temperatures to occur less frequently in Finland. In other respects unseasonably warm periods, and also heat waves in summer, will be more common and longer, and cold periods will occur less often. The highest temperatures during heat waves will rise. By the end of the century, cooling needs in the southern and southeastern parts of the country are expected to be up to five or six times greater than today. (Tuomenvirta et al. 2018)

Snow and ice conditions

The snow-covered period of the year will grow shorter, and the total thickness and water value of the snow layer will decrease. In Northern Finland, the snow cover is not expected to start declining until the end of the century. Rather than decreasing, the number of heavy snowfalls may even increase in other parts of Finland, too.

The depth and duration of soil frost will be reduced, especially in areas where snow is cleared away, including roads, airports and yards. During mild and rainy winters the soil will be wet, and its bearing capacity will be low. Ice cover on lakes, rivers and the Baltic Sea will be thinner, and the period of ice cover will be shorter.

Precipitation

It is estimated that precipitation in Finland will increase by 8% to 20% from the current situation in 2070–2099 compared to the average values in 1981–2010. Rainstorms will be more frequent in summer. The number of days with precipitation in winter will increase, and icy rain will also occur more frequently. Wind-driven rain loads are expected to increase across the country. The volume of wind-driven precipitation that falls as rain or sleet will increase in winter between melt-freeze cycles. (Tuomenvirta et al. 2018)

Estimates of precipitation trends involve greater uncertainty than estimates of temperature development. Even in today's climate, there are major geographic and temporal fluctuations in precipitation, which is why the trend in rain observations is less clear than temperature trends.

Floods

Great natural fluctuations are observed in floods and droughts even today, which is why the impact of climate change on them will only be more prominent in the medium and long term (Tuomenvirta et al. 2018).

Floods can be divided into fluvial, coastal and pluvial floods. The most typical events in Finland have been spring floods caused by meltwaters. It is possible that declining snow volumes will mean fewer meltwater floods in the future. The higher precipitation resulting from climate change and, on the other hand, increase in built environments will exacerbate the risk of pluvial floods. The risk of coastal flooding will be affected by rising sea levels and also by storms, which may become more frequent.

Key flood risks over the short term are likely to be the following:

- higher risk of frazil ice floods
- increased flood risk of large rivers and lakes
- more frequent pluvial floods in small water bodies
- more frequent pluvial floods in cities.

The risk of coastal flooding will increase, and towards the end of the century this risk in the Gulf of Finland will be clearly higher than at present, mainly due to the thermal expansion of sea water and the melting of continental glaciers. Current estimates indicate that the average sea level in the Gulf of Finland will rise by approx. 30 cm by 2100, while the highest estimate puts this figure at approx. 90 cm. In the Gulf of Bothnia, land uplift will compensate for or even exceed the rise in sea levels. At some of the monitored coastal sites, the flood risk will continue to decrease in the near future and only start to rise after 2050. It is estimated that by 2100, flood heights will increase in almost all sea areas compared to the current situation. In the Baltic Sea, this rise is expected to be less than the average for the oceans. (Kahma et al. 2014)

The impact of climate change on the risk of fluvial floods varies in different water bodies. In Southern Finland, winter floods will be more frequent and stronger, while spring floods will decrease in Northern Finland. However, this change will take place slowly. (Finnish Meteorological Institute)

Drought and forest fires

While the estimates are associated with some uncertainty, the likelihood of dry periods is expected to increase. Whereas precipitation will generally increase, droughts in the soil surface layer will become more common in spring, and very dry summers may also occur (Kilpeläinen et al. 2010).

Drought will exacerbate the risk of forest and grass fires. The number of days on which a forest fire warning is in effect is likely to go up by 5 to 10 days compared to the present by the end of the century. In Southern Finland, the risk of forest fires will increase more than in Northern Finland. As global warming progresses, days when strong winds, high

temperatures and low humidity coincide will be more frequent, exacerbating the risk of fires spreading. (Tuomenvirta et al. 2018; Ministry of the Interior 2023)

Cloudiness and fog

Climate models indicate that cloudiness will increase, especially in winter. Solar radiation will also be reduced by atmospheric pollutants. By the end of the century, solar radiation will decrease during the winter months and increase in the summer months by a few per cent. This will mean a greater difference in brightness between winters and summers. The reduction in solar radiation will, for instance, affect the availability of solar energy; evaporation and drought, the need for protection against the sun and perceived thermal comfort in the summer; and the occurrence of seasonally affective disorder in the winter. In winter, the decline in light levels will be emphasised by the higher number of snow-free days, especially in Southern Finland. (Tuomenvirta et al. 2018)

It has been estimated that the probability of fogs will increase in the autumn, but this assessment is associated with a great deal of uncertainty. Due to poor visibility, fog may increase the risk of accidents, mainly in road traffic and shipping.

Storms

While no major changes are expected in windiness, winds combined with other changes may have significant impacts. Reduced soil frost, for example, may mean that trees are more liable to fall in high winds.

While the average of the estimates regarding changes in wind speeds is close to zero, the estimates produced by various climate models differ significantly from each other. Knowledge of the impacts of climate change on deep low pressures or such small-scale phenomena as powerful thunderclouds is similarly inadequate. Consequently, assessments of trends in strong winds are associated with uncertainties, and natural variations will be significant. As the climate warms, individual storms may be more violent than before, or the share of the most powerful storms of all storms may be greater in the future than today, even if there is no change in their total number. (Tuomenvirta et al. 2018)

3.3 Impact of climate change on the Baltic Sea

Climate change is likely to shorten ice winters in the Baltic Sea significantly. The shorter ice winter will make it possible to extend the boating season and facilitate port operations. In some situations, an increased thermal load on vessels in summer may require more cooling capacity. While ice winters will change, winters with extreme ice conditions will not disappear completely. The reduced ice cover in the Baltic Sea may cause heavy seas and, consequently, hamper winter navigation. Even if the size of the ice field did decrease, high winds will press the ice together, forming pack ice and brash ice zones. Conditions favourable for ice accretion on vessel structures will also occur more frequently in sea areas.

The decline of ice cover will reduce the loads on port and other coastal structures created by ice while also exposing the structures to storms during the ice-free period. The shorter ice winter may increase marine traffic in the Baltic Sea, possibly warranting more territorial surveillance missions.

Particular challenges to navigation will be created by storm winds, high seas, heavy rainfalls, snowstorms, rapid changes in sea levels, low temperatures combined with high winds, fog, and changes in the locations of sediment layers and shallows due to rising sea levels (Tuomenvirta et al. 2018).

The increased occurrence of invasive alien species and, in particular, organisms that attach to vessel hulls in the Baltic Sea will put a strain on structures and vessels. When attached to vessels they increase water resistance and, consequently, fuel consumption. These species may accelerate embrittlement in structures, increasing the need for maintenance. Lowered salinity, on the other hand, will reduce corrosion in water structures and those exposed to splashing.

3.4 Impact of climate change on human health

The impacts of climate change will pose health risks to varying degrees. Climate change is expected to affect the following health risks in Finland, in particular: health hazards caused by heat, water-borne outbreaks, vector-borne infectious diseases, slipping accidents, and indoor air problems related to moisture damage in buildings. (Tuomenvirta et al. 2018)

- Ticks spreading borreliosis and tick-borne encephalitis as well as other animals that spread infections may multiply, and their ranges may expand with the warming climate.
- Increased precipitation, rainstorms, floods and rising temperatures will impair the water quality in lakes and rivers and possibly at water abstraction plants. The consequence will be more frequent exposure of recreational and domestic water users to waterborne outbreaks caused by harmful microbes.
- Higher precipitation may cause more moisture and mould damage in buildings and impair indoor air quality, which in turn can be a health risk.
- It has been estimated that as climate change advances, the pollen season of many plant species will start earlier in the year and be longer, and the amount of pollen will be larger. Pollen allergy symptoms may also be exacerbated.
- The decline of snow cover and growing cloudiness will result in darker winter days, which may make the symptoms of seasonally affective disorder worse. (PILMUS workshop 29 September 2022)
- Temperatures of around zero and icy rain will make for slippery road conditions, increasing the risk of accidents.
- Heat waves are expected to become more frequent and prolonged and bring higher temperatures. During heat waves, buildings will warm up, and indoor temperatures will remain high also at night, exposing the human body to prolonged heat stress.
- The risk of hypothermia or frostbite will be exacerbated in winter regardless of higher temperatures if humidity and wind enhance the effects of the cold. A humid environment and strong winds expose the body to hypothermia, even if they do not occur simultaneously. (Turunen 2019)
- To prevent spoiling, colder and warmer conditions than usual will require precautions when handling and storing perishable foods.

3.5 Energy transition and other transitional effects of climate change

The transition from fossil fuels to renewables and other alternative forms of energy as a result of emission reduction measures taken to mitigate climate change is included in the transitional effects of climate change. While the energy transition is excluded from adaptation measures in the National Climate Change Adaptation Plan, it is examined in this plan for adaptation in the defence administration. Russia's war of aggression on Ukraine and the uncertainty of energy supply resulting from the sanctions imposed on

Russia are also creating pressures to ensure energy efficiency and use alternative forms of energy. Europe, in particular, is striving for greater self-sufficiency in energy, which is likely to accelerate the green transition.

The energy transition is associated with causal relationships that have inconsistent impacts in terms of climate change. An example of this is electrification, which will significantly increase electricity consumption and require major investments in both electricity production and transmission and distribution capacity. Even if the increase in electricity production were mainly covered with non-fossil energy sources, large-scale investments will have an impact on climate change adaptation and biodiversity loss through material needs, construction and land use.

In parallel with the energy transition, society is also going through other kinds of transitions, including a technological revolution and digital transformation. Climate change and the energy transition tend to accelerate them. The technological revolution and digital transformation may be helpful, for example by providing remote digital connections that replace travel or new solutions to mitigate climate change, including smart grids, electricity storage and the hydrogen industry. On the other hand, technological production and the energy needs of server rooms have a negative impact on electricity dependence, energy consumption and greenhouse gas emissions. A dramatic increase in digitalisation will make functions more vulnerable to cyber influencing and similar attacks.

The drivers of the green transition include other factors besides climate change. For example, sustainable use of natural resources and the prevention of environmental pollution create a need for transitioning to a circular economy. Biodiversity loss and climate change are intertwined and enhance each other. Similarly, biodiversity protection promotes the creation and maintenance of carbon sinks. The drivers of the green transition also include pursuit of security of supply and self-sufficiency.

3.6 Climate security

According to IPCC's Sixth Assessment Report (IPCC 2022), climate change is contributing to humanitarian crises, for example through loss of livelihoods and by driving involuntary migration. While armed conflicts are often caused by non-climate factors, climate change can also be one of the factors at work behind the crises, intensifying them. Climate change can exacerbate conflict risk or conflict itself, especially in conjunction with poverty, poor governance, resource scarcity and other factors that contribute to instability. (Hakala et al. 2021)

The EU Strategic Compass for Security and Defence and also NATO's Strategic Concept identify climate change as a factor that contributes to instability and intensifies security threats.

The security risks created by climate change may be the result of direct, indirect or casdading impacts of climate change, or transitional effects resulting from climate change mitigation. The security risks affecting Finland due to climate change consist of both local risks and the repercussions of global climate risks taking effect through different causal chains (Erkamo et al. 2020). These risks may be associated with harm to people, damage to ecosystems and infrastructure, or political, economic and transnational impacts. Geopolitical impacts may include heightening of tensions in international relations due to diminishing resources as well as more frequent confrontations within states, forced migration or changes caused by the energy transition in positions of power related to energy production. (Government 2022a)

A broad view of climate security includes accidents and damage caused by storms, slippery road conditions or power outages (safety). The threats to the security environment caused by causal chains have an impact on the Defence Forces' core activities.

Comprehensive security is the Finnish cooperation-based preparedness model, in which the vital functions of society are jointly managed by the authorities, business operators, organisations and citizens. The general principles and strategic tasks of comprehensive security are outlined in the Security Strategy for Society (Government 2017). Climate change is one the factors promoting the realisation of the risks described in the Security Strategy for Society. The comprehensive security model provides a ready-made, highly usable framework for preparing for risks associated with climate change (Government 2022b).

Climate change will bring about significant changes in the Arctic region, where it has progressed three times faster than elsewhere over the past 50 years. The change in the Arctic region will have a global impact on such phenomena as rising sea levels and extreme weather events. While the Arctic region is changing permanently, global emissions reductions and the achievement of the Paris Agreement goals would slow down the progress of these changes by the middle of this century. Climate change is the greatest threat to biodiversity in the Arctic region. (Government, 2021)

Biodiversity loss in the Arctic region and, on the other hand, the carbon released as permafrost melts would accelerate climate change. Increasing human activity in the area freed from ice also poses a risk of pollution in this unspoiled environment with sensitive ecosystems. This interest is largely due to the rapid and dramatic advancement of climate change, in which the Arctic is on the forefront of change. Maintaining stability and peace in this region is in the common interest of all Arctic states. Finland contributes to achieving this aim following its Strategy for Arctic Policy. This Strategy drawn up in 2021 notes that growing military activity and presence as well as increased tensions partly result from the challenges and opportunities created by climate change, which include exploiting the region's natural resources. (Government, 2021)

Changes in the security policy situation have contributed to the growing strategic importance of the Arctic region and the heightened tensions in it. A tenser international situation in one region may quickly lead to increased military activity also in other areas. From Finland's perspective, the security of the Arctic region is closely linked to the security situation in the Baltic Sea region and elsewhere in Europe, in which tensions have been heightened in the 2010s. In 2022, an overview of the impacts of Russia's war of aggression was prepared to complement the Strategy for Arctic Policy (Koivurova et al. 2022). Russia's armed attack on Ukraine rapidly resulted in the suspension of most of international Arctic cooperation. Russia's war of aggression has further underlined the strategic importance of a European Arctic region. The setting for improving or maintaining regional stability is very difficult, and no positive change is on the horizon. It is likely that the Arctic sea and land areas will be the object of increasing pressures due to the major powers' conflicting interests.

The links between climate security and hybrid influencing have been analysed relatively little. The weaponisation of energy and water resources, which means using them to exercise power or exert pressure, is one form of hybrid influencing. Information influencing is also part of hybrid influencing, and the division of opinions, which is an inherent part of climate change mitigation, creates an opportune platform for misinformation and may increase distrust in a government striving for a low-carbon transition. Extreme weather events may also create opportunities for hybrid and cyber influencing. For example, disrupting electricity networks would hamper recovery from exceptional storm damage, while information influencing can be used to incite dissatisfaction with the government's slow handling of the crisis. (Hakala et al. 2021)

3.7 Climate change adaptation

As climate change mitigation measures, however effective, will not be able to completely halt climate change, climate risks must be reduced as efficiently as possible through adaptation measures. When adapting to climate change, an effort will be made to avoid

and reduce vulnerability and exposure to adverse effects while also taking advantage of the opportunities brought about by climate change. (The Climate Guide)

Adaptation can take the form of short-term, reactive preparedness (such as crisis and disaster response) or proactive and long-term strategic adaptation aimed at creating or strengthening structures, functions and institutions that support adaptation. Through well-planned adaptation measures, the adverse impacts of climate change can be alleviated while taking advantage the opportunities it creates. Adaptation to climate change mitigation will also be required. For example, adaptation to a regulatory environment that promotes emission reductions can be facilitated by means of renewable energy projects. Adaptation should ideally be proactive over the long term. So far the measures have mainly been reactive, which means that they are only taken when the impacts are already noticeable, or predicted to occur in the short term. Unless preventive measures are taken, the same risk may reoccur later. Care should also be taken to avoid maladaptation which, instead of promoting adaptation, either increases vulnerability and/or violates against the principles of sustainable development, for example by accelerating climate change (UNEP 2022). A concrete example is increased use of air-conditioning to adapt to heat waves, as it can increase energy consumption and emissions that are harmful to the climate and the environment.

As part of the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), an updated report on Impacts, Adaptation and Vulnerability was published in February 2022 (IPCC 2022). In particular, the report focuses on the energy transformation and the energy system transition; land, ocean, coastal and freshwater ecosystems; urban and rural infrastructure, as well as industry and society. These transitions make possible the adaptation required for high levels of human health and well-being; economic and social resilience; and ecosystem and planetary health. These system transitions are also important for achieving low global warming levels that would avoid many limits to adaptation.

The report notes that in the near term, climate-associated risks to natural and human systems depend more strongly on changes in their vulnerability and exposure than on differences in climate hazards between emissions scenarios. Based on the report's conclusions, we can say that correctly dimensioned adaptation is of primary importance for risk management.

According to future scenarios outlined in a national assessment of weather and climate risks (SIETO report), the poorer society's general preconditions for reducing and managing risks are, the more likely the risks are to be realised (Tuomenvirta et al. 2018). The speed of climate change will also affect this issue. Should climate change mitigation fail, the risks will increase rapidly. This combination may lead to self-perpetuating development that will further erode society and undermine its ability to respond to risks.

Such undesirable developments (general social unrest, economic uncertainty and destabilisation of the security environment) can also pose challenges to the defence administration's ability and capacity to adapt to (and mitigate) climate change as resources are increasingly tied to acute security issues. Putting climate change adaptation to the long finger would be short-sighted, however, as it could jeopardise defence capabilities over the long term.

4

Climate risks and adaptation in the defence administration

4.1 Objectives of climate change adaptation: capability through adaptation

The Defence Forces are able to and must adapt reactively to varying weather conditions as part of normal operations. The impacts of climate change and adaptation to them were also considered in the Energy and Climate Programme at a general level. This Climate Change Adaptation Plan of the Finnish Defence Administration is the first document that sets targets for the adaptation. The time span of the targets is long, and rather than ending at a particular year, adaptation plans need to be updated far into the future as the climate keeps changing. Target achievement will be examined at multiple levels; annually for measures to be implemented, and every four years in connection with Energy and Climate Programme updates. The focal point for target attainment is the same as in the National Climate Change Adaptation Plan, or 2030. The adaptation work will also continue after this, and the targets will be updated if necessary. The long-term target is set for 2050 in keeping with the EU Strategy on Adaptation to Climate Change.

The objectives of climate change adaptation in the defence administration are:

Climate-resilient and energy smart defence.

- **The defence administration is aware of the impacts affecting national defence capabilities, training, exercises and planning brought about by climate change and the energy transition.**
- **The defence administration understands the security impacts of climate change, both in the national and the international context, and recognises and is able to anticipate its role in the face of these impacts.**
- **The defence administration has the ability to manage known climate risks and actively identify and assess new risks.**
- **The defence administration is able to take advantage of the positive effects of climate change.**

4.2 What adaptation measures have already been taken?

The Defence Forces plan operations for, train and exercise in all conditions, including various weather conditions. Operations are planned as required by weather conditions and adapted to them. In addition to such basic preparedness, the following actions have been taken in anticipation of the long-term consequences of climate change and energy crisis:

- The impacts of climate change on operations were assessed at the general level for the first time in 2014.
- More emergency power has been made available to secure critical sites and functions.
- Efforts have been made to strengthen medical intelligence to anticipate pandemics and detect new pathogens better.
- To some extent, preparations have already been made for a multi-fuel situation.
- Energy resilience in water supply is being investigated.
- The Defence Forces use quite a wide range of simulators for both driving and firing training, which can be seen as an adaptation to the energy transition.
- An operating model exists for preparing for and responding to forest fires, which can also be resorted to as the risk of forest fires increases.
- Preparedness for price fluctuations has already been accounted for in projects and procurements.
- To prevent the spread of alien species, an operating model for cleaning equipment is in use.
- In newer buildings, indoor conditions (humidity and temperature) can be adjusted automatically.
- The effects of increasing humidity are addressed in the design of new buildings and structures.
- Correct dimensioning of stormwater systems is also ensured in new buildings.
- The first phase of flood risk mapping was completed in autumn 2022.

4.3 Assessment of climate risks

As noted in Chapter 3.1, the significance of climate risks is assessed as a combination of a hazard, exposure and vulnerability. In this Climate Change Adaptation Plan of the Defence Administration, the term ‘hazard’ is replaced with the word ‘impact’, as the phenomena associated with climate change (increased precipitation, shorter period of snow cover, more frequent heat waves etc.) may themselves be rather neutral or even have positive impacts. Exposure refers to the fact that an object or function is located in an area affected by a climate change phenomenon, or that there is some other interface between the phenomenon and the object/function in question. Vulnerability can mean that an object is sensitive to humidity, weather conditions or breakage, or refer to difficulty in repairing/replacing it or the susceptibility of a function to disruptions if climatic conditions change. In addition to sensitivity to disruptions, the defence administration's vulnerability analysis emphasises the criticality of the functions in terms of performance/defence capabilities.

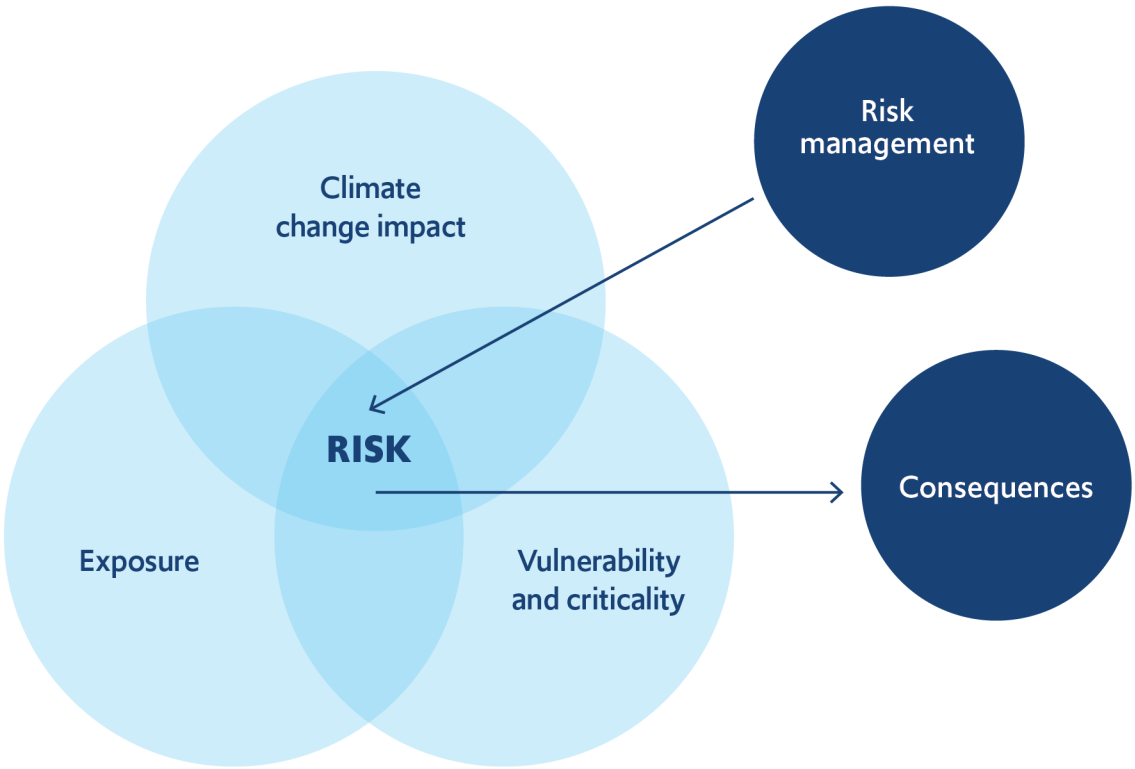


Figure 3. A climate risk emerges when an object or activity is exposed to the impact of climate change and is vulnerable to it.

A simple model has been developed for assessing the significance of climate risks in the defence administration. Based on the views of experts in different fields, the model assigns numeric values to exposure and vulnerability, the product of which gives an indication of the essential risks. While this method does not provide an absolute answer concerning the magnitude of the risk, it can be used to identify interfaces between climate change and the defence administration that require greater attention or measures, or that may have significant cost impacts. See the following Chapters for the risk assessment model and the risks identified with the help of it.

4.3.1 Exposure

The direct and indirect impacts of climate change described in Chapter 3 to which the Defence Forces' functions or objects may be exposed are:

- Increased precipitation
- More frequent pluvial and fluvial floods
- More frequent heat waves
- More frequent rainstorms and possibly more violent storms
- Warmer winters
- Longer periods of around-zero temperatures
- Increased ice accretion
- Longer ice-free period at sea
- More difficult conditions at sea during the period with ice cover (including pack ice)

- Shorter period of snow cover
- Reduced soil frost and more frequent occurrence of uneven soil frost
- Rise of the sea level and increased risk of coastal flooding
- Increased cloudiness and fog
- Higher number of pathogens and emergence of new pathogens/spread of pathogens to new areas
- Biodiversity loss
- Energy transition

When assessing exposure, location is a key factor: how will climate change and the object or function converge, and how likely this is.

- Electrical infrastructure
- Fuel distribution infrastructure
- Telecommunications infrastructure
- Domestic water, sewage and stormwater infrastructure
- Road network
- Airport manoeuvering areas
- Ports
- Facilities
- Other structures
- Shooting ranges and exercise areas
- Land vehicles
- Land transport
- Vessels
- Maritime transport
- Aircraft
- Air traffic
- Weapons systems
- Sensor systems
- Occupational and service safety and health
- Planning and implementation of training, exercises and operational activities

In the workshop and expert discussions, climate change phenomena were recognised as having a wide impact on the objects and functions of the Defence Forces. The impacts of wind and rainstorms were the easiest to identify. Changes in winter conditions were also identified as having a wide-ranging impact. Some of the exposures listed above pose a potential risk, whereas others were assessed to have a positive effect.

Once a potential exposure had been identified, its likelihood was assessed on the following scale:

0 = no exposure or not relevant

1 = low exposure or exposure associated with uncertainty

2 = significant exposure

4.3.2 Vulnerability and criticality

Safeguarding functions and objects critical for national defence is emphasised in the defence administration's climate change adaptation. While the impacts of climate change are not expected to put the defence system at risk in a near future, regional and local impacts on energy systems, for example, may at worst endanger or hinder certain activities.
The vulnerability of the identified objects and functions was assessed numerically, and similar results were also obtained in workshop discussions. The following scale was used:

0 = no significant vulnerability

1 = a) potentially vulnerable, or b) vulnerable but not particularly critical for defence capability

2 = vulnerable and critical for defence capability

3 = highly vulnerable/highly critical to defence capability

4.3.3 Key risks

The risk figure obtained as the product of exposure and vulnerability ranges from 0 to 6.

0 = no risk

1–3 = low risk

4–6 = requires action/has cost impacts

Based on the exposure and vulnerability analysis, the most significant climate risks of the Defence Forces/defence administration are:

- Stress on premises caused by increased precipitation (4)
- The risk posed by more frequent pluvial and fluvial floods, especially for water infrastructure, roads, premises and other structures (3-6). To some extent, there is also a risk to fuel distribution infrastructure and airport manoeuvering areas (3).
- Stress caused by heat waves on premises, telecommunications infrastructure (need for cooling), domestic water infrastructure and personnel's safety and health (4)
- Risk caused by rain, wind and/or snow storms to virtually all infrastructure, buildings and areas as well as to weapons and sensor systems and personal safety (4). The estimate of more frequent wind storms is still uncertain, and there will be regional differences.
- Risk to roads and personnel safety caused by more frequent occurrence of around-zero temperatures (4).
- Risk to electricity and telecommunications infrastructure, roads, equipment, airport manoeuvering areas and ports caused by ice accretion and icy rain (4-6).
- Risk to shipping caused by pack ice (4).
- Risk of rising sea levels and coastal floods, especially to ports and to some extent facilities and water infrastructure (3-4). However, the probability of coastal floods will not increase significantly in this century.
- Risk to roads and airport manoeuvering areas caused by reduced soil frost and, in particular, uneven frost heave (4).
- Risk caused by increase in pathogens to domestic water infrastructure, health and, especially in case of pandemics, to training, exercises and operations through personnel resources (4).

- Pressures for change on electricity and fuel distribution infrastructure caused by the energy transition as well as the risk to land, maritime and air transport and, especially in the event of energy shortages, also to training, exercises and operations (4).

In addition to actual climate risks and measures taken to manage them, the changing climate will also affect operations at the so-called meta level. When planning operations and costs, attention must be paid to such factors as changes in heating and cooling needs, maintenance needs of properties, maintenance needs of equipment, the navigation season, fuel needs, fuel compatibility requirements and training conditions as well as the spillover effects of biodiversity loss on shooting ranges and exercise areas. Changes in weather loading on equipment and propulsion power, for instance, must be taken into consideration more systematically in development programmes and projects. Global risks and their crossborder effects are also excluded from the risk assessment. They include impacts on intergovernmental relations, population movements and disruptions to production chains.

The defence administration is exposed to the same climate risks as the rest of society, for example relating to buildings, transport, logistics and health. The operations of the Defence Forces depend on the functional capacity of the rest of society.

4.3.4 Positive impacts

The impacts of climate change will not be exclusively negative for Finland or the defence administration. A characteristic feature of drivers of change often is that their effects are inconsistent, for example cancelling out any cost savings. The advancement of climate change will not be linear, which also causes uncertainty about any positive impacts. The following examples have been identified (PILMUS workshop 29 September 2023):

- Rising winter temperatures will reduce the need for heating buildings, whereas the increasing need for cooling in summer will erode these savings in energy consumption and costs.
- The period with snow cover will be shorter in winter, reducing the need for snow ploughing as a whole. However, there may be an even greater need to keep snow ploughing fleet standing by, as increasing precipitation may mean that larger amounts of snow fall at once. On the other hand, the declining snow cover may also result in slippery road conditions and, consequently, increase the need for anti-skid treatments. It should also be noted that while the period with snow cover will be shorter on average, there will occasionally be long, cold and snowy winters, which hampers adaptation to or exploitation of the changing conditions.
- The navigation season will be longer as the period with ice cover grows shorter. We should note, however, that as uniform ice cover dwindles, pack ice and brash ice zones may occur more frequently and create an obstruction to shipping.

The fact that successful adaptation to climate change and the energy transition will also improve the Defence Forces' resilience in other ways was identified as a clearly positive consequence of climate change and its side effects. Regional and local cooperation relating to preparedness will also be stepped up.

4.4 Adaptation needs

4.4.1 Introduction to adaptation needs

Rather than being a separate or transient activity, tackling climate change must have a role in all activities and planning.

Energy resilience and efficiency as well as preparedness for the energy transition and challenges associated with the availability of energy will directly affect core areas of capabilities. This is why it will be necessary to develop energy management, ensuring that all needs and requirements are addressed in the energy sector as a whole at an adequate level.

The future energy production solutions selected by society may have an impact on the deployment of the Defence Forces' capabilities, which must be taken into account both in the material procurements of the Defence Forces and the central government's energy production solutions. Wind turbines, which have already been found to be a performance-limiting factor for some Defence Forces systems, are an example of this.

The risks and changes brought about by climate change should be anticipated and addressed in strategic plans as well as in development programmes and projects. In projects and procurements, preparedness is needed for the possibility that climate change may cause disruptions and interruptions in international supply chains, for example when a production plant is flooded.

As a whole, climate risk management and anticipation require extensive cooperation, both nationally and internationally.

The following chapters describe the needs for climate risk management and adaptation to climate change phenomena.

4.4.2 Flood risk

The inadequacy of stormwater systems will be the cause of one of the most acute flood risks in a near future. As precipitation and the intensity of rainstorms increase, rainwater will cause local flooding in built-up areas, unless stormwater collection and control are sufficiently effective. Floods may spread harmful substances and pathogens and put the quality of domestic water at risk.

It is likely that pluvial floods in lakes and rivers will also become more frequent in a near future. As the risks of rising sea levels and coastal floods become significant towards the end of the century, they will put coastal port operations at risk. For example, permanent docks and facilities excavated inside bedrock may be vulnerable. Not locating functions critical for the Defence Forces' operations, including infrastructure related to energy and communications networks, in flood risk areas will be vital.

Senate Properties prepared a flood risk map for its property portfolio regarding coastal and fluvial floods in 2022. This mapping exercise also covered the buildings owned by Defence Properties Finland. The examination shows not only the locations of the buildings but also their intended uses. The map has additionally been complemented with a preliminary examination of areas owned by Metsähallitus and used by the Defence Forces. The map indicates that a flood occurring once every 250 years would cover two buildings used by the Defence Forces in the areas prone to fluvial floods, whereas coastal floods (occurring once every 250 years) would affect 13 buildings. Some roads found in or leading to the Defence Forces' areas would additionally be flooded. Senate Properties did not examine the vulnerability of the objects or the risk magnitude in its flood risk mapping. Based on the small number of buildings located in flood risk areas, a preliminarily estimate indicates that the financial risk is lower than anticipated. Climate change may result in more frequent flooding, but according to estimates, this change will take place slowly. It is also possible that the flood risk areas may expand in some cases as precipitation increases and sea levels

rise, but the existing flood maps prepared by the Finnish Environment Institute and the ELY Centres (regional Centers for Economic Development, Transport and the Environment) were used in this examination. Based on the mapping exercise, the next step is assessing the risk tolerance of the buildings, structures and areas that may at times be inundated by a flood, and the need for any precautionary measures. If necessary, relocating functions or improving flood protection by other measures should be considered. The necessary measures may also include updating the operating models and rescue plans for floods.

4.4.3 Rain and wind storms

Rainstorms, heavy snowfall, thunderstorms and strong winds disrupt energy supply and telecommunications. These incidents also affect the Defence Forces' operations. While many of the Defence Forces' functions are protected by backup power arrangements, the impacts of long-term disruptions, in particular, may also be significant for the Defence Forces. Ensuring the functioning of the backup power systems and producing plans for long-term disruptions will guarantee the Defence Forces' functional capacity in these exceptional situations.

Even if wind storms do not necessarily become more frequent, winds may nevertheless become stronger. Storms may cause concatenating risks relating to energy, in particular. For example, the availability of fuel may be affected if fuel deliveries are prevented or delayed or a power cut interrupts fuel distribution.

Rain and wind storms can cause a wide range of destruction and accidents related to premises, transport routes and personal safety, for instance. Rainstorms increase the risk of stormwater flooding, spread of contaminants and contamination of domestic water. In addition, heavy rain and stormwater floods may result in more frequent overflows of environmental protection structures and the transport of contaminants into the environment.

The impacts of more frequent storms and other sudden extreme weather events brought about by climate change are difficult to assess in advance, especially as there is a great deal of uncertainty about the extent to which their frequency will be affected. However, extreme weather events are likely to cause more damage in the future, resulting in additional costs. Data for future use can be collected by monitoring the situation and keeping a record of damages caused by storms and other factors.

4.4.4 Increased precipitation and cloudiness

Higher rainfall amounts will put a strain on the structures, equipment and other materials exposed to them. The impacts of rainfall will materialise in several different ways:

- impact on soil's load-bearing capacity and leaching
- higher flood risk
- moisture stress in structures
- wind-driven rain in winter will expose concrete structures to frost weathering
- moisture and mould damage in buildings will affect indoor air

Normative guidance of construction, in which the impacts of climate change will necessitate modifications, will have an impact on the existing building stock and new construction, for example with regard to the moisture fatigue requirements of wall structures. Weather stress on structures will increase the need for maintenance and upkeep, pushing up costs. Frost weathering caused by wind-driven rain and corrosion of reinforcement bars will shorten the service life of concrete structures. (Tuomenvirta et al. 2018)

In terms of technological development, the fact that increased cloudiness will have an adverse effect on visibility (navigation) and reduce the efficiency of remote sensing must also be taken into account.

4.4.5 Changes in winter conditions

Rising temperatures, especially in winter, will reduce the consumption of heat energy and fuels in the premises and equipment used by the Defence Administration.

As the temperature rises in Southern Finland, the shorter period of snow cover may hamper training for winter conditions. If around-zero temperatures and slippery road conditions occur more frequently, there will be a higher risk of slipping accidents, and the increased use of anti-slip treatments will stress the need to control the contaminant loading of the environment. In addition to slippery roads at temperatures around zero, icy rain is expected to occur more frequently, which may have adverse effects on electrical infrastructure and equipment, for instance.

On the other hand, considerable variations in snow and ice conditions from year to year will hamper maintenance planning. Frost heave will be reduced as winters become warmer. In practice, however, this will manifest itself as unevenness and variability of frost heave, exacerbating damage to roads.

The maintenance costs of roads and airports will go up as a result of anti-skid measures, weathering of paving materials and intensifying frost heave.

Changing winter conditions, such as shorter periods of snow cover and infrequent sub-zero temperatures, may affect the planning of training for winter conditions. Even today, some contingents may not experience a proper winter, with the exception of conscripts in Northern Finland. There may be several consecutive snow-free winters in Southern Finland in the future. Despite the warming of the climate, snow and frost will remain such a common phenomenon in Finland that, in practice, all conscripts must learn to operate in winter conditions. For some contingents, plans must be made to provide the requisite training for winter conditions in its entirety in the north, or later as a refresher exercise, and this need will increase.

4.4.6 More frequent heat waves

Rising summer temperatures will increase the cooling needs of premises and vehicles, undermining the benefits of reduced need for heating in winter.

More frequent heat waves and rainless periods will result in droughts, which will in turn exacerbate the risk of forest fires. However, the Defence Forces have traditionally had a high level of preparedness for forest fires, which cannot be avoided due to the nature of the operations. In general, the higher risk of large-scale forest fires in Finland may also mean that executive assistance for responding to such incidents will be needed more frequently.

Plenty of experience of operating in hot conditions has been accumulated in crisis management operations in Africa and Asia (Lindholm et al. 2011). When missions take place in hot countries, where the temperatures are rising further due to climate change, it is vital to ensure that the personnel are familiar with the special characteristics of operating in hot conditions. Knowledge of operating in extremely hot conditions will also be applied in Finland during long heat waves.

4.4.7 Changes in the Baltic Sea

Changes in the Baltic Sea were not examined as a separate entity in the risk assessment, but as the Baltic Sea is of great importance to Finland and also for the Finnish Defence Forces' operations, the climate risks and adaptation needs associated with it have been listed here.

As ice winters become shorter, the operating period of several vessel types can be extended. Among other things, this will necessitate greater flexibility in vessel maintenance compared to the current situation. In some situations, an increased thermal load on vessels in summer may require more cooling capacity. The shorter ice winter may increase marine traffic in the Baltic Sea, possibly warranting more territorial surveillance missions.

Ice accretion on vessel and port structures will create challenges to winter operation. The shorter period of ice cover combined with more difficult ice conditions (pack ice, brash ice areas and ice barriers) will increase maintenance needs and fuel consumption. The proliferation of species that attach to vessel hulls will also result in higher fuel consumption and more maintenance needs.

Major occurrences of blue-green algae in the Baltic Sea will be more frequent in summer. This will limit the water supply of vessels if purified seawater cannot be used as domestic water.

4.4.8 Health risks

Several of the climate risks described in the earlier chapters will create health risks. The impacts of climate change will also affect the personnel and trainees of the Defence Forces, and this must be taken into account as necessary when planning operations.

Climate change may exacerbate the risk of emerging health threats and spread of new pathogens. The risk of waterborne infectious diseases is likely to be higher. As vector animals, such as ticks, expand their ranges, vector-borne diseases may also occur in new areas. Effective and efficient medical intelligence is needed to anticipate the health threats. This is why sufficient resources must be secured for medical intelligence. To reduce the spread of pathogens, cleaning equipment arriving from abroad will also be crucial.

The impacts of climate change on water supply will result from long periods of drought as well as rain and wind storms, which will be more frequent. As a result of floods, surface water may infiltrate groundwater and water abstraction plants, and the risk of overflows from wastewater pumping stations will be higher. Long periods of drought may cause problems for water quality and the adequacy of raw water sources. Consequently, domestic water may be contaminated in many different ways, also posing a health risk for the Defence Forces.

The effects of moisture and mould damage on indoor air quality should be addressed both preventively and through corrective measures.

To ensure safe and healthy operation in a changing climate also in the future, training or information campaigns may be needed to cope with more frequently occurring slippery conditions as well as operating in hot weather and damp winter conditions. Human beings' ability to regulate their temperature is limited, and it is important to maintain functional capacity in severe heat and similar conditions. Among other things, it is necessary to know about hydration, correct sequencing of work and rest periods, right types of personal protective equipment, the risks of heat stress illnesses and first aid, and the methods of keeping cool.

The health of staff and conscripts may also be affected by pollen allergies and more severe cases of seasonally affective disorder caused by lower light levels.

Global warming and more frequent extreme weather events will increase the risk of food contamination and spoilage, food poisoning and food-borne outbreaks.

4.4.9 Energy transition

Energy transition from fossil fuels to renewable energy forms, which is necessary for climate change mitigation, has been identified as a factor that, if successful, will improve the Defence Forces' energy resilience and support defence capabilities well into the future. However, it is also associated with vulnerabilities and risks. Careful preparedness is a precondition for a successful transition, as the Defence Forces' fleet is largely energy-intensive and has a very long life span, in addition to which fuel storage periods are long. The Defence Forces' operations are highly energy critical. Ensuring the availability, preservation and compatibility of electricity and fuel with the available power sources is essential. The energy transition must not compromise military capability. Not only an excessively fast transition to renewable and new forms of energy but also relying fully on fossil fuels would be a risk. As purely fossil fuels are no longer available on the commercial

market in the future, committing to a solution that differs from the rest of society could endanger military capabilities.

A wider range of energy sources will be available in the future, and there will be a number of propulsion power options in addition to fossil fuels. It is possible that only a few of them will remain in long-term use, while others will be transition stage fuels. The best possible solution cannot yet be determined at the moment. The Defence Forces must join the rest of society in also being able to use temporary power sources. The energy sources that will remain in permanent use will largely be selected on the basis of economic factors, which will be affected by international and national environmental policy decisions. Finland must participate in international development and advocacy work. For example, it has been proposed that a Green Camp initiative on partly replacing fossil fuels with low-emission energy sources, such as solar and wind power, be included in the update of the UN's COE Manual in 2023. This will reduce vulnerability associated with fossil fuels.

The most realistic and significant method for achieving emissions reductions currently is renewable liquid fuel (diesel), as the Defence Forces' requirements relating to energy content and operating range cannot yet be solved with other energy solutions in the 2030s, especially in heavy land equipment, larger vessels and military aviation. Vehicles can be electrified on a small scale, for example official cars.

4.4.10 Impacts on the security environment

The concept of climate security, including direct safety threats arising in Finland from slipping, storm damage and power outages, have been discussed in other chapters. A particular climate security risk for the defence administration is associated with the spillover effects of the complex impacts of climate change on Finland's security environment. They may take the form of tensions between states, migrations, and increased presence in the Arctic region as well as unrest or conflicts ensuing from these factors. Existing tensions underlie unrest and conflicts in many cases, and they are heightened and intensified by the negative effects of climate change. Climate change has been identified as a so-called 'threat multiplier' in the military context. While the defence administration cannot influence these impacts in advance, it is necessary to prepare for them as part of foresight and strategic planning.

Supporting other authorities is one of the statutory tasks of the Defence Forces. In the future, requests for support may be more frequently related to phenomena caused by climate change. The Defence Forces currently have a wide range of capabilities that are useful in various incidents affecting society. No assessment has been made of how well these capabilities will meet the needs for executive assistance caused by climate change. In addition to capabilities, questions of authority should be examined to assess if climate change will pose threats the responsibility for which is not assigned to any authority under the statutes on executive assistance and for which no cooperation agreements exist. It is also important to note that rather than building separate capabilities for supporting other authorities, the primary objective of the Defence Forces' capacity building is Finland's military defence. Discussions and assessments focusing on this theme should be conducted actively.

The Defence Forces' tasks also include international assistance and crisis management. Geopolitical tensions exacerbated by climate change may affect these tasks. The intensifying effect of climate change may be the result of deteriorating living conditions, competition for natural resources or changes in positions of power caused by the energy transition. These tensions may also have impacts on Finland's security situation and national defence. In the future, international operations may increasingly relate to crises caused or intensified by climate change.

Uncertainties resulting from climate change may open up opportunities for hybrid influencing, including disrupting electricity networks to hamper repairs of storm damage or disinformation related to climate work, which may also have some impact on defence capabilities.

4.4.11 Protection of biodiversity

Climate change will drive a need for nature conservation, which has a direct interface with the Defence Forces' shooting ranges and training areas as well as the activities taking place in them. When establishing and reviewing nature reserves, care must be taken not to obstruct the Finnish Defence Forces' activities in these areas.

It should also be noted that the areas used by the Finnish Defence Forces provide 'safe havens' for many species and habitats (such as sun-lit environments that remain open), and they may be part of ecological corridors between protected areas. Such corridors allow slow-moving species to travel in search of favourable living conditions, which may be shifting with climate change.

As the climate warms, the importance of combating the spread of invasive alien species and pathogens will be stressed further. In the context of exercises, cleaning equipment coming from abroad, both land fleet and vessels, plays an important role in this. The need for cleaning applies to both foreign equipment and Finnish fleet returning from abroad. In addition to the fleet, it is also important to ensure that the personal gear, especially boots, of those who participated in the exercises is cleaned.

On a large scale, preserving biodiversity promotes ecosystem services, such as food production and human well-being.

5

Adaptation in practice

5.1 Methods and measures

Method 1. Addressing climate change and its consequences in the operations and operational planning.	
Measure	**Responsible party**
Climate change is included in the cooperation model for comprehensive security. The impacts of climate change are appropriately included in the strategic tasks set out in the Security Strategy for Society.	Secretariat of the Security Committee
Climate change is addressed more systematically in the Defence Administration's foresight and strategic planning. For example, an overview of climate change, the energy transition and climate security is added to the Defence Forces' strategic plan as a standard section. NATO policies on climate strategy are also taken into account.	Defence Forces and Ministry of Defence
Preparations are made to take the change in winter conditions into account in conscript training. Snow-free winters may occur more frequently in the south in the future, in which case the relevant contingent's training for winter conditions must be organised in the north or as refresher exercises.	Defence Forces
Addressing climate change is added to the life cycle management of materiel. Equipment will be subjected to additional strain, for example as precipitation increases and icy rain occurs more frequently, and because of needs to fulfil requirements arising from the energy transition.	Defence Forces
Phenomena related to climate change, the energy transition and climate security are incorporated in exercise scenarios. This serves as a resilience stress test and increases readiness to act in unexpected situations related to climate change.	Defence Forces

Method 1. Addressing climate change and its consequences in the operations and operational planning.	
Measure	**Responsible party**
Potential increase in requests for executive assistance and the adequacy of resources are assessed. Climate change may directly or indirectly involve increasing needs for executive assistance in the context of forest fires, floods, power outages, pandemics and refugee flows and similar. The rest of society may expect more executive assistance from the Defence Forces than it is possible to deliver. Coordination of plans, cooperation between authorities and joint exercises will be the key.	Defence Forces, Ministry of Defence and Secretariat of the Security Committee
National and international cooperation is continued. National cooperation: operating model for comprehensive security, legislation, reconciling biodiversity protection with the Defence Forces' activities, adaptation to the energy transition and intelligence relating to energy innovations. International cooperation: global climate security, including NATO and EU forums for promoting climate change adaptation.	Ministry of Defence and Defence Forces

Method 2. Adapting the operating environment to a changing climate.	
Measure	**Responsible party**
Detail is added to the existing flood risk map. Based on the uses of buildings and structures located in flood risk areas, their criticality and risk tolerance is assessed. If necessary, risk mitigation measures are planned.	Defence Forces
Operating instructions for floods, storms, icy rain etc. are reviewed. The existence of adequate operating instructions is ensured and, if necessary, instructions are drawn up or updated.	Defence Forces
When constructing new stormwater sewers and paving large new areas, the impact of increasing precipitation on the dimensioning of stormwater sewers is taken into account.	Defence Properties Finland
Statistics are collected on incident reports concerning storms, floods and other extreme weather events. This will help identify vulnerabilities in the infrastructure and assess if extreme weather events occur more frequently. Defence Properties Finland is currently investigating the technical prerequisites for monitoring or compiling statistics on the alarm data of technical systems. This measure is also included in the Senate Group's climate change adaptation plan.	Defence Properties Finland
The impacts of climate change are addressed when planning and budgeting for the maintenance of properties and equipment. While taking annual fluctuations into account in budgeting in advance may be difficult, it is essential to prepare for them with sufficient flexibility. Issues to note include: • Less heating will be needed in buildings, while the need for cooling will increase in summer. • More building automation must be provided for, for example to regulate the conditions. • Cooling needs in the Defence Forces' fleet will increase. • The availability of adequate snow disposal sites and ploughing equipment must be ensured, taking into account high annual variations in snow cover. • The need for anti-skid treatment will increase, however with annual variations. • Increased moisture fatigue may increase the need for maintenance and upkeep. • As international activities expand and the climate changes, the growing need to clean the equipment off alien species and pathogens is addressed.	Defence Forces and Defence Properties Finland

Method 3. Adapting to the energy transition and preparing for energy shortages.	
Measure	**Responsible party**
The defence administration's energy management is improved at all levels. In keeping with the Energy and Climate Programme of the Defence Forces, a proposal is prepared for an energy management operating model. By developing the management of energy and climate issues, these issues can be incorporated better in foresight, strategic planning and the logistics system.	Ministry of Defence and Defence Forces
The measures of the roadmap for emissions reductions to be completed in 2023 are implemented.	Defence Forces
The development of civil society energy solutions is monitored closely, and new, fit-for-purpose solutions are deployed as they become usable. Innovations are also monitored in the international context.	Ministry of Defence and Defence Forces
Solar power is used, where cost-effective. This is already taking place as part of Defence Properties Finland's strategic carbon neutrality target; Defence Properties Finland invests approximately EUR 1 million a year in solar power systems.	Defence Properties Finland and Defence Forces

Method 4. Managing health risks.	
Measure	**Responsible party**
Sufficient resources are secured for medical intelligence. Adequate information on health threats and their impacts is the basis for planning and using timely, correctly dimensioned and effective management methods.	Defence Forces
The situation of tick-borne infections is monitored. Criteria are modified to correspond to the occurrence of ticks as necessary.	Defence Forces
Preparedness for incidents affecting domestic water is enhanced. Incidents affecting domestic water may be caused by such phenomena as droughts, floods and rainstorms. An incident may result in domestic water becoming contaminated and cause a health hazard.	Defence Forces
Soldiers' combat outfits are developed with a view to extreme weather events. In this development, operation in international missions and in varying climatic conditions (modifiability) is also provided for. The number of international missions will increase, and the climate may become rather severe in some regions of the planet.	Defence Forces
Information campaigns are organised concerning the health risks of climate change. For example, correct outfits for heat and wind, increased need for drinking liquids in hot conditions, protection against ticks and caution in slippery road conditions.	Defence Forces

5.2 Cost impacts

It is highly likely that the impacts of climate change will increase costs as a whole (PILMUS workshop on 29 September 2023). Some of the climate change phenomena will bring cost savings (such as reduced need for heating in winter and shorter period of clearing snow off roads), but they will be difficult to predict or cancelled out by phenomena working in the opposite direction (including increased need for cooling buildings in summer, anti-skid measures in winter, and having ploughing equipment standing by in case of heavy one-off snowfalls).

It is very likely that not anticipating climate change would be more costly than proactive measures, but this cost difference is also impossible to estimate. Dealing with damage is usually more expensive than preparing for it.

In order to integrate climate change adaptation as an elemental part into all planning and activities where necessary, budgeting for it separately is not appropriate as a rule. This means that the additional costs will be divided in small amounts between different budget items and vary from year to year, possibly increasing gradually. This makes it impossible to build an overall picture of the cost impact and development. However, a separate budget for climate change adaptation that would be easier to monitor would not be fit for purpose, as it would indicate that adaptation work is separate from normal activities and, on the other hand, it would be difficult to assess what share of such activities as planning of training represents separate work specifically carried out because of climate change adaptation.

Despite the challenging nature of assessing the cost impacts, any additional costs arising from climate change mitigation and adaptation need to be taken into account in the budgeting of the Defence Forces, and demonstrating and justifying the probable need for additional funding must be possible. It is likely that information on cost impacts will accumulate over time, enabling more detailed assessments of the additional costs.

The costs of renewable fuel and other new procurements made due to climate change mitigation and adaptation can be estimated indicatively. The costs of any one-off development projects can also be estimated.

5.3 Implementation

In observance of the Ministry of Defence's strategic steering, the Defence Forces will further incorporate the measures set out in this plan into the action plan prepared in the operational and resource planning process and the Energy and Climate Programme the next time it is updated. In the future, the objectives presented here and the measures taken to achieve them will be part of the Energy and Climate Programme for the part of measures assigned to the Defence Forces. The measures for which Defence Properties Finland is responsible and which are included in the Senate Group's climate change adaptation plan will be implemented by Defence Properties Finland following the plan drawn up by the Group.

Measures involving one-off studies or development projects will be implemented as projects. Project plans and cost estimates will be drawn up for them, and a schedule and responsible parties will be determined.

The need to update the Climate Change Adaptation Plan of the Defence Forces will be reviewed in connection with the update of the national Climate Change Adaptation Plan every second government term.

5.4 Reporting

Reporting on the Climate Change Adaptation Plan of the Defence Administration will take place in conjunction with the monitoring of the national climate change adaptation plan and following instructions to be issued later.

The defence administration's corporate responsibility report will contain reports on the measures at a general level. A more detailed report on progress made with the measures will be submitted in connection with reporting on the Energy and Climate Programme. To the extent that the measures are relevant to the Defence Forces' environmental sector, they will be reported in the environmental report.

Defence Properties Finland’s measures will be reported as part of the Senate Group's monitoring of adaptation measures and, upon request, to the defence administration.

6

Conclusion

The defence administration has identified climate change and its parallel and consequential phenomena, including the energy transition, as one of the factors affecting the operating and security environment. As part of the Defence Forces' Energy and Climate Programme, attention has for the last decade been paid particularly to the energy efficiency of properties and emissions reduction and, to an increasing extent, to emissions caused by fuel consumption in operations. While adaptation to climate change is included as one of the themes in the Energy and Climate Programme, it is discussed at a fairly general level. An ability to adapt reactively to changing weather conditions is also part of the Defence Forces' normal activities, but a need for more systematic development of preparedness for a changing climate has emerged. Rather than only affecting the climate, climate change will also have a highly multidimensional impact on society as a result of cascading impacts and spillover effects. For example, climate change will affect industries, ecosystem services, the energy and technology transition, the economy, and security and safety. These causal relationships will have different levels of impacts on the Finnish Defence Forces' operations, which must be adequately addressed at all levels of planning.

The Defence Forces must recognise the risks posed by a changing climate and the energy transition to its operations as well as be able to adapt the operations appropriately and assess the impact of the change on their priorities. Climate change is affected by several factors working in different directions and at varying strengths, which is why the trends cannot be estimated with certainty. This is why, rather than being a one-off activity, the assessment of climate risks and adaptation needs will continue, following the model now created.

This plan assessed the risks by examining the exposure and vulnerability of objects and functions to climate change phenomena, on the basis of which key risks were identified. The risk assessment identified the fact that climate change phenomena can pose risks to infrastructure, equipment, operations and personnel across a fairly broad front. Minimising and managing risks are investments in securing defence capabilities far into the future. Accounting for the risks to a sufficient extent in strategic planning and foresight is one of the key methods of doing this. Adapting the operating environment to climate risks and the increasing annual variations caused by climate change is another one. A third important theme is completing the energy transition while ensuring that capabilities are supported rather than put at risk. As the fourth theme emerged measures related to safeguarding the personnel's health.

This plan is part of the national Climate Change Adaptation Plan, in connection with which adaptation measures are also monitored nationally. The internal adaptation measures of the defence administration will be carried out and monitored following the Defence Forces' operational and resource planning and monitoring process and as part of the Energy and Climate Programme.

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