D1.3: REPORT ON SEGMENTS OF VULNERABILITY COUNTRY BY COUNTRY BASIS – INSIDE AND OUTSIDE THE OFFICIAL DATA

Project acronym: BuildERS

Project title: Building European Communities' Resilience and Social Capital

Call: H2020-SU-SEC-2018-2019-2020/H2020-SU-SEC-2018

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Executive Summary

This report contains the results of the work conducted to fulfil T1.2 and T1.3 by the contributing partners of the BuildERS consortium. Both tasks focus on vulnerability and vulnerable groups in past crises and disasters in a sample of countries of BuildERS consortium to better understand how vulnerabilities are considered at the national level and which vulnerable groups are those most affected by crises. The report shows that categorising vulnerable groups is a challenging endeavour when this phenomenon is studied through the lenses of intersectionality. The intersection of multiple social variables results in different positions of privilege and disadvantage. These different positions make the study on vulnerable groups more complex, but at the same time more nuanced and helpful for a fine-grained mapping of vulnerabilities. The report calls for a more systematic application of intersectionality in research to study vulnerabilities and vulnerable groups to serve better targeted policies towards vulnerable groups and their needs in the field of crisis and disaster management, disaster risk reduction and emergency management.

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List of Acronyms

BuildERS	Building European Communities Resilience and Social Capital project
CRED	Centre for Research on the Epidemiology of Disasters
D	Deliverable(s)
DDoS	Distributed Denial of Service
DSB	Norwegian Directorate for Civil Protection
DTM	Displacement Tracking Matrix
EIGE	European Institute for Gender Equality
ESS	European Social Survey
EU ERCC	EU Emergency Response Coordination Centre
GDP	Gross domestic product
GRI	Global Risk Index
IOM	International Organization for Migration
IPCC	(United Nations) Intergovernmental Panel on Climate Change
MSB	Swedish Civil Contingencies Agency
NEET	Not in Education, Employment, or Training
NESA	National Emergency Supply Agency
NGO	Non-Governmental Organisation
RVA	Risk and Vulnerability Analysis
SMHI	Swedish Meteorological and Hydrological Institute
T	Task(s)
UNDRR	United Nations Disaster Risk Reduction
UNISDR	United Nations International Strategy for Disaster Reduction
WVS	World Values Survey
WP	Work Package

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1. Introduction

1.1 Background

The BuildERS approach covers three main research elements in exploring the nexus between vulnerability and resilience: 1) risk perceptions, risk awareness and social capital; 2) institutional settings including organisational architectures, capacities and cultures of collaboration and shared values; 3) tools, processes and methods to enhance resilience-building, social capital and coping skills. Work Package 1 (WP1) is devoted to studying this nexus by exploring in particular the first element.

1.2 Aim of the Report

By offering a better understanding of vulnerabilities and of the characteristics of vulnerable groups, this report (D1.3) fulfils Task 1.2 (T1.2) and Task 1.3 (T1.3), which, respectively, are:

T1.2 Identification of segments of vulnerable populations: Assessing vulnerability includes identifying pre-disaster social and cultural factors that engender and perpetuate inequality, exclusion, and lack of access to and control over resources in a population.

T1.3 Identification of segments of vulnerable populations outside the official data: The characteristics of vulnerable segments of populations not picked up by pattern recognition analyses will be mapped by drawing on literature and media reports from a sample of central events occurring in Europe and outside Europe during the past 15 years.

In the present report, the underlying factors creating vulnerabilities will be accounted for when identifying vulnerable segments of the population in past crises[1]. Special attention will be given to equity considerations, as the intersection of multiple social variables result in different positions of privilege and disadvantage (commonly referred to as intersectionality). The report will therefore integrate categories of differentiated vulnerabilities as they appear as part of the analysis, rather than merely addressing binary categories such as women and men or poor and rich, which ends up glancing over individual differences and reducing entire demographics to homogenous categories. A cross-dimensional classification of vulnerable groups will be provided to enable pattern recognition according to intersectionality. This will be useful for future mappings of vulnerabilities. The recognised patterns' may or may not match the conceptual structure from D1.1 (*First report presenting the unified theoretical framework on the concepts of risk awareness, social capital, vulnerable segments of society, and their inter-dependencies*) and will contribute to further elaboration in D1.2 (*Final report presenting the unified theoretical framework on the concepts of risk awareness, social capital, vulnerable segments of society, and their inter-dependencies*).

[1] Crisis refers to an unwanted event that leads to consequences which trigger vulnerability. See BuildERS Terminology in Appendix A of D1.1 *First report presenting the unified theoretical framework on the concepts of risk awareness, social capital, vulnerable segments of society, and their inter-dependencies*.

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This report makes an extensive use of concepts and definitions from D1.1. At the same time, it brings to the attention of the reader the difference that may occur between vulnerable groups identified and included in official data and the groups that fall outside these data sources. The definition of vulnerabilities and the categories used (e.g., elderly or children) in national, cross-national or international surveys is what we refer to as inside the official data. The presentation and analyses of past crises looking for vulnerable groups that may have not been picked by pattern recognition analyses collected within public surveys or reports is what we refer to as outside the official data. In addition, this report introduces intersectionality as an approach to overcome binary categorisations of vulnerable groups. Intersectionality is explained in Chapter 6. Finally, this report uses the term vulnerable groups as synonym for segments of vulnerable population, the reason being that vulnerable groups is a more common and understandable term.

1.3 Structure of the Report

Chapter 2 summarises methods and research design, while Chapter 3 presents the main cross-national surveys and databases which have been scrutinised to find out how vulnerability is considered. Chapter 4 focuses on a sample of countries of the consortium including Estonia, Finland, Norway and Sweden by analysing how official data address vulnerability and vulnerable groups. Chapter 5 proposes a series of crises and disasters from which it is possible to extract examples of vulnerability factors and vulnerable groups. Chapter 6 introduces intersectionality and discusses the examples of vulnerable groups from Chapters 4 and 5 through the lenses of intersectionality. Chapter 7 offers the conclusion and Chapter 8 lists the references.

1.4 Relationship to other Deliverables

In general, the overall work within WP1 and the deliverables therein serve as the basis for the subsequent WPs. This report relies on the findings of D1.1 as for the concepts and definitions explored there, while it presents some crises and disasters from D1.4 and later illustrated in WP4. The main findings will feed a scientific publication in a later stage (D1.6). Together with D1.1, D1.2 and D1.4, this report provides a very good basis for the ongoing work in WP2, especially T2.1 on institutional aspects of resilience and T2.3, regarding social media as an information channel for authorities' campaigns and their use by vulnerable groups. This report provides, as well, a solid background on vulnerabilities and vulnerable groups for the implementation of D3.1 and D3.2, concerning the survey on vulnerable groups. Finally, the findings are meant to feed the recommendations to policy-makers, which will be elaborated in WP5.

2. Methods and Research Design

2.1 Method

D1.3 presents the results from a scoping study by gathering and analysing data from a variety of sources. According to O'Brien et al. (2016: 1), "scoping studies (or reviews) are a method used to comprehensively map evidence across a range of study designs in an area, with the aim of informing future research practice, programs and policy". This method fits with the research aims of T1.2 and T1.3. The research design included steps of collaborative literature searches and iterative analysis of the data (Johannessen et al., 2010), which were collected from three sources 1) official public

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international and national surveys and data bases; 2) grey literature (Schöpfel, 2010); 3) scientific literature, through snowballing searches (Jalali and Wohlin, 2012). Snowball is used when the researcher starts out with one central article or book and further pursue references after references using inclusion criteria (Greenhalgh and Peacock, 2005).

Official data	***Grey literature***	***Scientific literature***
International and national surveys	Public policy documents from international organisations and national governments	Latest published research in peer reviews journals
International and national data bases	Reports from previous projects	
	Newspapers' articles	

Table 1. *Sources used within this report*

Literature searches, generally, followed standard procedures (Gough and Richardson, 2018; Whittemore and Knafl, 2005) mostly in the national language of the contributing partners, so databases and search phrases differed accordingly. This is an example of quantitative search in the case of Norway by using Google Scholar and Oria. The following searches yielded the following hits:

1. Google scholar: "Sårbare Grupper"[2] 350 hits, 13 applicable in first screening, 5 found applicable in second screening

2. Google scholar "vulnerable groups" +crisis +Norway +study +quantitative +disaster +vulnerable +groups +social +"social capital" 378 hits, 1 applicable

3. Google scholar "vulnerable groups" +crisis +Norwegian +study +quantitative +disaster +vulnerable +groups +social +"social capital" 269 hits, 0 applicable

4. Oria "sårbare +grupper +Norge +krise"[3] 30, hits 0 applicable

2.2 Phases during data collection

The leader of D1.3 (UiS) instructed the contributing partners to look for and collect the following data in the context of vulnerabilities and vulnerable groups in crisis, disasters, and disaster risk reduction: a) National databases and surveys addressing issues of vulnerability and vulnerable groups, specifically seeking to find how vulnerability is defined and mapped; b) Factors explaining and creating vulnerability that are often mentioned; c) Examples of at least three man-made and three natural crises, from which it is possible to extract information about vulnerable groups and/or vulnerabilities; d) Potential linkages with issues related to risk awareness, social capital, and use of social media, drawing on the first version of the butterfly model proposed in WP1 (D1.1, 2019: 18)[4]; f) Potential examples of multi-dimensionally classified vulnerable groups at national level. As for c) in particular, the contributing partners were instructed to provide background information about the crisis (when it happened, where, type of hazard, eventual losses etc.); which vulnerable groups were explicitly

[2] Vulnerable groups in Norwegian.
[3] Vulnerable groups, Norway and crisis in Norwegian.
[4] The BuildERS butterfly conceptual model is part of an on-going process that will end with D1.2. It seeks to link the main concepts of this project - social capital, risk awareness, vulnerability, and resilience – in the context of crisis management. Its aim is to capture the nuances and complexity of crises and to underline how the diversity within and between societies needs to be understood and the specific needs of its components recognised.

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mentioned in the collected information; if the crisis affected groups not mentioned in official national surveys and databases.

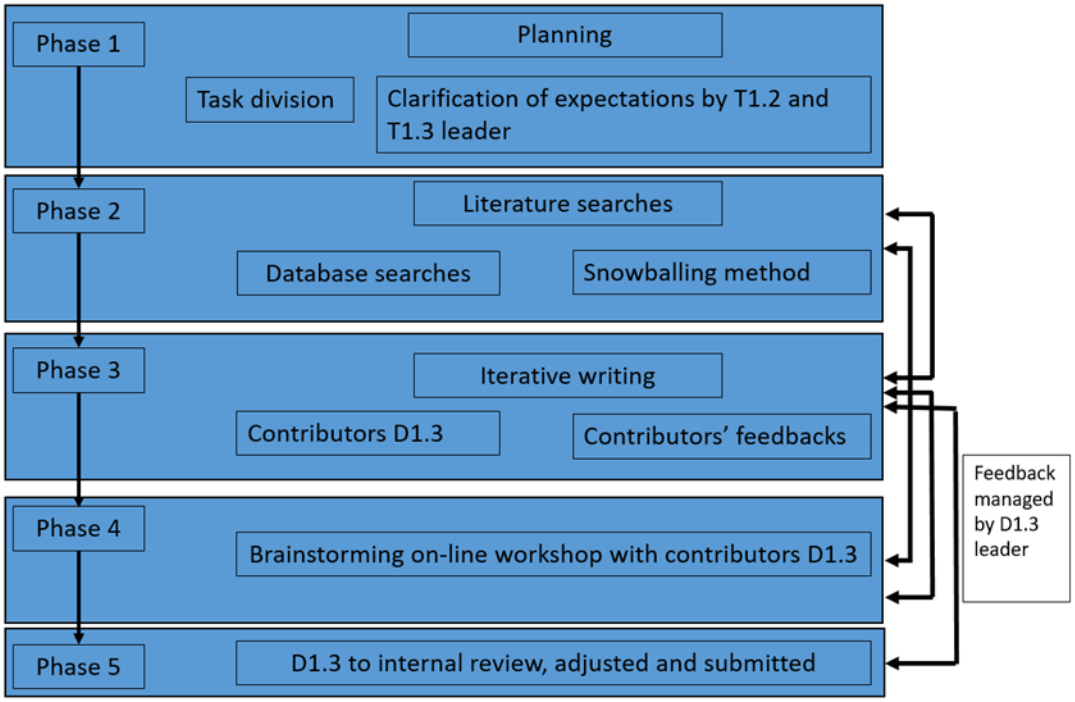

Figure 1. *Research design*

When the work in phases 1 and 2 was concluded and the leading partner of the report had organised the material received in a draft report, the contributing partners met in a so-called brainstorming on-line workshop (phase 4 in Figure 1). During this workshop, examples of vulnerable groups and vulnerabilities were discussed to find common patterns. Then, intersectionality (see section 6.2) was applied to problematize the underlying elements creating vulnerabilities and to understand better the intersection of multiple social variables and how these influence the categorisations of vulnerable groups.

The workshop was organised as follows:

Agenda:

1. *Aim of the meeting*
2. *Short introduction on intersectionality*
3. *Presentation of national cases from the draft report. Discussion on:*

    - *Which segments of population are vulnerable according the case. Discussion in the following order:*
      Estonia
      Finland
      Norway
      Sweden
    - *Range of vulnerability elements.*
    - *How we organize the taxonomy/classification*

4. *How intersectionality can help us in our classification*
5. *Next steps*

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After the workshop, a new draft was prepared and improved with comments and feedback from the contributing partners. Then, the draft was sent to internal review to fulfil dissemination and ethical standards and for the general review.

3. Cross-national data on vulnerabilities and vulnerable groups

Before focusing on national surveys and databases, this report offers an overview of cross-national surveys and databases, which were collected following the snowballing principle. We opted to be inclusive rather that restrictive in our collection. This overview was deemed necessary to better understand to what extent cross-national surveys, most of them including the countries of this report, address vulnerability and vulnerable groups and whether there are already data at international level that can be used as a foundation for data gathering at national level. One major challenge encountered in looking for and systematising these surveys and databases was that very few of them (such as CRED, UNDRR, and INFORM) specifically address vulnerability in hazards, crises and/or disasters. On the other side, this confirmed that BuildERS work is very relevant, since in WP3 the project provides a survey that covers exactly this issue: vulnerabilities and vulnerable groups in crises and/or disasters.

Once the main surveys and databases were identified, the first step was to recognise some elements or factors of vulnerability. The report D1.1 and the draft for D1.2 informed this step, by using the butterfly model and the literature review. These elements were useful to scrutinise vulnerability from the perspectives of various institutional bodies and agencies, but they were not proven in hazards, crisis and/or disaster contexts, since they do not adequately show the complexities of vulnerability within these contexts.

The main surveys and databases were:

CRED https://www.cred.be/. The Centre for Research on the Epidemiology of Disasters produces two main reports relevant for this Report: the Annual Disaster Statistical Review; the International Disaster Database (https://www.emdat.be/).

EIGE https://eige.europa.eu/. The European Institute for Gender Equality collects, analyses, processes and disseminates data and information on gender equality issues.

Eurostat https://ec.europa.eu/eurostat. Eurostat is the statistical office of the EU and provides statistics at European level that enable comparisons between countries and regions.

ESS http://www.europeansocialsurvey.org/. The European Social Survey is provided by the European Research Infrastructure Consortium.

INFORM https://www.preventionweb.net/publications/view/62347. INFORM is a multi-stakeholder forum for developing shared analysis to help to manage humanitarian crises and disasters. Each year, it publishes the INFORM Global Risk Index (GRI).

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OECD https://www.oecd.org. The Organisation for Economic Co-operation and Development publishes annual statistics and databases on a wide range of topics, such as trade, agriculture and education, on country by country basis.

Our world in data https://ourworldindata.org/. This is a free database founded and directed by Max Roser, an economist at the University of Oxford, in 2011. Global challenges such as poverty, health, and the distribution of incomes are covered by statistics and charts accessible for everybody.

Transparency International https://www.transparency.org/. The Global Coalition against Corruption, funded in 1993 and now working in more than 100 countries, is most famous for its annual publication of the Corruption Perception Index.

UNDRR https://www.unisdr.org/. The UN Office for Disaster Risk Reduction runs several statistic reports and data. In particular, this website https://www.unisdr.org/we/inform/disaster-statistics

Vision of Humanity http://visionofhumanity.org/. The Institute for Economics and Peace is the world's leading think tank dedicated to developing metrics to analyse peace and to quantify its economic value and runs Vision of Humanity.

WHO https://www.who.int/. The World Health Organisation publishes reports on the current situation and trends for priority health issues and annual statistics on key health indicators.

World Bank https://data.worldbank.org/. The World Bank data portal provides data on a wide range of topics, such as world development indicators and living standards measurements.

World Values Survey WVS http://www.worldvaluessurvey.org/wvs.jsp. The WVS is a global network of social scientists studying changing values and their impact on social and political life.

WTO https://data.wto.org/.The WTO Data portal contains statistical indicators related to WTO issues. Available time series cover merchandise trade and trade in services statistics, market access indicators and so on.

We found several elements or factors of vulnerability in these surveys and databases, which were regrouped under broader categories, such as:

1) Living conditions: house quality, location of the house, access to services, but also theft rate, homicide/assault/robbery rate and corruption level
2) Economic and financial conditions: income, economic capacity, health care expenditure, unemployment rate, GDP per capita
3) Education: access to education, expenses for education, offer of education
4) Nutrition: food security, access to food
5) Poverty: material deprivation, at-risk-of-poverty-rate
6) Health: access to medical services, expenses for health, mental and physical impairments, mortality, suicide rate, infant mortality
7) Age: elderly often defined as 65+, children age <15
8) Trust: level of corruption, trust in public institutions

While all these categories and the elements therein show the richness and variety of data, they do not focus on issues of vulnerability in related topics relevant for BuildERS, such as social capital, risk awareness, or risk perception within crises and/or disasters contexts.

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One of the few data listed above relevant for the vulnerability perspective promoted by BuildERS is the INFORM Global Risk Index (GRI) (INFORM, 2019), which represents the most relevant source of information to understand vulnerability at national level, since the GRI includes three dimensions of risk to assess the risk level of countries: a) hazards and exposure; b) vulnerability; and c) lack of coping capacity. Each dimension encompasses categories and components as the table 2 below shows:

Ranking level	InfoRM																			
Concept level (Dimensions)	Hazard & Exposure										Vulnerability					Lack of Coping Capacity				
Functional level (Categories)	Natural					Human					Socio-Economic			Vulnerable Groups		Institutional		Infrastructure		
Component level	Earthquake	Tsunami	Flood	Tropical cyclone	Drought	Conflict intensity	Regime stability	Extrajudicial and Unlawful killings	Development & Deprivation (50%)	Inequality (25%)	Aid Dependency (25%)	Uprooted People	Other Vulnerable Groups	DRR	Governance	Communication	Physical Infrastructure	Access to Health System		

Table 2. *INFORM Index model (Marin-Ferrer et al., 2017:12)*

Hazards, exposure, vulnerability and lack of coping capacity are strongly dependent on people's circumstances and choices and the state of society. INFORM defines vulnerability as the susceptibility of communities to hazards (Marin-Ferrer et al. 2017:7), while a vulnerable group is defined as a "population within a country that has specific characteristics that make it at a higher risk of needing humanitarian assistance than others or being excluded from financial and social services. In a crisis such groups would need extra assistance, which appeals for additional measures, i.e. extra capacity, as a part of the emergency phase of disaster management" (ibid., 2017:34). The level of social and economic development affects vulnerability and thus, in assessing vulnerability, the relative changes in social and economic development are taken into account. Indeed, according to the INFORM model, vulnerabilities are affected by, for example, economic conditions, educational level, population age structure, institutions and organizations, whose ability to forecast exposure and reduce vulnerability is critical to the magnitude of the consequences of a crisis or a disaster. By combining the three dimensions (hazards, vulnerability, and coping capacities) the model provides the INFORM risk index for all the countries in the world according to a scale from 1 to 5, where 1 is the lowest national risk and 5 the highest.

The information provided by INFORM on the countries analysed in this report was completed by the inclusion of national risk assessments based on the EU Risk Assessment and Mapping Guidelines for Disaster Management (European Commission, 2010), which define vulnerability following the 2009 UNISDR definition as "the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard" (ibid., 2010:10). The EU member states and Associate Countries have to develop risk assessments at the national or appropriate sub-national level and submit a summary of the relevant elements to the European Commission every three years (European Commission, 2013). The latest national risk assessments were submitted in 2019 and they

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represent a very useful source of information as for understanding which kind of risks and vulnerabilities countries face.

4. National data and research on vulnerability and vulnerable groups

In this Chapter, we focus on four European countries from the BuildERS consortium: Estonia, Finland, Norway and Sweden, to uncover whether definitions of vulnerability and the categorisation of vulnerable groups vary among countries. In addition, we aim to problematize the trans-national data from the previous Chapter, showing that the elements of vulnerability singled out in the transnational surveys and databases are not necessarily representative for the focus of the various countries institutions and agencies. For each country we briefly present 1) an overview of the country based on cross-national and national statistics relevant for BuildERS research. Eventually we point out some peculiarities of the country (see Estonia); 2) the INFORM Index and national risk assessments (mostly through maps and figures) to understand which the main risks are considered; 3) if there is a clear definition of vulnerability in the public and official discourse; 4) which the main vulnerable groups are, according to national surveys, policy documents and research.

4.1 Estonia

4.1.1 Overview about Estonia

Estonia, one of the three Baltic countries, has made pioneering advances with its innovative e-Estonia initiative – fostering innovative education, virtual business and digital citizenship. Nowadays, the country ranks among the most digitally advanced states in the world. Yet, the digital divide is still present between the older generation, struggling with elementary skills, and the younger generation, which has greater awareness and abilities to ensure its quality of life and well-being through ITC services. High digital skills and user frequency also correlate with better digital hygiene[5], whereas less use of digital services also means lesser skills (higher vulnerability) to handle malicious content on the web. As the digital becomes more and more pervasive in Estonia, malicious actors also have the chance to exploit eventual weaknesses of vulnerable cyber subjects to shake the stability of the country. Cyber security in an information society like Estonia is of paramount importance in ensuring conditions for using the possibilities of ICT in efficient and secure ways.

Estonia falls in the bottom tier of OECD countries on household net adjusted disposable income. The unemployment rate is 5,4% in 2018 (OECD, 2020b). Life expectancy at birth in Estonia is 78 years, which is lower than the OECD average. 51% of the population declares that its health is good or very good. Similarly, in Estonia life satisfaction is the third lowest among the OECD countries. Conversely, Estonia's upper secondary educational attainment and students' cognitive skills are among the highest among the OECD countries. As for the major societal trends, social support in Estonia has increased, with the share of the population reporting that they have relatives or friends whom they

[5] See analyses from the project Enhancing knowledge of European children's online opportunities, risks and safety http://www.lse.ac.uk/media-and-communications/research/research-projects/eu-kids-online.

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can count on to help in case of need increasing from 85.4% to 90.5%, one of the largest improvements in the OECD countries.

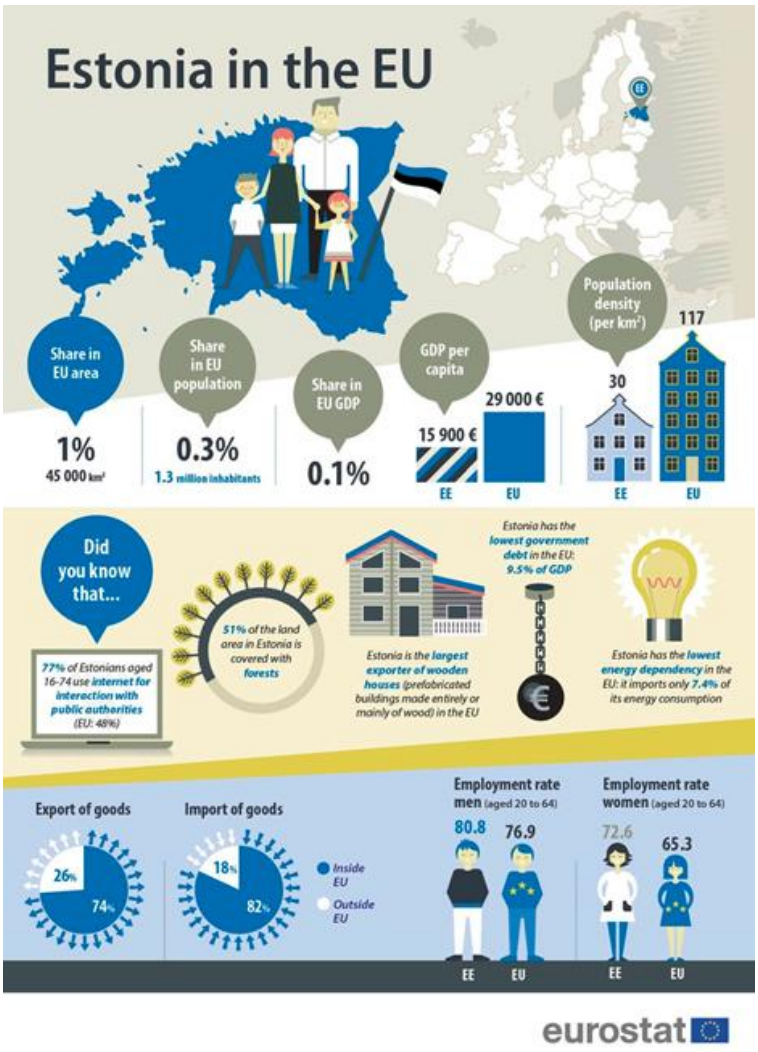

Figure 2. *Some figures about Estonia (Source: Eurostat, 2017)*

Estonia's development has two sides: welfare has increased greatly, but it continues to be unevenly distributed (Tammaru, 2017). The growth of welfare measured against the human development index (health, education, wealth) is one of the biggest in Europe within the last 25 years, after Croatia and Ireland. At the same time, inequalities are still significant and among the highest in Europe (see OECD, 2020a, for income inequalities, for instance). One of the challenges is the still deficient social links between the Estonian-speaking and Russian-speaking communities. The kindergarten and school system is still dividing children into parallel worlds on the basis of the Estonian and Russian languages. Within the last 25 years, Estonian-speaking people have progressed quicker to higher career levels than Russian-speaking people. As a result, the income of Estonian-speaking people is also higher. For instance, Russian-speaking people cannot afford to purchase homes in the same areas as Estonians (Kährik et al., 2019).

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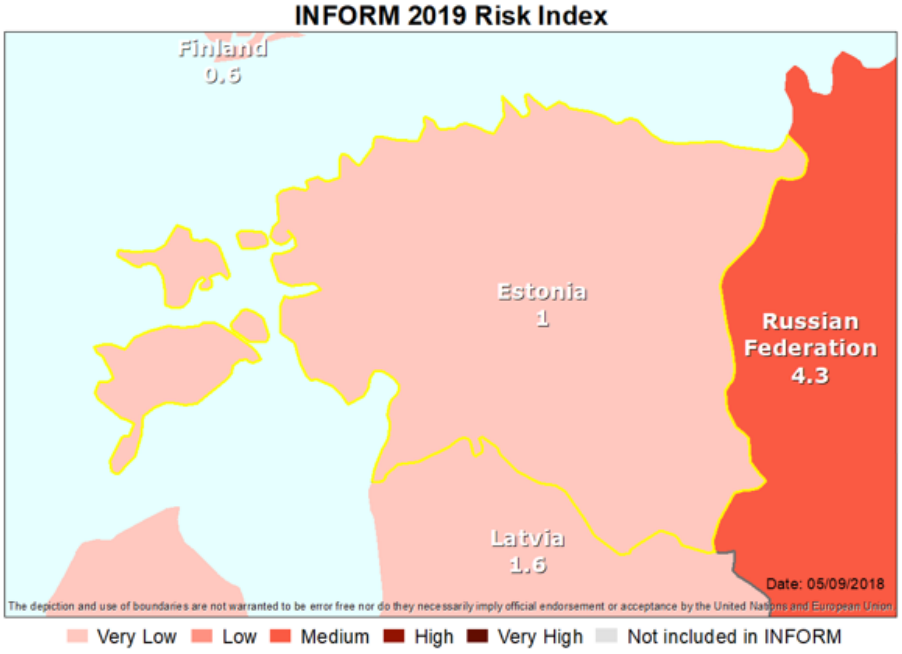
4.1.2 National risks in Estonia



	Value	Rank	Trend
INFORM	1.00	185	EQUAL
Hazard	0.50	184	EQUAL
Vulnerability	1.10	180	EQUAL
Coping Capacity	2.00	169	EQUAL

Figure 3. *INFORM index (Source: INFORM, 2020)*

The latest national risk assessment released by the Estonian Ministry of Interior is dated 2013 (Otsla, 2016)[6]. According to this risk assessment, the greatest threats that could affect Estonian citizens would likely happen outside Estonian territory (e.g. in a nuclear power station close-by to Estonian border). Threats having the most negative effects on the well-being of people and functioning of critical infrastructure in Estonia include natural, man-made, technology-related, industrial as well as combined threats. According the Estonian Ministry of Interior, the following events can lead to an emergency in Estonia and are thus subject to risk assessment: a flood in a densely populated area; an extensive fire; an explosion; a collapse; a transport accident; an industrial accident; environmental pollution; a mass disorder; mass influx of refugees; an attack on a site; epidemic and poisoning; an infectious animal disease caused by a biological pathogen; a radiological or nuclear accident; a cyber-incident. Besides, an interruption of a vital service can also cause an emergency. According to the Emergency Act of 2017, vital services in Estonia are: electricity, natural gas and liquid fuel supply;

[6] More recent national risk assessments are not made available to public.

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operability of national roads; phone, mobile phone and data transmission services; digital identification and digital signing; emergency (health) care; payment services and cash circulation.

4.1.3 Vulnerabilities and vulnerable groups in Estonia

A recent policy paper, the Estonian Civil Protection Concept (Estonian Government Office, 2017), sets the foundation for a more civilian-oriented emergency policy, which encourages greater responsibility of individuals and communities in preventing and coping with crises. The Concept describes as vulnerable those individuals who lack skills and capacities to cope with a disaster. Another recent policy paper, the Estonian State Protection Concept (Ministry of Defence, 2017) highlights that social networks, prevalence of shared values and trust in state institutions represent protective factors against vulnerability in threat conditions. The Estonian State Protection Concept emphasises that these protective factors work towards building social cohesion and solidarity to buffer the shocks that extreme events may pose to the Estonian society. In general, Estonian official documents consider a variety of psychological, physical, social and economic factors as shaping and influencing individual skills and capacities to cope with emergencies. These factors are described as follows.

Age. In the Estonian Civil Protection Concept, emphasis in given to vulnerabilities related to age by considering two age extremes: children (up to 18) and elderly (from 65+ years). A recent national population Survey (Kantar Emor, 2017) showed that the elderly possess lower capacities to react to a crisis. In Estonia, among individuals from 65+ years, there are significantly more people that would not do anything in case of a crisis than those in the category up to 39-years (11% versus 4%). In another Survey, commissioned by the Estonian Rescue Board, the elderly rate their capacities to cope with extreme events lower: in the age group of 65+, 48% individuals responded that they would be able to cope in extreme weather events against the 57% among younger age groups (TNS Emor, 2016). Furthermore, elderly assess their knowledge on all major threats lower than the younger population (TNS Emor, 2016). The same group claims to not possess skills in case of a failure of vital services, compared to younger age groups (70% versus 54%) (TNS Emor, 2016). The same Survey indicated that in case of a crisis, older generations are more likely to stay in the impacted area, while younger individuals are more prone to leave that area. This behaviour can be related to health issues, particularly affecting the lives of the elderly, and thus decreasing their mobility. In case of crises, the elderly with limited mobility may require special assistance from the emergency services and if assistance is not properly offered, their capacities to respond may be lower (Estonian Government Office, 2017). Another important issue related to the elderly is that 36% of the 239 600 individuals living alone in Estonia are older than 65 years (Estonian Statistics, 2019). In case of crises, this can be a risk factor since there is no one else to rely on for information or help in evacuation, especially if the individual is physically or cognitively disabled. Another group of people (often overlapping with the elderly) that may need extra care in times of crisis is individuals with chronic disease. According to Estonian Statistics (2019), 30% of the Estonian population has a chronic disease or other severe health problems. A chronic disease may decrease the sensory, regulatory or motoric capabilities of an individual, which may impede appropriate response in disaster. Considering that Estonia has a population of 1,4 million, this means that a significant proportion is vulnerable in case of a crisis.

Cultural belonging. Besides age, the Civil Protection Concept (Estonian Government Office, 2017) considers individuals the Russian-speaking population minority, which accounts for one third of the Estonian population, more vulnerable the Estonian speaking population. This minority is mostly concentrated in the capital Tallinn and the North-eastern part of Estonia (Ida-Virumaa). Most of the

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Russian-speaking population minority has Estonian citizenship, but speaks little Estonian. One of the aspects that is considered to make this group vulnerable is the fact that this minority often uses Russian media as information source (Me.Media.World, 2014). This may lead to an increased risk of politically motivated reports by Russian media that do not mirror the real situation of a crisis unfolding in Estonia. Furthermore, the TNS Emor Survey (2016) indicates that the Russian-speaking minority is less likely to positively assess its coping skills in case of a failure of vital services, compared to Estonian-speaking population. In addition, the Russian minority is materially less prepared, rarely possessing an alternative to an electric or gas stove or to central heating, should there be a power outage. Unlike the majority of the population, the Russian minority rarely has a second home to evacuate to in times of crisis (Estonian Government Office, 2017). Thus, in general the Russian minority is less prepared for crises. In addition, the TNS Emor Survey (2016) shows that there is a higher percentage of Russian-speaking individuals in Estonia who claim to have been affected by a crisis (27% versus 22% of Estonian-speaking individuals). Nevertheless, compared to the Estonian-speaking population, among Russian-speaking individuals, there are somewhat more individuals that claim that they do not take warnings seriously (3% among Estonian speakers compared to 6% among Russian speakers). Furthermore, individuals from the Russian minority more likely claim that they cannot easily find information on threats. Compared to Estonian-speaking individuals, among Russian-speakers there are less individuals that would rely on information from media channels, particularly on radio or various internet sites (79% versus 88% of the Estonian-speaking population).

Another factor influencing vulnerability is the **economic situation**, which has a direct correlation with material preparedness: purchasing a first aid or crisis preparedness kit, and food stocks is linked to the household's financial situation. Income is also a primary factor in preparing the house estate for crises, for instance major storms, which increasingly hit Estonia (Mölter et al., 2016). Only 1/10 of Estonian households have necessary stocks in order to be prepared for a crisis, while 2/3 of the Estonian population has food stocks for one week (Estonian Ministry of Interior, 2015). The economic situation influences the purchase of the housing estate. In Estonia, blocks of flats are less expensive than other types of houses and usually purchased by individuals or families with a lower income (Torpan et al., 2019). The part of the population living in blocks of flats (57%) is materially the least prepared to cope with a crisis (Estonian Government Office, 2017). Compared to houses with eight or less apartments, larger blocks of flats' inhabitants tend to be materially less prepared. For example, they are less likely to have a torch, radio with batteries, possibilities to store food, and have alternative heating system. This might be related to the lack of storage place in these households. The concentration of blocks of flats is higher in larger cities in Tallinn, as well as in Ida-Viru region, including Narva, Kohtla-Järve and Jõhvi cities. These are also areas where the Russian minority prevails.

Spatial segregation in certain Estonian regions is considered another factor contributing to vulnerability (Ministry of Defence, 2017). Inhabitants in sparsely populated municipalities (with fewer taxpayers to support local budget), with less economic capacities are considered to be more vulnerable due to their local governments' reduced abilities to offer social care in case of emergencies or under a failure of vital services. The regions with weak physical as well as social infrastructures within health care and education are less able to support their inhabitants in severe threat conditions. In addition, areas with low level of social movements and volunteerism affect societal resilience (Estonian Ministry of Interior, 2015). Furthermore, according to the Estonian Internal Security Development Programme 2015-2020 (Estonian Ministry of Interior, 2015), 7% of Estonian population lives in regions where the rescue and response is difficult to reach. These areas are, however,

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characterised by closer interpersonal relations, which provide better unofficial support in times of emergencies (Head of Tõutsi village, personal interview, 19.12.2019).

Dependence on vital services (e.g. electricity, water central heating) **and e-services** is described as an increasing and all-encompassing source of vulnerability in Estonia (Estonian Government Office, 2017). Information provision is a vital service as well, but, without electricity, the chances to communicate with the population during a crisis decrease in a country considered the most advanced digital society in the world. Due to the privatisation of many of the vital service providers, the provision is dependent on (global) economic security. In case of cease of information provision service, particularly individuals with smaller social capital are affected (Estonian Government Office, 2017). When usual information channels do not work, the dependence on informal communication networks leaves individuals with lesser networks. However, reliance on only informal communication networks may be leave those individuals out of the reach of official crisis guidelines.

The Estonia's national Cybersecurity Strategy 2019-2022 (2018: 20) highlights the growth of cyber risks in the following way: "Considering that a significant share of people's activity has moved into cyber space, the largest share of offences is also committed by exploiting virtual means. A distributed denial of service stack or ransomware campaign no longer requires high technical skills or major resources to commit. This means a much larger pool of potential criminals with the capability of attacking Estonian state and people via the internet. [...] As the ICT sector develops, new means and methods for committing cyber-attacks will arise". The Strategy lists various activities in the area of raising cyber awareness of citizens, state and private sector. These include: "Activities for raising awareness aimed at the general public will be carried out"; "Knowledge and skills of students and teachers will be measured systematically and a supply of training in the field of cyber security will be provided for general educational school and vocational school teachers"; "A systematic, nationwide platform for government institutions and local governments for raising cyber awareness will be developed"; "The knowledge and skills of the state's mid-level and top officials will be strengthened" (Estonia's national Cybersecurity Strategy 2019-2022, 2018: 66-69).

In Estonia, the term **vulnerability** is frequently used in various official documents and reports dealing with cyber security. What is notable in these texts, however, is that the term is almost always used to refer to infrastructures and technological weaknesses, such as software or hardware issues. For example, the latest annual cybersecurity assessment Report produced by the Estonian Information Systems Authority (2019) contains phrases such as "whenever devices are vulnerable, that vulnerability gets exploited", "devices in private and public networks use the same vulnerable software" (Estonian Information Systems Authority, 2019: 8) and "vulnerability on the chips used on the EstonianID card" (Estonian Information Systems Authority, 2019: 51). In a similar vein, whenever the term resilience appears in these documents, it refers solely to certain desired technological attributes of information systems and digital services, as in the phrase "strong technological resilience" (Estonian Information Systems Authority, 2019: 53). This observation serves as a useful reminder that in this context, vulnerability and resilience are qualities of the systems under attack and not of the people affected by cyber-attacks. However, as the Cyber Security Strategy underlines, the Estonian state and people are the first to pay for the consequences of cyber-attacks. Indeed, the nature and scope of the cyber-attack affects the most exposed groups, which become more vulnerable than others. For example, when a cyber-attack causes power disruptions, one can argue that people in rural areas are more likely to have access to firewood, fresh drinking water and enough farm food supplies to go through the outage (Klaos, 2019). Peoples' vulnerability also varies depending on the time of the outage (summer-winter, day-night etc.), the presence of vital service providers in their area and the relative position of the problem in critical infrastructure (Matthewman

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and Byrd, 2014). In terms of wealth, poorer families have less opportunities to prepare themselves for crises materially and may therefore suffer from the lack of supplies and necessities (Klaos, 2019). While the factors which may contribute to peoples' vulnerability in such situations are generally known by emergency managers, reaching out to particular segments of population to raise their risk awareness remains a challenge (Saar, 2019).

While the notion of cyber-attack is not used in statistical population surveys, they do address individuals who have experienced security vulnerabilities. For example, Estonian Statistics measures a "share of internet and computer users aged 16-74 in the last 12 months who experienced at least one of the following security vulnerabilities: Infection with virus or other malware resulting in lost data and/or time; abuse of personal data entered on the internet or other infringement of privacy; financial losses sustained from following instructions in a malicious email, spoofed website; falling victim to card fraud; children accessing inappropriate web content" (Estonia's national Cybersecurity Strategy 2019-2022, 2018: 65).

There is some evidence that individuals who have suffered from computer crime such as fraud learn from their mistakes and take measures to avoid becoming a victim again in the future (Bada and Nurse, 2020: 81). However, people who do not know much about computers and cyber-crime may develop a sense of 'learnt helplessness', accept the 'inevitability' of becoming victimised by attackers at some point, especially because of the anonymous nature of cyber-crime, and therefore do not take precautions necessary to defend themselves (ibidem: 84).

How people perceive and respond to risks related to cyber-attacks is influenced by news media coverage of cyber-crime. For example, in Estonian major newspapers, vulnerability to cyber-attacks has been much discussed in the context of hospitals and medical services. The chief of information security of the Central Hospital of West Tallinn has claimed that medicine is a very attractive field for cyber criminals because of the data that is being processed by health information systems, while the chief of Tallinn's Ambulance has assured people that even though ambulances are connected to internet, cyber-attacks do not interfere with their vital service (Tamm, 2018). The vice director of the Estonian Information System Authority has also emphasised the necessity of protecting the medical grid, saying that a cyber-attack on medical equipment could result in the death of patients (Vaks, 2017).

4.1.4 Reflections on Estonia

In Estonia, social and economic factors influencing vulnerability allow one to spot certain typologies of vulnerable groups, such as elderly, children, minorities, households in rural areas, but also in blocks of flats. In the public documents analysed, gender and race apparently play not a big role. In addition, the spread of technology in all the sectors of Estonian society if, on the one side, has improved the competitiveness of the state and increased the wellbeing of its population, but also it has introduced new types of vulnerabilities, as in the case of cyber-attacks. Developing strategies and antibodies against such threats become fundamental not only to shield the society on the outside, but also to strengthen the increasingly digitalised way of life.

The official documents and surveys seem to follow classical categories of vulnerable people (elderly, children, minorities, isolated households, residents in small municipalities vs those in big cities). However, the complexities raised by technologies need to be included, since they lead to new and different typologies of vulnerability.

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Drawing from above, key dimensions of vulnerability in Estonia are:

1. Cultural variances. Depending on the social-political context, being a Russian minority may affect the economic and social capital, but also the information sources that an individual relies on in a crisis.

2. In the context of urbanization, increasing dependence of vital services, including e-services and information-technology as means of payment, moving data, identification may be a source of vulnerability. This is also related to the de-skilling of individuals and households, who have not had a chance to acquire skills of coping with crises and disasters.

3. Peripheral areas laying distant from official response areas. The main challenge here is lower population density and lower social capital and community activeness to prepare for and mobilise in case of disasters. This may be a source of vulnerability. These regions often have weaker local governments and institutional capacities.

4. The level of personal exposure or mental proximity of the affected areas and populations determines the interest in and knowledge about threats. Since Estonia is very small by its territory and the information coverage tends to be Estonian centred, there is smaller likelihood of info on threats reaching the larger public through for example media (Orru et al., 2018). The sense of protection eases the minds of Estonians and may lead to sub-optimal preparation for threats.

4.2 Finland

4.2.1 Overview about Finland

Finland is a Nordic country offering a high level of social services, equality in income distribution (5th lowest in OECD), high level of transparency (3rd least corrupted country in the world) and a high level of gender equality (8th in the world) (OECD, 2020a; CPI, 2018; GGGR, 2018). According to Statistics Finland (Statistics Finland, 2019), the population is relatively homogenous and quite highly educated, with 71% population over 15 years holding a degree after primary school.

The level of risk of poverty or exclusion in Finland is lower than the European average. In the EU-28, approximately 22.4% of the population was at risk of poverty or exclusion in 2016, compared with 15.7% in Finland in the same year. In Finland, the risk of poverty or exclusion due to low incomes is particularly targeted at young adults and those over 75 years of age, whose risk of poverty or exclusion is on average in the EU. In particular, the risk for children, the working age population and younger pensioners is well below the EU average (Statistics Finland, 2019).

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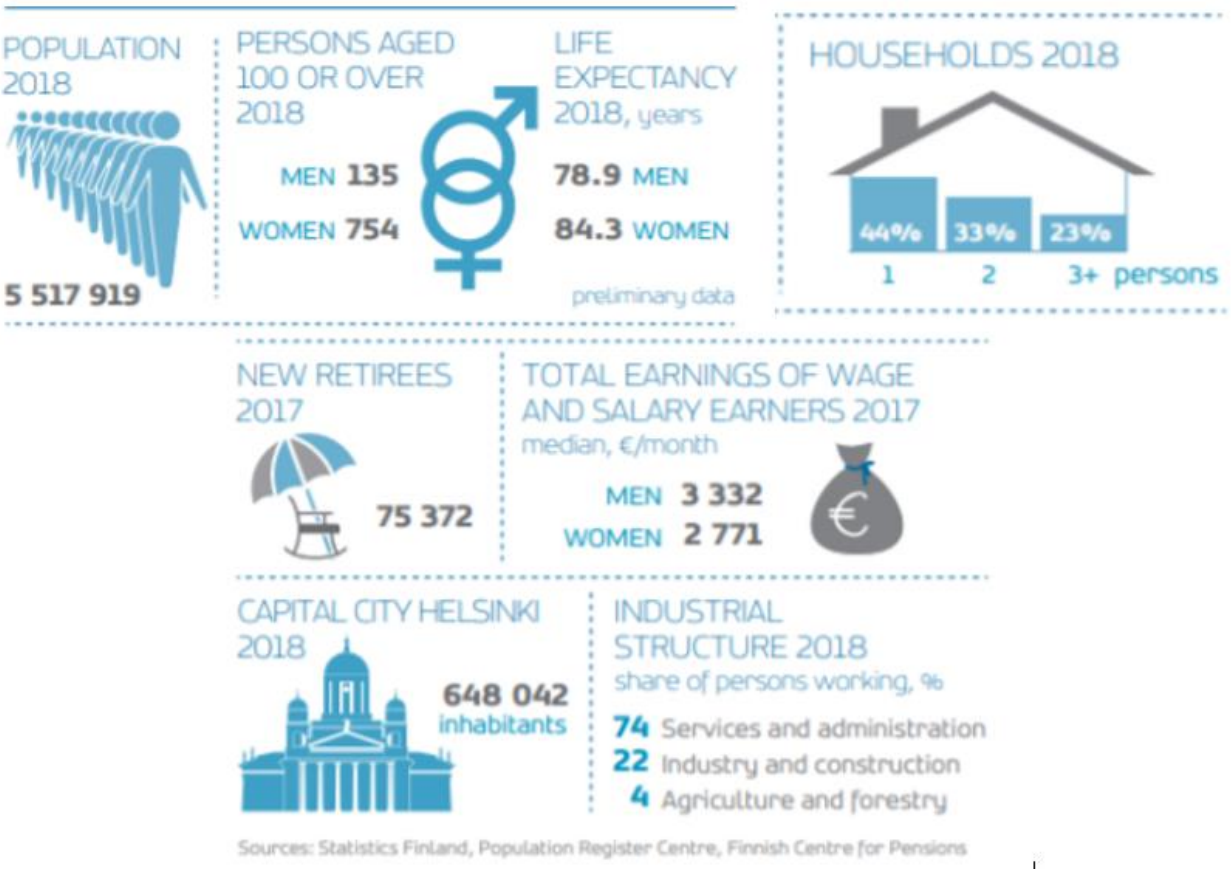

Figure 4. *Some figures about Finland (Source: Statistics Finland, 2019)*

Finland is affected by the global economic situation and its positive and negative trends. If economic wellbeing is polarised between different demographic groups and regions, social, cultural and health-related polarisation will also challenge the Finnish welfare system. In general, the Finnish welfare system offers a high level of services that have contributed to build and maintain a robust Finnish society. Finnish society has a high level of trust in authorities and in fellow citizens as well as a general trust in the ability of society to recover from crises. General willingness to help and provide volunteer help during a crisis is diffuse (OECD, 2017; Kekki and Mankkinen, 2016).

Inequality and marginalisation are the most serious factors of conventional threats to security, such as crime and becoming a victim of crime. In Finland, the average age of the population is increasing at the fastest rate among the EU countries and the ageing of the population is not spread equally throughout the land, since the population of the sparsely populated areas is mostly ageing (OECD, 2020a; OECD, 2019). In economically healthy growth centres, the political challenge is to increase wellbeing and income equality, since inequality can lead to further disparities among residential areas.

Finnish society is becoming more diverse due to several reasons. Lifestyle differences between different generations are increasing. The role of authority is changing and power is distributed in a new way. Population diversity has increased as a result of migration, as well. New and different values have been introduced: on the one side, they enrich Finnish society, but, on the other side, they can also separate people in groups and increase confrontations and conflicts between them. In general, a society that is fragmented in terms of values is also more vulnerable to the spread disinformation, aiming to accelerate confrontations (Finnish Ministry of Interior, 2019).

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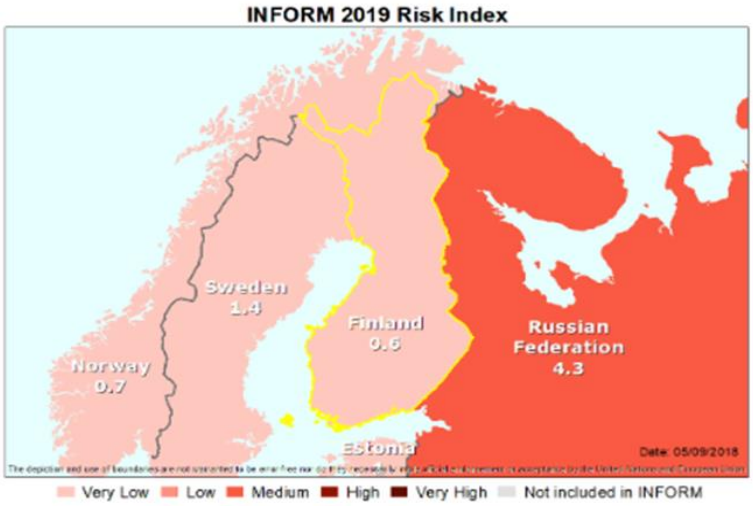
4.2.2 National risks in Finland

According to the INFORM index, Finland's risk index is very low.



	Value	Rank	Trend
INFORM	0.60	190	EQUAL
Hazard	0.10	190	EQUAL
Vulnerability	1.70	154	EQUAL
Coping Capacity	1.40	184	EQUAL

Figure 5. *INFORM index Finland (Source: INFORM, 2020a)*

The first national risk assessment in Finland was provided to the EU in 2015 and the second in 2018 (Finnish Ministry of Interior, 2019). In the latest national risk assessment (Finnish Ministry of Interior, 2019), particular risks, such as hydro-meteorological and climatic risks, were assessed within different sectors, threat scenarios or major disruptions were identified, and their impacts on vital functions were assessed. Altogether 20 threat scenarios/disruptions were identified and assessed (see Table 3 below). The change trend of threat scenarios and disruptions likelihood was also assessed and presented visually with an arrow (increase, decrease or remain unchanged). Direct impact on vital functions was presented with red colour and indirect impact with yellow colour. The more impact symbols in the table, the more severe impact on each vital functions threat scenario/disruption caused.

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Threat scenario/disruption	Trend of likelihood	Impacts of the threat scenario/disruption on vital functions						
		Leadership	International and EU activities	Defence capability	Internal security	Economy, infrastructure and security of supply	Functional capacity of the population and services	Psychological resilience
Information operations	↑	**	**	**	**	**	**	***
Political, financial and military pressure	↑	***	**	**	**	***	**	***
Use of military force	—	***	***	***	***	***	***	***
Large-scale immigration	↑	**	**	*	***	*	***	**
Terrorist act targeting the structures of the society or large crowds	—	**	*	**	***	*	*	***
Violent, large-scale civil disturbances	—	**	*	**	***	*	**	***
Disruption of the public economy	—	*	**	**	**	**	**	***
Disruption of the financial system	—	*	**	**	**	***	**	***
Major disruption in power supply	—	**	*	*	**	***	***	**
Disruption in the availability of fuels	—	*	*	**	**	***	**	**
Severe disruptions in communications networks and services	↑	**	*	**	***	***	***	**
Disruptions in logistics	—	*	**	**	**	***	***	**
Antimicrobial drug resistance	↑	*	*	**	*	*	**	**
Pandemic influenza or similar widespread epidemic	—	*	*	**	**	**	**	**
Highly infectious severe animal disease	↑	*	*	*	*	**	*	**
Plant hazards - plant disease epidemic		*	*	*	*	**	*	**
Water supply disruptions	↑	*	*	*	*	**	**	**
Disruptions in food supply	↑	*	*	*	*	**	**	**
Maritime multi-sector accident	↑	**	*	*	**	***	*	**
Nuclear power plant accident in Finland or Finland's neighbouring areas	—	**	*	**	**	***	***	***

Table 3. *Assessment of the trend of likelihood and impact (Finnish Ministry of Interior, 2019)*

In a report from 2018 (Tuomenvirta et al., 2018), hydro-meteorological and climatic risks were assessed as a combination of the hazard (hydro-meteorological phenomenon), exposure (location of

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the asset or people at risk) and vulnerability (features of the asset or people at risk), following the 2014 United Nations Intergovernmental Panel on Climate Change (IPCC) 5th Assessment Report concept, where hazard, exposure and vulnerability together contribute to risk formation. Therefore, both the changing climate and the role of socioeconomic factors on the risk formation, now and in the future, were considered.

The Finnish Ministry of Interior provides, as well, a risk matrix of serious regional events, which highlights the likelihoods and impacts of hazards, such as winter storms, maritime accidents, water supply problems, road traffic accidents and serious violence. In addition, terrorist attacks and thunderstorms are abnormal situations with severe impacts, but these events are assessed to be more unlikely in Finland (Finnish Ministry of Interior, 2016). Regional-level security planning and preparedness is carried out in a wide-based cooperation with regional councils, municipalities, organisations and villages' associations, and coordinated by the regional state administrative agencies.

4.2.3 Vulnerabilities and vulnerable groups in Finland

Finnish strategic security documents, such as the national risk assessment, the Security Strategy for Society, the Future Review of the Ministry of the Interior or vocabulary of comprehensive security, do not contain a definition of vulnerability. Nonetheless, the term **vulnerability** is used to describe, for instance, the sectors of vital functions that may be threatened by a disruption like a serious pandemic. The Finnish National Emergency Supply Agency (NESA, 2020) defines vulnerability as an exposure to a security threat, and states that the vulnerability of, for example, electronic infrastructure and logistics systems is growing. So, vulnerability is mainly ascribed to infrastructures, as in Estonia, and to threats to vital functions.

In addition, vulnerability is considered in relations to individual security/insecurity and preparedness. The Finnish National Rescue Association is an independent, national, non-profit expert organisation in fire and rescue services, individual emergency planning and civil protection and has provided studies about the relationship between the individual and his/her community and which factors contribute to strengthening or hampering security, safety and coping capacities (SPEK, 2019). In addition, the Association studies the likelihood of various risks and the acceptability of political decision-making (SPEK, 2019). In its Report (Kekki and Mankkinen, 2016), the Association argued that individual insecurity, considered as an individual's experience or belief in one's own vulnerability, increases, if an individual feels that he/she does not have the competence to influence his/her private matters. However, insecurity is also related to exogenous factors, not pertaining to the private sphere of the individual. For instance, higher fear of crime than in other types of threats is associated not only with individual vulnerability, but also with signs of disturbance in the surrounding environment or with a weakening of the community's spirit (Kekki and Mankkinen, 2016: 20).

The Finnish National Rescue Association also conducts national surveys on various topics to feed its Reports. For instance, to explore the sense of security and the security of society, a survey was conducted involving about 3 000 Finnish citizens between 18 and 79 years old through interviews by phone. For the respondents, family, close relatives or friends were the main providers of security. Home, livelihood, employment and health were other issues that influence individual security. In addition, the responders highlighted that authority and service structures - including police, rescue services, social and health care, pension and education – and governmental factors, such as peace, independence and democracy, contributed to individual security (Kekki and Mankkinen, 2016). More

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detailed questions addressed the respondents' coping behaviour in case of a crisis. 87% of the respondents could manage without public transport for more than a week or even longer; 22% could manage without running water for less than a day; 60% could survive without running water for no more than two days. These answers showed that a quite large percentage of the interviewed did not have reserves of water in their homes. Storing groceries was much more common for the respondents, since one every five answered that they could survive more than a week without going to the grocery store. The worst off without water and going to the grocery store were those, who had only sufficient income to cover their expenses. About 50% of the respondents could survive without electricity for up to two days. The smaller the municipality or the further away from the centre, the better the respondents thought they could survive, for example, without electricity. Men answered they could cope with different types of crises better than women could (Kekki and Mankkinen, 2016: 64).

In general, the results of this survey emphasized the importance of family ties and economic and financial community support. Being part of a circle of friends or a community were important for safety and security. According to the survey, the majority of respondents had strong social capital when it comes to informal social relationships, their willingness to participate in taking care of common issues, and their trust in other members of the community. The survey showed that the respondents had good social relationships, since they could count on help from their circle of friends or relatives when needed and were able to open up about their personal issues (Kekki and Mankkinen, 2016: 68). In addition, the identification in one's own territory or area and the possibility to influence the place of residence increased the sense of security. In general, respondents felt that the safety of their own area was good for themselves and also for the children, and that they were capable of dealing with crises or risk in their area. The majority of respondents felt that they were able to influence their own personal issues and that each individual has a role to play in increasing the common sense of security (Kekki and Mankkinen, 2016: 68). Finally, the respondents perceived the Finnish society and themselves as quite resilient, capable of coping, adapting, recovering and developing despite of threats or crises. They did not consider various threats, such as serious pandemics, environmental disasters or problems with energy supply to be, very likely, since it is difficult for both ordinary citizens and experts to identify, assess and anticipate threats in a globalized world (Kekki and Mankkinen, 2016). Citizens' basic security and trust in the authorities' ability to deal with various threats have not been weakened (Kekki and Mankkinen, 2016). The newest survey carried out in year 2018 also confirms this positive result (Kekki, 2019).

In Finland, there are significant differences in crisis preparedness between the urban and rural population: the rural population seems better prepared than the urban population, although the latter shares, in general, the conviction to be well prepared. Segments of population such as families with children and single parents, which in other countries can be considered vulnerable, are not treated as such in Finland. The same concerns the part of the population renting houses instead of owing them (Kekki and Mankkinen, 2016; Kekki, 2019).

The next follow up of the survey conducted by Finnish Rescue Association is under analysis and will be published in January 2020. Based on the oral briefing of the preliminary insight of the survey from the Finnish National Rescue Association Research Manager, we highlight five vulnerable groups in Finland in the disaster context (oral information 13.9.2019): 1) elderly (65+ years); 2) young adults in an urban environment; 3) low-income/low-educated households; 4) homeless people; 5) undocumented migrants. These groups are described briefly below and for each group social, cultural, economic and political factors have been taken into account to discuss their vulnerabilities.

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1) The growth in the number of **elderly** will accelerate in Finland in the next few decades. According to population projections, by the year 2030 there will be over 1,5 million people of 65+ years in Finland - a quarter of the country's whole population (Statistics Finland, 2019). The quantity of elderly will mostly raise in large cities, where most of them will be ageing in apartments, being less prone to leave their households for other places. However, elderlies' preferences of living indicate that many of them would like to live downtown, in urban areas and in an apartment house (Helminen et al., 2017). This demographic change places new demands on the safety of elderly, since the consequences of crises are often much more serious for the elderly than for the younger population. In general, aging most likely affects physical and psychological behaviour and makes individuals vulnerable and susceptible to harm (Finnish Ministry of Interior, 2018). In addition, elderly can be vulnerable for a variety of social, cultural, economic and political factors. Socially, elderly can lack social networks or they have become invisible for service providers, authorities, NGOs and rescue organisations. Culturally, elderly can miss tight family connections. According to Statistics Finland (2019), people who felt the loneliest were over 75 years of age, 73% of whom were lonely most of the time, while around 29% were so occasionally. Economically, the lack of state resources to prove home care services to all the elderly in need influences elderly's vulnerability. At the same time, the personal economic situation impacts elderly's life. Politically, Finnish state housing policies promote living at home for older people. These reasons influence their exposure to risks. Furthermore, aging may impair adaptation to rapidly changing temperatures. There is also a tool co-developed in Finland for assessing adaptive capacity and vulnerability of elderly to climate change. This tool is interactive and web-based and has been developed for mapping and combining indicators of climate change vulnerability of the elderly, by municipality, across three Nordic countries: Finland, Norway and Sweden. It can also be used for projecting temperature related mortality in Finland under different projections of future climate (Carter et al., 2014).

In 2018, the Finnish Ministry of the Interior updated an Action Plan that describes the safety challenges facing elderly and provides recommendations on how to improve safety and security in the homes for elderly, to reduce the number of accidents and to prevent and combat maltreatment, violence and crime. Improving the safety and security of elderly people calls for broad-based and close cooperation between different authorities and organisations. The Action Plan focuses on measures that help to improve inter sectoral cooperation and exchange of information, to promote best practices and to support the security work undertaken by counties and municipalities (Finnish Ministry of Interior, 2018).

2) According to Statistics Finland, in 2015, the proportion of the so-called **Not in Education, Employment, or Training (NEETs)** among the age 20-24 was approximately 15%. In 2018, the share had fallen to just under 12%. This means that the share of young people without a post-primary qualification is declining and their employment rate is improving. In particular, the situation of young male has improved. In 2015, nearly 17% of them were neither in work nor studying. At present, their share is 12%. Almost all primary school graduates at age of 16 apply for education and training places are available for the entire age group. Nevertheless, the share of 20-24 year olds without a tertiary qualification is still significant, although the trend has been declining (Official statistics of Finland, 2020). Since the latest data are not yet published, preliminary insights of the survey from the Finnish National Rescue Association Research Manager indicate that NEET experience social and economic vulnerabilities: they act poorly in the crisis situation and they are at risk of poverty or exclusion.

3) 890,000 Finns or 16.4% of the entire population were at risk of **poverty or exclusion** in 2017, according to Statistics Finland's Living Statistics. The majority of those at risk of poverty or exclusion are low-income people, accounting for 12.1% of the population. After low income, the most common

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is underemployment, which affects 7.6% of the population. The rarest is severe material deprivation, affecting 2.6% of the total household population (Statistics Finland, 2019a). These groups experience vulnerability according to:

- Social factors: mistrust to mainstream media, they assess their ability to cope low (Kekki and Mankkinen, 2016)
- Economic factors: economic situation affects crisis preparedness (lack of food supplies)
- Urban factors: Urban population less prepared for crises than rural population (Kekki and Mankkinen, 2016)

4) There are about 5500 **homeless people** in Finland. The following are considered homeless: people who are sleeping outdoors or in the homeless shelters, people living in dormitories and lodgings or in different institutions, prisoners who do not have a permanent apartment after release and people temporarily staying with relatives and acquaintances. Most of the homeless belong to the last group. Luckily, this number is declining - in 1987 there were 20000 homeless (ARA, 2018). Over 60% of homeless people lives in the Helsinki Metropolitan Area. Homelessness is also centred in other large cities. 80% of homeless people are men. There were a total of 600 homeless families and couples (ARA, 2018). Three out of four homeless families (77.4%) were single-parent families. A recent trend has been the increase in the proportion of women, young people and immigrants (ARA, 2018).

Finland has a social benefits system, which helps ensure that a person does not immediately end up on the streets after becoming unemployed or seriously ill. Health care is also free or affordable for everyone. The challenge with the forms of support is that a person has to know how to apply for the help he/she needs. The Housing First-model was launched in 2007 to eliminate long-term homelessness by 2015. The main principle was stated as “this requires adopting the Housing First principle, where a person does not have to first change their life around in order to earn the basic right to housing. Instead, housing is the prerequisite that allows other problems to be solved”. In practice, the service providers help clients with getting access to assistance and services provided by the state or municipalities. The Housing First model in Finland has taken into account the existing social benefits system so that it is utilised as much as possible and is based on understanding homelessness extensively. Therefore, it does not only apply to sleeping rough and it is not a problem that can be solved within just one sector (Y-foundation, 2017).

5) **Undocumented migrants** are people living in Finland without the legal right to do so. An undocumented migrant’s residence is not officially known to, or permitted by the authorities. It is estimated that there are between 3,000 and 10,000 undocumented immigrants in Finland although the estimations vary (www.paperittomat.fi). Their number has increased sharply since 2015, due to the so-called migration and refugee crisis. The group of undocumented migrants is diverse. People may end up living in Finland undocumented after a rejection of the asylum, after a negative residence permit decision, after the expiry of a visa or residence permit or if a residence permit has not been applied for. Generally, undocumented migrants wish to legalise their residence and live a normal life as part of the Finnish society. Since undocumented migrants are not able to turn to the authorities the same way as official residents, they are extremely vulnerable to exploitation and mistreatment. They form a particularly vulnerable group whose living conditions is exacerbated by diseases, general poor health conditions, poor or non-existent housing and poverty (Jauhiainen et. al., 2017; Nykänen et al., 2017).

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4.2.3 Reflections about Finland

Finland shares with Estonia the same approach to vulnerable groups, since it takes into account social and economic factors influencing vulnerability for its categories of vulnerable groups. As Estonia, Finland considers the elderly a vulnerable group. However, the public document propose other groups not mentioned in Estonia, such the NEETs, which is a quite unique group compared with the other countries in this report, homeless people and undocumented migrant. Vulnerability is described is relation if infrastructures as in Estonia, but also in terms of security/insecurity as a subjective understanding of one's own vulnerability.

4.3 Norway

4.3.1 Overview about Norway

Norway is a Nordic country known for its robust welfare system. As Finland and Sweden, Norway scores high in equality in income distribution (OECD, 2020a), high level of transparency (4th least corrupted country in the world) (CPI, 2018) and high level of gender equality (2nd in the world) (GGGR, 2018). According to Statistics Norway (SSB, 2019), at the start of 2019, there were 944 000 immigrants and Norwegian-born to immigrant parents in Norway, representing 18% of the entire population. 80% of the population lives in urban areas. 15% of the population is 67 years old and over. A total of 39% of households consist of people living alone, and these account for 18% of all people in private households. In the population as a whole, there is no significant difference between the percentage of men and women who live alone. However, while single women are in the majority in the elderly population, men make up the majority among those who are younger. One-person households are particularly common in the centres of the largest cities and in sparsely populated areas. The number of elderly is increasing every year due to high life expectation. The level of risk of poverty or exclusion in Norway is lower than the European average. In the EU-28, approximately 22.5% of the population was at risk of poverty or exclusion in 2016, compared with 18.1 % in Norway in the same year. In Norway, the risk of poverty or exclusion due to low incomes relates mainly to single persons (Eurostat 2018:30)[7].

[7] At the time of publication of this report, the figure for 2019 was not yet available.

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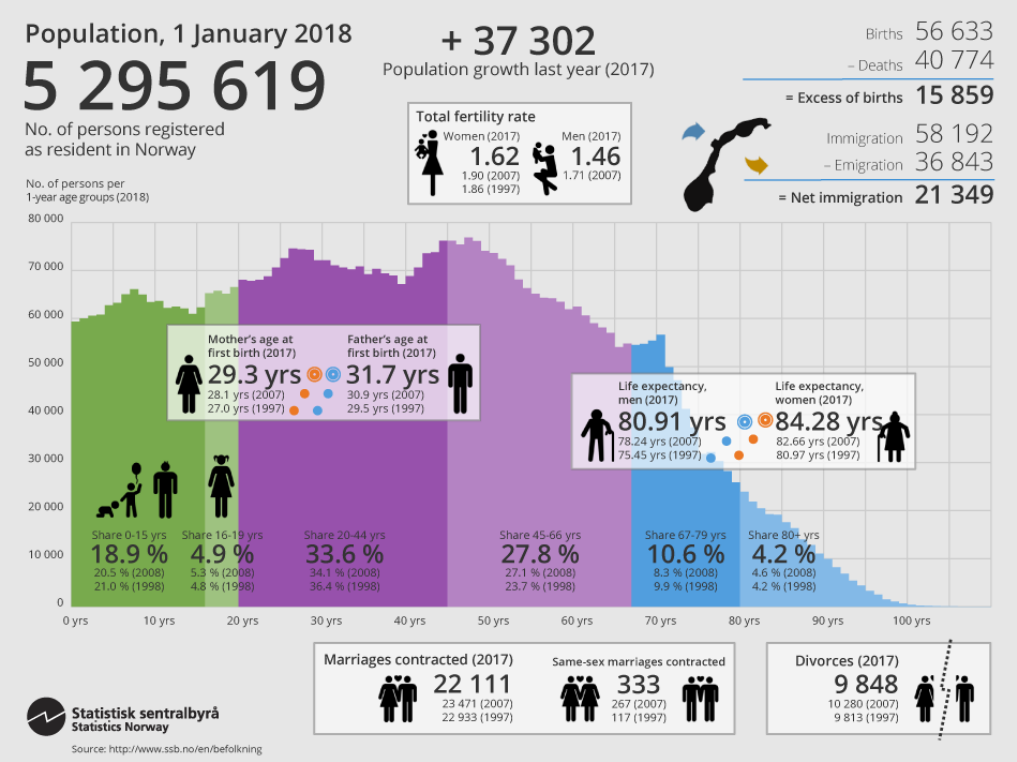

Figure 6. *Some figures about Norway (Source: Statistics Norway, 2019)*

4.3.2 National risks in Norway

According to the INFORM Index, Norway's risk index is very low, 0.7 (see figure 5 above with Finland and Sweden). Hazard exposure score is 0.1, lack of coping capacity score is 1.6, and vulnerability score is 2.2 (INFORM, 2020c). The most recent National Risk Assessment Report (DSB, 2019) shows that in Norway events like fires in subsea tunnels, urban floods caused by heavy rain, and medicine shortages have the highest probability to happen in Norway, while long-term electricity rationing, oil and gas blowout and gas emission from industrial plants are those with the lowest probability. This is understandable in a country where the state has heavily invested in the construction of subsea tunnels and the number of floods has increased in recent years (Steen and Morsut, 2019). It can come as a surprise to read that, in the third place, we find medicine shortage, which is a relatively unknown problem. However, a report published by the Directorate of Health in June 2019 unveiled that Norway is very depended on the global supply chain for medicines and just a small failure in this system leads to serious problems for the vast majority of the population, especially for vulnerable groups like patients at the hospital or individuals in constant need of medication (Helsedirektoratet, 2019).

4.3.3 Vulnerabilities and vulnerable groups in Norway

Even though an official definition of vulnerable groups does not exist in Norway, many different groups are considered vulnerable in various contexts. By surveying various governmental agencies, we found the extent to which vulnerable groups are relevant for good practices and in need for targeted policies. Norwegian researchers have, as well, studied vulnerability and vulnerable groups. The tables below summarise the findings: age, gender, disabilities and migration status are the most recurrent categories used to define vulnerable groups. Irregular immigrants, in particular, are often considered a vulnerable group in several examples below (UDI, 2019).

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Agency	*Vulnerable group(s)*	*Context*
Equality and Anti-Discrimination Ombudsman (LDO, 2010)	Romani peoples	Discrimination
International Organization for Migration (IOM Norway, 2019)	Victims of human trafficking (adults and children), underage and unaccompanied children, underage immigrants, immigrants with medical needs, other vulnerable migrants	Immigration
National centre for the minority health (NAKMI, 2013)	Migrants and other vulnerable (undefined) groups	Public health
Norwegian Directorate of Immigration (UDI, 2019)	Irregular immigrants	Immigration
Ombudsman for children (Barneombudet, 2019)	Underage and unaccompanied children, children of poor travellers and children with Romani background	Childcare and immigration
Religious Norwegian human rights NGO (Menneskeverd, 2019)	Deathbed patients	Ethics

Table 4. *Norwegian governmental agencies dealing with vulnerable groups*

Research institution	*Vulnerable group(s)*	*Context*
Gender research (KILDEN, 2019)	Women inmates, women with immigration background, surrogate women	Gender
Institute for Social Research (ISF, 2019)	Asylum seekers, irregular migrants, elderly	Immigration and age
NORCE - Research Unit for General Practice in Bergen (AFE Bergen, 2019)	Vulnerable patients	Public health
Norwegian Centre for Violence and Traumatic Stress Studies (NKVTS, 2019)	Women	Gender
Norwegian Institute of Public Health (NIPH, 2018)	Immigrants, persons with chronical physical and mental health issues, addictions or low-skilled	Public health
NTNU Research (NTNU, 2012)	Disabled children and young people in reception centres	Immigration
Volda College (HiV, 2019)	School children with psychological, somatic or social challenges	Education
Østfold University College Faculty of Health and Welfare (HIOF, 2019)	Drug addicts	Public health and rehabilitation
Welfare Research Institute (NOVA, 2017)	Elderly, persons with chronical physical and mental health issues, addiction subject to domestic violence	Public health

Table 5. *Norwegian research on vulnerable groups in Norway*

Within the context of crisis, disasters and resilience, Norwegian policy documents describe **vulnerability** as “an expression of the problems a system experiences when it is exposed to an unwanted event and problems associated with resuming its functions” (NOU 2000:24, 2000: 18). The same definition is elaborated by the National Risk Assessment Report as it follows: “Vulnerability refers to the problems a system has to properly work when it is exposed to an unwanted event, as well as to the problems the system has to resume its functions” (DSB, 2019:28). A system encompasses infrastructures, value or production chains, organizations or a community at local, regional or national level. The vulnerability of a system affects both the probability that an unwanted event will occur and what consequences it will provoke. To assess vulnerability, the Norwegian Report raises questions like: 1) Which abilities does the system have to withstand adverse events?; 2) Which abilities does the system have to resist adverse events without having serious consequences?. This definition does not make any reference to groups or individuals. The same Report states that vulnerability is the opposite of resilience, which is defined as a “general and dynamic ability to manage stress, and resume original functions” (DSB, 2019: 28). On the other side, there is no official definition of vulnerable group. The term vulnerable groups is used only once in a procedure document by the Norwegian Directorate for Civil Protection (DSB) for the development of comprehensive Risk and Vulnerability Analysis (RVA) for Municipalities and is not clearly defined, although the protection of vulnerable groups is considered one of the critical functions of society (DSB, 2018).

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In peer reviewed scientific literature about vulnerable groups in Norway in the context of crises, we found an interesting study on vulnerable groups, which categorized vulnerability according to geospatial data as an attempt to quantify vulnerability (Rød et al., 2014). The study focused on people living in high-risk areas for flood hazards in the County of Trøndelag, situated in the middle of Norway, bordering Sweden to the East and the North Sea to the West. The vulnerable groups were described according to general criteria, such as age, income, and type of household. This study was part of a national project about climate change and local resilience, Climres (Climres, 2020).

4.3.5 Reflections on Norway

In Norway there is an extensive and constant focus on vulnerable groups and vulnerabilities. Groups, such as substance abusers, immigrants, children and elderly, are singled out and considered to be the responsibility of various agencies. The vulnerability of these groups seems very much based on the social model of disability, which distinguishes two dimensions: 1) the impairment, which is the physical, mental or emotional condition of an individual and 2) the disability, which is a potential consequence of how society deals with this condition (Johnstone, 2006). Still, there is little research on vulnerability and vulnerable groups in the context of crises and disasters. While there is no official definition of the term vulnerable groups, there is a special attention to children and women in Norway, more than in Estonia and Finland. Gender is often mentioned in the Norwegian documents as a vulnerability factor.

4.4 Sweden

4.4.1 Some figures about Sweden

Sweden is located in Northern Europe, with a landscape dominated by forest and lakes (SCB, 2019a). The population is just above 10 million people (SCB, 2019b), out of which 87% live in urban areas and the remaining 13% in rural areas (SCB, 2019c). Nearly 20% of the total population are above 65 years of age, while children and youth below the age of 20 make up 23% (SCB, 2019d). Demographic changes have resulted in an aging population, where the number of people above the age of 80 is expected to increase with 255 000 individuals by 2028, an increase with 50% (SCB, 2018a). In terms of income inequality, Sweden has similarly low levels as neighbouring Nordic countries such as Norway and Finland, with a Gini-coefficient of 0.28 (OECD, 2020a). Moreover, levels of trust between people are high (WVS, 2014a), confidence in the government is relatively high (WVS, 2014b), and estimated levels of public sector corruption are low (Transparency International, 2019).

The Swedish Civil Contingencies Agency (MSB) is a central actor when it comes to public safety, crisis management, and civil protection and defence. Civil society plays an important role in case of emergencies or crises, and is expected to increasingly do so in the future. A recent study conducted by Novus and the Swedish Red Cross finds that nine out of ten of their respondents are willing to offer help as a volunteer in case of a severe crisis (Swedish Red Cross, 2019a).

4.4.2 National risks in Sweden

According to the INFORM Index, Sweden has an overall risk score of 1.4 (see Figure 5 above with Finland and Norway), a hazard exposure score of 0.7, a lack of coping capacity score of 1.5, and a vulnerability score of 3.1. (INFORM, 2020b). The vulnerability score is the only dimension where risk

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has increased over the past years, as compared to the other categories where scores have remained stable over time. The highest sources of risk are related to natural hazards, uprooted people, and a lack of institutional as well as disaster risk reduction capacity (INFORM, 2020b).

The Swedish Contingency Agency defines risk as "a consideration of the probability that an incident will occur and the (negative) consequences that this could lead to" (MSB, 2012: 78). Similarly, the Swedish National Audit Office refers to risk as the probability and impact of an undesired event. The probability is defined as the estimated frequency of an event during an infinitely long time horizon. The impact is defined as the impact an undesired event has for people, the environment, and material values (Swedish NAO, 2008).

4.4.3 Vulnerabilities and vulnerable groups in Sweden

As in Norway, in Sweden, as well, **vulnerability** has been defined at system level. Indeed, the Swedish National Audit Office describes it as a system's (in)ability to function when under stress. Sometimes, also the magnitude of impacts of undesired events are accounted for. Related terms include robustness, defined as the ability to keep providing desired functions when under pressure, as well as the term ability – in the context of risk understood as societal robustness and preparedness (Swedish NAO, 2008). For an in-depth discussion on different conceptualizations, indicators, and ways to measure vulnerabilities, see for example Johansson and Blumenthal (2009).

The report *A summary of risk areas and scenario analyses 2012–2015* (MSB, 2016) synthesizes knowledge from the national risk and capabilities assessment carried out between 2012 and 2015. MSB differentiates between four types of risk categories: 1) natural hazards, 2) major accidents, 3) disruption of technical infrastructure and supply systems, and 4) antagonistic hazards. The national risk and capabilities assessment carried out in the past years makes use of scenario analyses to better understand how different types of risk under each category affect the five national values of protection. Risks assessed under the category of natural hazards include volcanic eruptions, mudslides, and heat waves. For major accidents, risks included in the analysis are nuclear accidents, fire on cruise ships, and dam failure. Disruptions of technical infrastructure and supply systems manifest themselves as, for example, disruptions in food supplies and contamination of drinking water. Lastly, the antagonistic incidents taken into consideration include bomb attacks, school shootings, and violent disturbances. Based on the scenario analyses, a number of key vulnerabilities have been identified, as well as critical capabilities to be strengthened to cope with these. The first area relates to the capability to ensure continuity in critical infrastructure. For example, there is a need to build capacity to secure the power supply, electronic communication, water supplies, and IT systems in case of emergency. MSB points to serious deficiencies in back-up power supplies, which is problematic due to the cascading effect of loss of power in case of a crisis. Risks that may affect the power supply include storms, breakdown of dams, and antagonistic actions. In terms of water supplies, a lack of back-up supplies or emergency sources are highlighted in the national risk and capabilities assessment. Around 90% of the permanent housing stock is dependent on municipal water supplies, which means that a large part of the Swedish population would be affected in case of a disruption in the drinking water infrastructure and delivery. MSB stresses that there is a lack of contingency plans in groundwater areas, as well as a lack of back-up power in case of a disruption to the energy system, on which the supply of drinking water is reliant.

Electronic communication has come to play an increasingly important role in society, yet the nature of the dependency on electronic information systems is not always evident. These systems are susceptible to risk in similar ways as national power supplies, e.g., through extreme weather events

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and antagonistic attacks. Disruptions may cause failure in critical infrastructure such as power supplies, transport systems, and may also limit access to drinking water. MSB has found that few municipal stakeholders have alternative communication channels in place in case of a disruption in the electronic communication systems, thus information sharing in the event of a crisis affecting these systems may not be sustained. As for the transportation system, if a serious disruption would occur, it may result in devastating impacts on society as a whole. Vulnerabilities arise as critical societal functions such as elderly care, emergency care, the distribution of drugs, and the ability of the police, rescue service, and repair services for other forms of critical infrastructure (e.g., power supplies and district heating) are critically dependent on transport infrastructure. Additionally, maintaining a stable food supply is based on functioning transport, and back-up storage supplies are minimal throughout the food supply chain. The second area where risk and a need to strengthen capabilities has been identified is in the ability to securely manage information. Multiple areas in society are dependent on IT systems and information- and cyber security, while this infrastructure is vulnerable to risks such as natural hazards and antagonistic events. Additionally, failure in securely managing information in a crisis might worsen impacts, as access to trustworthy and timely information would not be guaranteed. Information- and cyber security issues highlighted by MSB include rapid technology development, where vulnerabilities can be exploited faster than problems are identified and addressed. Also, there are more individuals that have access to tools that may influence IT-systems, causing harm by small means, as compared to other systems such as the physical electrical system. A third area where capabilities need to be strengthened is in relation to the ability to coordinate action in the event of an incident. Areas in need of specific attention include public-private collaboration, rapid evacuation (e.g., in case of a nuclear accident, mudslide, or terrorist attack), and setting in place procedures for making priorities in terms of resource distribution. Another concern with respect to resources is a lack of personnel with the right competencies to deal with the types of risks covered in the national risk and capabilities assessment. Health care and social services are assessed to be the worst affected across many of the scenarios analysed, with the consequence that the functioning of these sectors will be severely disrupted in case of a serious emergency or crisis (MSB, 2016).

There is no general agreement on how to define or identify **vulnerable groups** in Sweden, and so the process of mapping and analysing vulnerable groups has been approached in different ways in various contexts. One example is related to the implementation of the 2030 Agenda, where Statistics Sweden makes a connection between the principle of leaving no one behind and the issue of measuring progress towards this aim. The 2030 Agenda states that all forms of poverty and hunger should be eradicated, while human potential, dignity, and equality should be achieved. These commitments imply that countries should identify, prioritize, and create better conditions for the most vulnerable groups in society. The agenda specifies a number of variables to be represented in a statistical breakdown to identify these groups, such as age, income, gender, race, ethnicity, migratory status, disabilities, geographic location, as well as other indicators relevant to national context (UN, 2015). While not defining vulnerable groups in Sweden, the reporting from Statistics Sweden aligns with the 2030 Agenda in terms of what is perceived as important factors to consider when seeking to meet the needs of those most vulnerable. While the current data collection in Sweden does not allow for a breakdown that captures different segments under all these categories (for example due to legal, resource, and ethical concerns), there is an ambition to better cover these aspects in the future. This is to identify and make visible vulnerable groups (SCB, 2019f).

The study *"Individual's ability to take responsibility for his or her own safety - Particularly vulnerable groups*" (MSB, 2015) points to the need to understand the underlying factors explaining why individuals might not be able to take full responsibility for their security in times of crises. The study

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stresses that these factors often are interrelated, and that they change over time, thus vulnerabilities are dynamic and not static. While underlining that it is not possible to make general statements about vulnerabilities among different segments of the population, some examples are still provided of underlying factors that may be important to take into consideration. These factors include financial situation, health, social networks and feelings of belonging, place of residence, ability to cope with stress, and access to information technology. The study also suggests that the following groups might be particularly vulnerable in a Swedish context: people with disabilities, dementia, and psychological issues, people that do not speak Swedish or English, those who are socially isolated, live in an environment that is unsafe, or belong to stigmatized groups, as well as ethical minorities, some migrant groups, and people with different forms of addiction (e.g., drugs, alcohol). However, the authors stress that only parts of these groups are particularly vulnerable to risk, that more knowledge is needed to understand the underlying factors creating vulnerabilities, and that it is important not to generalize or stigmatize (MSB, 2015).

More context-specific examples of how different individuals and groups may be vulnerable can be found in the scientific literature and in documents provided by, for example, interest organizations. In a study on climate change risk conducted by the Swedish Meteorological and Hydrological Institute (SMHI), elderly with poor health, people with low socio-economic status, as well as personnel within low-paid care work, are identified as particularly vulnerable to climate change impacts (e.g., heat waves and spread of new types of disease). Additionally, there is a risk that these vulnerabilities remain “invisible”, which may result in a lack of resources and interventions (SMHI, 2014). Other studies assess vulnerabilities in relation to issues that are not directly related to disaster risk. Examples of findings include that financial vulnerability and material deprivation is most common among unemployed as well as foreign-born Swedes (SCB, 2019e). Among the working population, seven percent still earn less than the EU at-risk-of-poverty threshold, where the most vulnerable are young people, single parents, and foreign-born (SCB, 2018b). There are also findings indicating that single mothers with children and foreign-born women are particularly vulnerable in terms of social exclusion and income insecurity (Swedish National Board of Health and Welfare, 2018). Despite these assessments not having been carried out in a disaster risk context, underlying factors explaining vulnerabilities in these situations might also be of importance when aiming to understand vulnerabilities in times of a crisis.

4.4.5 Reflections on Sweden

In Sweden, risk levels are similar to those in Finland and Norway. However, due to factors such as climate change, the disaster risk might increase in the future, and a number of areas where capacity needs to be built has been identified in, for example, the national risk and capabilities assessment. These areas are related to both natural and human-made hazards, such as storms, flooding, and terrorist attacks. It is difficult to generalize about vulnerable groups in the Swedish society, as the underlying factors creating these vulnerabilities are context specific, interrelated, and dynamic in nature. However, some examples of dimensions to account for include place of residency, age, financial situation, and health.

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5. Vulnerabilities and vulnerable groups in past crises

In this Chapter, various man-made and natural crises, mainly based on national risk assessments reports, are presented for each of the four European countries. The 2018 earthquake in Indonesia is included, as well. As one of the non-European partners of BuildERS, we aim to find out the extent of overlapping issues Indonesia may have with the studied European countries, in terms of categories of vulnerable groups inside and outside the official data. Indeed, in the various crises, in addition to the groups mentioned in the official documents and surveys from Chapter 4, we looked for vulnerable groups not picked up by those sources. The contributing partners summarised the information on the crisis in a table, which shows the type of hazard, the crisis, the vulnerable groups and the elements of vulnerability.

The information on the crises is retrieved by several sources, mainly on-line newspapers and post crisis public investigations, so the information provided varies very much due to the sources. Some descriptions are detailed, some others are short and concise.

5.1 Estonia

27 and 28 October 2019. Wind storm.

Extreme storms (winds up to 30m/s) are a normality in Southern Estonia. However, the type os stromf that occurred had been not seen in Southern Etsonia since 1971 (Hindre, 2019). The wind was so strong that an electric power post fell down and there was a power outage that lasted several hours (Kuusk, 2019). The lack of electricity affected the provision of water and the functionality of phone lines and other communication devices, as the telecommunications operators in the region were weakened or taken out altogether. The communication companies' mobile masts ceased to work for two hours after the power outage, when the mobile masts' batteries were exhausted. This also meant that individuals could not reach rescue services on the phone neither send information about their situation.

62 000 households, about 1/6of the total, were cut off from electricity. The majority of these households were reconnected to the power network within 24 hours, while around 8000 were out of electricity for five or more days. Most of the households were located in blocks of flats, where alternatives to central heating and water supply were not available. In addition, the local hospital, the South Estonia Hospital, was without electricity for eight hours and was powered by backup generators. The hospital could not admit new patients in this situation. A cascading effect was the lack of autonomously-powered gas stations in the Võru region. This meant that also the emergency operators could not re-fuel their tanks and had to spend hours to drive and refuel in other parts of Estonia. This delayed the crisis response to individuals with health problems.

Hazard	*Type of crisis*	*Vulnerable groups*	*Vulnerability elements*
Wind storm	Power outage	People living in blocks of flats Patients in the local hospital New patients Emergency operators	Lack of electricity Lack of water Lack of fuel Lack of phone lines

Table 6. *Wild storm: Vulnerable groups and vulnerability elements*

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April 2019. Wild-fires.

In 2019, the Estonian Rescue Board declared a fire hazard period on 6 April following a relatively warm and dry period for that time of the year, a phenomenon experienced across northern Europe. In general, safety precautions applied and fires were forbidden in some built up areas. Nevertheless, the Estonian Rescue Board received more than 600 emergency calls for fighting wildfires in April 2019 (Estonian Rescue Board 2019b). 6 individuals were also killed by the wild-fires. Among those were individuals who had started fire under the influence of alcohol and elderly individuals with limited mobility who were trying to put off the fire that had spread out of control.

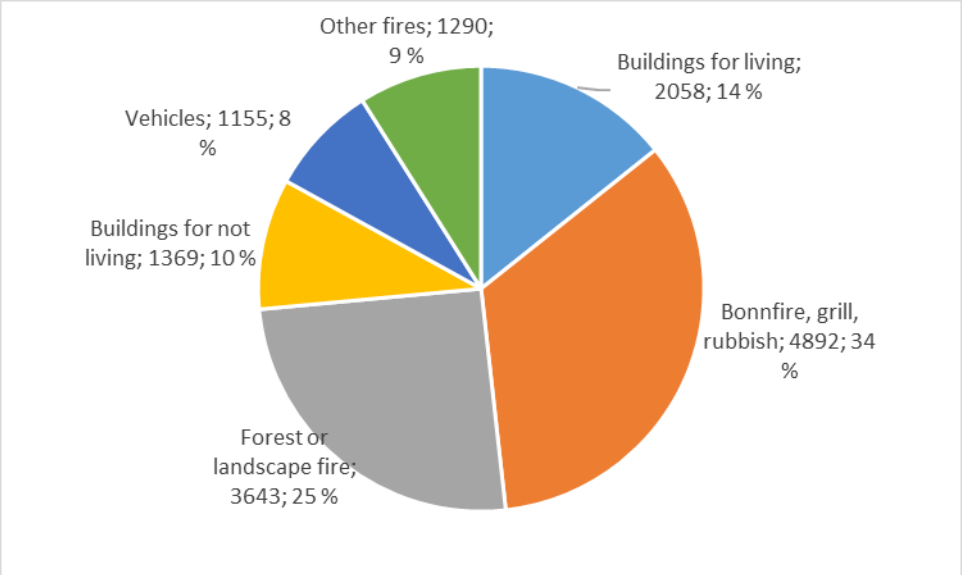

Figure 7. *The share of different types of fires on January 2017- December 2019 (Source: Estonian Rescue Board, 2019a)*

Hazard	*Type of crisis*	*Vulnerable groups*	*Vulnerability elements*
Fire	Bush and forest fire	Inhabitants of the affected area Elderly with limited mobility Individuals momentously impaired	Demolishing of property and forest Health effects of smoke inhalation Age Impaired mobility Exposure

Table 7. *Wild fires: Vulnerable groups and vulnerability elements*

January 2019. Wind storm.

This wind storm hit Western Estonia and, in particular, the islands, included the largest island in Estonia, Saaremaa. 10 000 households were left without electricity in Saaremaa, which is 66% of the households of the island region. Families with small children and disabled individuals were the most vulnerable, as they needed extra care in the aftermath of the storm (Vinni, 2019). Gas stations could not pump fuel, mobile services were irregular, kids were sent home from school, card payments did not go through in shops. Already this case was described as a cautionary example of internal security and local government preparedness (or lack thereof) for crises.

Hazard	*Type of crisis*	*Vulnerable groups*	*Vulnerability elements*
Wind storm	Power outages	Families with small children School children Disabled	Lack of electricity Lack of water Lack of fuel Lack of mobile services Age Disabilities

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Table 8. Wild storm: Vulnerable groups and vulnerability elements

9 and 10 December 2010. Snowstorm Monica.

This snowstorm violently raged through Estonia at the beginning of December 2010 (ERR, 2010). Several roads were closed, since municipalities did not have resources to keep the local and state roads open. Many of Tallinn airport's flights were cancelled, while schools were closed. Difficult road conditions and poor visibility resulted in nearly 80 road accidents across Estonia, and, in the conditions of low visibility, one man who had got out of his car stuck in the snow was hit by a passing vehicle and died. In the northeast rural municipality of Viru-Nigula, hundreds of people were stranded in their cars. Two people got lost during the storm and were later found frozen to death. Help took time to arrive because ordinary rescue service vehicles could not move. In highly mobile society, anyone could have got stranded in the car due to extreme road conditions.

Hazard	*Type of crisis*	*Vulnerable groups*	*Vulnerability elements*
Snow storm	Power outages Roads closed	Travellers (car and plane) Children Emergency operators	Limited and restricted mobility Lack of heat (people in the car)

Table 9. *Snow storm: Vulnerable groups and vulnerability elements*

April-May 2007. Cyber-attacks.

Cyber-attacks are "events which aim to compromise the integrity, confidentiality or availability of a system (technical or socio-technical)" and these "range from hacking and denial-of-services (DoS), to ransomware and spyware infections, and can affect everyone from the public to the critical national infrastructure of a country" (Bada and Nurse, 2020: 74). They occur each time computer systems are tampered with ill intent to cause harm, such as real destruction of property, loss of business revenue, spread of disinformation, and theft of vital or confidential information (Abomhara and Koien, 2015). Unlike several other threats, cyber-attacks can have global reach, since they do not follow national boundaries. In this sense, the three-week wave of massive cyber-attacks in Estonia in April-May 2007 represents nowadays the first known cyber-attack against a state. While Russia and Estonia were embroiled in their worst dispute since the collapse of the Soviet Union, a row erupted in April 2007 over the removal of the Bronze Soldier Soviet World War II Memorial in central Tallinn, Estonia was subjected to a barrage of cyber-attacks on 27 April. Cyber-attacks consisted of disabling the websites of government ministries, political parties, three of the country's six big news organisations, two of the biggest banks and firms specializing in communication. A wave of Distributed Denial of Service (DDoS) attacks suddenly swamped websites with tens of thousands of visits, jamming and disabling them by overcrowding the bandwidths for the servers running the sites. The attacks poured in from all over the world, but Estonian officials and computer security experts indicated that, particularly in the early phase, some attackers were identified by their internet addresses - many of which were Russian, and some of which were from Russian state institutions. Defence, government institutions and communication companies closed down the sites under attack to foreign internet addresses in order to try to keep them accessible to domestic users (Postimees, 2007). Estonia remains highly vulnerable to cyber-attack (Ottis, 2018). In Estonia, cyber-attacks are seen as having a potential to cause damage at a much larger scale than any natural hazard (Saar, 2019). In year 2018, the Information Systems Authority (2019) registered 3,390 cyber incidents that affected data or information systems (Figure 9).

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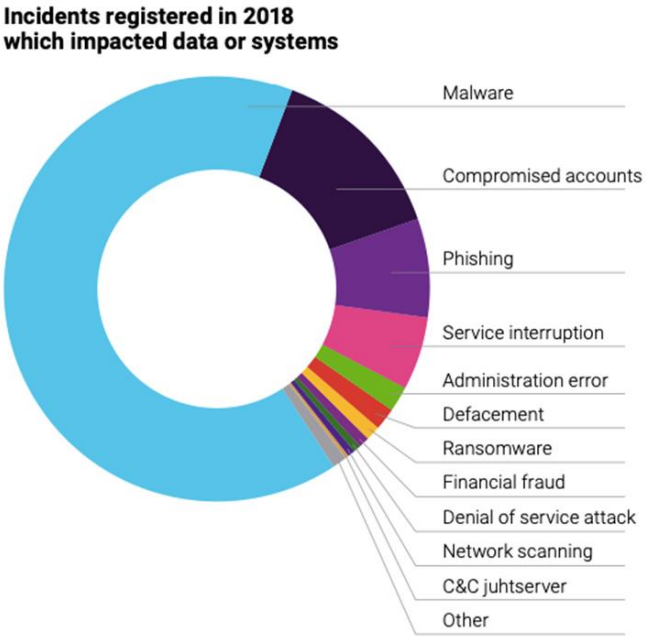

Figure 8. *Typologies of cyber incidents (Source: Estonian Information Systems Authority, 2019: 7)*

Financial scams that started with so-called executive schemes and hijacked email conversations did the most damage, taking small and medium businesses for at least 600 000 € in 2018. Cyber-attacks against banks have halted one of the vital services – the banking system. In a state where most of the payments are conducted electronically this may impede economic activities, but also limit the possibilities to purchase goods necessary for everyday livelihood. From 2018, other noteworthy incidents included cyber-attacks against family medicine centres and leaked health data of soldiers and schoolchildren from state document management systems. Attacks on databases with health info is a major threat to anyone's privacy. Attacks on email systems harm individuals and businesses relying on online communication. The impact of these events is brought out in Figure 10.

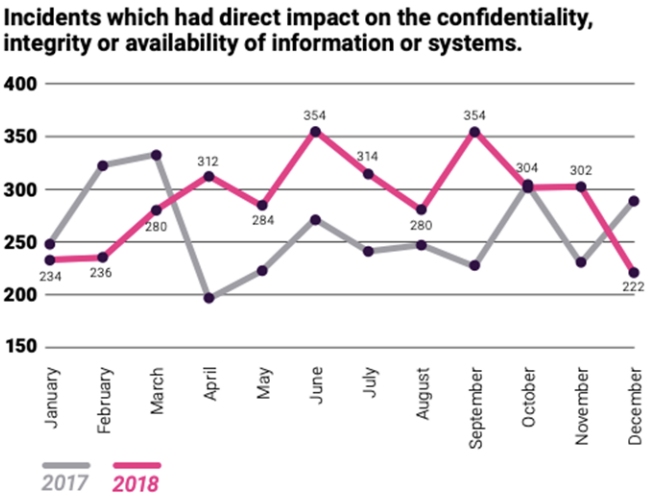

Figure 9. *Impact of cyber incidents (Source: Estonian Information Systems Authority 2019: 7)*

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Hazard	*Type of crisis*	*Vulnerable groups*	*Vulnerability elements*
Cyber-attack	Websites disabled Information systems disabled Information exchange disabled Flooded emails Disabled online media sites Disinformation	Computer users Patients in hospitals Medical services Online (social) media followers	Limited access to information Delays in health services Exposure to disinformation Violation of privacy

Table 10. *Impact of cyber incidents (Estonian Information Systems Authority 2019: 7)*

5.2 Finland

December 2017 – January 2018. Heavy snowfall.

At the turn of the year 2017-2018, the Kainuu region, Northeast Finland, experienced extensive power outages as a result of the snow burden. Heavy snowfall accumulated heavy snow layers on the branches of trees, causing trees to fall on the electricity lines, leaving thousands of households without electricity. Most of the electricity was recovered quickly, but some had to be discharged for several days. The Finnish National Rescue Association made an on online survey about the event. In general, the situation was largely resolved, as the worst power outages occurred in areas where the population was prepared and had the resources needed to survive, such as fireplaces, home supplies and a source of emergency water. According to the respondents, their own attitude and skills also played a key role in the success of the recovery. Although self-reliance and residents' resilience to the crisis seems to have been good, it should be noted that feelings of security were shaken of the most respondents. Respondents raise a concerns about the elderly, but also for families with children and farm entrepreneurs as for a slow recovery. The most vulnerable groups in the incident were people depended on electrically-powered health-related devices such as oxygen concentrators at the local hospital.

Hazard	*Type of crisis*	*Vulnerable groups*	*Vulnerability elements*
Snow fall	Power outages	Elderly Families with children Hospitalised patients Farm entrepreneurs	Dependence on electrically-powered health-related devices Age Heath conditions Exposure

Table 11. *Snow fall: Vulnerable groups and vulnerability elements*

18 August 2017. Radicalisation.

The 2017 Turku terroristic attack took place on 18 August 2017 at around 16:02–16:05 when 10 people were stabbed in central Turku, Southwest Finland. Two women were killed in the attack and eight people sustained injuries. Police was informed at 16:02. Three minutes later the attacker, Abderrahman Bouanane, a Moroccan rejected asylum seeker, was detained. At the time of his arrest, Bouanane was using the name Abderrahman Mechkah, which was subsequently discovered to be a false identity. In June 2018, Bouanane was found guilty of two counts of murder with terrorist intent and eight counts of attempted murder with terrorist intent. It was the first time a person had been sentenced for a terrorist crime in Finland. Bouanane reportedly identified as a soldier of the Islamic State of Iraq and Syria (ISIS). He had been radicalised three months before the stabbing took place. During the investigation, he was discovered possessing ISIS propaganda material and a video of him reciting a manifesto and (Safety Investigation Authority, 2018).

A recent study on jihadism in Finland commissioned by the Finnish Interior Ministry pointed out that "Even though there has been increasingly extensive networking among people interested in jihadism

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in Finland in recent years, jihadist activism in the country is still quite fragmented and disorganised. There are still no organisations openly engaged in jihadist activism in Finland. Indeed, there appears to be only a few key activists that are capable of and willing to organise and encourage these activities" (Malkki and Saarinen, 2019:11).

Hazard	*Type of crisis*	*Vulnerable groups*	*Vulnerability elements*
Radicalisation	Terroristic attack	The whole Finnish society	Exposure

Table 12*. Radicalisation: Vulnerable groups and vulnerability elements*

January 2017. Water contamination.

On 26 January 2017, a reporter called to the local health centre and asked if tap water could be a cause of the suspicion of stomach disease in the municipality of Nousiainen, Southwest Finland. For nearly two weeks, the water utility had been searched for a pipe break as tap water was running to the terrain. A debate on the possible contamination of tap water begun in social media. Authorities of the local water utility, supervising authorities and public health service representatives discussed the situation, but as no abnormal amount of disease cases occurred and the location of pipe break was still under investigation, it was decided to monitor the situation (Nivola, 2018). In the next morning, more information of stomach disease patients was received and tap water sampling actions started. The residents were informed of the suspicion of contaminated tap water, chlorination was started, and water boiling warning was published. Efforts were made to inform about the water crisis extensively: on the municipality's website, on municipality's Facebook, at the doors of shops and supermarkets, and via an extensive email distribution list to the local councillors and authorities. The official emergency warning was published by the local rescue service (Nivola, 2018). The first laboratory results confirmed tap water contamination and new water boiling warning was published. An extensive household water sampling started. Various responsible organizations started to prepare for expanded and prolonged disruption. The stomach epidemic increased. On 30 January, the pipe breakage point was founded: the tap water pipe, the sewer pipe as well as the storm water pipe were broken. As a result of the pipe breakage, waste water flowed into tap water network (Nivola, 2018). A water tank was reserved for the use of residents. Schools, kindergartens, retirement homes and few farms with production animals were given clean water by tanker trucks. Particular care was taken in the provision of information to potential social exclusion or dementia sufferers. Volunteers distributed paper bulletins about the situation to their and other residents' homes. With the help of volunteers, all residents of the municipality were informed about the ongoing cleaning actions of water supply network as thorough chlorination was carried out. The residents were also given clean water, if necessary. For example, elderly people who had no relatives to help, were given water bottles to their homes (Nivola, 2018).

The population of Nousiainen is about 5 000 residents. Hundreds of them were affected by stomach disease after drinking contaminated water. The official emergency warning was suspended after one month. There was a long debate on responsibilities, crisis management and communication after the acute situation was ended (Nivola, 2018).

Hazard	*Type of crisis*	*Vulnerable groups*	*Vulnerability elements*
Water contamination	Spread of stomach diseases	Children Elderly Patients at the local hospital Marginalised people Dementia sufferers	Reduced health Age Poor health conditions Social exclusion

Table 13*. Water contamination: Vulnerable groups and vulnerability elements*

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November 2015. Snow storm.

On Saturday 21 November 2015, a snow storm heavily hit the Juupajoki municipality, Central Finland, leaving its about 2000 inhabitants without electricity. Power blackouts had already occurred since Friday evening, but the entire municipal centre went dark on Saturday afternoon (YLE news, 2015). People relied on battery-powered light sources and candles. The municipal district heating was not working. Residents of blocks of flats and terraced houses without wood-burning fireplaces or stoves were without heating. The street lights had also blacked out. Although the outdoor temperature was close to zero, there was no acute danger for the inhabitants. On Sunday, electricity recovered in the municipal centre after a weekend in darkness (YLE news, 2015). The local retirement home and the water pumping plant operated with reserve power and the use of a generator. The evacuation was planned, but fortunately inner temperature did not fall under 20 degrees and patients did not need to be evacuated (YLE news, 2015). On the contrary, elderly people living in residential care homes were evacuated to the retirement home. The municipal emergency management was in constant contact with the local rescue services, which faces major problems with mobile phone networks not properly working. He was, as well, in close contact with the operating electric company, which, after a short assessment of the damages, admitted the several days were needed to give the electricity back to all. The regional rescue department was, as well, monitoring the situation.

Snow storms are not a rare phenomenon in Finland, but their increase in number has provoked serious disruptions in the electricity system, as this event showed. As a consequence, Finnish electric companies are currently replacing existing overhead power lines with underground cable networks, which means that the wires are not vulnerable to the weather (YLE news, 2015).

Hazard	*Type of crisis*	*Vulnerable group*	*Vulnerability elements*
Snow storm	Power outages	Elderly in residential care homes Households in blocks of flats without fire place	Age Type of house Reduced health-care

Table 14. *Snow storm: Vulnerable groups and vulnerability elements*

November 2007. Water contamination.

Between 28 and 30 November 2007, treated wastewater (technical water) from the wastewater treatment plant accidentally entered the drinking water network of Nokia, a town in southern Finland. At the beginning of the accident, the wastewater treatment plant was completing installation and maintenance work. The installation work required that the plant's drinking water network was closed for a period of time. At the same time, information-technology-related installation works were also ongoing in another waterworks, and additional household water from neighbouring water supply network was released. Consumers sent several notifications concerning ill-smelling and ill-tasting water to the wastewater treatment plant. The waterworks' personnel concluded that this was caused by the maintenance work and water pipe repair work completed earlier, but started rinsing actions in the water network. In response to the complaints that were accumulating, the health inspector issued a recommendation that drinking water has to be boiled before using. Soon thereafter, the reason for the water's contamination became apparent: technical water had entered into the drinking water network because a valve had been built, in breach of regulations, between the sewage network and the drinking water network (Accident Investigation Board, 2007). The local health inspector gave the first announcements to boil water to the media 30 November 2007 in the afternoon. The announcement was shared via Tampere's radio news programmes, on the town of Nokia's Web site, and via other media channels (Accident Investigation Board, 2007).

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Several hundred calls were made to the Nokia health centre during the night of 30 November 2007, continuing the next morning, obliging the nursing and medical staff to work non-stop. In addition, during the following days, the number of patients, manifesting abdominal pain, began to increase at the health centre. Although, on 3 December 2007, the number of patients at the health centre was similar to previous days, the patients were worsening. At the Tampere University Hospital, the pressure especially in childhood disease emergency care started in the evening, where the situation was described as chaotic. Children who needed hospital care were sent to the Tampere University Hospital, because the facilities and resources of health-care personnel at Nokia Health Centre were too small to treat a large number of child patients. Also, health-care personnel at Nokia Health Centre started to get sick. During the acute phase, between 30 November and 16 December, the Nokia health centre treated a total of approximately 715 Nokia residents (out of about 30 000 in year 2007), while the Tampere University Hospital cared for a total of 167 Nokia residents, 114 of whom were children. Patients also sought health care for the neighbouring municipalities, private medical centres and occupational health care, but no systematic information has been collected on these cases (Accident Investigation Board, 2007).

The contaminated drinking water caused the largest water epidemic ever registered in Finland. According to the Public Health Institute, the use of contaminated drinking water caused various levels of intestinal diseases for more than 8 000 people. Some suffered from symptoms that continued for several months. Some of the sufferers had joint symptoms and, in particular, prolonged illness which caused significant mental distress. The police investigated two deaths linked to contaminated drinking water use (Accident Investigation Board, 2007).

Hazard	*Type of crisis*	*Vulnerable groups*	*Vulnerability elements*
Water contamination	Spread of diseases	Residents in the affected area Children Patients at the local hospital Health-care personnel	Reduced health Age Poor health conditions

Table 15. *Water contamination: Vulnerable groups and vulnerability elements*

Summers 2003, 2010, 2018. Heat waves.

Despite the fact that summers are cool in Finland, higher temperatures have been registered lately, causing health problems. Heat waves have invested Finland, increasing mortality rates, especially in health care units. For example, the 2003 heat wave in Finland caused over 200 premature deaths, while the 2010 heat wave about 300 premature deaths. The mortality rate increased in particular among those over 75. During the heat wave in 2010, the hospital district of Helsinki and Southern Finland had 60 deaths more than usual during the summer months (Tuomenvirta et al., 2018). The extended heat wave of summer 2018 caused around 380 premature deaths. This information is based on an assessment by researchers at the National Institute for Health and Welfare. Mortality was examined on a 24-day period in July and August during which temperatures were hot across Finland. The effects were focused on the age group of over 65-year-olds, in which daily mortality grew by on average 14% during the heat wave compared to regular rates (Finnish Institute for Health and Welfare, 2019).

In 2016, the Helsinki region climate-based vulnerability survey examined people's vulnerability to floods and heat waves. The survey studied the factors of social vulnerability to climate change, expressed in terms of floods and heat waves, in the Helsinki region. The studied factors were: age, access to health care, income, information use, overcrowding, green areas, social networks, and tenure. The results were presented as maps (see an example in figure 11). The positive side of the mapping is to divide vulnerability into different dimensions: sensitivity, enhanced exposure, and the ability to prepare, survive, and recover (Kazmierczak and Kankaanpää, 2016).

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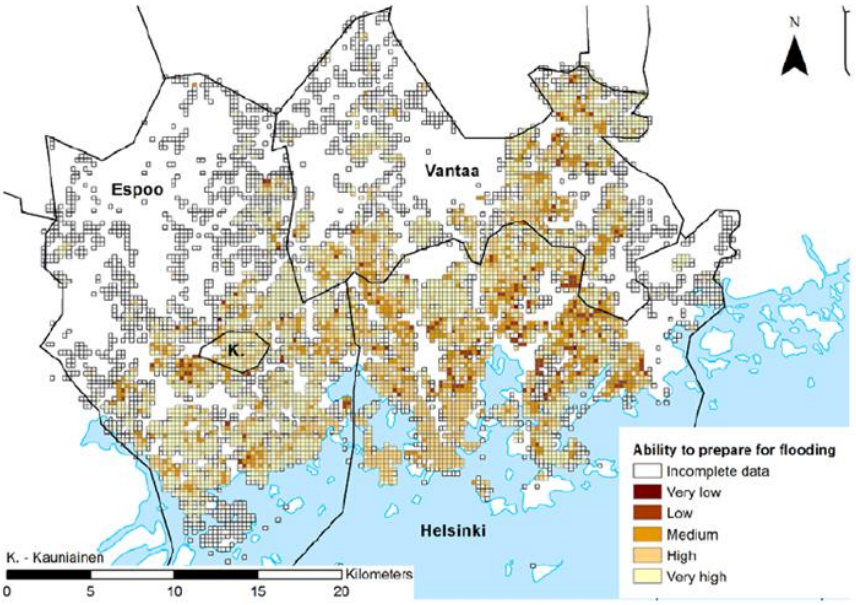

Figure 10. *Dimensions of vulnerability: ability to prepare for floods in Helsinki region (Source: Kazmierczak and Kankaanpää, 2016)*

In Finland, in general, extreme weather events may affect some people more than others. Individual's vulnerability is determined by their physical characteristics, such as age and health. In addition, vulnerability is affected by people's ability to cope with harmful weather events; be prepared, cope with the actual situation, and the opportunities to repair damages and return to a normal life as quickly as possible. For example, social networks, such as friends and neighbours, improve people's ability to adapt and respond in harmful weather events without long-lasting damages. (Kazmierczak and Kankaanpää, 2016). Lonely elderly people may be at risk during long periods of heat wave unless they have friends or relatives who can help them. The living environment can increase or decrease vulnerability. The quality of the housing, the location of the dwellings, and the amount and quality of the green areas affect the impact of floods and heat waves (Kazmierczak and Kankaanpää, 2016). In terms of the heat, non-ventilated interiors comprise big risk. Especially in small dwellings with large windows facing south or west, the indoor temperature can rise to very high levels during the heat wave. This makes the heat a greater risk than extreme cold. In Helsinki, vulnerable groups in most cases are able to go indoors and protect themselves against extreme cold weather conditions (Pilli-Sihvola et al., 2018).

Hazard	*Type of crisis*	*Vulnerable groups*	*Vulnerability elements*
Heat wave	Deterioration of human health Higher mortality	People living in houses with large windows People living in houses without the possibility of adequate cooling Elderly	Age Reduced health

Table 16. *Heat waves: Vulnerable groups and vulnerability elements*

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5.3 Indonesia

28 September 2018. Earthquake.

An earthquake with 7,4 magnitude hit the Donggala-Palu area of Central Sulawesi on Friday 28 September 2018, at 17:02 Western Indonesian Time (WIB – Jakarta), followed by a tsunami shortly after. Buildings, including houses, stores, mosques, and hotels, swept away and were destroyed. According to data from 20 December 2018, there were 2 227 fatalities with over 4 084 injuries and 671 missing persons. 164 626 people had to evacuate to shelters and tents outside their houses, and 20 257 people need shelters. Smaller early afternoon earthquakes in Palu and Donggala preceded the more devastated earthquake on Friday. These pre-shock preliminary earthquakes had magnitude of between M 3.1 - M 5.1 with the centre adjacent to the main earthquake. The epicentre was part of the Palu-Koro sliding fault, one of the most active faults in Indonesia. Even though the earthquake centre was on land, the earthquake was shallow, and the shift that occurred was horizontal, this earthquake had an impact on the occurrence of tsunamis that hit the coast of Palu and Donggala. The tsunami arrived when the ground was still shaking, a few minutes after the earthquake.

In the first two weeks of the emergency response, a Joint Needs Assessment (JNA) was conducted in the suburban level, while another assessment - the International Organization for Migration's (IOM) Displacement Tracking Matrix (DTM) - was done between October and December 2018. A third assessment - the Multi-Sector Needs Assessment - was done four months after the earthquake, between January and February 2019. All these assessments helped to spot out the needs of the citizens affected by the earthquake. Four vulnerable groups were in focus (REACH, 2019): 1) children; 2) women; 3) people with mental and/or physical disabilities; 4) elderly; 5) minorities.

Hazard	*Crisis*	*Vulnerable groups*	*Vulnerability elements*
Earthquake	Collapse of infrastructures Interruption of vital functions	Elderly Disabled Children Women Minorities	Age Mental and physical conditions Gender Ethnicity

Table 17. *Earthquake: Vulnerable groups and vulnerability elements*

5.4 Norway

10 August 2019. Radicalisation[8].

The Bærum mosque shooting was a terrorist attack that occurred on 10 August 2019 at the Al-Noor Islamic Centre mosque in Bærum. Bærum is a Norwegian municipality in Akershus country neighbouring the capital city of Oslo. The shooter, identified as Philip Manshaus, was wearing a uniform and helmet when he entered the mosque, shooting his way through the locked door. He was carrying two shotguns or shotgun-like weapons and a pistol. When inside, he opened fire in the room of prayer. Luckily, prayers had just ended, with only three elderly remaining in the mosque. One of the men approached Manshaus and managed to hold him on the floor and to move his weapons away. The two began to struggle and Manshaus injured him. Another of the men in the room then hit Manshaus on the head to subdue him. The police was called by worshippers at the Mosque at 16:07 local time, shortly after Manshus was stopped and held down by a 65 year old immigrant with experience from the Pakistani air force. Initially, the language barrier hindered the police in their

[8] All the information collected for these crises comes from several sources, such as national television broadcast NRK, several types of on-line newspapers etc.

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understanding of where the shooting was taking place. Manshaus was in a chokehold when police arrived.

Hazard	*Type of crisis*	*Vulnerable groups*	*Vulnerability elements*
Radicalization	Terrorist attack	Individuals in a mosque	Language Belonging to different ethnic group and/or religion than the terrorist Exposure

Table 18. *Terrorist attack: Vulnerable groups and vulnerability elements*

6-18 June 2019. Water contamination.

In June 2019, an outbreak of the bacteria Campylobacter and E.coli hit the Askøy water system. Askøy is a municipality in Hordaland County, the municipality is of moderate size in a Norwegian context with its 28821 inhabitants. 2000 inhabitants fell sick. On 6 June, Askøy emergency medical facilities saw a sharp increase in people with digestive problems arriving at the local hospital emergency room, all coming from the Kleppestø island. Public institutions were alerted and at 18:00 the following day a general alarm was sent via SMS to boil any drinking water in the affected area. On 18 June, the sources of water were considered safe, but the contaminated water source was shut down and water was diverted to the area from a different source on 23 June. Still today, the water is under continual surveillance to detect in time similar bacteria. One elderly and one child died after digestive complications that may have been affected by the bacteria.

Hazard	*Type of crisis*	*Vulnerable groups*	*Vulnerability elements*
Contaminated water	Waterborne disease outbreak	Elderly Children	Age

Table 19. *Contaminated water: Vulnerable groups and vulnerability elements*

2 January 2019. Snowfall.

On Wednesday 2 January 2019, the police received a warning about a heavy snowfall on the Blåbärtinden, also known as Blåbærfjellet (1,442 m above sea level), in Tamokdalen in Troms Country, Northern Norway. The Norwegian Water Resources and Energy Directorate assigned the area a danger level of three out of five, which means considerable risk for a snow avalanche. Five tourists had been hiking in the mountains, three Finnish men, one Swedish woman and one Swedish man. When they arrived at the tree line, where the vegetation became limited due to the altitude, the Swedish man chose to turn around, discovered that the avalanche had occurred and alerted authorities. The ski trails of the other four entered the avalanche area and they were reported missing. Poor weather and high danger for landslides in the area prevented the search for the four. On Friday morning, almost two days after the avalanche, the weather conditions improved and the voluntary search crews could fly into the area to search for the four missed people. Around 12 noon on Friday 4 January, the search crews found two different avalanches in the area and half an hour later, the police changed the status from missing to suspected deaths' search, after both the National Main Rescue Centre and the police concluded that the four missing persons probably had died in the landslide. Three of the dead were dug out of the snow after two weeks. On 10 July, the police found the last body.

Hazard	*Type of crisis*	*Vulnerable groups*	*Vulnerability elements*
Snow fall	Snow avalanche	Tourists First responders	Faulty risk perception Lack of knowledge concerning the local avalanche risk Not perfect weather conditions (for the first responders)

Table 20. *Snow fall: Vulnerable groups and vulnerability elements*

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5 May 2017. Fire in tunnel.

The Oslofjord tunnel, which connects the eastern and western sides of the Oslofjord, has been subject to several fires. On 5 May 2017, due to an engine failure, a heavy goods vehicle, loaded with toilet paper, caught fire inside the tunnel while driving up a slope towards Drøbak, a municipality in Viken County in the Eastern part of Norway. The fire escalated quickly and within a short time the heavy goods vehicle, including its load, was completely burnt out. While the tunnel was in the process of being closed, there were some delays in the lowering of the barriers at the tunnel entrances, and several vehicles managed to drive into the tunnel before and while the barriers were going down. Among these were two other heavy goods vehicles that continued driving all the way to the scene of the fire before stopping. There were also incipient fires starting there, but the fire service intervention was decisive in extinguishing the fire and limiting it to only one vehicle.

Since similar events in the same tunnel were studied before (Njå and Kuran, 2014), the table shows the breath of vulnerabilities and vulnerable groups that could be caught in tunnel fires.

Type of Hazard	*Type of crisis*	*Vulnerable groups*	*Vulnerability factors*
	Fire in tunnel	People in vehicles	Dependence on medicines Reduced mobility Reduced visibility

Table 21.*Tunnel fire: Vulnerable groups and vulnerability elements*

10 November 2016. Landslide.

On Thursday 10 November 2016, a massive landslide occurred in Asakveien in Sørum, a municipality in Akershus County. The area covered was approximately 400 x 300 meters and 60 meters deep. At 15:55, only minutes after the landslide, the local Fire Department was notified by workers in the area. The area was initially not considered safe for first responders: geologists from Norwegian Water Resources and Energy Directorate reported that there were still floating masses and the danger of new landslides. Three Lithuanian men clearing forest and cutting down trees in the area were killed. One of three presumed victims was found by police and voluntary search parties the same day. The two other forest workers where not found. The police eventually concluded the search two days later.

Hazard	*Type of crisis*	*Vulnerable groups*	*Vulnerability elements*
	Landslide	Workers First responders	Exposure to a risky terrain

Table 22. Landslide: Vulnerable groups and vulnerability elements

5 - 8 December 2015. Synne storm.

The Synne storm was a relatively short-lived, but extremely bad weather event, characterised by the heaviest rainfall since records began in 1897 and violently hit the town of Eigersund between 5 and 6 December 2015. The storm provoked a flood from both rivers surrounding the town, damaging the road system, including the bridges, which cross the rivers, the railway, and households around the harbour and close to the rivers' banks. During the flood, the local crisis management evacuated several hundred people from over 80 houses, while the local home care centre and the local tourist centre had to provide temporary shelters for their guests, elderly and tourists residing there. The flood destroyed a large area of farmland, damaged the town's infrastructure, disrupted road and rail traffic and cut off power supplies in several areas. The total impacted area was the Rogaland and Vest-Agder counties, which are 9 378 km² and 7 276 km², respectively. Losses were estimated at more than 1,5 million Norwegian Crowns (Steen and Morsut, 2019).

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Hazard	*Type of crisis*	*Vulnerable groups*	*Vulnerability factors*
Heavy storm	Flood	Elderly Tourists House owners close to the rivers	Age Exposure Type of house

Table 23. *Flood: Vulnerable groups and vulnerability elements*

22 July 2011. Radicalisation[9].

Friday 22 July 2011, Norway suffered two terrorist attacks. The first against the government quarter in Oslo where a car bomb exploded at 15:25. The second at the Labour Party's youth organization AUF summer camp on the island of Utøya, where a man in a police uniform began shooting people who were there at 17:21. Five minutes before the first attack, the security centre in the government quarter was notified about an incorrectly parked car at the entrance of the High Block building where the Prime Minister and the Minister of Justice had their offices. The surveillance cameras showed a man in a police uniform leaving the car. There were 250 people at work in the government quarter, while in the nearest streets there were about 75 people. The car bomb explosion affected all these people. The explosion left 8 dead people, 9 severely injured and more than 200 with less severe injuries. The explosion caused major material destruction for hundreds of meters around the High Block building. At 15:26 the police received the first message about the explosion and at 15:28 the first police patrol reported arriving at the chaotic scene: people dead and injured inside and outside the building were laying among glass, documents and building components. The first images showed by the national television were impressive: the government quarter looked like a war zone. In a short time, the television network worldwide transmitted these images.

The national newspaper VG, the regional newspaper Dagsavisen and the commercial broadcaster TV2, which all had offices close to the government quarter, had to evacuate their premises due to the explosion. A witness called the police at 15:34 to report a person in a police uniform holding a pistol in his hand, entering a vehicle. Information - including the vehicle's license plate number and description of the suspect - was written on a yellow note, and hand delivered to the police operation centre, where it lay for twenty minutes before the witness was phoned back. The license plate number was not transmitted to the police radio until two hours later. Just before half past six, the police operation centres in Oslo, Hønefoss and Drammen received alarming messages from young people gathered on the island of Utøya that a man in a police uniform was walking around and shooting people. Some hide indoors and in the tents, some other run to hide among the trees or in the water. Some tried to swim or take a boat over to the mainland. In the social media, this terrible news quickly spread. Many called and sent messages to family and friends asking for help. Many called the police emergency number without getting in touch. Residents and tourists on the mainland close to the island, at risk of their own lives, went out by boat and rescued people. Without this effort, the number of killed people would have been higher. The police arrested the man after over an hour of shooting, at 18:34. He was a 32-year-old Norwegian, Anders Behring Breivik, who had carried out both attacks alone, after a long time planning. With his police uniform and badges he had made himself, he managed to lure out people who were hidden by saying he was from the police. There were 564 people on the island when the man started shooting. 530 of these were young people attending the

[9] The main source for this part was the NOU 2012:14 (2012), Rapport fra 22. juli-kommisjonen. Oslo.

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summer camp. 69 people were killed, 110 were injured, 55 of them seriously. Several of the survivors had to cope with mental and physical health problems afterwards.
During his trial, started 16 April 2012, Breivik described himself as an ultranationalist and justified his acts according to right-wing and anti-Islamist extremism. He stated that he perpetrated the two attacks to defend the Norwegian indigenous people and Norwegian culture against multiculturalism. In his eyes, Norwegian politicians, and especially the Labour Party, betrayed the country through an immigration policy, which would lead to a majority of Muslims in Norway. On 24 August 2012, he was sentenced with the most severe punishment allowed by the Norwegian law - 21 years in prison with a minimum term of 10 years.

The 22 July terrorist attacks are the most shocking and unimaginable crisis Norway has experienced. The crisis management system showed clear deficiencies and inadequacies in the management of the crisis, being this a new and unprecedented crisis for Norway (NOU 212: 14, 2012).

Hazard	*Crisis*	*Vulnerable groups*	*Vulnerability elements*
Radicalisation	Terrorist attack	Public officers in the government quarter People walking and working close to the government quarter Adults running the camp on Utøya Youths on Utøya, the youngest was 11 the oldest 25	Lack of information Exposure

Table 24. *Terrorist attacks: Vulnerable groups and vulnerability elements*

5.5 Sweden

Summer 2018. Heat wave.
Summer 2018 was unusually warm in Sweden, breaking previous heat records in multiple places in the country. The heat wave lasted from May to August, July and August being particularly warm. The highest average temperature reported from weather stations around the country was 31.2°C. The long period of elevated temperatures resulted in drought and forest fires (SMHI, 2018a; SMHI, 2018b). Many actors participated in efforts to reduce risk in relation to the heat wave, including the Ministry of Health and Social Affairs, the Public Health Agency of Sweden, the National Board of Health and Welfare, as well as the Swedish Association of Local Authorities and Regions. Weekly coordination meetings were organized during the heat wave, addressing issues such as what actions the responsible actors were undertaking to help those at risk. The public was directed to sources such as the medical advice service for information on health-related risks, to the World Health Organization for advice on how to prevent adverse health effects of heat, and to the National Food Agency website for information on how to handle food in a safe way in times of high outdoor temperatures. The Government Offices went out with warnings to particularly vulnerable groups, including elderly, young children, chronically ill and people on medication, people with disabilities, and pregnant women (Government Offices of Sweden, 2018). Although, the Swedish reports proposed in Chapter 4 are reluctant to define vulnerable groups, in the context of a heat wave, there is a precise account to which groups need to be address by public authorities.

In addition to impacts such as drought and forest fires, the heat wave affected human health. Reported cases of infectious diseases increased during the 2018 heat wave, as compared to the same period during the past four years (Public Health Agency of Sweden, 2018). Furthermore, mortality rates increased during the summer, with an estimated 600-750 excess deaths attributed to the heat (Åström et al., 2019). The reported cases of heat related mortality concerned primarily elderly with heart

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conditions (Public Health Agency of Sweden, 2018). European studies have shown that increased mortality rates are more common among women as compared to men during heat waves, while previous studies in Swedish contexts have shown the opposite (SMHI, 2011). However, no studies allowing for a further breakdown of the data on reported cases of death during the 2018 heat wave have been found in the literature screening for the present report.

In a follow up study on how the public handled the heat wave and what type of information people had access to, The Public Health Agency of Sweden sent out a survey with 4 600 respondents. One fourth of the respondents reported having suffered mild health related issues due to the elevated temperatures, but only around two percent had needed emergency care. Most of the reported cases of mild health issues concerned elderly, small children, pregnant women, chronically ill, and people with specific types of disabilities. 72% of the respondents reported that they had been changing their habits in some way to cope with the heat. Also, 96% reported that they had the information they needed to cope with the heat, which may indicate a certain level of risk awareness in the case of heat waves among the public (Public Health Agency of Sweden, 2018).

Due to the cool climate, heat waves such as the one experienced in summer 2018 have previously been relatively unusual in a Swedish context. However, as a consequence of climate change, they are expected to become increasingly common. It is suggested that the frequency of extreme temperatures will increase from once every twentieth year to every third or fifth year by the end of the century (SMHI, 2011). Risk arises as the Swedish society is adapted to a cold climate, and what could be perceived as normal temperatures in other countries may be disruptive in a Swedish context. Buildings are constructed to handle cold weather but not heat. The outdoor environment is designed to maximize light, rather than shade. Electronic infrastructure is not equipped with cooling systems, and may break down during extended periods of elevated temperatures. Additionally, there is a suggested lack of awareness in the population around how to act during a heat wave and how the body might respond to high temperatures (MSB, 2015). Against this background, building capacity to handle the consequences of elevated temperatures is of importance for risk reduction and protection of human health, societal functions, and infrastructure (Public Health Agency of Sweden, 2017).

Hazard	*Type of crisis*	*Vulnerable groups*	*Vulnerability elements*
Heat wave	Deterioration of human health Higher mortality Fires	People living in houses with large windows People living in houses without the possibility of adequate cooling Elderly Children Chronically ill and on medication people People with disabilities Pregnant women	Age Reduced health Type of house

Table 25. *Heat waves: Vulnerable groups and vulnerability elements*

Summer 2018. Forest fires.

Following the 2018 heat wave, multiple places in Sweden experienced severe forest fires during the summer months. Firefighting airplanes and helicopters detected over 500 fires, which is five times as many as during a normal summer (MSB, 2018b). Around 25 000 ha forest land was burnt, and approximately 7 000 rescue interventions carried out in the field (SOU, 2019). The largest fire areas were found in Dalarna (2 500 ha), Gävleborg (8 500 ha), Västernorrland (500 ha), and Jämtland (8 500 ha) (SVT, 2018). The forest fires and related efforts to control them unfolded over a period of several months. In response to high fire risk expected in early summer, MSB organized a number of coordination meetings. The focus was on fire risk reduction, and county administrative boards and

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other actors participated. On 1 June, several complicated fires were spreading around the country. A few days later MSB reached out to the EU Emergency Response Coordination Centre (ERCC) in a proactive effort, and did also form a specific internal unit for fire management. ERCC firefighting airplanes arrived to assist with fire control on 10 June, leaving again ten days later. The special task unit at MSB reduced their capacity at the same time. However, the situation got more intense again at the beginning of July, when several severe fires broke out. Helicopters from Norway were called in to build capacity. MSB got in contact with the ERCC again on 16 July, to receive additional support. MSB coordinated help actions with volunteer organizations and the Red Cross on 19 July. On 23 July, large fires broke out in the north of Sweden. The situation was stabilized around 27 July, when also some of the international back-up resources began to leave Sweden. The fire risk was assessed to be back at normal levels on 12 August, and the last remaining international resources left the country the day after (MSB, 2018b).

Taken together, many different actors helped with fire management. Aside from the national and international resources mentioned earlier, also organizations such as the Swedish Armed Forces, the Swedish Transport Administration, Radio Sweden, and the Swedish Maritime Administration played important roles. Additionally, forest owners and residents in the areas affected by the fires contributed with knowledge and resources (SOU, 2019). In addition, over 6 000 people spontaneously signed up as volunteers through the Red Cross (Swedish Red Cross, 2019b). No major disruptions to societal functions were experienced during the 2018 forest fires, and no damage to permanent housing was reported. However, around 100 people had to be evacuated from their homes, and the rescue service and other actors working to control the fires faced challenging working conditions. One fire-fighter lost his life in an accident in relation to the fires, but no other severe personal injuries were reported. The group in society most affected was the forest owners, for example through financial losses and feelings of stress and uncertainty. The operational work on fire control in 2018 has been assessed to have followed best practice, but in general Sweden is not sufficiently well prepared for these types of events, in light of potential large and complicated future forest fires (SOU, 2019).

Hazard	*Type of crisis*	*Vulnerable groups*	*Vulnerability elements*
Heat wave	Forest fires	Inhabitants of rural areas First responders Forest owners	Demolishing of property and forest Health effects of smoke inhalation

Table 26. *Forest fires: Vulnerable groups and vulnerability elements*

7 April 2017. Radicalisation[10].

Sweden was hit by a terrorist attack on 7 April 2017. During the attack, a truck was stolen and driven at high speed down one of central Stockholm's pedestrian walkways, hitting pedestrians before crashing into the window of a shopping centre. Five people lost their lives, and additionally 12 people were severely injured. The first call to the emergency number was made at 14:52, reporting a truck driving on a pedestrian street. The call was transferred to the policy further handling. At 14:53 the first call reporting that there were people injured reached SOS Alarm. The incident was first noted down as a traffic accident, but within minutes re-classified as a terrorist attack. The SOS Alarm activated their crisis organization at 14:54. Thereafter, the government offices, MSB, the security services, and county administrative board were informed. Societal functions and service providers were put under large pressure during the attack, including the health care system and the police. A number of public

[10] This section draws mainly on the report Utvärdering av hanteringen av attentatet i Stockholm 7 april 2017: redovisning av regeringsuppdrag Ju2017/05643/SSK, evaluating how the attack was handled by responsible actors (MSB, 2018a).

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spaces as well as public transport were closed down for an extended period of time (MSB, 2018a). The perpetrator was Rakhmat Akilov, a 39 year old rejected asylum seeker and a citizen of Uzbekistan, who was apprehended several hours later.

Sweden has been relatively spared from terror attacks, but a modern, open and democratic society is vulnerable to attacks and future incidents cannot be excluded. A trend has been seen where attacks are directed at public spaces rather than societal institutions, causing large consequences and harm to all groups in society (MSB, 2019b). In the 2017 terrorist attack, some groups were identified as particularly vulnerable, mainly due to a lack of efficient spread of information. These groups include persons who do not speak Swedish, as crisis information was initially only provided in Swedish from responsible authorities. Also, people with disabilities and children are groups that may have experienced difficulties in accessing information. When it comes to children and youth, krisinformation.se, the main information provider in times of crisis has had as a policy to primarily reach children and youth through adults in their close surroundings. During the terrorist attack in 2017, many children had left school for the day, and did not have an adult close to them. Hence, there might be a need to re-assess how to reach children and youth in times of crisis. In addition, as a consequence of the shutdown of public transport, thousands of people had to walk to get home, or got stranded. An indirect effect was that child- and elderly care got affected, for example as personnel could not get to work, or as children could not leave schools and day-care centres. Furthermore, a lack of correct information affected the rescue service personnel working at the location of the attack. For example, unconfirmed rumours about a potential bomb or dangerous object being placed in the truck were circulating, creating feelings of worry and fear among rescue personnel (MSB, 2018a).

Hazard	*Type of crisis*	*Vulnerable groups*	*Vulnerability elements*
Radicalisation	Terrorist attack	Swedish society as such Children People non speaking Swedish People not able to go home from work	Ethnicity Language Age Insufficient spread of information Exposure

Table 27. *Terrorist attack: Vulnerable groups and vulnerability elements*

8 January 2005. Storm Gudrun.

On 8 January 2005, Sweden was hit by a storm named Gudrun. With wind gusts reaching up to 42 m/s, equivalent to a hurricane class one, the consequences were severe. Nine people lost their lives during the storm (Sydsvenskan, 2010), another eleven people lost their lives during the cleaning up afterwards, and 141 accidents were reported in the cleaning up phase (SVD, 2006). The Swedish Energy Agency estimates that 730 000 households lost power, 12 000 of which were still without power 20 days after the storm. Some households were without power as long as for 45 days. Among the households without power, some were located in small remote villages and or secluded rural areas. Other affected services include roads, rail roads, telecommunications, and infrastructure. Gudrun has also been the storm which has affected forest areas the most – 75 million m3 of trees fell (slightly more than the yearly logging in Sweden). The societal cost for the disruptions to the energy system was estimated to 4-5 million Swedish kroners (Sydsvenskan, 2010; Swedish Energy Agency, 2015). For the forestry sector, insurance companies may have paid to up to 1 billion Swedish kroners to cover the impacts of Gudrun. As storms usually affect larger areas, they are estimated to be costlier as compared to, for example, forest fires (de Lima Fagerlind, 2018). The storm since Gudrun that is on second place in terms of affected forest is the storm Per (14 January 2007) with 12 million m3

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fallen trees[11]. Per is also the only other storm in Sweden that has caused loss of lives – three persons died due to falling trees (Expressen, 2007).

Hazard	*Type of crisis*	*Vulnerable groups*	*Vulnerability elements*
Wind storm	Interruption of vital services Households without electricity Destruction of forests	Households First responders Households in remote areas	Lack of electricity Lack of water Lack of fuel Lack of phone lines Leaving in rural areas

Table 28. *Wild storm: Vulnerable groups and vulnerability elements*

Spring 2015. Migration crisis[12].

Sweden has a history of accepting migrants, dating back almost one hundred years, and to an extent not frequently matched by other European countries. After the Second World War, considerable numbers were accepted from the Middle East and Latin America. Owing to the Yugoslav Wars in the 1990s, a number of refugees from the Balkans were also accepted into Sweden. From 1900, when the Swedish population numbered approximately 5 million persons, just 7% were foreign born. In 2010, foreign born individuals living in Sweden numbers 14% of the total population. By 2009 (well before the highly publicized 'crisis' discussed below), the number of asylum seekers was already climbing and the geography of origin shifting to North Africa. Indeed, in 2013, immigration reached its highest level since records began, with 115,845 people migrating to Sweden.

In 2015, over one million asylum seekers and refugees fled from the conflict zones in Iraq, Syria and Afghanistan and crossed the borders into Europe (Migrationsverket, 2018:4). According to official statistics, 162 877 persons applied for asylum in Sweden in 2015 - more than twice as many as in 2014. Of these, over 35 000 were unaccompanied minors who arrived without parents or a legal guardian (ibid.). In comparison to most other countries within the European Union, Sweden had accepted the largest number of refugees and asylum seekers in relation to its population size (Migrationsverket, 2018:42). Additionally, Sweden became a transit country for several thousands of asylum seekers on their way to Finland or Norway (Migrationsverket, 2018:12). The extraordinary high number of people that applied for asylum in Sweden in 2015 was mainly concentrated towards the end of the year, which posed a great challenge to Sweden's public administration (SOU, 2017:27).

According to a state official report on the refugee crisis, no Swedish government agency had anticipated the developments that would unfold in 2015 (SOU, 2017:28). The Swedish Migration Agency was under great pressure even before the crisis, with climbing processing times for asylum seekers and uncertain access to asylum accommodations. The capacities of municipalities and other authorities were similarly under considerable strain. Agencies that had past experience of refugee reception, usually driven by events, had better structures in place for cooperating with different actors, were thus better prepared (ibid.).

It is possible to outline three phases of the Swedish Government's administration of the refugee situation during the fall of 2015 (Migrationsverket, 2018:12). The first phase started in September 2015 and is depicted by the attempts within the Government Offices to address the extraordinary

[11] Two previous storms were more severe: one in 1969 – 25 million m3, and one in 1954 – 18 million m3.

[12] We hasten to mention the controversial use of the word 'crisis', since some observers feel this word exaggerates the event and plays into the hands of right-wing political parties. Indeed, the so-called 'crisis' of 2015 was part of a longer-term, and largely manageable, trend. We use the term here to connote the terminology employed by government officials and agency personnel, who describe this event in terms traditionally associated with a 'crisis' in the academic literature.

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situation, such as the extreme shortage of accommodation for asylum seekers. However, no agreements on how to manage the situation were made, and the working methods of the Government remained the same. In the second phase starting in October 2015, the Government began deciding on accommodation issues for asylum seekers, including unaccompanied minors. The third phase started with the bipartisan migration agreement of the government in 23 October 2015. The aim of the agreement was to reduce the number of asylum applicants coming to Sweden. The Swedish immigration and asylum laws would be subject to continuous changes throughout the year and well into 2016 (ibid.).

The most pressing concern during the autumn of 2015 was the accommodation of asylum seekers (SOU, 2017:29). The Swedish Migration Agency was under immense pressure but had to prioritise accommodation acquisition (ibid.). This prompted various measures such as the use of evacuation shelters, tents and military facilities (Migrationsverket, 2018:12). The Agency succeeded in providing temporary housing in all but one occasion in November 2015 when all accommodation options were exhausted, and a group of asylum seekers had to sleep outside the Swedish Migration Agency's office (ibid.).

The processing of asylum seekers was another urgent issue. To cope, the Swedish Migration Agency simplified the registration of asylum seekers to speed up the process, but it was still lagging behind with registrations (SOU, 2017:29). Hence, a large number of asylum seekers had to wait a long time to register their applications - which also delayed their asylum processes. Unaccompanied minors had to reside in temporary housing in the municipalities they had arrived in, waiting for registrations. Because of the difficulties in organising accommodation, these minors had to move around between different municipalities until the housing issue was solved (ibid.). Overall, when the activities of the Swedish Migration Agency were not functioning properly, it led to difficulties for other government agencies. It also jeopardised the legal rights of the asylum seekers (SOU, 2017:32). A reason behind the latter was the severe shortage of suitable legal representatives (SOU, 2017:30).

The right to information and, in particular, knowledge of the asylum process is fundamental to an asylum seeker's legal certainty (SOU, 2017:23). During the autumn of 2015, this information was not always communicated correctly, which negatively affected the asylum seekers, especially unaccompanied minors (ibid.). When the asylum seekers arrived at ferry terminals and railway stations in Sweden, there was limited or no information available in their languages (SOU, 2017:286). This caused confusion as to who the volunteers on site were and how the asylum process worked. Consequently, rumours and disinformation circulated among the newly arrived (ibid). There was a shortage of interpreters during the fall of 2015 and many asylum seekers, in particular the unaccompanied minors, were thus not given information about their rights in their own language (SOU, 2017:386). Written information was often given in English, although not everyone could speak English. The lack of information caused the reception of the asylum seekers to disintegrate at the very fundamental stage of a legally certain reception. There are examples of unaccompanied minors that registered their asylum applications with the Swedish Migration Agency, but that did not understand that this meant that they were seeking asylum in Sweden (ibid).

Indeed, one of the most highly publicised vulnerable groups in this instance were unaccompanied minors. Children are supposed to receive information about their rights from their legal guardian (SOU, 2017:385). The United Nations Committee on the Rights of the Child has called on Sweden to ensure that a legal guardian is appointed within 24 hours of the unaccompanied child's arrival. During the autumn 2015, it could take several weeks or even months until a legal guardian was appointed. Not

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all children knew that they were entitled a legal guardian. The municipalities also failed to make satisfactory checks on the qualifications and background of those who were chosen as legal guardians and have stated that in some cases unsuitable persons were appointed the role. The confusion around legal guardians further delayed the children's' asylum processes (ibid.).

The official reports confirm that unaccompanied minors were considered the most vulnerable group of the newly arrived asylum seekers during the autumn of 2015. In media reports at the time, the discourse on vulnerable groups among the asylum seekers was likewise mainly focused on the unaccompanied minors. *Dagens Nyheter*, a Swedish daily newspaper, published an interview with the Head of the Border Police, Patrik Engström, reflecting on the situation in 2015:

> When we started to see how many young people there were, the issue of protection also became important. The unaccompanied children and young people were particularly vulnerable migrants. We didn't know who they were, not where they came from and where they disappeared. Just a few weeks before we got border control, we had a situation where there were minors who got off the trains and ferries in Malmö and Gothenburg and then just disappeared. Some were picked up by aid organisations and taken to the social service, some were picked up by unknown adults (Bodin, 2016).

Aftonbladet, a Swedish daily tabloid newspaper, published an article focusing on the 'missing unaccompanied children', saying:

> A total of 1,400 unaccompanied children have disappeared from Sweden since 2014 - the largest group comes from Morocco. Several authorities and organizations are now criticizing Sweden's passivity. Factors that influence: The system of legal guardians (which does not work), lack of cooperation across national borders and lack of social security numbers are some of the problems that make the children difficult to trace (Sidner and Morales, 2018).

Expressen, a Swedish evening newspaper, also reported on this issue. Below are some words from an interview with Kjell Terje Torvik, national coordinator for unaccompanied minors at the Swedish Migration Agency:

> No one knows how many unaccompanied children are living underground in Sweden. The Swedish Migration Agency only has information about the children who applied for asylum and then disappeared. Those that the authorities know of are far from everyone. What has happened this year is that a group that has previously not been to society's knowledge has increased. It's a group that we don't even have a number on. They have never entered the system, he says, describing the situation as alarming. Currently children are arriving in buses to Stockholm, buses that they just got on somewhere without us knowing who it is. There is a fairly large number of children just floating around in society (Olsson and El-Mochantaf, 2015).

On the same note, the United Nations Committee on the Rights of the Child has criticised Sweden for the disappearance of unaccompanied children and has pointed to the inaction of authorities following these disappearances (SOU, 2017:372). In a debate article published by *Aftonbladet*, the authors emphasised the human, social and economic costs that the Swedish temporary asylum legislation brought in the form of mental illness, social vulnerability and exclusion. They argued that the temporary residence permits set the bar for integration and reduce the incentives to learn Swedish and the opportunities to understand how the Swedish society works. The temporary residence permits

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also struck hard on traumatised children – “they face a long waiting time with the only hope of a temporary residence permit, and little hop of being reunited with their families” (Hellström et al., 2017).

A third article published during the autumn 2015 by Aftonbladet brought attention to a vulnerable group typically outside the ‘official’ definition of vulnerable groups:

> As many as 900 refugees have arrived every day at the central station in Stockholm. Many of them are so-called transit refugees, which means that they do not seek asylum in Sweden. They are particularly vulnerable because neither the municipalities nor the Migration Agency are responsible for them (Tronarp, 2015).

Indeed, much of the discourse on vulnerability during the refugee crisis was ascribed to unaccompanied minors, both in official and unofficial data. Asylum seekers and refugees in transit are the two most identified vulnerable groups identified in unofficial data. However, the intersection of these two vulnerabilities certainly adds complexity to the exposure of unaccompanied children. It is a group that never entered the system and is therefore not regarded as anyone’s responsibility. It can be noted that, after the height of the crisis, Swedish County Administrative Boards began issuing official reports regarding unaccompanied minors and transit refugees (Länsstyrelsen Stockholm, 2016).

Hazard	*Crisis*	*Vulnerable groups*	*Vulnerability elements*
	Uncontrolled immigration	Unaccompanied minors Transit refugees	High number of people with poor information provided by authorities Unprepared national and local reception system Slow processing times that kept people in insecure situations Few procedures dedicated to unaccompanied minors

Table 29. *Uncontrolled migration: Vulnerable groups and vulnerability elements*

6. Discussion

In this chapter, we take stock of the information provided in Chapters 4 and 5 to address T1.2 and T1.3 aiming at the identification of vulnerable groups inside and outside the official data. In addition, we introduce intersectionality as a useful approach to better understand vulnerability and vulnerable groups in face of crises and disasters.

6.1 Cross-dimensional classification of vulnerable groups

The tables provided for each crisis in Chapter 5 were merged together in a quite extensive table. The purpose of providing the following table is three-fold: 1) to provide a summary of the tables in Chapter 5; 2) to merge vulnerable groups and elements of vulnerability from various crises; 3) to allow identifying several aggregated or meta-categories og vulnerable groups, which are a combination of those groups often mentioned in survey and policy documents from Chapter 4 (inside the official data) and of those groups not picked up by pattern recognition analyses. The latter share elements of vulnerability with inside official data groups due to situational, temporal, and spatial dimensions.

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Hazard	*Type of crisis*	*Vulnerable groups*	*Vulnerability elements*
Wind storm	Power outages Interruption of vital services Households without electricity Destruction of forests	Households in blocks of flats Households in remote areas Hospitalised and new patients Emergency operators/first responders Children Disabled Elderly	Lack of electricity Lack of water Lack of fuel Lack of phone lines (fix and mobile) Living in rural areas Age Disabilities
Fire	Bush and forest fire	Inhabitants of rural areas Individuals living alone Elderly with limited mobility Individuals momentously impaired	Demolishing of property and forest Health effects of smoke inhalation Age Impaired mobility Exposure
Snow storm	Power outages Roads closed	Households without fire place Travellers (car and plane) Emergency operators Elderly Families with children Farm entrepreneurs Hospitalised patients	Limited and restricted mobility Lack of warmth (people in the car) Age Type of house Reduced health
Cyber-attack	Websites disabled Information systems disabled, information exchange disabled Flooded emails Disabled online media sites Disinformation	Computer users Patients in hospitals Medical services Online (social) media followers	Limited access to information Delays in health services Exposure to disinformation Violation of privacy
Snow fall	Power outages Snow avalanche	Elderly Families with children Farm entrepreneurs Tourists First responders	Dependence on electrically-powered health-related devices Impaired abilities
Radicalisation	Terroristic attack	Society as such Children People not speaking native language People not able to go home from work Public officers working in the government quarters	Belonging to an ethnic minority, religious group, sexual minority and/or engaging in activities associated with a group targeted by terrorist ideology and violence Language Age Lack of information Exposure

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		People walking and working close to the attack Adults and youths on an island	
Water contamination	Spread of diseases	Local residents Hospitalised patients Children Elderly Marginalised people Dementia sufferers	Reduced health Age Social exclusion Poor health conditions Exposure
Heat wave	Deterioration of human health Higher mortality Fires	People living in houses with large windows People living in houses without the possibility of adequate cooling Elderly Inhabitants of rural areas First responders Forest owners Chronically ill and on medication people People with disabilities Pregnant women	Age Reduced health Type of house Demolishing of property and forest Health effects Exposure Gender
Earthquake	Collapse of infrastructures Interruption of vital functions	Elderly Disabled Children Women	Age Gender Type of the house Mental and physical conditions
	Fire in tunnel	People in vehicles	Dependence on medicines Reduced mobility Reduced visibility Reduced cognitive functions Exposure
	Landslide	Workers Tourists First responders	Exposure
Heavy storm (wind+rain)	Flood	Elderly Tourists House owners close to the rivers	Age Exposure Type of house
	Uncontrolled immigration	Unaccompanied minors Transit refugees	High number of people with poor information provided by authorities Unprepared national and local reception system Slow processing times that kept people in insecure situations Few procedures dedicated to unaccompanied minors

Table 30. *Unified table of vulnerable groups and vulnerability elements*

This table allows the following aggregated or meta-vulnerable groups to be identified: a) elderly; b) children; c) physically and/or mentally impaired (broad label to include hospitalized patients and

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people with disabilities, for instance); d) socially marginalized (irregular migrants, but also elderly in some cases); e) accidentally (e.g tourists, households living in certain type of houses and in certain geographical areas) or intentionally (e.g first responders) exposed to hazards and crises.

By problematizing the interplay between crises and elements of vulnerability, some issues emerge: 1) some groups seem vulnerable in most types of crises: elderly, children, people with mental and/or physical disabilities, people with a medical condition. In most of the cases, they correspond to those groups described inside the official data; 2) exposure or a spatial/situational condition to hazards triggers vulnerability in groups not belonging to vulnerable groups inside the official data; 3) in several crises, exposure is the main, if not the only, element of vulnerability. This is especially true for those groups outside the official data, such as first responders, tourists, workers and people who, by coincidence, were in the crisis area. The fact that they were exposed in a certain way to a crises made them vulnerable. In these groups, vulnerability may not be a general characteristic, but depends on the actual exposure and on the situation in question.

6.2 Intersectionality

The next step is to look at the underlying factors of vulnerability by taking into account intersectionality. While table 30 above shows factors to assess vulnerability, the intersectionality approach reminds us of acknowledging the variety of dimensions determining a person's vulnerability and provides a necessary conceptual platform where the different vulnerabilities of individuals are taken into account in the categorization of groups. In this regard, intersectionality is a very useful analytical perspective as it helps highlighting some social variables and loosing focus on others. In addition, intersectionality becomes a very useful approach to study vulnerabilities and vulnerable groups within the context of crises and disasters, where the multiplicity and fluidity of identities and experiences tend to be overlooked. Indeed, a few studies on vulnerable groups in crises and disasters (see Fordham, 1999; Schuller, 2015; Lovell et al., 2019) point out that too often the identities of vulnerable groups are "homogenized in practice without regard for the intersecting traits and continual factors that result in unequal disaster and environmental outcome" (Vickery, 2018: 136).

The theory of intersectionality was introduced in 1989 by the American lawyer, civil rights advocate and leading scholar of critical race theory Kimberlé Crenshaw, to study and understand the oppression of African-American women. Intersectionality became very fast "the cutting edge of contemporary feminist theory" (Davis, 2008: 69), which, since the early 1990s, has explored forms of oppression and discrimination based on various factors like class, ethnicity, age, ability, sexuality and other identities. Intersectionality can be defined as "the interaction between gender, race, and other categories of difference in individual lives, social practices, institutional arrangements, and cultural ideologies and the outcomes of these interactions in terms of power" (Davis, 2008: 68). Lugones (2008: 4) interprets the term as follows: "Intersectionality reveals what is not seen when categories such as gender and race are conceptualised as separate from each other". Intersections among categories, such as age, gender, ethnical background, ability, sexual orientation, and socioeconomic status, are endless and constantly interact with each other by shaping a series of individual identities, which are part of a broader concept of social (in)equality and power hierarchies (Nightingale, 2011; Bradley, 2016; Djoudi et al., 2016). Intersectionality helps recognizing that social constructs of identities, such as gender and ethnicity, and of identities such as women and men, are not homogenous (Nightingale, 2006; Buckingham-Hatfield, 2000; Leach, 2007). In addition, it opens up for an analysis of inequalities of interacting social identities, such as gender, class, caste, race, nationality, and ethnicity to understand the multidimensional complexities of social constructions

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(Rocheleau et al., 1996; Elmhirst, 2011; Tschakert, 2012; Arora-Jonsson, 2014; Meinzen-Dick et al., 2014; Elmhirst, 2015).

Since age is often mention as a factor determining vulnerability, intersectionality can help better understanding how age interacts with other factors, such as income, gender or race. Indeed, the most vulnerable groups in crises according to age are often considered children and elderly (Ngo, 2001; Cutter et al., 2003). However, Fothergill and Peek argue that "Age alone does not make a child vulnerable to disaster. Instead, age interacts with many other factors that may render children particularly at risk. Moreover, vulnerability factors tend to build over time and cluster together, resulting in what we refer to as cumulative vulnerability … a racial minority child with a physical disability who lives in an impoverished household in a hazard-prone area will experience multiple, intersecting forms of social, environmental, physical, and economic vulnerability to a disaster … it is not solely age or race of ability status or poverty or hazards exposure, but how these risk factors accumulate in a child's life" (Fothergill and Peek 2015: 23, cf. Tierney, 2019: 146).

In addition, intersectionality contributes to a dynamic understanding of vulnerability, which can shift and change over time. Tierney remarkably explains that the degree of vulnerability does not depend on one dimensional attribution (e.g. to a demographic group, such as elderly or children), but is the result of a complex relationship between different factors, like social class, race, gender and age (Tierney, 2019) to name just a few: "[...] people are not born vulnerable, they are made vulnerable. [...] different axes of inequality combine and interact to for systems of oppression – systems that relate directly to differential levels of social vulnerability, both in normal times and in the context of disaster. Intersectionality calls attention to the need to avoid statements like 'women are vulnerable' in favor of a more nuanced view [...]" (Tierney, 2019: 127–128).

This dynamic understanding of vulnerability often refers to a very strong dependency on the situation, which renders targeted disaster relief actions increasingly difficult, as pre-determined categories would not be suitable (Gabel, 2019). Taking into account intersectionality in relation of vulnerability and vulnerable groups means to challenge the diffuse tendency in public policy to categorise groups in terms of vulnerability to hazards, which ignores or overlooks the within groups' differentials in vulnerability and resilience terms. As Tierney suggests "[...] vulnerability has temporal, spatial, and situational dimensions. It exists at particular points in time and in particular locations; while disaster vulnerability is shaped by historical trends, conditions can also evolve and vary in ways that make individuals and groups more or less vulnerable, both in terms of impacts and in terms of outcomes" (Tierney, 2019: 125). In addition, crisis conditions may render traditionally robust individuals and groups vulnerable because of their exposure to the consequences of the crisis in question.

6.3 Vulnerable groups through intersectionality

The main effort in approaching vulnerability and vulnerable groups through intersectionality is to avoid generalisations by inserting people in one group or the other, but to recognise that social groups are a mix of social variables. In using intersectionality with the various elements/factors of vulnerability found in the vulnerable groups above, it is possible to shed a critical and more nuanced look at vulnerable groups that are, prima facie, considered to be vulnerable. For instance, age is a very important intersectional issue in the case of migration, if one combines a transit refugee being also a minor. A transit refugee is particularly vulnerable because falls out from the reception system a country has, since he/she is considered somebody who aims to reach another country. However, if the same individual is a minor, then the situation becomes more complicated for the national authorities, since

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is a person in need of care and protection due to his/her age. Another example emerged from the Estonian cases about power outages due to storms in rural areas. Here, the centre-periphery dichotomy might be more relevant than previously thought, since living in rural areas is not always a vulnerable factor: people living in rural areas are more likely to have access to firewood, fresh drinking water and enough farm food supplies to last through the outage than people living in a city. Ethnicity emerges as a vulnerable factor in terrorist-attacks. Ethnicity combined with age, gender, and language skills becomes a very challenging element, for instance, being an old men, belonging to a minority group and relatively unskilled with the language of the majority of the population.

The elements of vulnerability deduced from the examples of crises proposed in this report raise the question of whether being vulnerable is a static (essentialism) or as a dynamic status (existentialism) (Adger, 2006: 270) or a mix of both. A dynamic approach to vulnerability considers vulnerability a situational and relative phenomenon (Hilhorst and Bankoff, 2004: 2–3), depending on the actual exposure and the interplay between external circumstances and personal conditions. Thus, there is the need to clearly define what vulnerability is: who is vulnerable? And vulnerable to what? (Birkmann, 2005). We argue that we should raise a further question: why is a group considered vulnerable? This is an issue that will be carried over to the further discussion on the draft butterfly model of BuildERS, during the second round of validation workshops in March 2020 and will feed D1.2 and the scientific publication stemming from this report (D1.6).

Since intersectionality distinguishes vulnerability as the result of societal (power) relations, it is highly useful to analyse those factors that cause injustices and discriminations and finally prevent people from being emancipated (in the sense of being freed from personal hardship). However, the insight that vulnerability is an intersectional phenomenon with a dynamic dimension makes it hard for crises and disaster managers and for policy makers to anticipate who might need help most urgently in a given situation, making planning very challenging.

This dynamic approach to vulnerability seems to be at odds with the static approach to vulnerability derived from supranational surveys, national surveys and governmental reports. For instance, often, governmental surveys and reports mentioned elderly as a vulnerable group. Both Estonia and Finland classify people of 65+ years as elderly and thus in need of particular care due to health or economic conditions. But, what about well-off elderly who have good networks and do not suffer from any socio-economic weakness? Are they still subsumed under the vulnerable group label only because of their age? We argue that empirically the elderly are disproportionally often - but not per se - subject to increased vulnerability. However, taking elderly as vulnerable group is a form of stigmatization that needs to be justified by the advantages of doing so. It helps statistically to know that aging population means structural changes in a society and this knowledge is useful to formulate political choices, such as building more retirements homes or provide services for this type of population when a crisis occurs. At the same time, we need to scrutinize in how far governmental reports produce the understanding of vulnerability they actually want to tackle. To some extent, Sweden avoids generalisations about vulnerable groups in the reports and documents we analysed and focuses more on vulnerability underlying factors which are context specific, interrelated, and dynamic in nature. In Norway, it was difficult to find a definition of vulnerable groups, perhaps since Norway focuses on individual and group's abilities to withstand a negative event and these are not necessarily determined by age, gender or socio-economic conditions.

In the previous section, we proposed the following aggregated or meta-vulnerable groups: a) elderly; b) children; c) physically and/or mentally impaired (broad label to include hospitalized patients and people with disabilities, for instance); d) socially marginalized (irregular migrants, but also elderly in

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some cases); e) accidentally (e.g tourists, households living in certain type of houses and in certain geographical areas) or intentionally (e.g first responders) exposed to hazards and crises.

These meta-categories can be, then, scrutinized through intersectionality for a more nuanced picture:

a) Elderly: Individuals in the category can be classified in a variety of variables such as men, women, healthy, poor, impaired/not impaired, with minority background, belonging to the majority of the population, living in rural areas or in cities, marginalised and so on. However, the main and most recognized element in official data is usually physical and/or mental impairment.

b) Children: Individuals in the category can be classified in a variety of variables such as male, female, healthy, impaired/not impaired, with minority background, belonging to the majority of the population and so on. However, the main and most recognized variable in official data is usually children's limited agency in crises situations and being dependent on care.

c) Physically and/or mentally impaired: While the previous categories of elderly and children can be physically and/or mentally impaired, there are other age groups that can fall into this category, for instance young men and women, with minority background or belonging to the majority of the population.

d) Socially marginalized: there can be overlapping elements for this category as well. One should take into account that language barriers, unfamiliarity with emergency services, lack of social capital, age can make the approach to this groups particularly challenging for emergency services.

e) Accidentally or intentionally exposed to hazards and crises. Two sub-groups fall into this category. The first consists of individuals belonging to groups a) to d). The other sub-group consist of individuals not belonging to groups a) to d) but still vulnerable due to exposure to hazards and crises. This meta-group is by far the one in which intersectionality is displayed in showing the full range of multiplicity and fluidity of identities and experiences in hazards and crises.

Through the intersectionality approach, we argue that it is necessary to problematize first and foremost how vulnerable groups are defined and classified in the official data, since groups may indeed be vulnerable to one type crises, but they can also be *less* vulnerable, if we approach their vulnerability through intersectionality and, thus, we take a closer look at the elements of vulnerability impacting that group. In addition, the issue of exposure adds a further dimension in discussing groups through intersectionality, since help uncovering those groups rarely or not at all mentioned in official data: first responders, but also tourists, for instance.

We argue that when studying, for instance, the meta-categories above, an individual may, indeed, be classified according to several more elements of vulnerability than the 'typical' ones and, thus, own, at the same time, a multiplicity and fluidity of identities and experiences which make him/her more or less vulnerable. The model below is the result of our reflections.

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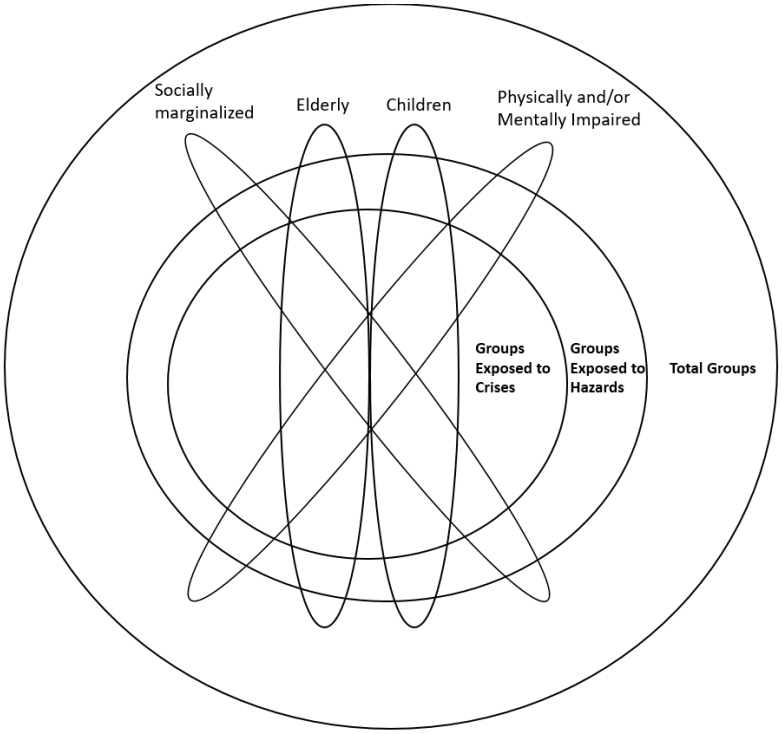

Figure 11. *Model for framing vulnerable groups, hazards and crises through intersectionality*

The model shows how often predefined meta-categories, such as elderly, children, physically and/or mentally impaired, and socially marginalized can be visualized through the intersectionality perspective. An individual may be categorized as belonging to one or more of the first four meta-categories - socially marginalised, elderly, children and physically and/or mentally impaired (the categories elderly and children being logically exclusive). In addition, an individual can also be vulnerable due to his/her accidental (e.g. tourists) or intentional (e.g. first responders) exposure to hazards and crises. An individual belonging to one of the groups is vulnerable not simply because he/she is categorised in that group *a priori*, but because various elements of vulnerability, as shown in table 30, have different impact and influence at individual level. In addition, intersectionality helps avoiding homogenisation of individuals within and between groups.

The model exemplifies the necessity of societal analyses, which take into account the variations of elements of vulnerability among meta-categories and from country to country as well. For instance, individuals of one particular ethnic group may in one country display elements of vulnerability connected to the categories socially marginalized and age, while in another country individuals within these categories display better skills to cope with crises and disasters and thus they are less vulnerable.

These reflections will be further developed in D1.6, in the form of a scientific publication.

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7. Conclusion

From this small sample of countries we can reach some conclusions that we deem useful for policy makers and researchers.

Vulnerability is shaped by a complex set of elements, some of them are stable characteristics of a group, while some others are context specific. They intertwine in such ways that, especially when looking at 'typical' or 'predefined' vulnerable groups, we need to broaden our understanding of vulnerability. In this vein, intersectionality become a useful approach to assess vulnerability as a dynamic phenomenon and helps to unveil groups that fall outside the official data. It is important not to generalize or stigmatize, but to approach vulnerability in a dynamic way.

We argue that policy makers should make more specific and targeted efforts to improve data, to formulate better and more targeted legislations, and to take better and more targeted actions in crises. In this endeavour, research plays a major role in providing studies about vulnerability in crises where intersectionality is constantly applied. Further research is needed to enable in-depth breakdowns of the data to move beyond categories such as elderly, children, migrants and women when analysing vulnerabilities. Research can provide a better and more nuanced picture of vulnerabilities and vulnerable groups to help national and local authorities and agencies to formulate specific guides, to hire staff with skills necessary to meet particular needs, to inform vulnerable groups in a particular way taking into account the differences that may coexist within the same group. In this vein, the reliability of cross national and national surveys and databases on vulnerable groups and vulnerability can be improved by a focus on 1) self-perceived vulnerability of individuals and intersectionality approach to unpack vulnerable groups; 2) cases on crises according to the level and/or likelihood of individual exposure to hazards to nuance better issues of vulnerability.

We argue that there are still little research on the intersectionality of vulnerable groups. The overarching questions should be: which vulnerable groups? Within vulnerable groups, who is the most impacted/vulnerable and why? And in which type of crisis?

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8. References

Abomhara, M. and Koien, G. M. (2015). Cyber security and the Internet of Things Vulnerabilities, threats, intruders and attacks. *Journal of Cyber Security and Mobility* 4(1), 65–88. https://doi.org/10.13052/jcsm2245-1439.414.

Adger, W. N. (2006). Vulnerability. *Global Environmental Change* 16(3): 268–281.

Accident Investigation Board (2007). Entry of treated wastewater into the drinking water network in Nokia, Finland, on 28-30 November 2007. Link for the investigation report made by Accident Investigation Board, English summary: https://turvallisuustutkinta.fi/material/attachments/otkes/tutkintaselostukset/fi/muutonnettomuudet/2007/b22007y_tutkintaselostus/b22007y_tutkintaselostus.pdf

AFE Bergen (2019). https://www.norceresearch.no/en/allmennmedisinsk-forskningsenhet/sarbare-grupper (last access 27.01.2020).

Ara (2018). The Housing Finance and Development Centre of Finland. *Report 3/2019. Finland Homelessness in 2018*. https://www.ara.fi/download/noname/%7B0707CEDD-2854-4EA0-ABDD-352120B49731%7D/145931

Arora-Jonsson, S. (2014). Forty years of gender research and environmental policy: Where do we stand?. *In Women's Studies International Forum* 47, 295-308.

Bada, M. and Nurse, J. R. (2020). The social and psychological impact of cyberattacks. In V. Benson and J. McAlaney (Eds.). *Emerging cyber threats and cognitive vulnerabilities*, 73-92. Academic Press.

Barneombudet (2019). Byomfattande barnevern for særleg sårbare grupper. https://barneombudet.no/for-voksne/brev-til-myndighetene/2014-2/byomfattende-barnevern-for-saerlig-sarbare-grupper/ (last access 27.01.2020).

Birkmann, J. (2005). *Danger need not spell disaster: But how vulnerable are we?* United Nations University Press.

Bradley, H. (2016). Gender and Work. In S. Edgell, H. Gottfried and E. Granter (Eds.) *SAGE Handbook of the Sociology of Work and Employment*, PAGE. Sage

Bodin, A. (2016). Polischef med historiskt uppdrag vid gränsen. *Dagens Nyheter*, https://www.dn.se/nyheter/sverige/polischef-med-historiskt-uppdrag-vid-gransen/ (last access 03.01.2020)

Buckingham-Hatfield, S. (2000). *Gender and Environment.* Routledge: London.

Carter, T.R., Fronzek, S., Inkinen, A., Lahtinen, I., Lahtinen, M., Mela, H., O'Brien, K.L., Rosentrater, L.D., Ruuhela, R., Simonsson L. and Terama, E. (2014). Characterising vulnerability of the elderly to climate change in the Nordic Region. *Reg. Environ Change* 16, 43-58.

Climres (2020). http://www.climres.no/ (last access 13.01.2020).

CPI (2018). Corruption Perception Index. https://www.transparency.org/cpi2018 (last access 27.01.2020).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 833496

Cutter, S. L., Boruff, B. J. and Shirley, W. L. (2003). Social vulnerability to environmental hazards. *Social science quarterly* 84(2), 242-261.

Davis, K. (2008). Intersectionality as buzzword: A sociology of science perspective on what makes a feminist theory successful. *Feminist theory* 9(1), 67-85.

de Lima Fagerlind, A. (2018). Bränderna kostar - men stormarna är värre. https://www.finansliv.se/artikel/branderna-kostar-men-stormarna-ar-varre/ (last access 02.01.2020).

Djoudi, H., Locatelli, B., Vaast, C. (2016). Beyond dichotomies: Gender and intersecting inequalities in climate change studies. *Ambio* 45, 248–262. https://doi.org/10.1007/s13280-016-0825-2.

DSB (2018). Samfunnets kritiske funksjonar.

DSB (2019). Analyser av krisescenarioer 2019.

Elmhirst, R. (2011). Introducing new feminist political ecologies. *Geoforum* 42, 129–132.

Elmhirst, R. (2015). Feminist political ecology. In, *The Routledge handbook of gender and development*, Coles, A., Gray, L., & Momsen, J. (Eds.). 82-90. Routledge: London.

ERR (2010). Chaos in Estonia as Violent Snowstorm Rages, Leaves One Dead. https://news.err.ee/109128/chaos-in-estonia-as-violent-snowstorm-rages-leaves-one-dead (last access 29.01.2020).

Estonia's national Cybersecurity Strategy 2019-2022 (2018). *Cybersecurity Strategy 2019-2022*. https://www.mkm.ee/sites/default/files/kyberturvalisuse_strateegia_2022_eng.pdf.

Estonian Government Office (2017). *Estonian Civil Protection Concept*. The Government Office of Estonia, Tallinn, Estonia.

Estonian Information Systems Authority (2019). *Annual Cyber Security Assessment 2019*. Information System Authority, Ministry of Economic Affairs and Communications, Tallinn, Estonia. https://www.ria.ee/sites/default/files/content-editors/kuberturve/ktt_aastaraport_eng_web.pdf.

Estonian Ministry of Interior (2015). *Internal Security Development Programme 2015-2020*. Ministry of Interior Affairs, Tallinn, Estonia.

Estonian Rescue Board (2019a), PÄHKAL database (last access 31.12.2019).

Estonian Rescue Board (2019b). Wild-fires in Estonia. Estonian Rescue Board, Tallinn, Estonia.

Estonian Statistics (2019). Population data. Estonian Statistics Board, Tallinn, Estonia.

European Commission (2010). COM (2010) 1626 final. *Commission staff working paper. Risk assessment and mapping guideline for disaster management*.

European Commission (2013). *Decision No. 1313/2013/EU of the European Parliament and of the Council of 17 December 2013 on a Union Civil Protection Mechanism*.

Eurostat (2018). Living conditions in Europe. https://ec.europa.eu/eurostat/documents/3217494/9079352/KS-DZ-18-001-EN-N.pdf/884f6fec-2450-430a-b68d-f12c3012f4d0.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 833496

Eurostat (2017). Estonia in the EU. https://ec.europa.eu/eurostat/documents/10186/8089712/Eurostat+Estonia+presidency+infographic+2017+EN.pdf/7faf6fdc-7113-466c-bab5-01f1041e9cee.

Expressen (2007). Tre döda i stormen. https://web.archive.org/web/20091220092640/http://www.expressen.se/nyheter/1.520784/tre-doda-i-stormen (last access 03.01.2020).

Finnish Institute for Health and Welfare (2019). Press release: Last summer's heat wave increased the mortality of older people – prepare for hot weather in time. https://thl.fi/en/web/thlfi-en/-/last-summer-s-heat-wave-increased-the-mortality-of-older-people-prepare-for-hot-weather-in-time (last access 27.01.2020).

Finnish Ministry of Interior (2019). *National risk assessment 2018*. Publications of the Ministry of the Interior 2019:9.

Finnish Ministry of Interior (2018). Update of the Action Plan - A Safe and Secure Life for the Elderly. Publication of the Ministry of the Interior 6/2018. Ministry of the Interior, Helsinki. http://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/160520/6%202018%20SM%20Turvallinen%20elama%20ikaantyneille.pdf (Only abstract in English).

Finnish Ministry of the Interior (2016). National Risk Assessment 2015. Ministry of the Interior Publication 4/2016. http://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/64973/04_2016_National%20Risk%20Assessment%202015_korjattu%20.pdf.

Fordham, M. (1999). Balancing resilience and vulnerability. *International journal of mass emergencies and disasters* 17(1), 15-36.

Fothergill, A. and Peek, L. (2015). *Children of Katrina*. University of Texas Press.

Gabel, F. (2019). Chancen dynamischer Konzeptionen von Vulnerabilität für den Katastrophenschutz. In M. Krüger and M. Max (Eds.). *Resilienz im Katastrophenfall: Konzepte zur Stärkung von Pflege- und Hilfsbedürftigen im Bevölkerungsschutz*. Bielefeld: Transcript, 77-96.

Gough, D., and Richardson, M. (2018). Systematic reviews. In P. Brough (Ed.). *Advanced Research Methods for Applied Psychology*, 63-75. Routledge: London.

GGGR (2018). Global Gender Gap Report http://reports.weforum.org/global-gender-gap-report-2018/data-explorer/ (last access 27.01.2020).

Government Offices of Sweden (2018). Värmebölja och hälsa. https://www.regeringen.se/artiklar/2018/07/varmebolja-och-halsa/ (last access 27.12.2019).

Greenhalgh, T., and Peacock, R. (2005). Effectiveness and efficiency of search methods in systematic reviews of complex evidence: audit of primary sources. Bmj 331(7524), 1064-1065.

Helsedirektoratet (2019). Nasjonal Legemiddelberedskap. https://www.helsedirektoratet.no/rapporter/nasjonal-legemiddelberedskap (last access 27.01.2020).

Hellström, A Under samordning av Forum – idéburna organisationer med social inriktning och Concord Sverige (2017). Sverige får inte svika de som söker asyl. Aftonbladet https://www.aftonbladet.se/debatt/a/zo9J5/sverige-far-inte-svika-de-som-soker-asyl (last access 27.12.2019).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 833496

Helminen, V., Vesala, S., Rehunen, A., Strandell, A., Reimi, P. and Priha, A. (2017). *The housing situations of ageing population now and in the future*. Report of the Finnish Environment Institute 20/2017. Finnish Environment Institute. (Only abstract in English).

Hilhorst, D. and Bankoff, G. (2004). Introduction: Mapping Vulnerability. In: G. Bankoff, G. Frerks and T. Hilhorst (Eds.). Mapping vulnerability: Disasters, development, and people. Sterling VA: Earthscan Publications: London, 1–9.

Hindre, M. (2019). Torm näitas, et riik pole kriisideks veel valmis. ERR. https://www.err.ee/996779/torm-naitas-et-riik-pole-kriisideks-veel-valmis (last access 29.01.2020).

HIOF (2019). Sårbare Overganger Trinn 2. Brukermedvirkning og recovery i utvikling av tjenester i ROP feltet: motsetninger og muligheter.

HiV (2019). Research project. https://www.hivolda.no/forsking/forskingsgrupper/sarbare-menneske-fra-ungdomstid-til-vaksenliv (last access 27.01.2020).

INFORM (2020). *Estonia Disaster & Risk Profile*. https://www.preventionweb.net/countries/est/data/ (last access 29.01.2020).

INFORM (2020a). *Finland Disaster & Risk Profile*. https://www.preventionweb.net/countries/fin/data/ (last access 29.01.2020).

INFORM (2020b). Country Profile. https://drmkc.jrc.ec.europa.eu/inform-index/Countries/Country-Profile-Map (last access 03.01.2020).

INFORM (2019). INFORM REPORT 2019. Shared evidence for managing crises and disasters.

IOM Norway (2019). Sårbare migranter https://www.iom.no/sarbare (last access 27.01.2020).

ISF (2019). https://www.samfunnsforskning.no/english/our-research/ (last access 27.01.2020).

Jalali, S. and Wohlin, C. (2012). *Systematic literature studies: database searches vs. backward snowballing*. Paper presented at the Proceedings of the ACM-IEEE international symposium on Empirical software engineering and measurement, Lund, Sweden.

Jauhiainen, J. S., Gladd, K. and Jokela, J. (2017). Undocumented migrants in Finland in 2017.

Johansson, M., Blumenthal, B. (2009). *Att mäta sårberhet mot olyckor. Om sårbarhet som begrepp och indikatorer*. Karlstads universitet, Fakulteten för samhälls- och livsvetenskaper, Karlstad.

Johannessen, A., Tufte, P. A., & Christoffersen, L. (2010). Introduksjon til samfunnsvitenskapelig metode (Vol. 4, pp. 45-232). Oslo: Abstrakt.

Kährik A., Kangur K., Leetmaa K. (2019). Socio-economic and Ethnic Trajectories of Housing Estates in Tallinn, Estonia. In: D. Hess and T. Tammaru (Eds.), Housing Estates in the Baltic Countries. The Urban Book Series. Springer: Cham. PAGE?

Kantar Emor, K (2017). *Elanikkonna hädaolukorraks valmisoleku alase teadlikkuse indeksuuring 2017*. Study commissioned by Estonian Rescue Board. Tallinn, Estonia.

Kazmierczak, A. and Kankaanpää, S. (2016). *Social vulnerability to climate change in the Helsinki Metropolitan Area*. Helsinki Region Environmental Services Authority (HSY). (Only abstract in English).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 833496

KILDEN (2019). http://kjonnsforskning.no/nb/2019/02/bade-menn-og-kvinner-er-sarbare-i-fengsel (last access 27.01.2020).

Klaos, M. (2019). 6 November 2019. Personal interview.

Kekki, T. (2019). Research Manager, Finnish National Rescue Association, oral information 13.09.2019.

Kekki, T., and Mankkinen, T. (2016). Turvassa? Kansalaisturvallisuuden tila Suomessa. https://vnk.fi/documents/10616/2009122/8_Turvassa.pdf/de1af9e2-58ae-4472-8317-3d25e6ffdbd3/8_Turvassa.pdf?version=1.0 (Only in Finnish).

Kuusk, A. (2019). Elektrilevi juht tormi tagajärgedest: Lahing on parim treening. ERR. https://www.err.ee/998393/elektrilevi-juht-tormi-tagajargedest-lahing-on-parim-treening (last access 29.01.2020).

Johnstone, C. (2006) Disability Studies and Disaster Services: Putting the “DS” in “DS”. *Review of Disability Studies* 2(3): 108–116.

LDO (2020). Likestilling og diskrimineringsombudet https://www.ldo.no/en/arkiv/nyheitsarkiv/Nyheter-i-2013/Sturla-Stalsett/ (last access 30.01.2020).

Leach, M. (2007). Earth mother myths and other ecofeminist fables: how a strategic nation rose and fell. *Dev. Change* 38(1), 67–85.

Lovell, E., Twigg, J., and Lung’ahi, G. (2019). Building resilience for all: Intersectional approaches for reducing vulnerability to natural hazards in Nepal and Kenya.

Lugones, M. (2008). The Coloniality of Gender. *Worlds and Knowledges Otherwise* 2, 1-17.

Länsstyrelsen Stockholm (2016). Lost in Migration: A Report on Missing Unaccompanied Minors in Sweden. Report 2016:28. http://www.lansstyrelsen.se/Stockholm/SiteCollectionDocuments/Sv/publikationer/2016/R2016-28-lost-in-migration-webb.pdf

Malkki, L. and Saarinen, J. (2019). Jihadism in Finland. Internal security. Publications of the Ministry of the Interior 2019:31, Helsinki. http://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/161780/SM_31_2019__Jihadism%20in%20Finland.pdf?sequence=1.

Marin-Ferrer, M., Vernaccini, L. and Poljansek, K. (2017). *INFORM. Index for Risk Management Concept and Methodology Version 2017*. JRC. European Commission.

Matthewman, S. D. and Byrd, H. (2014). Blackouts: A sociology of electrical power failure. *Social Space*, 1-25.

Meinzen-Dick, R., Kovarik, C., and Quisumbing, A. R. (2014). Gender and sustainability. *Annual Review of Environment and Resources*, 39. PAGE

Me.Media.World (2014). *Population Survey*. Institute of Social Sciences, University of Tartu, Tartu, Estonia.

Menneskeverd (2019). Sårbare grupper https://www.menneskeverd.no/tag/sarbare-grupper/_(last access 27.01.2020).

Migrationsverket (2018). *The changing influx of asylum seekers in 2014- 2016: Member States’ responses: EMN Country Report Sweden*. EMN Sweden 2017:3.

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No. 833496

http://www.emnsweden.se/download/18.4cb46070161462db113232a/1524049376523/EMN-study_2017_The-changing-influx-of-asylum-seekers-in-2014-2016_SWEDEN_FINAL.pdf

Ministry of Defence (2017). *The foundations of Estonian Security Policy*. Ministry of Defence, Government of Estonia, Tallinn, Estonia.

Mölter, T., Schindler, D., Albrecht, A.T., Kohnle, U. (2016). Review on the projections of future storminess over the North Atlantic European Region. Atmosphere 7(60) https://www.mdpi.com/2073-4433/7/4/60.

MSB (2019a). Risk- och sårbarhetsanalyser. https://www.msb.se/sv/amnesomraden/krisberedskap--civilt-forsvar/risk--och-sarbarhetsanalyser/ (last access 16.12.2019).

MSB (2019b). Säkerhet i offentlig miljö – Skydd mot antagonistiska hot och terrorism (No. MSB1448). Karlstad.

MSB (2018a). Utvärdering av hanteringen av attentatet i Stockholm 7 april 2017: redovisning av regeringsuppdrag Ju2017/05643/SSK (No. MSB1193). The Swedish Civil Contingencies Agency (MSB), Karlstad.

MSB (2018b). MSBs arbete med skogsbränderna 2018: tillsammans kunde vi hantera en extrem skogsbrandssäsong (No. MSB1274). Karlstad.

MSB (2016). A summary of risk areas and scenario analyses 2012–2015 (No. MSB1021). Karlstad.

MSB (2015). Individens förmåga att ta ansvar för sin egen säkerhet Särskilt utsatta grupper (No. MSB836). Mittuniversitetet Risk and Crisis Research Centre.

MSB (2013). Swedish national risk assessment 2012 (No. MSB556). Karlstad.

MSB (2012). Guide to risk and vulnerability analyses. Swedish Civil Contingencies Agency (MSB), Karlstad.

NAKMI (2013). Rapport Standarder for likeverdig helsetjeneste for innvandrere og andre sårbare grupper http://norskhph.no/wp/wp-content/uploads/2014/11/2012-03-456-Rapport-Pilot-Standards-of-Equity-elektronisk.pdf

NESA (2020). Vocabulary in the website of Finnish national emergency supply agency. https://www.huoltovarmuuskeskus.fi/sanasto/#h (Only in Finnish).

Ngo E. B. (2001). When disasters and age collide: Reviewing vulnerability of the elderly. *Natural Hazards Review* 2(2), 80-89.

NIPH (2018). Systematic Review: Employment-oriented mentoring programmes for vulnerable populations https://www.fhi.no/globalassets/bilder/rapporter-og-trykksaker/2018/arbeidsrettede-mentorprogrammer-for-sarbare-grupper-rapport-2018.pdf.

Nivola K. (2018). Presentation in the annual development day of water supply, arranged by Centre for Economic Development, Transport and the Environment, Southwest Finland. https://ely-keskus.fi/documents/10191/35445231/2_Nousiaistenvesikriisi_Kaisa+Nivola.pdf/3f34db06-7558-4a5b-bd93-3b530384e95e (Only in Finnish).

Nightingale, A. J. (2011). Bounding difference: Intersectionality and the material production of gender, caste, class and environment in Nepal. *Geoforum* 42(2), 153-162.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 833496

Nightingale, A. J. (2006). The nature of gender: work, gender, and environment. *Environ. Plan.* 24, 165–185.

Njå, O. and Kuran, C. H. A. (2014). Erfaringer fra redningsarbeidet og selvredningen ved brannen i Oslofjordtunnelen 23. juni 2011. Intervjuer med beredskapspersonell og trafikanter. Iris Rapport.

NKVTS (2019). https://www.nkvts.no (last access 27.01.2020).

NOVA (2017). Vern av risikoutsatte voksne Kommunenes varslingssystemer for avdekking av vold og overgrep. Nettutg-NOVA-Rapport-1-17-Vern-av-risikoutsatte-voksne.pdf.

NOU 2000:4 (2000). Norges offentlige utredninger 2000:4. Et sårbart samfunn – Utfordringer for sikkerhets- og beredskapsarbeidet i samfunnet. Justis- og politidepartementet. Oslo.

NOU 2012:14 (2012). Rapport fra 22. juli-kommisjonen. Oslo.

NTNU (2012). Dobbelt sårbare funksjonshemmede barn og unge i Asylmottak https://samforsk.no/SiteAssets/Sider/publikasjoner/Dobbelt%20sårbar%2015%20april%202012.pdf

Nykänen, E., Keskimäki, I. and Kuusio, H. (2017). Paperittomien ulkomaalaisten oikeus terveyspalveluihin. In Kalliomaa-Puha L. and Tuovinen A-K (edit.). Sosiaaliturvan rajoilla. *Kirjoituksia kansainvälisestä sosiaalioikeudesta*. Kela: Helsinki.

O' Brien, K. K., Colquhoun, H., Levac, D., Baxter, L., Tricco, A. C., Straus, S., Wickerson, L., Nayar, A., Moher, D. and O'Malley L. (2016). Advancing scoping study methodology: a web-based survey and consultation of perceptions on terminology, definition and methodological steps. Health Services Research 16(305). DOI 10.1186/s12913-016-1579-z.

OECD (2020a). Income inequality (indicator). doi: 10.1787/459aa7f1-en (last access 30.01.2020)

OECD (2020b). Unemployment rate (indicator). doi: 10.1787/997c8750-en (last access 30.01.2020)

OECD (2019). Finland: Country Health Profile 2019, State of Health in the EU, OECD Publishing, Paris/European Observatory on Health Systems and Policies, Brussels, https://doi.org/10.1787/20656739-en.

OECD (2017). Government at a Glance 2017. Country Fact Sheet Finnland. https://www.oecd.org/gov/gov-at-a-glance-2017-finland.pdf.

Olsson, D. and El-Mochantaf, C. (2015). De ensamkommande försvinner spårlöst. Expressen. https://www.expressen.se/nyheter/de-ensamkommande-forsvinner-sparlost/ (last access 10.12.2019).

Orru, K., Tillmann, M., Ebi, K. L., Orru, H. (2018). Making Administrative Systems Adaptive to Emerging Climate Change-Related Health Effects: Case of Estonia. *Atmosphere* 9(6), ARTN 221.10.3390/atmos9060221.

Otsla, J. (2016). Various crises in Estonia. Ministry of Interior Affairs, Tallinn, Estonia.

Ottis, R. (2018). Analysis of the 2007 Cyber Attacks Against Estonia from the Information Warfare Perspective. Cooperative Cyber Defence Centre of Excellence, Tallinn, Estonia.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 833496

Official Statistics of Finland (OSF): Educational structure of population [e-publication]. ISSN=2242-2919. Helsinki: Statistics Finland [referred: 30.1.2020]. Access method: http://www.stat.fi/til/vkour/index_en.html

Pilli-Sihvola, K., Haavisto, R., Leijala, U., Luhtala, S., Mäkelä, A., Ruuhela, R., Votsis, A. (2018). Weather and Climate Change risks in Helsinki. Urban Environment Division, City of Helsinki. (Only in Finnish).

Postimees (2007). Välisministeeriumi kodulehekülg taas kättesaadav kõigile. Postimees Online. https://www.postimees.ee/1655473/valisministeeriumi-kodulehekulg-taas-kattesaadav-koigile (last access 29.01.2020)

Public Health Agency of Sweden (2017). Att hantera hälsoeffekter av värmeböljor - Vägledning till handlingsplaner (00926-2017-7). Solna.

Public Health Agency of Sweden (2018). Ökad dödlighet under sommarens värmebölja [WWW Document]. URL https://www.folkhalsomyndigheten.se/nyheter-och-press/nyhetsarkiv/2017/maj/vagledning-for-att-hantera-varmeboljor/ (last access 27.12.2019).

REACH (2019). Multi-sector needs assessment: Executive Summary Report. Liquidation, Central Sulawesi Earthquake and Tsunami: Population Needs.

Rocheleau, D., Thomas-Slayter, B. and Wangari, E. (Eds.) (1996). *Feminist Political Ecology: Global Issues and Local Experiences*. Routledge: London.

Rød, J. K., Berthling, I., Lujala, P., Vatne, G., and Lein, H. (2014). Hvor sårbare er vi i Trøndelag for flom og skredhendelser. *Forskning i Trøndelag*, 145-162.

Saar, P. (2019). Personal interview 4 November 2019.

Safety Investigation Authority (2018). Safety Investigation report Turku stabbings on 18 August 2017. Investigation report 7/2018. https://turvallisuustutkinta.fi/material/attachments/otkes/tutkintaselostukset/en/muutonnettomuudet/2017/oNRjHqmjf/P2017-01_Turku_EN.pdf

SCB (2018a). Störst folkökning att vänta bland de äldsta. https://www.scb.se/hitta-statistik/statistik-efter-amne/befolkning/befolkningsframskrivningar/befolkningsframskrivningar/pong/statistiknyhet/sveriges-framtida-befolking-20182070/. (last access 30.12.2019).

SCB (2018b). Percentage of people in work and below the poverty threshold remains unchanged https://www.scb.se/en/finding-statistics/statistics-by-subject-area/living-conditions/living-conditions/living-conditions-surveys-ulfsilc/pong/statistical-news/living-conditions-surveys-lfsilc/ (last access 17.12.2019).

SCB (2019a). Marken i Sverige https://www.scb.se/hitta-statistik/sverige-i-siffror/miljo/marken-i-sverige/ (last access 02.01.2020).

SCB (2019b). Befolkningsstatistik https://www.scb.se/hitta-statistik/statistik-efter-amne/befolkning/befolkningens-sammansattning/befolkningsstatistik/#_Nyckeltal (last access 16.12.2019).

SCB (2019c). Localities and urban areas 2018. https://www.scb.se/en/finding-statistics/statistics-by-subject-area/environment/land-use/localities-and-urban-areas/pong/statistical-news/localities-and-urban-areas-2018/ (last access 03.01.2020).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 833496

SCB (2019d). Sveriges befolkningspyramid. https://www.scb.se/hitta-statistik/sverige-i-siffror/manniskorna-i-sverige/sveriges-befolkningspyramid/ (last access 03.01.2020).

SCB (2019e). Sweden's rate of material deprivation is lower than in most other European countries https://www.scb.se/en/finding-statistics/statistics-by-subject-area/living-conditions/living-conditions/living-conditions-surveys-ulfsilc/pong/statistical-news/living-conditions-survey-ulfsilc6/ (last accessed 17.12.2019).

SCB (2019f). Implementation of the 2030 Agenda in Sweden Statistical Review 2019. Stockholm.

Schöpfel, J. (2010). Towards a Prague Definition of Grey Literature. Paper presented at the Twelfth International Conference on Grey Literature: Transparency in Grey Literature. *Grey Tech Approaches to High Tech Issues*. Prague, 6-7 December 2010, Czech Republic.

Schuller, M. (2015). Pa Manyen Fanm Nan Konsa: Intersectionality, Structural Violence, and Vulnerability Before and After Haiti's Earthquake. *Feminist Studies* 41(1), 184-210.

Sidner, J. and Morales, F. (2018). Kritik mot Sveriges hantering: "Barnen behandlas inte som andra barn". Aftonbladet https://www.aftonbladet.se/nyheter/a/vmzaVw/kritik-mot-sveriges-hantering-barnen-behandlas-inte-som-andra-barn (last access 03.01.2020).

SMHI (2011). Värmeböljor i Sverige (No. Fact sheet no 49). Norrköping.

SMHI (2014). Risker, konsekvenser och sårbarhet för samhället av förändrat klimat – en kunskapsöversikt. SMHI Klimatol.

SMHI (2018a). Värmebölja https://www.smhi.se/kunskapsbanken/klimat/varmebolja-1.22372 (last access 26.12.2019).

SMHI (2018b). Sommaren 2018 - Extremt varm och solig https://www.smhi.se/klimat/klimatet-da-och-nu/arets-vader/sommaren-2018-extremt-varm-och-solig-1.138134 (last access 28.12.2019).

SOU (2019). Skogsbränderna sommaren 2018. SOU 2019: Betänkande från 2018 års skogsbrandsutredning, Statens offentliga utredningar. Norstedts Juridik AB: Stockholm.

SOU (2017). Att ta emot människor på flykt, Sverige hösten 2015, Betänkande av Utredningen om migrationsmottagandet 2015 [report], Statens offentliga utredningar, Stockholm. https://www.regeringen.se/contentassets/e8c195d35dea4c05a1c952f9b0b45f38/hela-sou- 2017_12_webb_2.pdf.

SPEK (2019). The Finnish National Rescue Association. http://www.spek.fi/In-English (last access 29.01.2020).

SSB (2019). This is Norway 2019.

Statistics Finland (2019). Finland in Figures 2019. http://www.stat.fi/tup/julkaisut/tiedostot/julkaisuluettelo/yyti_fif_201900_2019_21461_net.pdf.

Statistics Finland (2019a). 890,000 people were at risk of poverty or social exclusion in 2017- Published 24.5.2019. http://www.stat.fi/til/eot/2017/eot_2017_2019-05-24_tie_001_fi.html.

Statistics Norway (2019). Key Figures for the Population. https://www.ssb.no/en/befolkning/nokkeltall (last access 15.12.2019).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 833496

SVT (2018). Så stor yta täckte sommarens skogsbränder [WWW Document]. URL https://www.svt.se/special/karta-skogsbrander-2018/ (last access 29.12.2019).

Steen, R. and Morsut, C. (2019). Resilience in Crisis Management at the Municipal Level: The Synne Storm in Norway. *Risk, Hazards and Crisis in Public Policy*. https://doi.org/10.1002/rhc3.12178

Swedish Energy Agency (2015). Stormen Gudrun https://www.energimyndigheten.se/trygg-energiforsorjning/lardomar-fran-intraffade-handelser/stormen-gudrun/ (last access 03.01.2020).

Swedish NAO (2008). Regeringen och krisen regeringens krishantering och styrning av samhällets beredskap för allvarliga samhällskriser. Riksrevisionen, Stockholm.

Swedish National Board of Health and Welfare (2018). Särskilt utsatta grupper https://www.kunskapsguiden.se/Ekonomiskt-bistand/Teman/Jamstalldhet-inom-ekonomiskt-bistand/Sidor/Särskilt-utsatta-grupper.aspx (last access 03.01.2020).

Swedish Red Cross (2019a). Tillsammans i krisen – framtidens frivillighet inom krisberedskap. Stockholm.

Swedish Red Cross (2019b). Skogsbränderna 2018 – så jobbade vi https://www.rodakorset.se/vad-vi-gor/kris-och-katastrof/krisberedskap/skogsbranderna-2018/ (last access 01.01.2020).

Sydsvenskan (2010). Gudruns spår blåser inte bort så lätt https://web.archive.org/web/20100109110236/http://sydsvenskan.se/sverige/article618579/Gudruns-spar-blaser-inte-bort-sa-latt.html (last access 18.12.2019).

Tammaru, T. (Ed.) (2017). Estonian Human Development Report: Estonia at the Age of Migration. Estonian Development Foundation, Tallinn, Estonia.

Tamm, M. (2018). Lukustatud andmed ja unustatud röntgenpildid. Küberrünnak perearstikeskuses pole naljaasi. Eesti Päevaleht. https://epl.delfi.ee/eesti/lukustatud-andmed-ja-unustatud-rontgenipildid-kuberrunnak-perearstikeskuses-pole-naljaasi?id=81876399

Tierney, K. (2019) *Disasters: A sociological approach*. Polity Press: Cambridge.

TNS Emor (2016). *Study on population's knowledge on crisis behaviour.* Commissioned by Estonian Rescue Board*.* Tallinn, Estonia*.*

Torpan et al. (2019) - Torpan, S., Hansson, S. and Orru, K. (2019). *Handling misinformation and social media use in crises - Estonian experiences.* Country report on institutional aspects of resilience management in BuildERS project. University of Tartu, Tartu, Estonia.

Tronarp, G. (2015). Polisen skärper kontrollen av flyktingar i Sverige. Aftonbladet https://www.aftonbladet.se/nyheter/a/oRVyRW/polisen-skarper-kontrollen-av-flyktingar-i-sverige

Transparency International (2019). How corruption weakens democracy https://www.transparency.org/news/feature/cpi_2018_global_analysis (last access 29. 12.2019).

Tschakert, P. (2012). From impacts to embodied experiences: Tracing political ecology in climate change research. *Geografisk Tidskrift* 112(2), 144-158.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 833496

Tuomenvirta H., Haavisto R., Hildén M., Lanki T., Luhtala S., Meriläinen P., Mäkinen K., Parjanne A., Peltonen-Sainio P., Pilli-Sihvola K., Pöyry J., Sorvali J. and Veijalainen N. (2018). Weather and Climate Risks in Finland - National Assessment. Publication of Prime Minister's Office. (Only abstract in English).

UDI (2019). Forskningsrapporter om innvandring. https://www.udi.no/statistikk-og-analyse/forsknings-og-utviklingsrapporter/?year=0andfilter=31 (last access 27.01.2020).

Umar, M., Margaglio, G., & Fitrayansyah, A. (2019). Post-tsunami survey of the 28 September 2018 tsunami near Palu Bay in Central Sulawesi, Indonesia: Impacts and challenges to coastal communities. International Journal of Disaster Risk Reduction, 38, 101229.

UN (2015). Transforming our world: the 2030 Agenda for Sustainable Development - Resolution adopted by the General Assembly on 25 September 2015 [http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1andLang=E (last access 15. 11.2016).

Vaks, T. (2017). RIA peadirektori asetäitja Toomas Vaks: küberrünnak seab ohtu inimeste elud. Eesti Päevaleht. https://epl.delfi.ee/arvamus/ria-peadirektori-asetaitja-toomas-vaks-kuberrunnak-seab-ohtu-inimeste-elud?id=78203446 (last access 29.12.2019).

Vickery, J. (2018). Using an intersectional approach to advance understanding of homeless persons' vulnerability to disaster. *Environmental Sociology* 4(1), 136-147, DOI: 10.1080/23251042.2017.1408549.

Vinni, R. (2019). Aasta esimene torm võttis särtsu ja murdis puid. Saarte Hääl

Whittemore, R. and Knafl, K. (2005). The Integrative Review: Updated Methodology. *Journal of Advanced Nursing* 52, 546-553.

WVS (2014a). World Values Survey Wave - Time Series http://www.worldvaluessurvey.org/WVSOnline.jsp (last accessed 29.12.2019).

WVS (2014b). World Values Survey Wave - Time Series, Confidence: The Government http://www.worldvaluessurvey.org/WVSOnline.jsp (last access 29.12.2019).

Y-foundation. Sahlman, E. and Lehtniemi, N. (2017). A Home of Your Own. Housing First and ending homelessness in Finland. Otava Book Printing Ltd, Keuruu. https://ysaatio.fi/assets/files/2018/01/A_Home_of_Your_Own_lowres_spreads.pdf.

YLE news (2015). Juupajoki related news in YLE: 21.11.2015-25.11.2015. https://haku.yle.fi/?language=fiandquery=juupajokiandtime=customandtimeFrom=2015-10-31andtimeTo=2015-12-31andtype=articleanduiLanguage=fi.

Åström, C., Bjelkmar, P. and Forsberg, B. (2019). Ovanligt många dödsfall i Sverige sommaren 2018. *Läkartidningen* 116(4), https://www.lakartidningen.se/Klinik-och-vetenskap/Originalstudie/2019/05/Ovanligt-manga-dodsfall-i-Sverige-sommaren-2018/

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 833496

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