EU-NATO Policy Coordination on Cascading Climate Risks and Their Implications for European Critical Infrastructure Resilience

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Abstract
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This thesis explores EU-NATO policy coordination on cascading climate risks and the implications for European critical infrastructure resilience. Using a mixed qualitative methodology, the study analyzes EU, NATO, and joint policy documents paired with semi-structured interviews with EU and NATO officials, national stakeholders, and key experts. It aims to ascertain how the EU and NATO address and frame cascading climate risks in existing policy domains and whether this is leading to shared responses, risk ownership, and implementation at the European-level.

The main findings suggest that the EU and NATO possess strong awareness of cascading climate risks, but there is limited integration in preparedness, resilience, and critical infrastructure policies. Hence, shared responses and risk ownership remain ad-hoc through national-level approaches and issue-specific coalitions of the willing. To improve policy coherence, the EU and NATO need to further mainstream cascading climate risks across necessary domains and provide guidance to EU member states, NATO Allies, and the private sector.

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Abstract

Since the Russian invasion of Ukraine in 2014, the EU and NATO have strengthened resilience, preparedness, and critical infrastructure policies in response to evolving transboundary threats. However, cascading climate risks, defined as cross-border and cross-sectoral impacts intensified by climate change, have the potential to be insufficiently understood and integrated into EU and NATO frameworks. In the rush to prepare for war, cascading climate risks may be underestimated and de-prioritized. Due to their spatial and dynamic complexity, they present novel challenges to critical infrastructure systems, EU-NATO cooperation, and civil-military readiness.

This thesis explores EU-NATO policy coordination on cascading climate risks and the implications for European critical infrastructure resilience. Using a mixed qualitative methodology, the study analyzes EU, NATO, and joint policy documents paired with semi-structured interviews with EU and NATO officials, national stakeholders, and key experts. It aims to ascertain how the EU and NATO address and frame cascading climate risks in existing policy domains and whether this is leading to shared responses, risk ownership, and implementation at the European-level.

The main findings suggest that the EU and NATO possess strong awareness of cascading climate risks, but there is limited integration in preparedness, resilience, and critical infrastructure policies. Hence, shared responses and risk ownership remain ad-hoc through national-level approaches and issue-specific coalitions of the willing. To improve policy coherence, the EU and NATO need to further mainstream cascading climate risks across necessary domains and provide guidance to EU member states, NATO Allies, and the private sector.

Key Words: EU-NATO cooperation, cascading climate risks, critical infrastructure, policy coherence, policy coordination, adaptation, climate security, preparedness.

Summary

Since the Russian invasion of Ukraine in 2014, the EU and NATO have strengthened resilience, preparedness, and critical infrastructure policies in response to evolving transboundary threats. To foster comprehensive resilience, the EU and NATO created complementary but distinct frameworks for civil preparedness, societal resilience, and critical infrastructure. NATO has increased resilience and preparedness budgets to 1.5% of GDP for each NATO member. The European Commission seeks to cultivate a preparedness-by-design mindset and accelerate an EU-wide Critical Entities Resilience (CER) directive. However, in the rush to prepare for war, climate risks may be underestimated and deprioritized, especially as their impact crosses international borders. Cascading climate risks, defined as cross-border and cross-sectoral impacts intensified by climate change, have the potential to be insufficiently understood and integrated into EU and NATO frameworks. This is consequential for a fundamental policy area of EU-NATO cooperation: critical infrastructure resilience. Due to their spatial and dynamic complexity, these risks present novel challenges to critical infrastructure systems, EU-NATO cooperation, and civil-military readiness.

This thesis examines how the EU and NATO address cascading climate risks in resilience, preparedness, and critical infrastructure policies, and how these approaches shape shared responses, risk ownership, and policy implementation across governance levels. Using a mixed qualitative methodology, the study analyzes EU, NATO, and joint EU-NATO policy documents paired with interviews with EU and NATO officials, national stakeholders, and key experts. In total, sixteen EU, nine NATO, and four joint EU-NATO documents were analyzed, and fourteen respondents were interviewed for this study. The results are presented as five key themes and fifteen sub-themes.

The findings suggest that the EU and NATO possess strong awareness of cascading climate risks, but there is limited integration in preparedness, resilience, and critical infrastructure policies. Climate risk consideration has only recently entered EU-NATO structured dialogues on resilience and military mobility. Nor are cascading climate risks overly featured in guidance to Member States and NATO Allies. Progress at the national-level remains ad-hoc and uneven due to critical constraints such as asymmetric threat and risk exposures, the lack of a common baseline for adaptation planning and climate risk assessments, the crisification of EU politics, and the politicization of climate change. In a worsening security environment, climate risks must compete with other pressing threats, such as hybrid and cyber-attacks, to grab the attention of policymakers and critical infrastructure operators. While the private sector and critical infrastructure operators are aware of cascading effects, the role of climate change as a specific trigger is emerging. A surprising result was the potential pathways for coalitions of the willing, regional cooperation, joint transboundary climate risk assessments, and public-private partnerships to address cascading climate risks.

While progress is slow, existing frameworks offer opportunities to mainstream cascading climate risks into other policy domains. Within the EU, there is promising potential for the EU Integrated

Framework on Climate Resilience and Risk Management to explicitly consider cascading and transboundary climate risks in national and EU-level climate risk assessments and adaptation planning for critical infrastructure systems. This can be further complemented by their inclusion in the CER directive and revised EU Integrated Security Strategy.

Climate-related risks function as a risk and threat multiplier in Europe. To improve EU-NATO policy coherence, cascading climate risks could be integrated into NATO baseline resilience requirements and defense planning for NATO Allies. Cumulatively, cascading climate impacts may have implications to European critical infrastructure resilience, necessary for military mobility and the sustainment of vital societal functions. Cascading failures from critical infrastructure disruption could potentially disrupt civil-military readiness and expose key bottlenecks for dual-use infrastructure such as the Trans-European Transportation Network (TEN-T) and European rail systems.

As European transboundary crises interact, the impetus shifts to how the EU and NATO govern interdependency itself with a constellation of new actors. The findings of this thesis suggest that EU and NATO awareness of cascading climate risks does not equate to preparedness. While EU-NATO policy coordination is aligning, harmonization still occurs at the capital level and is subject to national political priorities, risk and threat perceptions, and policy implementation. Uneven comprehensive risk assessments and implementation could create a two-tier EU and NATO based on the systemic resilience of cross-border critical infrastructure systems. Ultimately, complementary EU and NATO frameworks for addressing and managing systemic climate risks are needed to better prepare for an uncertain and dynamic risk landscape. While critical infrastructure resilience is important, the consequences of cascading effects, in general, and cascading climate risks, in particular, for societal resilience and preparedness warrant further research.

Acronyms

CER – Critical Entities Resilience
CI – Critical Infrastructure
COVID-19 – Coronavirus Disease of 2019
ESABCC - European Scientific Advisory Board on Climate Change
EU - European Union
EUR – Euro
IPCC – Intergovernmental Panel on Climate Change
JRC- Joint Research Centre
NATO – North Atlantic Treaty Organization
RQ – Research Question
TEN-E – Trans-European Energy Network
TEN-T - Trans-European Transportation Network

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1. Introduction

1.1 The EU and NATO in a Shifting Risk Landscape

Since the Russian invasion of Ukraine in 2014, the European risk landscape has shifted. This has changed how intergovernmental organizations, like the European Union (EU) and the North Atlantic Treaty Organization (NATO), prepare for and respond to transboundary crises (Boin et al., 2021). To foster resilience, the EU and NATO created complementary but distinct frameworks for civil preparedness, societal resilience, and critical infrastructure (Niinistö, 2024; Jacuch, 2024). NATO has increased resilience and preparedness budgets to 1.5% of GDP for each NATO member (NATO, n.d.; NATO, 2026a). The European Commission seeks to cultivate a preparedness-by-design mindset and accelerate an EU-wide Critical Entities Resilience (CER) directive (European Commission, 2025a; European Commission, 2025b). However, in the rush to prepare for war, many countries struggle to implement national resilience and preparedness policies while integrating into EU and NATO frameworks (Asp, 2025; Wrange, 2025). Consequently, decision-makers may underestimate and de-prioritize non-traditional security risks, such as cascading climate risks.

According to the IPCC (2022), "*climate change impacts and risks are becoming increasingly complex and more difficult to manage* […] *multiple climate hazards will occur simultaneously, and multiple climatic and non-climatic risks will interact, resulting in compounding overall risk and risks cascading across sectors and regions*" (p. 18). The 2024 European Climate Risk Assessment suggests that climate hazards such as wildfires, heatwaves, floods, and droughts are intensifying in magnitude, scale, and complexity (European Environmental Agency, 2024). Like the COVID-19 pandemic, cascading climate risks pose novel challenges as their impacts propagate across borders and regions, making them difficult to manage and prepare for (Collins et al., 2020; Anisimov et al., 2023). Strikingly, institutional knowledge of these risks remains fragmented in the EU and NATO and under-prioritized in frameworks for preparedness, security, and resilience (Farhan et al., 2023). This is consequential for an important area of EU-NATO cooperation: critical infrastructure resilience.

1.2 A Creeping Crisis: Cascading Risks and European Critical Infrastructure

Critical infrastructure and entities are necessary for essential services and vital societal functions (Kytömaa & Niskanen, 2024). For this thesis, critical infrastructure is defined as an asset, network, or system that provides essential services and supports vital societal functions. In 2023, the EU-NATO Task Force on the Resilience of Critical Infrastructure was created to drive policy coordination (European Commission, 2023). While critical infrastructure remains a national responsibility, EU and NATO frameworks shape implementation and cohesion (NATO, n.d.; European Parliament and Council, 2022). By July 2026, the EU will legally require member states to identify critical entities, develop national strategies, and perform comprehensive risk assessments for a range of threats every four years (Critical Entities

Resilience Directive, n.d.). However, so far, Bulgaria, France, Luxembourg, the Netherlands, Poland, Spain, and Sweden have not transposed and notified national measures for the directive (European Commission, 2026).
For NATO, critical infrastructure is related to national baseline resilience requirements and is included in a NATO-wide strategic resilience assessment conducted every four years (Kytömaa & Niskanen, 2024; Christie & Berzina, 2022). For countries that are EU and NATO members, the task is double. Moreover, the risk of differential customization, implementation, and risk prioritization is high for EU members and NATO allies alike (Cabane & Lodge, 2024).

Due to their interconnectedness, critical infrastructures set the conditions for systemic risks to emerge (Renn et al., 2022; Pescaroli & Alexander, 2016). Luiijf and Klaver (2021) estimate that a third of the reported national incidents in Europe result from disruptions to other services due to cascading effects. In the near term, cascading climate risks can undermine civil-military readiness in times of crisis and war. In the long term, cascading climate risks could stretch EU-NATO policy coherence and coordination (Farhan et al., 2023). Yet, there is often a lack of explicit guidance for how to identify, prepare for, and address cascading climate risks.

1.3 Purpose and Research Questions

This research study will investigate EU-NATO policy coordination on resilience and preparedness planning for cascading climate risks and its implications for European critical infrastructure resilience and risk governance.

This research is structured by two interconnected research questions (RQs):

- *RQ1 - How are cascading climate risks addressed by the EU and NATO in preparedness, resilience, and critical infrastructure policies?*
- *RQ2 – How are these policies translating into shared coordination, responses, and risk ownership across governance levels to address cascading climate risks? (i.e., EU-NATO level to national level).*

To date, research on EU-NATO policy coordination has rarely focused on cascading climate risks. Moreover, existing research has not considered how cascading climate risks are reflected in EU and NATO policies for resilience, preparedness, and critical infrastructure. This research is exploratory and seeks to connect these areas for further research. The next section provides necessary background to the research study.

2. **Background**

2.1 The Complexity of European Risk Governance

As Europe responds to a shifting risk landscape, the role of the EU and NATO in risk governance takes center stage through the enactment of resilience, preparedness, and critical infrastructure policies. Risk Governance "*denotes both the institutional structure and the policy*

process that guide and restrain collective activities of a group, society or international community to regulate, reduce or control risk problems" (Renn et al., 2011, p. 31). The EU and NATO play a central role in the discursive framing of transboundary crises and their management through policy responses and planning (Lippert, 2016). Climate-related security risks have emerged as a priority issue area for EU-NATO cooperation. However, climate-related risks are characterized by high uncertainty, ambiguity, and longtime horizons (Becker, 2023; Nilson & de Herve, 2023).

While the EU and NATO have developed crisis management, resilience, and preparedness capacities, national harmonization and implementation within supranational frameworks remains essential (Boin, 2019). In the event of a transboundary crisis, the centralization of full authority in a supranational entity, such as the EU and NATO, is rare, as national governments seek to maintain decision-making powers (Boin, 2019). Moreover, the spatial and dynamic complexity of risks involves a range of actors from the private sector, national governments, and civil society. Yet, the complexity of such cross-border and multi-stakeholder risk governance creates blurred organizational boundaries and issues of divergent risk framing, prioritization, and ownership (Canales et al., 2025).

As critical infrastructure is both national and cross-border, governance remains a contested space between supranational organizations and national sovereignty, which are equally reliant on private actors who own and manage the infrastructure. Public-private partnerships have grown in importance because most critical infrastructure and supply chains are owned and operated by the private sector (Kytömaa & Niskanen, 2024; Kremidas-Courtney, 2025). To manage modern risks, national governments and international organizations increasingly depend on critical infrastructure operators to co-manage risks (Kytömaa & Niskanen, 2024).

Yet European infrastructure is often outdated and ageing, meaning it is not adapted to emerging risks. Additionally, operators are not fully aware of mutual dependencies with other critical infrastructure and prefer specialization towards one risk (i.e., cyber) rather than all potential combinations of risk (Nilson & de Herve, 2023; WEF, 2026). Policymakers often miss the underlying complexity and interactions between distinct risks (i.e., climatic and non-climatic risks) and their transmission across shared systems and borders (Benzie et al., 2025).

2.2. EU and NATO approaches to Resilience and Preparedness

Within EU-NATO cooperation, risk ownership remains a negotiated reality. This is further complicated from a risk governance perspective as the EU and NATO influence and are influenced by their members. At the EU-NATO level, alignment through the EU's regulatory and investment instruments, coupled with NATO's normative alignment and political consensus, influences how members pursue societal security and risk management (Pursiainen et al., 2026; Friede, 2025). However, while EU-NATO alignment is crucial, neither the EU nor NATO possesses a uniform definition for resilience, preparedness, or critical infrastructure (Pursiainen et al., 2026). Moreover, the EU and NATO have different approaches to resilience

and preparedness (Jacuch, 2024). For the EU, resilience and preparedness approaches are more comprehensive and have wider objectives than NATO. Said in another way, Friede (2025) suggests that "*NATO treats resilience as a means to an end, whereas, for the EU, resilience represents an end in itself*" (p. 5).

Central to the EU is all-encompassing resilience and preparedness. In 2025, the EU adopted the European Preparedness Union Strategy to cultivate a preparedness-by-design mindset based on an all-hazards approach to risk management (European Commission, 2025a). An important aspect of this strategy was a focus on strengthening civil-military preparedness and readiness to respond to cross-border threats from technical accidents, extreme weather disasters, cyber-attacks, pandemics, and, increasingly, the threat of armed aggression (European Commission, 2025a; Niinistö, 2024). This is further operationalized through the CER directive, which targets critical infrastructure and vital societal functions and mandates looking at cascading effects (European Commission, 2022a).

NATO's approach to resilience and preparedness centers on collective defense and military preparedness (Jacuch, 2024). For NATO, resilience and preparedness focus on civil-military capacities to absorb and recover from unexpected shocks and threats (CCOE, 2025; NATO, n.d.). NATO's concept of resilience is largely defined by seven national baseline requirements (BLRs), adopted in 2016, with a focus on civilian transport, infrastructure, logistics, and networks that support the NATO military command structure for operations (CCOE, 2025). As part of deterrence and defense, NATO must maintain constant readiness to respond to armed aggression. Therefore, NATO Allies are encouraged to possess sufficient civil-military readiness supported by national resilience, enablement, and defense plans (NATO, n.d.).

EU-NATO cooperation on critical infrastructure progresses through EU-NATO structured dialogues on resilience (Jacuch, 2024). According to Kremidas-Courtney (2025), "*the NATO resilience baselines define the what and EU regulations identify the how*", while both institutions define who must manage the risks (p. 9). While the EU and NATO are converging due to common threats, this does not always equal effective policy implementation. The degree to which the EU and NATO possess joint responses and mechanisms is unclear (Bendiek & Kerttunen, 2025). Across Europe, legal and institutional fragmentation, divergent risk prioritization, and differing national capacities make European-level resilience and preparedness an uneven process (Horan et al., 2025; Quis & Buldioski, 2025). As a result, some experts claim that "*NATO-EU cooperation is more often about political show than policy substance*" (Lindley-French, 2025, p. 446). Moreover, according to Friede (2025), an increased focus on resilience and preparedness represents a "*controlled loss of control by the EU and NATO,"* meaning a policy shift to "*mitigate internal vulnerabilities*" through empty resilience and preparedness language (p. 8).

2.3 An Uncertain Climate Present and Future

Europe is the fastest-warming continent. In 2025, 95% of Europe saw above-average temperatures (C3S/ECMWF & WMO, 2026). According to Farhan et al. (2023), "*climate*

change is impressing upon international organizations their responsibility to anticipate risk, manage crises, and coordinate the actions of others to strengthen awareness and resilience" (p. 4). In a future of increasing climate risk, the investments in resilience and preparedness today can determine future outcomes. However, there is a preference for short-term risk thinking influenced by security and defense priorities at the expense of preparation for more complex climatic risks. This is an example of a risk-risk trade-off that is common amongst large institutions, where policy focus is geared towards some risks at the expense of others (Collins et al., 2020). When considering cascading climate risks and other transboundary threats, anticipatory and systemic risk governance is necessary (European Commission, Joint Research Centre, 2025). Neither the EU nor NATO alone can respond to cascading climate risks; cooperation is essential (Farhan et al., 2023).

The EU and NATO are mutually dependent on shared private assets and critical infrastructure systems across Europe, warranting a consideration of cascading risks (European Commission, 2023). NATO's defense posture largely depends on infrastructure it does not own or command, thus cooperation and coordination are a must (Didelot, 2026). Cascading climate risks can impact critical infrastructure, causing second and third-order effects across sectors, supply-chains, and vital societal functions (Rinaldi et al., 2021). As systemic and cascading climate risks intensify, the EU, NATO, and national militaries may be called to respond to climate disasters, hence the need for an optimized response and preparedness (Retter et al., 2021; Kalkman & Bollen, 2024; Kingham & Moran, 2025). However, it is unclear if and how the EU and NATO prioritize these risks and consider them in guidance for national governments.

3. Conceptual Framework and Clarifications

This section presents the conceptual framework. For this thesis, I developed a conceptual framework by applying Talebian et al. (2025) typology for cross-border climate impacts, while connecting to additional concepts, such as climate as a risk multiplier (Goodman, 2024), transboundary crises (Blondin & Boin, 2020), policy coordination and coherence (Cejudo & Michel, 2017), and multi-level governance (Hooghe & Markes, 2021). This framework is useful for analyzing cascading climate risks and governance structures.

3.1 Climate Change as a Security Risk and Threat Multiplier

Risk is both objective and socially constructed, and the prioritization of risks is a choice made by risk governance actors (Aven & Thekdi, 2022). Over the past decade, climate change is framed as a security threat and risk multiplier. Climate change as a risk and threat multiplier exacerbates existing security risks by interacting with and worsening pre-existing vulnerabilities, creating cascading impacts on national security (Goodman, 2024). This is a common framing for the EU and NATO strategic documents (European Commission, 2022b; NATO, 2022). Climate change is a systemic risk that transforms the underlying risk landscape and alters the strategic, operational, and tactical environments for the EU and NATO (European

Commission, 2022b; NATO, 2022). For NATO, this is introducing a new uncertainty into deterrence. It has the potential to destabilize mission-critical national infrastructure, vital societal functions, and preparedness capacities across the EU and NATO (da Costa et al., 2023). Moreover, climate risks coincide and interact with other security threats such as hybrid, cyber-attacks, and mis/disinformation campaigns (Niinistö, 2024; Ellison, 2025).

Therefore, climate change may require the "*reconsideration of security and defense assumptions, practices, priorities, and policies*" in the near and long term (NATO Science & Technology Organization, 2026, p. 1-6). While climate change has security consequences, it is not always apparent how they manifest. Recently, climate adaptation has been criticized for being too confined within local and national borders (Benzie & Persson, 2019). Current approaches ignore the dynamic and spatial complexity of climatic risks and their transmission pathways across geographies (Anisimov et al., 2023). According to Pescaroli and Alexander (2016), "*the presence of a line of causality between diverse incidents and their impacts denotes a cascade*" (p. 177). However, a cascade can have numerous second- and third-order impacts that are emergent and spread across risk recipients (Canales et al., 2025). Therefore, it is important to present a typology of cascading climate impacts to guide the reader.

3.2 A Typology of Cascading Climate Risks and Impacts

This research applies Talebian et al. (2025) conceptual typology for cross-border climate impacts. The author extends on Talebian et al. (2025) by framing cascading climate risks as cross-border and cross-sectoral impacts intensified by climate change. Focusing on critical infrastructure systems, cascading climate impacts refer to cascading disruptions caused by one or multiple climate hazards with compounding effects across interconnected systems. An example could be an extreme heatwave causing the failure of a power grid that leads to cascading disruptions on interconnected transport, health, and telecommunications infrastructure within and across borders. Cascading climate risks can emerge from sudden and slow onset triggers, embody dynamic and spatial complexity, and generate compounding effects (Canales et al., 2025; Mikaelsson, 2026).

Originally, climate risks were framed as direct impacts; however, there is a new emphasis on their cascading and systemic nature. While potentially a sub-set of cascading risks due to shared properties, cascading climate risks require climate-informed adaptation and preparedness measures. Cascading climate risks warrant further attention because they remain insufficiently addressed in Europe (European Environmental Agency, 2024). In **Figure 1**, Talebian et al. (2025) introduce a typology of cross-border climate impacts. The author refers to this as cascading climate impacts and risks.

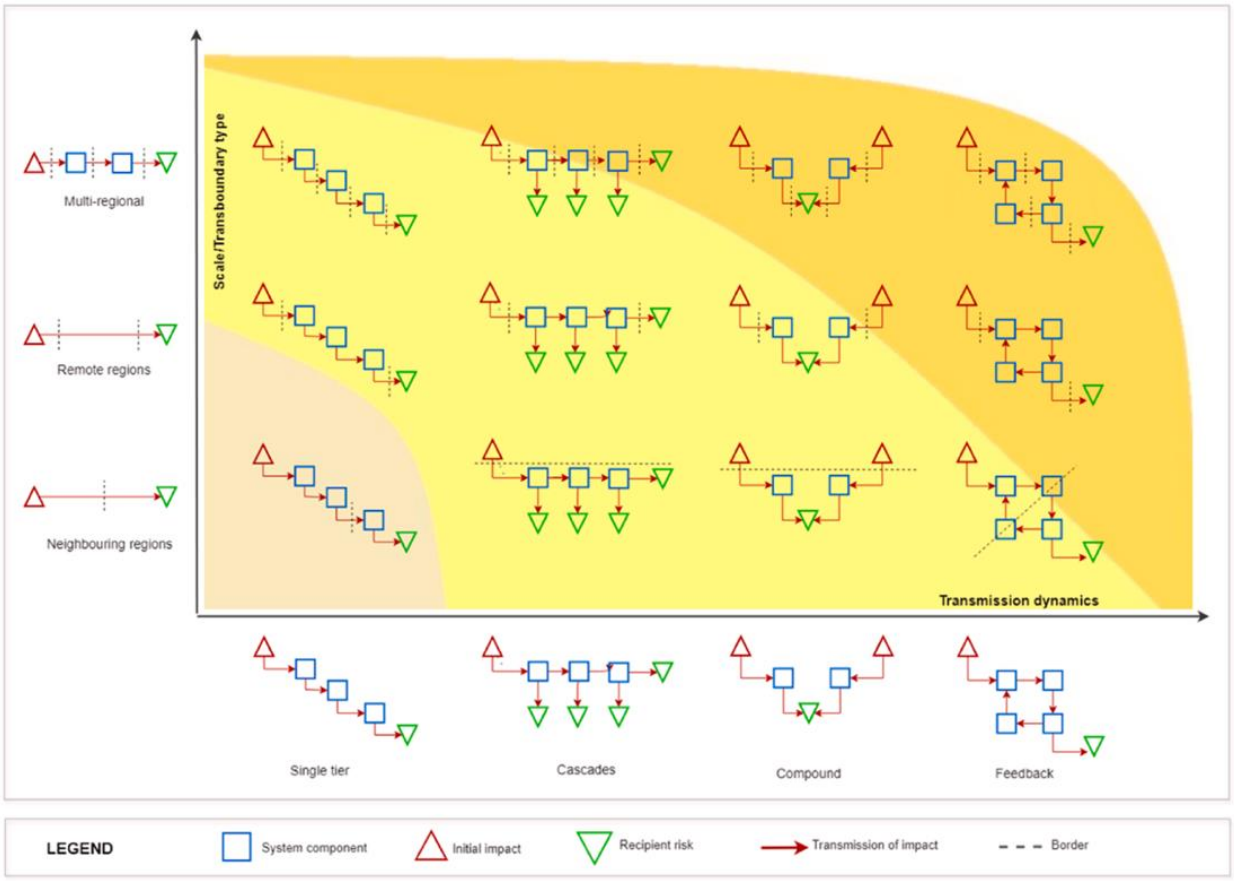

Figure 1 - A typology of cascading climate risks

(Source: Talebian et al., 2025).

Cascading climate risks are inherently cross-border and cross-sectoral and often require complex and adaptive governance modalities to manage successfully (Talebian et al., 2025; Anisimov et al., 2023). Hence, the term natural disasters or hazards does not quite encapsulate these risks, as the hazard patterns diverge from historic data. Due to the hyperconnectivity of interdependent sociological, ecological, and technological systems, cascading crises and disasters are becoming a new normal (Pescaroli & Alexander, 2016). As shown in **Figure 1**, the initial impact of a climatic event can possess numerous risk transmission pathways that intersect with system components or recipients across borders. An important aspect of cascading climate risks is their dynamic and spatial complexity (Canales et al., 2025). Simple impacts transmit across one country or system to another but are largely confined to the system component. More complex climate impacts can affect multiple systems and countries, and lead to significant second- and third-order impacts. These are presented in **Table 1**.

Type	Summary description
Simple	Climate impact in one country transmits to another country (neighboring or remote regions) in a single-tier cascade from one system component to the other. Spatial and dynamic complexity is low.
Spatially complex	Climate impact in one country transmits to another country through system components in multiple locations (in remote regions or multi-regional). The dynamic of transmission is a single-tier cascade, with direct links between critical infrastructure assets and supply-chains. Spatial complexity is high, dynamic complexity is low.
Dynamically complex	Climate impact in one country cascades through multiple system components, and can originate in multiple locations before affecting another country, or can generate feedback between multiple system components. High dynamic complexity and low spatial complexity.
Systemic	Climate impact in one country transmits through multiple system components in multiple regions. The transmission dynamic could be through multiple system components, can originate in multiple locations, and can generate feedback. High spatial and high dynamic complexity

Table 1 - Typology of Cascading Climate Risks and Spatial/Dynamic Complexity (Adapted from Talebian et al., 2023 and Canales et al., 2025).

Significant scholarship in this field has emerged in recent years. Scholars have traditionally focused on cascading or transboundary climate risks, and their implications for international trade, supply chains, food security, and adaptation planning (Adams et al., 2021; Berninger et al., 2022; Cote & Mikaelsson, 2023; Harris et al., 2022; Benzie & Persson, 2019). The first European Climate Risk Assessment significantly highlighted Europe's vulnerability to cascading and systemic climate risks (European Environmental Agency, 2024). However, they remain normally confined within climate ministries and the adaptation community (Mikaelsson et al., 2024).

In more recent years, scholarship has expanded to include international security, strategic resilience, risk ownership, and risk governance (Benzie et al., 2025; Talebian et al., 2025; Canales et al., 2025; Farhan et al., 2023). Benzie et al. (2025) and Townend et al. (2023) have introduced the problem of cascading climate risks to European strategic resilience. In addition, Knaepen et al. (2023) have explored EU-NATO cooperation on cross-border climate impacts and food security. While Auer et al. (2025) presented critical intervention points for EU adaptation to cascading climate impacts from outside of Europe, explicitly highlighting critical infrastructure. However, according to Verschuur et al. (2024), "*How the occurrence of one or multiple hazards in space and/or time may interact with interdependent infrastructure systems, and can cause cascading impacts, is not well addressed in the literature"* (p. 11). Expanding on this, there is a need to expand scholarship on the implications of cascading climate risks for European critical infrastructure systems. This thesis focuses on cascading climate risks and

impacts within Europe. Therefore, there is less focus on cross-regional/global transboundary climate risks.

Cascading climate risks introduce the same challenge of spatial and dynamic complexity as other transboundary crises. Take, for example, COVID-19. While not a climate risk, the COVID-19 pandemic presented a novel case of cross-border impacts that proved paralyzing as it cascaded across borders and between regions (Collins et al., 2020; Anisimov et al., 2023). The complex and systemic nature of cascading climate risks makes risk ownership an imperative (Harris et al., 2022; Canales et al., 2025). Without a risk owner, it is unlikely that cascading climate risks will be managed by anyone (Harris et al., 2022). Moreover, the possibility of unilateral interventions can create significant risk-risk trade-offs and risk transference to other actors through risk contagion (Nilsson & de Herve, 2023). Cascading climate risks will make this scenario more likely.

3.3 The Transboundary Crisis, Policy Coordination, and Cohesion

In a time of cascading risks, the transboundary nature of crises is becoming more pronounced. According to Blondin and Boin (2020), a transboundary crisis can be defined as "*a crisis that crosses geographical and/or policy boundaries*" (p. 199). Such crises can range from cyber and hybrid threats, international migration, and pandemics to cascading climate risks and critical infrastructure failures (Blondin & Boin, 2020; Boin et al., 2021). Transboundary crises often require international collaboration across governments and numerous policy domains. However, coordinated approaches face obstacles due to a lack of joint responses, exposure asymmetries, and a preference not to be directed by a centralized authority (Blondin & Boin, 2020).

Blondin and Boin (2020) build on collective action and crisis management theories to explore whether states choose to manage a transboundary crisis. They find that, in cases where exposure asymmetries and divergent risk prioritizations exist, joint responses remain elusive or fragmented (Blondin & Boin, 2020). However, states may join joint responses if they cannot decouple from a risk, risk exposure is more symmetrical, or perceived benefits are high (Blondin & Boin, 2020). These insights resonate with Talebian et al. (2025), who suggests that a constellation of actors can form around managing a cascading climate impact if risk owners and recipients are identified. Lastly, Blondin and Boin (2020) suggest that "*the availability of organizational capacity to facilitate emergent coordination across boundaries makes transboundary crisis management collaboration more likely*" (p. 204). In recent years, the EU and NATO have developed strong transboundary crisis management capacities, yet they are not always used by EU Member States and NATO Allies (Boin et al., 2013; Boin et al., 2014; Blondin & Boin, 2020). Yet, with a wider security and risk environment, there may be greater demands on the EU, NATO, and national governments.

As the EU and NATO share twenty-three members, EU-NATO policy coordination and coherence are imperatives, but hard to achieve. Policy coordination and coherence are two

distinct concepts. While there are a plethora of definitions for coordination, this thesis relies on the definition from Cejudo & Michel (2017), which defines policy coordination as: "*A process in which members of different organizations define tasks, allocate responsibilities, and share information in order to be more efficient when implementing the policies and programs they select to solve public problems*" (p. 750). Said in another way, policy coordination requires agreeing on how to manage shared risks and ensure distinct policy areas are coherent with wider EU and NATO policy goals. According to Cejudo & Michel (2017), "*Coordination focuses on the decision-making process, and the implementation….but says nothing about the substantive content of those decisions*" (p. 754). That is policy coherence.

In contrast, policy coherence is the "*the process where policy makers design a set of policies in a way that, if properly implemented, they can potentially achieve a larger goal"* (Cejudo & Michel, 2017, p. 225). Policy coherence concerns inter-institutional fit and shared goals, which is the foundation of EU-NATO cooperation. If the EU or NATO creates a policy that is at odds with, duplicates, or undermines the other, it depreciates their ability to manage a transboundary risk. Policies should be horizontally coherent across other EU and NATO policies. They should also be vertically coherent at the national level. Policy coherence also means that distinct policy domains must align to address a shared challenge (Cejudo & Michel, 2017). In this case, climate adaptation, preparedness, and critical infrastructure policies should align and be coherent to address cascading climate risks (Mikaelsson et al., 2026) Policy integration is not a focus as the EU and NATO rarely integrate their policies.

3.4. Multi-level Governance

Over the past two decades, political theorists have applied multi-level governance theory to explain how authority, risk management, and problem-solving are distributed across supranational institutions, national governments, and non-state actors (private sector, civil society, etc) (Hooghe & Markes, 2021; Scharpf, 2001). This system involves sharing policy-making responsibility across actors, but also navigating conflicts of mandates, roles, and institutional identities. In multi-level governance, there are two pathways: vertical and horizontal. Vertical governance is distributed across national, regional, and local levels, while horizontal governance is between member states and non-state actors (Pursiainen et al., 2026; Hooghe & Markes, 2021). In normal politics, coordination becomes a structural challenge because actors can compete or free ride in addressing shared problems (Hooghe & Markes, 2021; Scharpf, 2001).

Transboundary crises can produce institutional fragmentation, ad-hoc decision-making, and uneven policy implementation (Boin, 2019). This is largely due to divergent risk perceptions and exposure asymmetries (Blondin & Boin, 2020). However, actors can distribute risk ownership and roles to manage risks proactively, if there are organizational capacity, policy coordination, and symmetric exposure (Boin et al, 2020; Blondin & Boin, 2020). Critical infrastructure networks are inherently multi-governance and complex adaptative systems as they span across supranational, regional, national, and local contexts (Große, 2023). They are

also characterized by mutual dependencies between infrastructure nodes and networks, as well as public and private partnerships (Arvidsson, 2024). Multi-level governance is a promising framework for groups of countries that share similar geographic conditions, risk profiles, and mutual dependencies to develop common best practices and coordination functions (Allain-Dupré, 2020).

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Taken together, the conceptual framework situates this study in past literature, theory, and research. These key concepts informed semi-structured interview questions, the abductive coding scheme, analysis, and discussion.

4. **Methodology**

This research employed a mixed qualitative method approach guided by abductive reasoning. This study used a triangulation technique across multiple data sources through (a) policy document review and document analysis, (b) semi-structured interviews with thematic analysis. In this, I have utilized an abductive approach to code and analyze data.

4.1 Selection of EU and NATO Policy Documents

To answer RQ 1, a document review and analysis were conducted by selecting EU and NATO policy documents across relevant policy domains that could be impacted by cascading climate impacts (resilience, preparedness, security, and critical infrastructure) (Bowen, 2009; Morgan, 2022). The document selection went beyond adaptation policies to ascertain whether and how cascading climate risks are considered across other adjacent policy domains. Policy documents were identified by their relevance to one of the mentioned policy domains and their potential to inform the research questions. When appropriate, additional documents were included if they appeared frequently across existing documents or were recommended by respondents as important to the study. Documents were selected from publicly accessible repositories and publication listings from the EU and NATO: the EUR-LEX and NATO official publications/library. In total, sixteen EU, nine NATO, and four joint EU-NATO documents were reviewed **(See Appendix l).** In most cases, NATO documents are not publicly available, and if they are, the content is limited. Hence, an understanding of NATO was gained through references to EU-NATO cooperation in EU policy documents (Bowen, 2009). When necessary, grey literature, academic articles, and NATO archive documents were used to fill in gaps in understanding and analysis. However, these were not part of the formal document analysis and coding scheme (Morgan, 2022).

4.2 Explanation of Document Coding Process

A close reading of the documents helped develop a pilot deductive coding scheme which emerged deductively from the conceptual framework. To scan EU and NATO documents, a

keyword search was applied. Keyword searches included: *climate as threat/risk multiplier, climate & security, climate security, cascading risk (climate), cascading effects (climate), cross-border climate impacts, systemic risk, EU, NATO,* and *EU-NATO.* These terms were used to check for policy coherence gaps across documents and were coded. Often, terms such as *cross-border risks*, *cascading risk*, or *compounding effects* were found across the documents. However, these were checked to ascertain their climate relevance and distinguish from non-climatic risks that possess similar cascading properties. This proved challenging but useful to determine where cascading climate risks are highlighted explicitly, rather than implied implicitly in umbrella terms and broad policy language.

Using N-VIVO, a formal coding scheme was applied to highlight the framings of cascading climate risks, EU-NATO cooperation, and climate-related security risks. Later, an abductive coding scheme was developed using the existing deductive codes and emerging inductive codes. An abductive approach allowed for flexibility in coding, which captured data to answer the research questions, and allowed for new patterns to emerge (Timmermans & Tarvory, 2012; Clarke & Braun, 2016). This abductive coding process was applied again after a 10-15 day interval to test for robustness and coding consistency (Timmermans & Tavory, 2012; Clarke & Braun, 2016).

4.3 Semi-Structured Interviews and Thematic Analysis

As a researcher, I aimed to understand my respondents and their professional backgrounds, roles, and risk perceptions (Ruslin et al., 2022; Sayrs, 1998). For respondent selection, a purposeful sampling strategy was employed to select respondents either working on this topic within their institutions and mandates, were a potential risk owner, or a notable expert (Creswell, 2013). Throughout the research process, a list of respondents was created and kept private to comply with the General Data Protection Regulation (GDPR). When appropriate, a snowballing method was used to recruit respondents from institutional gatekeepers. Often, the same respondents were recommended multiple times, confirming data saturation. This resulted in a diverse range of respondents, such as EU and NATO officials, national-level stakeholders involved in preparedness and civil-military cooperation, critical infrastructure experts, and private sector actors (**see Appendix ll**).

All informants were kept anonymous during the interview and data analysis process. Upon verbal consent, respondents were assigned a pseudonym. The document analysis helped identify preliminary awareness of cascading climate risks and construct the guiding questions for semi-structured interviews (Ruslin et al., 2022; Bowen, 2009). Core concepts such as cascading climate risks and policy coordination were also integrated. Semi-structured interviews were conducted to go beyond what is written in policy documents and capture what happens in practice. These were deemed appropriate to ensure flexibility and adaptability to introduce new questions, develop probes, and guide discussion (Ruslin et al., 2022; Gray, 2014). An interview guide was developed to structure interview questions around the research questions and support insights from the coding of policy documents (Bearman, 2019) (**see**

Appendix V). These were refined to 6-8 questions, which were sometimes customized based on a respondent's expertise and focus.

An informed consent form and a research study summary document were provided (Creswell, 2013) (**see Appendix lV)**. Interviews were recorded and transcribed with backup files stored in a safe location (Gray, 2014; Creswell, 2013). For in-person interviews, an audio recording was developed and transcribed. If a respondent was uncomfortable being recorded due to ethical, security, or reputational concerns, detailed notes were created and structured around the guiding questions. This is further explored and motivated in the ethics and limitations section. In total, fourteen interviews were conducted. Twelve respondents opted for being recorded and transcribed, while two declined to be recorded. Follow-up questions and probes were applied when appropriate (Rubin & Rubin, 2005).

After concluding interviews, a thematic analysis was used to code and analyze the interview transcripts and notes guided by an abductive approach (Clarke & Braune, 2016). According to Clarke & Braune (2016), "*Thematic analysis is a method for identifying, analyzing and reporting patterns (themes) within data*" (p. 79). Its flexibility was an advantage when paired with semi-structured interviews (Clarke & Braun, 2016). In parallel, policy documents were re-coded inductively in a feedback process to capture new insights prompted by the interviews and to update core findings (Clarke & Braun, 2016; Timmermans & Tavory, 2012; Ruslin, 2022). This triangulation of data across multiple sources was important for deeper insights and distinguish policy language from reality (Bowen, 2009; Morgan, 2022). Deductive codes were applied from the coding scheme, but inductive codes were not fully homogeneous across policy documents and interviews. The coding results are presented as key themes and subthemes. Often, themes and subthemes appeared across the policy documents and interviews. A theme is constructed from various sub-themes. Sometimes deductive codes emerged as themes due to their frequency (Clarke & Braun, 2016). Units of code from quotations are aligned with their source to represent a theme or sub-theme. An example can be found in **Appendix lll** with a full list of themes and subthemes in **Figure 2.**

4.4 Ethical Concerns and Limitations

Due to security concerns, certain ethical and data limitations impacted this research. Respondents were given the option to decline to be recorded or change their minds. This was deemed a valid ethical concern as many respondents work on highly sensitive topics (Rubin & Rubin, 2005). Informants were able to opt out of questions deemed sensitive or too revealing for the study (Ruslin et al., 2022). However, this rarely occurred. Given insufficient data in NATO policy documents, this flexibility was crucial to access elite experts and officials (Fujii, 2017). Moreover, establishing trust with the respondents was deemed critical to answer the research questions and produce authentic responses (Rubin & Rubin, 2005; Rutakumwa et al., 2019; Harvey, 2011).

While it is optimal and the norm to record all interviews, if the respondent felt uncomfortable, the interview was conducted without recording. In this case, detailed notes were created. The note structure was based on the interview guide and research questions for clear grouping and consistency (Hayes & Mattimore, 2004). Note-taking was conducted during the interview process, and a rough transcript was written immediately afterward as a memory report (Vogel & Funck, 2016; Rutakumwa et al., 2019).

While this process is flexible, it does produce some limitations. Key data and insights may have been lost in this process due to a lack of word-to-word transcription. To mitigate the risk of inconsistencies and invalidity in data collection, respondents were asked about the accuracy of key insights, and, in some cases, a second interview was conducted, building on the existing notes/transcript (Vogel & Funck, 2016; McGrath et al., 2019; Bryman & Cassell, 2006). Those who declined to be recorded were given less focus in the results, not due to their lack of expertise, but because of data incompleteness.

5. **Results**

The results from coding EU and NATO policy documents and interviews are presented in this section. In **figure 2**, key themes are presented from the abductive coding. These are further categorized into their sub-themes in the boxes and the main units of code that compose the sub-theme. Units of code **(Black)** are grouped under each sub-theme **(White)**. Some codes are deductive from key concepts, literature, and frameworks, while others are inductive from the interviews and policy documents.

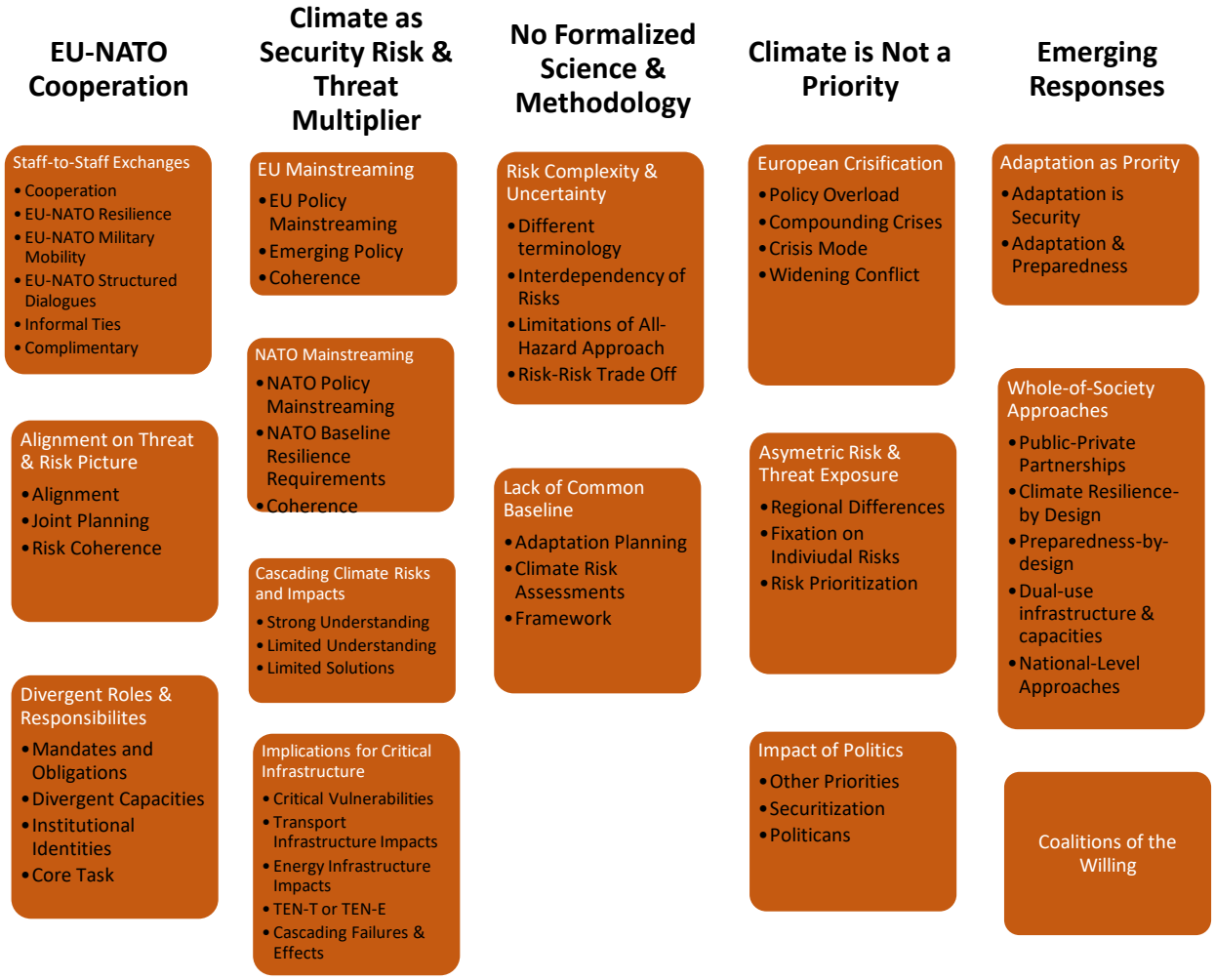

Figure 2 – Key themes and subthemes

The identified theme, *EU-NATO cooperation* (Theme 1), captured how the EU and NATO coordinate on resilience, preparedness planning, and complementary policies. *Climate as a security risk and threat multiplier* (Theme 2) explored how the EU, NATO, and national stakeholders framed and integrated climate security risks and cascading climate risks The theme *No Formalized Science and Methodology* (Theme 3) highlighted constraints in addressing cascading climate risks, while *Climate is Not a Priority* (Theme 4) reflected political and risk perception barriers affecting coordination, risk ownership, and collective responses. Lastly, *Emerging Responses* (Theme 5) presented emerging practices and policy framings that create an enabling environment to address cascading climate impacts despite the constraints.

In the next sub-sections, EU and NATO documents and respondents are referenced in abbreviated form (i.e., EU-Document one (EU-D1) and NATO respondent 2 (NATO-2)). These correspond to the documents and respondent lists in **Appendix I** and **II**.

5.1 EU-NATO Cooperation

EU-NATO cooperation was a consistent theme across the policy documents and interviews. With a dynamic risk landscape, EU-D10 stressed: "*the EU needs to be better prepared for this most extreme crisis from a European perspective, in coherence and complementarity with NATO*" (p. 51). In EU-D2 and NATO-D5, there was a strong focus on synergies and coherence between EU and NATO policies across governance levels to ensure alignment. While EU-NATO D1-D3 stressed EU-NATO coherence, complementarity, and interoperability. However, expert-2 suggested that "*in terms of coordination, I think we see that issue-specific coordination is happening… out of pure necessity*". While EU-1 highlighted the parallel coordinated exercises for crisis management. Stronger EU-NATO alignment on critical issue areas was common across interviews, mainly for defense and preparedness. Improved EU-NATO coordination on climate-related security risks was explicitly mentioned as a priority area in EU-D5 and EU-NATO-D3. NATO-2 explained that "*EU-NATO coordination, dialogue, and cooperation have evolved over the years to look at a number of different, transversal policy issues and files, and to my knowledge, climate was added a few years ago*." Climate change, while a new area for coordination, will likely grow in the coming decades. NATO-3 expressed "*I have confidence that there is enough overlap to make a difference*".

5.1.1 Staff-to-Staff Exchanges

Staff-to-staff exchanges, structured dialogues, and informal ties came across in policy documents and interviews as the most substantial avenues of coordination. Key focus areas included military mobility, resilience, and climate change, energy, and defense. The outputs from the structured dialogues are then translated down to the capital level with guidance and recommendations to be implemented by EU Member States and NATO Allies. EU-D2 stressed the need for "*intensifying strategic communications, coordinating and/or adopting joint statements and conducting joint visits by senior EU and NATO representatives*". However, Trans-Atlantic tensions have resulted in stronger EU leadership in key issue areas. According to EU-2, *"the dialogues help make sure we are aligned, but the EU is really in the lead for the the climate, energy, and defense structured dialogue, because NATO's hands are increasingly tied together…".* NATO Allies influence whether climate change is a priority. Yet, these tensions have not reduced EU-NATO dialogues and staff-to-staff exchanges, which continue to expand across issue areas out of necessity. EU and NATO respondents stressed the importance of informal ties, while expert-3 claimed, "*the farther you get from Brussels, the easier it gets"*.

5.1.2 Aligned Threat and Risk Picture

An aligned threat and risk picture was essential to avoid institutional duplication and promote synergies to guide policy development at the capital level. EU-D10 stressed "*the importance of coherence and synergies between NATO policies and EU legislation and funding instruments*". The Ukraine war has brought the EU-NATO into greater threat alignment. This has centralized preparedness and resilience as being "*integrated into EU-NATO Structured Dialogues, reciprocal cross-briefings, and training*" and a core feature of future collaboration (EU-D11, p.17). Climate change entered EU-NATO coordination as an emerging risk with strong institutional alignment. NATO-3 suggested that "*the EU and NATO bilateral meetings that there will be a lot of common understanding about what we are talking about when we say we are feeling the effects of climate change*". There was agreement that climate change does transform the tactical, operational, and strategic environments in which the EU and NATO operate.

5.1.3 Divergent Roles, Responsibilities, and Capacities

Divergent roles and responsibilities often go down to core mandates, institutional identities, and capabilities. Across the interviews, multiple respondents qualified that the EU and NATO are different organizations that seek complementary goals and functions. While the EU has the capacity to provide legislation, funding, and capacity-building to Member States, NATO can only steer Allies towards a common direction and standards. For example, NATO can conduct informal risk assessments across countries; however, NATO-2 expressed that "*NATO can't specify what to implement. That is an EU or national government job*". Moreover, with a deteriorating security environment, many respondents suggested that NATO is returning to its core mandate of deterrence and defense, focusing less on climate change. This aligns with national stakeholder-1, who claimed that they expected "*more from the EU than from NATO to really make the EU countries or the EU as a whole resilient to climate change*". Across multiple issue areas, the EU has greater competence and capacity to improve preparedness and resilience. Yet, division of labor was seen as important. National stakeholder-3 stated that "*like everything that the EU and NATO do together, it has to be complementary, not duplication*". EU-NATO complementarity and coherence were central across numerous policy documents (EU-D2; EU-D10; EU-D11; NATO-D5; EU-NATO-D3; EU-NATO-D4). Yet, many respondents felt that some level of duplication was inevitable across different issue areas such as disaster response, crisis management, and preparedness.

5.2 Climate as a Security Risk and Threat Multiplier

In strategic documents, EU-D2 and NATO-D5, climate change was framed as a risk and threat multiplier with significant cascading effects. EU-D5 claimed that "*the security and defense implications of climate change and environmental degradation have* […] *become more urgent, challenging and multifaceted*" (p. 3). While NATO-D5 suggested that "*climate change is a*

defining challenge of our time, with a profound impact on Allied security" (p. 15). For NATO, adaptation is a top priority to address climate-related security risks. EU-1 suggested that "*climate change is an exacerbator*" of risks and operational challenges. EU-1 and NATO-1 suggested that Europe is now realizing its vulnerability to climate risks, albeit with regional variance. While these risks are seen as important, EU-2 stated that "*the EU is on a high-speed train on security and defense, so much so that climate can sometimes be left behind*". Most respondents highlighted tensions between addressing climate risks and more immediate security challenges.

5.2.1 EU Mainstreaming

The EU prides itself on possessing integrated policy approaches. While resilience and preparedness featured frequently in EU policy documents, the mainstreaming of climate-related security risks was uneven. For example, climate risks were well covered in EU-D1, D2, D5, D7, D10, and D-11; however, they are scarcely mentioned in EU-D3, D4, D8, D12, D14-16. In recent EU policy documents on military mobility and defense readiness, climate risks are entirely omitted. National-stakeholder-4 stressed EU-level policy coherence between the Integrated Framework, military mobility, and defense. However, EU-1 suggested that it is important to recognize that just because climate change is not mentioned, it does not mean nothing is being done. For example, the EU-2 highlighted the EU Climate Change & Defense Roadmap and the climate and defense network that mainstreams climate-related security risks into defense and security planning across EU capitals. Moreover, EU respondents brought attention to a new initiative under development: the EU Centre on climate change, defense, and security. The EU policy documents and interviews gave the impression that climate-related risks will be further mainstreamed through the revised EU Integrated Security Strategy and the upcoming Integrated Framework on Climate Resilience and Risk Management. National stakeholder-4 claimed the EU is "*these kind of integrated approaches are very good* […] *the EU is quite good at collecting these kind of approaches and plans*"

5.2.2 NATO Mainstreaming

Across NATO policy documents, climate change is well covered in NATO D1-D8. However, concrete steps and guidance are not found publicly available. According to NATO-2 and NATO-3, climate change is mainstreamed into civil-military operations, defense planning, and "*a lot of the work that we do on resilience*". With resilience in mind, NATO-D1 asked NATO Allies to "*fully recognize climate change-related risks as significant threat multipliers in their foreign and security policies*" (p. 2). However, according to NATO-1 and NATO-2, NATO has only recently included climate risks within the NATO baseline resilience requirements. A promising area of NATO mainstreaming is found in annual NATO climate and security impact assessments, NATO-D6-D8. However, there has not been a new assessment in two years. Ultimately, the way that NATO prioritizes climate risks depends on the willingness of NATO Allies to implement and operationalize policies. According to NATO-3, "*The difficulty from a*

NATO perspective is that we have no authority to direct Nations to do anything they do not want to do […] *but we are allowed to articulate where we think there to be risk*". While NATO does mainstream climate risks, NATO-3 saw greater capacity for the EU to drive substantial mainstreaming at the national level rather than NATO. This was confirmed by EU-1, EU-2, national stakeholder-1, and national-stakeholder-4. Altogether, NATO-1 claimed that NATO is still reconciling that "*adaptation will need to be continuous*" and suggested that "*our future will be determined by our systemic resilience*".

5.2.3 Cascading Climate Impacts and Risks

Understanding and addressing cascading climate risks came in two forms: strong and limited across actors. Both the EU and NATO are aware of cascading climate impacts; however, they are rarely mentioned directly, with a few key exceptions. In EU policy documents, EU-D1, EU-D7, and EU-D10 explicitly mention cascading climate impacts. EU-D10, which focuses on EU-wide preparedness and security, stressed that "*cascading climate and environmental hazards act as a risk multiplier and can lead to system-wide challenges affecting whole societies and exacerbating existing social, economic, health, and environmental risks and crises"* (p. 34). While EU-D1 on the EU adaptation strategy, claimed "*the impacts of climate change have knock-on effects across borders and continents"* (p. 21). EU-1 explained that the cascading effects of climate change are also featured in the EU Disaster Resilience Goals. However, for EU-2, cascading climate risks remained a "*Pandora's box of issues and effects*", making it hard for risk owners to consider their full risk exposure.

The cascading effects of climate change feature strongly in NATO-D6-D8. NATO-D6 stated that "[Climate change] *cuts across the traditional operating domains of maritime, land, air, and space with cascading effects on the readiness and sustainability of NATO forces and capabilities*" (p. 5). However, NATO-1 qualified that "*second and third order effects are generally not overly accounted for*" in national-level risk assessments for NATO Allies. While NATO is aware of cascading climate risks, NATO respondents suggested that it has not been fully integrated into resilience and preparedness efforts or EU-NATO structured dialogues. Commenting on this, NATO-2 expressed that "*whether there has been policy coordination at the EU-NATO level on, as you say, the cascading climate impacts on critical infrastructure* […] *that is a very good question. I honestly do not know if we have gone into that level of detail*".

Across EU and NATO policy documents, cascading climate risks are rarely covered in full depth. Furthermore, in documents related to critical infrastructure policies, such as EU-D3, D4, D8, D12, mention cascading effects, cross-sectoral risks, and cross-border but rarely climate impacts as a trigger. Despite the potential implications for European security, EU-D15 does not mention cascading climate impacts or climate-related security risks. While the EU and NATO are aware, it remains uncertain how well national-level governments and CI operators understand them. NATO-1 explained that "*most countries at the national level still plan for climate change based on historic impacts and linear models…not for second or third order effects".* This aligns with expert-1, who stated that governments have only started to talk about

this topic in the past "*two or three years* […] *before that nobody did"*. Respondents also referenced specific events that increased awareness of cascading risks, such as the 2021 Central European floods, the 2024 Valencia floods, and the 2025 Blackouts in Spain and Portugal.

At the national level, there was an emerging awareness of cascading climate risks. For national stakeholder-2, *"all hazards risk assessment approach looking at cascading effects, interconnections, and that awareness has significantly increased* […] *for the Belgian climate risk assessment and the Belgian national risk assessment*". This is similar in Nordic countries. National stakeholder-4 suggested that "*In the comprehensive security model, climate change is sort of looked at both as a direct security threat, because it can undermine these vital functions and even multiple vital functions simultaneously*". Furthermore, they shared how the implications of cascading climate risks were explored across national ministries in Finland. However, these are ad-hoc processes rather than directed by the EU or NATO.

5.2.4 Implications for Critical Infrastructure Resilience

Climate impacts on critical infrastructure resilience were a concern shared across respondents. The vulnerability of critical infrastructure was seen as a critical area for EU-NATO Structured Dialogues on Resilience. EU-NATO-D4 claimed that physical damages and disruptions "*are increasing with climate change, which will expose infrastructure to rising sea levels, shifting weather patterns and more frequent extreme weather events*" (p .4). In EU policy documents, these risks are widely acknowledged, but appear less often in EU-D3, D4, and D8, despite being explicitly about critical entities and infrastructure. Yet, EU-D7 claimed that "*all transport infrastructure is at risk from climate change"* (p. 20). Furthermore, EU-D7 suggested that the EU faces a *"knowledge gap* […] *in terms of risk exposure, adaptation needs and solutions as well as investment needs*" for critical infrastructure (p. 20). This knowledge gap is not bridged in EU-D3, D4, and D8*,* as they are non-specific on adaptation needs and climatic risks.

For NATO, the importance of critical infrastructure was featured in NATO D2-D8. For example, NATO D6-D8 presented how climate impacts could disrupt critical infrastructure necessary for military operations across Europe. EU-2 highlighted 500 military mobility hotspots in the Trans-European Transportation Network (TEN-T) identified in consultation with NATO. NATO-3 stated that "*Nations are interested in critical national infrastructure and SACEUR, Supreme Allied Commander Europe, is interested in mission-vital infrastructure*". Mission-vital infrastructure, such as energy and transportation systems, was seen as crucial for military mobility, enablement, and sustainment of operations in NATO host nations. However, NATO-3 claimed that it is uncertain how each nation prioritized climate risks to critical infrastructure due to divergent threat and risk perceptions amongst Allies.

This uncertainty was shared with national stakeholders and private sector respondents. According to private sector-1 and private sector-2, critical infrastructure operators and businesses will prepare for climate risks that threaten their underlying business model. However, they claimed that preparing for systemic climate risks "*has to be something enforced,*

otherwise they stay in their field of play". Critical infrastructure operators' awareness of cascading climate risks was siloed by sector. National-level stakeholder-2 claimed that operators *"are aware of climate risks, especially the big companies and organizations* [...] *but it is very hard to tackle that*". Furthermore, national stakeholder-3 suggested that inter-institutional coordination for critical infrastructure disruptions remained "*response-oriented...we don't do prevention and preparedness. We have no exercise to tell what they need to prepare for...only response".* Expert-2 claimed that climate change is a systemic risk that needs to be accounted for in infrastructure preparedness. Yet, private sector-1 claimed that many companies were unaware of the CER Directive and attributed challenges related to policy and regulation overload.

5.3 No Formalized Science and methodology

A common obstacle for respondents was a lack of formalized science and methodology to address cascading climate impacts. Expert-1 explained that *"we're talking about systemic risk, resilience, cascading failures and all that, but I think we don't have good methodology, we don't have consensus on how it should be done*". Many practitioners simply do not know where to begin due to a lack of scientific consensus or concrete policy actions to mitigate cascading effects. With no formalized science or methodology, national stakeholder-2 suggested that governments would lack comparable risk assessments to inform policymaking and decisions. They claimed that most risk assessments would be ad-hoc and lack a transboundary dimension. This was echoed by private sector-2, who suggested the need to move from traditional to dynamic risk assessments with more complex risk profiles.

Respondents felt a need to simplify cascading climate risks for policymakers. Expert-2 claimed that "*Ultimately, if we want to base policy on science, we have to be able to abstract things that are translatable into policy. We cannot work with too complex science. It doesn't work*". This view was also shared by national stakeholders 1 and 4 for their national governments. The EU, NATO, and national stakeholder respondents also claimed these risks must be filtered through a resilience and security prism to be policy relevant. Respondents suggested that any formalized science and methodology on cascading climate risks must be relevant and actionable for resilience, preparedness, and critical infrastructure policies.

5.3.1 Risk Complexity and Uncertainty

As cascading climate risks possess dynamic and spatial complexity, risk complexity and uncertainty were concerns. According to NATO-1, "*all the records are being broken…we thought climate change was going to be incremental based on the science, but it's not* […] *the climate system is becoming strange*". Despite this strangeness, Expert-2 claimed that the private sector and national ministries need clear timelines and risk assessments for planning, preparedness, and investment purposes. However, according to national stakeholder-4, "*if you simplify things too much, then it actually becomes counterproductive. If you just talk about*

climate change and natural disasters, then that is a very simplified version of what the world really is…". When it comes to cascading risks, national stakeholder-4, suggested that "*they're really hard to sort of describe or like pinpoint like this is now the risk that is happening because it takes a lot of time and I think that is very challenging for a lot of decision makers and politicians*". The lack of clear risk ownership and owners was highlighted by stakeholder-3, expert-2, and NATO-3. Expert-2 claimed that even with EU regulations and frameworks "*either there is no delegated or dedicated authority on the subject. Or they're like in different corners in the institutional architecture*". NATO-3 suggested that a clear risk owner with authority and accountability is rare, while expert-3 stated that it is the national government.

This risk complexity and uncertainty were also characteristics of interdependent infrastructure systems. EU-NATO-D4 suggested that "*Due to this high degree of interdependence among different types of infrastructure, the effects of disruption in one sector can cascade, affecting critical infrastructure in other sectors as well*" (p. 8). The cascading failures across infrastructures made impacts uncertain until it happens. Due to the inherent "*complexity of our system*", expert 1 concluded that "*you cannot prevent cascading failures from happening*". As systems were designed for efficiency and speed, they recommended that policymakers focus on adaptation and recovery instead.

5.3.2 Lack of Common Baseline for Adaptation Planning and Risk Assessments

Multiple respondents expressed the need for a common baseline for adaptation planning and risk assessments, as well as similar terminology for risks. National-stakeholder-2 claimed that at the EU and national level, there is no baseline scenario for climate risk assessments, analysis, and adaptation planning. National stakeholder-2 emphasized, "*If you want to compare and adjust, you need to have that same baseline".* This meant that each member state and critical infrastructure operator may not have comparable risk assessments. Expert-1 and expert-2 expressed the need for a shared EU-wide baseline to assess climate risks and pursue adaptation measures for climate-related triggers. Without a common EU-wide baseline for risk assessments and adaptation planning, efforts would remain fragmented and ad hoc. While EU-D3 requires comprehensive risk assessments and strategies for critical entities, the directive is unclear about cascading climate impacts. Echoing this, EU-D7 claimed: "*there are no reliable assessments of how well EU infrastructure will be able to function in the changing climatic conditions*" (p. 19). EU respondents highlighted the upcoming EU comprehensive risk and threat assessment to address this for preparedness.

5.4 Climate is not a priority

EU-D1, EU-D2, NATO-D5, and EU-D7 framed climate change as an existential threat. However, many respondents suggested that climate change is not a top priority for decision-makers and policymakers. They qualified that does not mean that nothing is being done, but that climate change is not the prime motivator for preparedness and resilience actions. National

stakeholder-1 claimed that "*my gut feeling is, yeah, it's underestimated the risk that climate change is posing for our overall societal resilience*". This mirrored expert-2, who expressed that "*our preparedness leaves much to be desired in a way…we're not doing anything for climate reasons here*". This is even influencing All-hazards risk assessments, as expert-3 claimed that "*climate is never at the top, it's never middle of the pack. And so even when climate is makes the list, and it's just an add-on*". This was confirmed by private sector-2, who claimed that some critical infrastructure operators may not consider climate change as a top priority compared to other short-term risks. Expert-3 suggested that "*… climate is important but not seen as urgent by a lot of the actors and things like Ukraine and Russian drones in Iran are urgent and important*."

5.4.1 European Crisisification

Multiple respondents felt that Europe is overwhelmed by converging crises. EU-2 stated that Europe has been *"…in crisis mode for the past few years now, bouncing from crisis to crisis".* Respondents cited the war in Ukraine, the conflict in the Strait of Hormuz, and the Trump presidency as contributing crises distracting from climate action. National stakeholder-3 suggested that *"…since the Russian invasion of Ukraine, climate risks are neglected at the political and policy level* [lacking] *the same priority, attention, and funding*". This is similar across other European countries. National stakeholder-1 claimed that, for preparedness and military operators, "*All the main effort is short-term…there is no point in being ready for the long term if you're not ready for tomorrow".* Despite short-termism, the policy documents claimed that Europe is facing a future of interconnected crises. EU-D10 stressed that "*major cross-sectoral crises, shocks and disruptions occurring simultaneously in the years ahead*" (p. 33). As such, "*Europeans need to be prepared for a prolonged period of increased risk and deep uncertainty, requiring a pro-active strengthening of preparedness and resilience across all sectors*" (p. 33). However, defense and security concerns are treated as more policy relevant than climate ones across EU-D14-D16 and NATO-D3.

5.4.2 Impact of Politics

The political landscape influenced how climate risks are prioritized. National stakeholder-4 shared this emerged as "*a four-year cycle of prioritization*" that influenced how climate change is framed and what resources are dedicated to mitigating the risks. This was echoed by national stakeholder-3, who claimed: "*It largely depends on who is in charge of German politics. And here, the political landscape really comes into play".* National stakeholder-1 expressed that you cannot fully speak about climate change, rather *"severe weather events that happened miraculously. So, but that's a political reality".* As a result, this influenced how resilience and preparedness efforts are implemented at the national level. NATO-3, when discussing national resilience plans for NATO Allies, stated that "*if you think climate is a hoax you probably aren't going to be doing a lot of national planning on the resilience of national critical infrastructure. But if you do take it seriously, you are...".* It also influenced where and how climate risks are framed in policy documents in the EU and NATO.

5.4.3 Asymmetric Threat and Risk exposure

Across Europe, many respondents believed that risks are not all experienced or prioritized the same. There were significant asymmetric threat exposure and perceptions. EU-2 claimed that "*Security has become the focus of the EU… in fact, the whole, entire EU Strategic compass direction has changed. It has become very different. More internally looking*". This was echoed by NATO-2 who argued that NATO has returned to the "*core priority of sustaining and shaping our deterrence and defense posture*". Across geographies, national governments prioritized risks differently, with what EU-1 termed as "*regional differences*". This influenced the diversity of risk perceptions for climate-related risks. NATO-3 suggested that "*those that are affected and take it seriously and will plan for it. And those that aren't affected, don't".* They suggested this asymmetry has implications for NATO collective resilience because it undermined policy mainstreaming and coherence. Expert-2 shared similar views of European-level fragmentation *"because of member states having different interests and priorities around these issues, because they go to the core of national security".*

While European securitization "*can elevate issues and create a sense of urgency. But it also kind of means in our political system at least, that things actually go back to the government level*" claimed Expert-2. As critical national infrastructure is a security issue, national stakeholder-3 claimed that "*We are in a completely new era where the climate is now overlooked. And they don't connect these dots for critical infrastructure. They see all these other risks or what the government tells them to look at"*. As a result, climate risks are not always prioritized the same way as hybrid and cyber risks. As the European risk landscape intensifies, EU-D6 stressed that *"the convergence of multiple, simultaneous risks that ripple across national borders calls for a change of mindset at all levels".* Respondents suggested that asymmetric threat perceptions and exposure would have implications for how resilience and preparedness actions are designed. Expert-2 and national stakeholder-1 also stressed that common definitions and perceptions of preparedness and resilience were not self-evident across stakeholders.

5.5 Emerging Responses

Some policy documents and respondents alluded to emerging and shared responses in Europe. Emerging responses are framed as new policy responses (i.e. legislations, guidance, and frameworks) and informal practices (i.e., networks, informal ties, new structures). Cascading climate risks occasionally featured within these emerging responses. However, new policy instruments are necessary to integrate climate resilience into European preparedness and resilience efforts. The EU respondents stressed that this will be addressed in the EU-wide Comprehensive Risk and Threat assessment and the EU Integrated Framework on Climate Resilience. While the comprehensive risk assessment presents a clear EU-wide risk picture, the integrated framework will embed an EU governance and coordination mechanism to address systemic climate risks. Both serve to improve EU coherence and mainstream climate adaptation and resilience across EU policy domains.

For EU-NATO coordination, one key development highlighted by EU-D5 was the launch of an EU centre for climate change, defense, and security, designed to complement the NATO Climate Change and Security Centre of Excellence. EU and NATO respondents suggested that, despite climate change not being a high political priority, informal ties and networks ensured continuity and mainstreaming. According to EU-2, the new EU arrangement would bring together "*all the people who need to be in the room*", including the EU, NATO, national authorities, and leading experts. Many respondents suggested that the development of a community-of-practice increases mainstreaming across mandates and policy domains.

5.5.1 Adaptation as Priority

Adaptation was seen as a priority if it aligned with wider preparedness, resilience, and security goals. The EU-D10 highlighted that "*climate adaptation and steps to enhance our long-term security should increasingly be considered as part of the same resilience-building challenge for Europe*" (p. 49). It suggested that the "*EU's climate adaptation policies will also need to integrate wider security and geopolitical challenges*" (p. 49). EU respondents expressed optimism that the revised EU Integrated Security Strategy will centralize climate-related risks to European security. NATO-1 suggested that adaptation is essential because "*climate change is today's security problem*". Similarly, NATO-3 and national-stakeholder-4 suggested the necessity for resilient infrastructure for military mobility to sustain and enable NATO missions and Host Nation support. National stakeholder-1 and 2 highlighted how climate risk assessments were being used to inform the Belgian National Resilience plan and plan for climate impacts horizontally. The private sector respondents 1 and 2 stressed that critical infrastructure operators can proactively engage with adaptation measures regardless of EU regulations and directives. Overall, many respondents saw EU and national legislation as important to stream-line adaptation.

5.5.2 Whole-Society Approaches

Whole-of-society and whole-of-government approaches emerged as critical to address preparedness and resilience challenges. As critical infrastructure systems span across all of society and perform vital societal functions, EU-D10 stressed that "*All major structural and regional investment supported by the EU budget should have security risk and disaster-proofing, climate-resilience and crisis-preparedness components further integrated by design"*. This merging of preparedness, climate resilience, disaster risk management, and security was the norm across respondents. In EU-D5, D9, D10, D11, D14, and D16, the role of dual-use considerations, infrastructure, and capacities were highlighted. National stakeholder-4 suggested that "*there is no purely military infrastructure. There are no military roads, railways, hospitals, accommodations, or food systems. It's all based on the civilian systems that are working properly..."*. Maximizing national investments, uniting divergent policy goals, and bolstering civil-military readiness were deemed essential to address transboundary crises.

Whole-of-society approaches also complemented NATO baseline resilience requirements and planning in NATO-D1, D3, and D4. NATO-2 stressed that "*resilience is one of those things where the Ally in question is meant to be the one leading the effort*". NATO does not say how it should be done. NATO-3 and NATO-1 suggested that bridging resilience and defense planning was essential. While EU-1 claimed that "*societal resilience is your direct link to climate resilience*".

Yet, whole-of-society approaches were adopted unevenly across Europe. Many respondents expressed how each country adopts it differently and are at different stages. EU and NATO policies are customized within this process. Expert-2 highlighted the importance of Nordic total defense approaches that the rest of Europe "*does not have yet*". At the national-level, expert-3 explained that there is still institutional and risk divergence between security actors, emergency services, civil protection, CI operators, and climate experts. For national coherence, "*uniting the resilience tribes*" was seen as crucial to maximize national budgets and avoid fragmentation. Expert-2 and expert-3 highlighted the centrality of public-private partnerships and aligning dual-purpose resilience for critical infrastructure. Ultimately, expert-3 claimed that "*now there's a sense of urgency on being prepared. But if people don't see climate as part of the equation and they treat it as a tack on, then we deserve what we get."*

5.5.3 Coalition of the Willing

Often, respondents found the EU and NATO deadlocked politically or too slow to respond to crises. Many opted for coalitions of the willing to cooperate on shared risks, threats, and priorities. Expert-2 claimed that "*We need to think less at a kind of integrated European level more and like these coalitions of the willing, that kind of lead action. And the EU should facilitate this*". They further suggested that coalitions of the willing emerge "*out of necessity*" and are "*issue-specific*". Regarding cascading climate risks, national stakeholder-2 presented a strong case from Belgium, which developed a joint transboundary climate risk assessment with the Netherlands, Germany, and France. National-stakeholder-4 suggested that regional groupings, as "*a good middle step between the national and then the European level to have this kind of joint coalition of willing…as a highway that goes both ways,*" and highlighted the Nordics due to their understanding of "*shared threats from climate change*". While not related to climate risks, NATO-3 highlighted regional cooperation, such as the Nordic-Baltic region, as a promising coalition and enabling environment. Expert-3 expressed the usefulness of European-wide best practices that can be applied elsewhere.

6. **Discussion**

6.1 Main Findings

The results from the document analysis and thematic coding suggest that European risk governance for cascading climate impacts is a complex endeavor. This section addresses the research questions and discusses the role of frameworks and multi-level governance. Key

themes and subthemes are discussed to present enablers and barriers to addressing cascading climate risks at the European level. Lastly, the potential implications for critical infrastructure resilience and military mobility are presented through the example of the TEN-T, which was highlighted by respondents and EU-NATO Structured Dialogues.

6.1.1 Addressing Cascading Climate Impacts in EU and NATO policies

For RQ1, the findings from EU and NATO policy documents and key respondent interviews suggested strong awareness of cascading climate risks in the EU and NATO. However, these risks have yet to be fully integrated into EU and NATO policies for preparedness, resilience, and critical infrastructure. While direct climate risks are regularly covered, cascading climate risks, with strong dynamic and spatial complexity, are still emerging. Both the EU and NATO have identified and, preliminarily, assessed cascading climate risks and their implications for their mandates. However, that does not mean that this is self-executing within the EU and NATO policy mainstreaming. This aligns with Mikaelsson et al. (2026) who found strong awareness, but fragmented operationalization and risk ownership at the national and EU-level.

At the EU-level, there is strong awareness of cascading climate risks within the Joint Research Centre (JRC), the European Environmental Agency (EEA), and the European Scientific Advisory Board on Climate Change (ESABCC). Regrettably, this knowledge remains siloed in the scientific and climate adaptation communities (Harris et al., 2026). For critical infrastructure, while the CER directive provides a promising voluntary template for assessing critical entities, it does not offer substantial guidance on cascading climate risks, preferring an all-hazards approach to cross-sectoral and cross-border risks (European Commission, 2025b). For NATO, cascading climate risks are acknowledged but have not yet been integrated into preparedness, resilience, and critical infrastructure planning. More often, they are framed as altering the current and future operational and strategic environment in which NATO and the EU operate.

As shown in the results, the reasons for this gap were influenced by mismatched policy and scientific tools, and priorities. A lack of formalized scientific methodology and a common baseline for climate risk assessments and adaptation planning make addressing cascading climate risks challenging. The inherent risk uncertainty and complexity make uniform policies complex. Moreover, there is likely a gap between scientific evidence and actionable policy guidance and best practices. Even if these had developed, uneven prioritization of climate risks by policymakers and asymmetric risk and threat perceptions could make EU-level progress uneven. Furthermore, European crisification can dictate the policy agenda and funding landscape (Rhinard, 2019; Garančovská & Meislová, 2026). For cascading climate risks to grow on the policy agenda, the findings suggest it will require a balance between EU-level climate risk assessments and adaptation planning, EU-NATO coordination, and multi-actor frameworks.

6.1.2 Shared coordination, responses, and risk ownership across governance levels

For RQ2, the results imply that current approaches to address cascading climate risks do not equal shared coordination, responses, and risk ownership. At least not at the EU-NATO level. Yet, there is potential to mainstream them into emerging responses and structures. EU-NATO policy coordination is strong and increasingly coherent through the EU-NATO Task Force on critical infrastructure and the EU-NATO structured dialogues on resilience, military mobility, and climate, energy, and defense (European Commission, 2023). As shown in the results, the informal ties and staff-to-staff exchanges between the institutions ensure a shared threat picture and alignment. Climate-related security risks are emerging as a priority area. As implied by respondents, NATO is returning to its core mandate. Therefore, the EU has greater capacity to address cascading climate risks through EU-level mainstreaming and policy instruments. Yet climate change adaptation will remain a strategic priority for NATO. However, EU-NATO alignment, coordination, and coherence will remain a constantly negotiated reality influenced by divergent roles, capacities, and mandates.

For cascading climate risks, as the respondents suggested, this division of labor still needs to be further established across governance levels. A common perception from respondents was that NATO provides the North Star, while the EU provides the map of regulatory, financial, and policy instruments to support the journey. This reflects the different institutional identities and capacities. The EU shapes behavior through regulations, directives, and funding; NATO through norms and standards (Pursiainen et al., 2026). NATO could update its baseline resilience requirements and defense planning to mitigate the consequences of cascading climate impacts in NATO's national-level resilience, defense, and enablement plans. Other sources suggest synchronization and coherence between the NATO baseline resilience requirements and the EU preparedness baseline requirements (Niinistö, 2024). This would improve policy coherence between the EU, NATO, and national governments, especially if enabled by whole-of-society approaches.

Yet this has many barriers. The results suggest a lack of clarity on how EU and NATO policies are harmonized at the national level. As such, there may be a gap between what is said and what is done. Confirming this, a recent study by Amakrane and Biesroek (2024) found limited evidence of concrete adaptation measures by the European military and defense sector despite the mainstreaming of climate-related security risks. This aligns with assertions made by EU and NATO respondents and policy documents. The gap widens as whole-of-society approaches remain piecemeal and uneven across Europe, with divergent levels of progress, integration, and threat exposure (International Institute for Strategic Studies, 2026).

A surprising finding from interviews was the emergence of ad-hoc responses and proactive measures. For example, national level and coalitions of the willing have filled the gaps between the EU and NATO on issue-specific areas. Some national governments developed a joint transboundary climate risk assessment with other countries, while other governments conducted

cascading climate risk awareness across ministries. This emerged organically, inspired by best practices, necessity, and past scientific inputs, such as the 2024 European Climate Risk Assessment. This result implies that addressing cascading climate risks will not rest with the EU and NATO alone.

While not related to cascading climate risks, other sources suggest a trend towards coalitions of the willing. Based on shared interests, the European Coalition for Civil Preparedness and Resilience, focused on critical infrastructure resilience, has been active since 2025, and includes Belgium, Estonia, Finland, Latvia, Lithuania, Luxembourg, the Netherlands, Poland, Germany, and Sweden (Finnish Government, 2026). For issue areas such as military mobility, Germany, the Netherlands, and Poland have developed the first European Military Mobility Area to harmonize assessments and coordination efforts (Håkansson et al., 2026). The emergence of coalitions of the willing for specific issue areas is significant. These examples, coupled with other emerging responses, confirm Blondin and Boin's (2020) theory that if actors cannot decouple from a risk or possess symmetrical risk exposure, then coordination and joint responses are possible. Collectively, the results imply that issue-specific coalitions and regional approaches could create a system of multi-level governance. Yet the opposite can also be true.

As Aven and Thekdi (2022) suggest, risk is both objective and socially constructed, and the prioritization of risks is a choice made by actors who manage and are affected by the risk. Cascading climate risks were seen as actor-less threats, unlike cyber or hybrid attacks, which are discreet or adversarial events. It grays the boundary between the risk owner, risk recipient, and mandates. Therefore, policy incoherence, ad-hoc responses, and unclear risk ownership also remain true. While the CER directive and other EU legislations do provide some alignment, that does not mean risk prioritization and policy implementation are even across Member States. Diverging from EU policy goals, the results suggest that asymmetric exposure and threat perceptions could lead to these risks being poorly assessed and prioritized across Europe. Moreover, preferences for national decision-making and planning made shared EU and NATO-level responses elusive (Blondin & Boin, 2022). This is compounded by the number of actors involved across governance levels, from supranational to national to local.

6.1.3 A New Framework for European Climate Resilience

Altogether, the findings suggest that there is no shared framework for climate resilience in Europe. As such, existing adaptation planning and risk assessments may miss or omit cascading climate risks entirely (Harris et al., 2026). However, there is potential for this to change. As signaled by EU respondents, the Commission will announce the EU Integrated Framework on Climate Resilience in fall 2026. This framework will guide EU policy coherence and establish a shared baseline for adaptation planning, climate risk assessments, and legislative requirements across EU policy domains. To complement the EU integrated framework, the ESABCC (2026) advocates the EU to "*explicitly consider transboundary, compounding, and cascading risks*" as a requirement for climate risk assessments across all EU policy domains (p. 11). The ESABCC suggests that current fragmented approaches to adaptation planning create opportunities for

transboundary and cascading climate risks to undermine EU coherence, cohesion, and societal resilience (ESABCC, 2026).

Respondents suggested that other EU-level policies will complement the Integrated framework, such as the revised EU Integrated Security Strategy, the updated EU comprehensive risk, and future iterations of the European Climate risk assessment. However, from a coherence perspective, the EU Integrated Framework and revised EU security strategy may be ineffective if they do not shift the CER directive to consider cascading climate risks explicitly. Including these risks in the CER directive, could position cascading climate risk considerations into updated risk assessments every four years for each EU member state. However, the delayed transposition by member states suggests the CER directive is uneven across the EU and has wider structural challenges for EU policy implementation (European Commission, 2026). Moreover, if the Integrated framework is not designed in consultation with NATO, then EU-NATO policy coherence may diverge (Cejudo & Michel, 2017).

The results indicate that although NATO cannot obligate its Allies to integrate these risks into their resilience and defense planning, it can highlight their importance. Recently, NATO updated its baseline resilience requirements for NATO Allies to improve Host Nation support (NATO, 2026b). While climate risks have been newly integrated into these requirements, as suggested by respondents, a further update to include cascading climate risk considerations is warranted. For NATO's 1.5% GDP budgeted for resilience and critical infrastructure, the assessment of cascading climate risks could be standardized to improve civil and military readiness. EU regulations and funding from the EU Multiannual Financial Framework (MFF) 2028-2034, paired with NATO policy signaling, can make climate resilience-by-design a new prerequisite. However, this will need to be considered after the MFF and proposed budget are finalized. Regardless, the EU and NATO must reach a consensus and move beyond direct climate impacts to risks of greater spatial, dynamic, and emergent complexity.

6.1.4. Multi-level Governance and Actor Constellations

For European risk governance, multi-level governance systems may need to become the norm to address transboundary crises. As transboundary crises test the response and preparedness capacities of the EU and NATO, signs of multi-level governance systems are emerging. As suggested by Hooghe & Markes (2021) and implied by the results, both vertical and horizontal pathways occur across risk actors. From a vertical perspective, the CER directive has the Critical Entities Resilience Group, composed of public and private stakeholders across local, regional, national, and supranational levels (CER Directive, n.d.). Horizontally, within countries, whole-of-society approaches to preparedness, resilience, and critical infrastructure bring together multiple actors.

While many preparedness and resilience structures are not created to address cascading climate risks, they do offer an enabling environment to mainstream and operationalize them. When responding to cascading climate impacts, Talebian et al. (2025) explained the need to classify

actor constellations (i.e., the combination of risk owners, managers, and recipients) in response and preparedness actions through multi-agency coordination. These can be public (between national governments), private (critical infrastructure operators), recipients (public and private actors), and system-level (EU and NATO) actor constellations (Talebian et al., 2025). It is important to find shared response types and roles to address cascading climate impacts, and where along a risk transmission pathway to intervene with adaptation and preparedness measures.

As shown in the results, risk ownership is an imperative. As the EU Integrated Framework is developed, it will be important to identify risk recipients and owners as well as mainstream potential adaptation responses for critical infrastructure systems, such as transport corridors, energy grids, port, and communication networks, identified in the CER directive. A study by Auer et al. (2025) confirmed that critical infrastructures are critical intervention points to enhance EU adaptation to cascading climate impacts from outside of Europe. However, the same principle applies inside Europe. These can be framed as response types as show in **Figure 3** from Talebian et al. (2025). In this, different actors, such as infrastructure managers, can engage in interventions to address cascading climate impacts with funding from the EU that complements NATO resilience targets. The different response types are presented as possible adaptation options and policy interventions for actors. However, particular response types depend on each risk owner(s) and recipient(s).

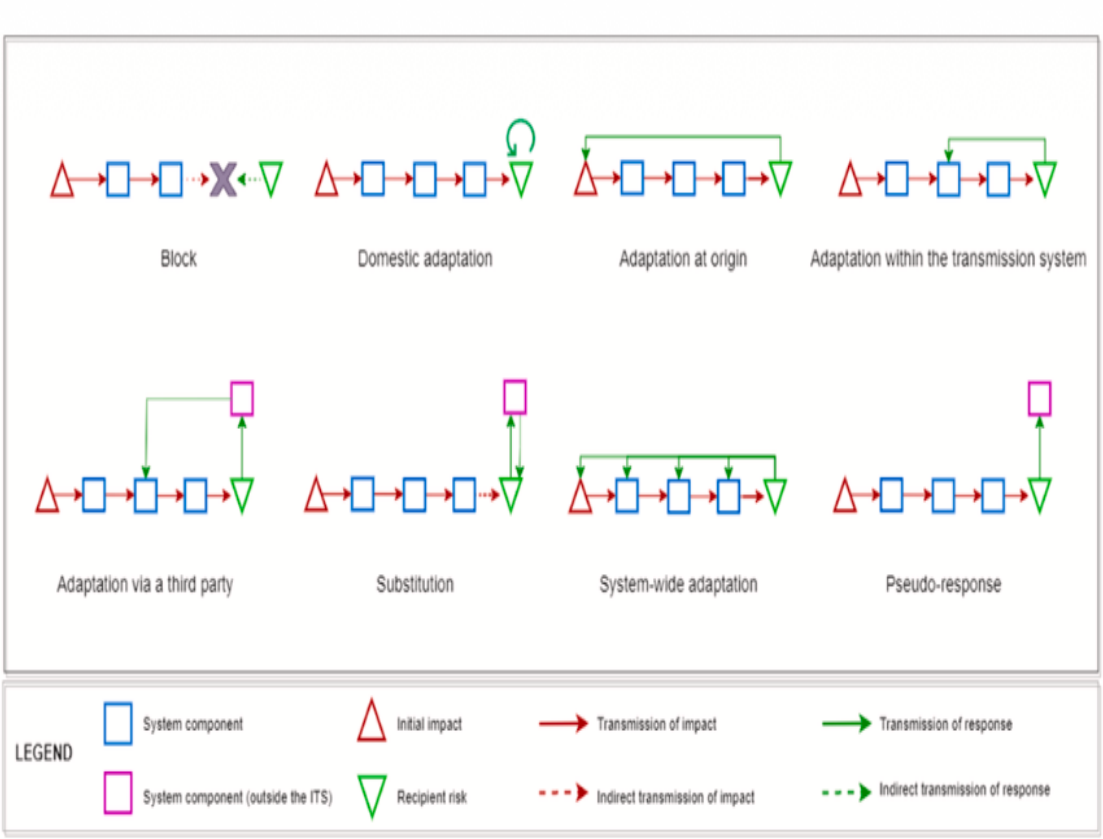

Figure 3 – Cascading Climate Impact Response Types
(Source: Talebian et al., 2025).

Climate adaptation may require multi-level and transboundary governance (Talebian et al., 2025). Extremely narrow interpretations of risk governance and policy planning could lead to limited risk ownership, while overly broad interpretations could equate to unclear risk ownership. Supranational organizations, national governments, coalitions of the willing, and the private sector will need to negotiate clear risk ownership, mandates, and responsibilities (Talebian et al., 2025). Complementary to the CER directive, they would need to map out potential risk recipients for cascading climate impacts on critical infrastructure (Talebian et al., 2025). Targeted adaptation measures for cross-border infrastructure spanning multiple countries are important to avoid risk contagion, maladaptation, and systemic vulnerabilities (Talebian et al., 2025; Logan et al., 2026). Aligned with the results, the ESABCC recommends a common EU-level baseline for adaptation planning, and a coordinated approach to climate risk assessments (ESABCC, 2026).

At the European-level, EU-NATO structured dialogues can align EU preparedness baselines with NATO resilience baseline requirements for joint EU-NATO members. As suggested, the EU has greater capacity and competence, while NATO can standardize such considerations across NATO Allies on critical issue areas such as military mobility, enablement, and Host Nation resilience. Lastly, reviews and checks on policy coherence would be essential to maximize harmonization and reduce fragmentation. To improve actor constellations, NATO can involve the private sector to jointly identify interdependencies, bottlenecks, and cascading effects on cross-border critical infrastructure networks (NATO Civil Protection Group & MCF, 2024).

Collectively, the creation of actor constellations, vertically and horizontally, could provide a foundation for shared risk ownership and joint responses to transboundary crises (Talebian et al., 2025). In this way, Hooghe and Markes (2021), Blondin and Boin (2020), and Talebian et al. (2025) complement each other when responding to and preparing for cascading climate risks. While promising, actor constellations and multi-level governance systems would need to overcome significant risk and exposure asymmetries, navigate risk complexity and uncertainty, and agree on who pays for what. There remains a distinction between these concepts as aspirational frameworks and their practice. The next sub-section explores the implications of the findings.

6.2 Implications

6.2.1 European Critical Infrastructure Resilience

The implications of cascading climate risks for critical infrastructure are emerging. The ESABCC (2026) claims that "*the EU faces systemic risks [from climate change] to critical infrastructure, supply chains and the single market, with cascading effects across borders*" (p. 47). Yet, as shown by the results, it does not appear that these risks are fully mainstreamed through the EU, NATO, or even national-level policies. For EU-level policy coherence,

cascading climate risks need to be uniformly considered by national governments and translated into requirements for critical infrastructure operators.

While assessing cascading effects is required in the CER directive, critical infrastructure operators may underestimate their exposure. A critical infrastructure operator may ask themselves, *Will my infrastructure asset be impacted*? Rather than what *happens if connected transport, communications, and energy systems are affected or fail together?* This becomes a different operational logic, requiring coordination across sectors and infrastructure systems. As a rule, traditional engineering risk assessments focus on isolated events or direct impacts (Logan et al., 2026). Yet progress remains limited due to a preference for *"individual systems and sectors, rather than a systems-of-systems perspective*" (Arvidsson, 2024, p. 40). There is a fundamental "*mismatch between the complexity of risk and the capability of prevailing assessment methods*" (Logan et al., 2026, p. 8). This aligns with respondents who suggested that the science and methods have not caught up with a changing risk landscape.

This looks different across sectors. According to Verschuur et al. (2024), "*systemic risk assessments of road and rail networks failures under climate change-driven hazards have been limited so far, and are much harder to validate"* (p. 7). Airport infrastructure also often fails to consider network failures and systemic risks, while consideration of climate risks to telecommunications systems is rare (Verschuur et al., 2024). Lastly, cross-sectoral considerations between mutually interdependent networks are still emerging for climate-related hazards (Verschuur et al., 2024). The EU and NATO possess a strong understanding of cascading effects and have integrated this into discussions on critical infrastructure, security of supply, and societal resilience (European Commission, 2023). Yet, this must be mainstreamed through regulations, norm-setting, and all-hazards risk assessments to be effective.

Mitigating cascading effects from climatic hazards requires critical infrastructure systems that are sufficiently adapted to climate risks. It moves beyond the adaptation of a single asset and towards systemic adaptation of connected systems (Harris et al., 2026). The CER directive could be strengthened by integrating cascading and systemic climate risks into EU Member States' comprehensive national risk assessments and critical entity strategies (Harris, 2026). As these assessments occur every four years, these risk considerations are relevant across the 11 CER sectors, including transport, energy, water, health, and food systems (CER Directive, n.d.).

Yet, improved risk awareness is not enough. As many respondents suggested, addressing cascading climate risks require a renewed consensus on European risk governance. It also requires enabling legal frameworks that emphasizes cross-border resilience and NATO Host Nation Support (NATO Civil Protection Group & MCF, 2024). As such, systemic risk assessments must be integrated into wider European risk governance (Logan et al., 2026). It must overcome reactive attitudes towards cascading risks, and national and cross-sectoral siloing between infrastructure operators (Rydén Sonessen et al., 2021). Collectively, this will need to be negotiated between a constellation of actors to develop shared responses, risk ownership, and prioritization (Talebian et al., 2025).

6.2.2 Military Mobility and the Trans-European Transportation Network

As the EU and NATO prioritize territorial defense and preparedness, vulnerable and mutually dependent critical infrastructure systems complicate a key EU-NATO priority area: military mobility in times of crisis and war. Military mobility relies on resilient dual-use transport infrastructure, such as railways, roads, airports, and ports, to move forces, personnel, and equipment across Europe (Chihaia, 2025). As highlighted by NATO respondents, critical infrastructure shapes defense and resilience planning. Since cross-border critical infrastructures are systems of systems, neighboring countries face mutual dependencies for military mobility and operations across regions (Ekström, 2024; Chihaia, 2025).

In a de-stabilized security environment, climate risks do not disappear. While climate risks are sometimes considered in military mobility challenges, other research implies they are overlooked due to more pressing short-term risks such as hybrid, cyber, and kinetic attacks (da Costa et al., 2023). Yet climate hazards could create similar cascading effects and failures that produce mobility bottlenecks and significant delays. While defense and military planners plan for some level of disruption and redundancies, mission-vital critical national infrastructure can remain exposed to cascading climate risks through indirect exposure by interconnected systems (da Costa et al., 2023). In this way, "*deterrence becomes less about preventing invasion and more about managing systemic disruption*" (Didelot, 2026, p. 1).

As shown in the results, EU-NATO structured dialogues on resilience and military mobility do not yet include cascading climate impacts. Herein lies the problem of policy coherence. Therefore, it is fair to assume NATO national resilience plans and EU national preparedness strategies may not include them, unless it emerges ad hoc via national governments, coalitions of the willing, or informal ties. However, this goes beyond just military mobility. Disruptions to non-military critical transport and energy infrastructure can, through cascading effects, have second- and third-order impacts (Arvidsson, 2024). Extending on the findings, the implications for the TEN-T are presented. While other critical infrastructures are relevant, transport infrastructure featured prominently in interviews and provided a strong example of implications.

The TEN-T is a series of transportation corridors designed to bolster transportation speed and competitiveness across Europe. The TEN-T is becoming dual-use by design to bolster civil-military readiness and must consider military mobility needs for constructing and upgrading existing infrastructure (European Commission, 2024). The TEN-T is shown in **Figure 4**.

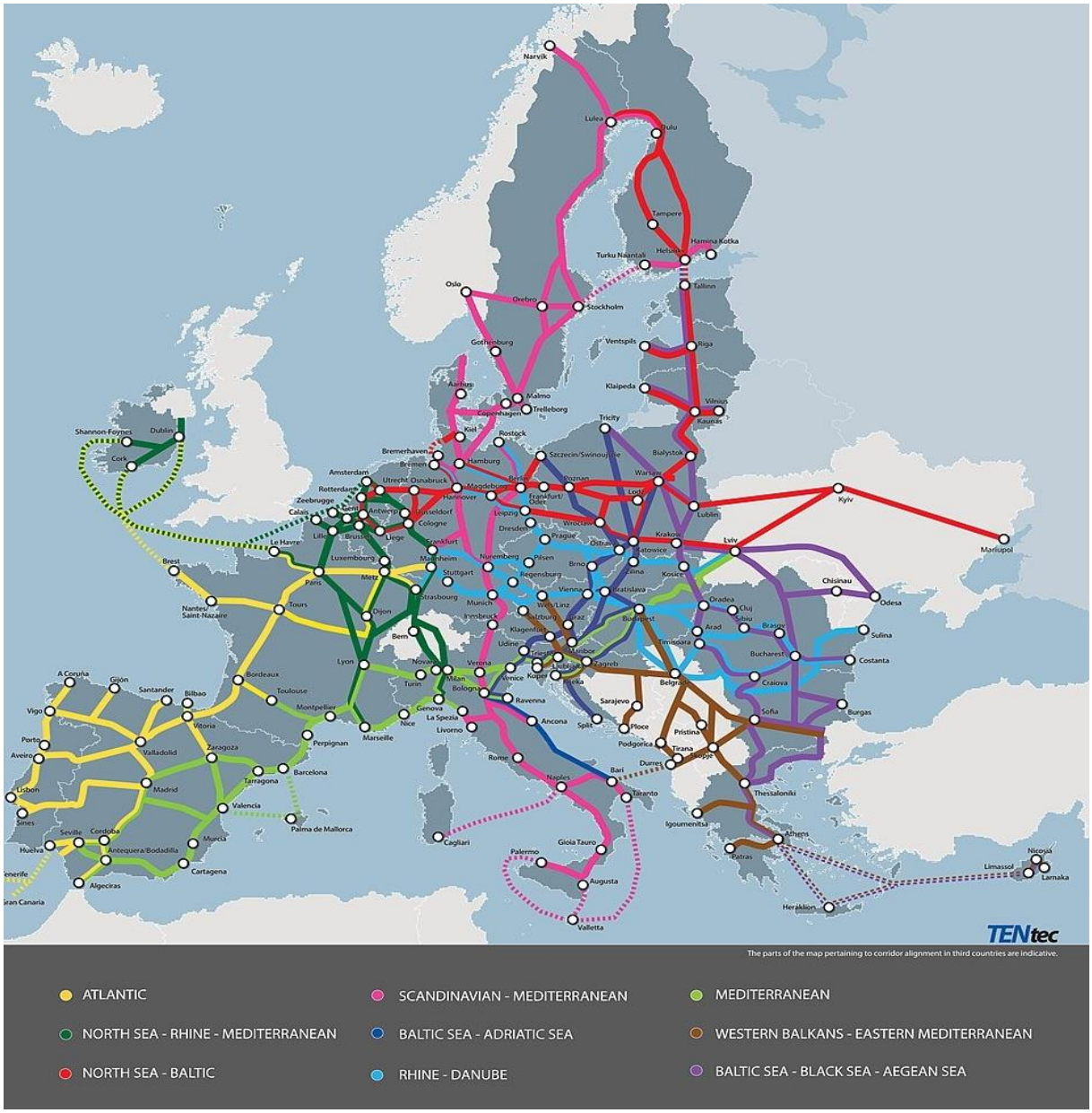

Figure 4 – TEN-T
Source: Wikipedia (2024). CC License 4.0. (From DG HOME).

A recent TEN-T assessment from the European Commission (Schade et al., 2024) found that "*all transport modes are already affected by climate extremes across Europe"* (p. 18). While the TEN-T is subject to climate-proofing legislation, it is estimated that 71 billion EUR is needed to adapt the TEN-T infrastructure by mid-century, with railways in the highest need. However, planned adaptation investments are only 3 EUR billion by 2035 (Schade et al., 2024). Moreover, this study found that vulnerability and preparedness diverged substantially across member states, with a correlation between a lack of preparedness measures and higher adaptation needs (Schade et al., 2024). Within this study, Eastern and Southern Europe had the highest adaptation needs and vulnerability. Consequently, Eastern Europe is also a priority region for military mobility, as outdated and limited infrastructure routes create significant bottlenecks (Marks & Arnold, 2026). While the revised TEN-T regulation does consider

cascading effects, cascading climate impacts are rarely mentioned (European Commission, 2024).

The lack of consideration of cascading climate impacts, coupled with adaptation gaps, implies that the TEN-T and its supporting transport infrastructure may not be resilient to systemic climate risks (ESABCC, 2026). A recent study found that despite 13,500 extreme weather events between 2005 and 2024, most European railways disregard climate risk in the design of new infrastructure (European Union Agency for Railways, 2026). While most all European railway infrastructure managers take ad-hoc adaptation measures, less than half have developed an adaptation plan (European Union Agency for Railways, 2026). This mismatch between adaptation planning, climate risk assessments, and uneven policy implementation brings challenges to the resilience of the TEN-T and CER directive. It is fair to assume this could lead to divergent capacities and capabilities across countries to manage cascading effects.

As critical infrastructure resilience is the heart of societal resilience, preparedness, and deterrence, this becomes a problem. In the event of a protracted conflict in Europe, NATO Allies would need to sustain infrastructure across multiple years. In the case of crisis or war, critical infrastructure shifts from reliability optimization to controlled systemic degradation (Johansson, 2026). Emphasis is placed on adaptation and recovery from cascading failures. Yet if cascading climate impacts are not accounted for, then the preparedness and resilience to those risks may be absent. As Ukraine has shown, kinetic and cyber-attacks on critical energy infrastructure during extreme weather events are becoming more common (IEA, 2024). So, too, is the convergence of climate security risks and hybrid threats (Briggs, 2020; Ellison, 2025). While critical infrastructure can manage one risk at a time, it is harder to manage multiple. With the potential for cascading effects across sectors and co-occurrence with hybrid and cyber-attacks, climatic risks become systemic and compounding (Wells et al., 2022; Renn et al., 2022).

Preparing for climate risks is central to European security. While EU and NATO policy coordination is strong, coherence needs to improve to streamline climate adaptation into substantive policies matched to changing climate risks. In the near term, Europe may be stress tested by an intensified El Nino with amplified extreme weather events and shifting hazard patterns (Wallace-Wells, 2026). In the medium-term, the crossing of earth system tipping points could further compound cascading climate impacts in Europe (Roman-Cuesta et al., 2025). As critical infrastructure can produce "*lock-in effects for decades*", it is important that they are sufficiently adapted to cross-sectoral climate impacts (ESABCC, 2026, p. 63). Over time, Thomasen (2025) implies that a widening adaptation gap could create a two-tier NATO where some Allies are adapted to and can operate in worsening climate conditions, while others cannot. The same two-tier logic is applicable to EU member states. In preparing for uncertain futures, climate resilience should function as a planning logic rather than serve as an "*empty signifier*" of policy intent (Stolzenburg, 2026; Friede, 2025, p. 2).

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The implications of this thesis suggest that transboundary crises and threats may become a new norm, further testing EU-NATO coordination and European-level responses. Cascading climate risks embody similar characteristics as other transboundary crises that exhibit cascading dynamics, such as the energy shock from the Strait of Hormuz and COVID-19. Therefore, the findings are applicable to cascading risks generally. Cascading risks require improved risk owners, policy coordination, and coherence. While critical infrastructure resilience is important, the consequences of cascading effects, in general, and cascading climate risks, in particular, for societal resilience and preparedness warrant further research.

7. Limitations and Future Research

This research study has many limitations. Firstly, as the research is exploratory, it will require further research and engagement with a wide range of stakeholders. More in-depth interviews with sector-specific critical infrastructure operators and national authorities could provide greater depth to the study. Secondly, the data collected from interviews could be improved by having full transcripts for all respondents. Thirdly, knowledge gaps persist due to the lack of publicly available material on NATO and EU critical infrastructure policies. Some key policy documents and regulations may have been missed. Lastly, my definition of cascading climate risks may diverge from other interpretations in the scientific literature due to terminological diversity.

Given the thesis's exploratory approach, the findings from this study are not representative of all EU/NATO countries. The generalizability of the findings may vary depending on respondent sampling and national and/or regional context if replicated. However, the broad sampling used in this study can provide a general picture of how cascading climate risks are understood at various levels. While the findings are presented through document analysis and interviews, national and sectoral case studies could have yielded new insights. The research has opened opportunities for further research on cascading climate risks, EU-NATO cooperation, and critical infrastructure resilience. Future research could consider how cascading climate impacts are addressed in national-level, regional, and cross-sectoral policies. Moreover, additional research is required to capture how national-level critical infrastructure operators understand these risks. Research could also consider how to design an EU-level systemic climate risk framework.

8. Conclusion

EU-NATO cooperation remains a negotiated reality. The findings of this research study suggest that EU and NATO awareness of cascading climate risks does not equal preparedness. The uneven appearance of cascading climate risks across EU and NATO policy documents suggests that policy coherence within the EU and NATO is not absolute. While EU and NATO policy documents provide policy intent, they are insufficient to capture how these risks are perceived and prepared for. The perspectives of practitioners and stakeholders across policy domains are essential to differentiate between policy signals and reality. While EU-NATO policy

coordination is aligning, policy harmonization still occurs at the capital level and is subject to national political priorities, risk and threat perceptions, and policy implementation.

As a result, shared responses, coordination, and risk ownership are still emerging across governance levels, but with promising pathways for national-level approaches and coalitions of the willing. However, uneven risk assessments and implementation have the potential to create a two-tier EU and NATO based on the resilience of their critical infrastructure networks to systemic risks. The lack of consideration of cascading climate risks may amplify consequences for vital societal functions, military mobility, and the TEN-T. While the EU Integrated Framework offers a promising start, Europe may require a European-level governance and coordination framework for systemic climate risks. Ideally, this could be based on EU-NATO policy coherence and climate resilience-by-design principles that make adaptation a strategic priority for Europe.

Statement on AI Usage

Grammarly AI was used to check for spelling and grammar accuracy. However, all research and content were performed by the author.

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List of Tables

[1] Talebian et al. (2025) and Canales et al. (2025) provided permissions for their figures and tables to be used and adapted for this research study.

Appendices

Appendix l

EU and NATO Documents Analyzed and Coded for the Research Study

EU Policy Documents	Short Form
Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - a climate-resilient Europe - the new EU Strategy on Adaptation to Climate Change (2021)	EU-D1
A Strategic Compass: For Security and Defence (EEAS) (2022)	EU-D2
Directive (EU) 2022/2557 of the European Parliament and of the Council of 14 December 2022 on the resilience of critical entities and repealing Council Directive 2008/114/EC (2022)	EU-D3
Regulation (EU) 2022/869 of the European Parliament and of the Council of 30 May 2022 on guidelines for trans-European energy infrastructure (TEN-E), amending Regulations (EC) No 715/2009, (EU) 2019/942 and (EU) 2019/943 and Directives 2009/73/EC and (EU) 2019/944, and repealing Regulation (EU) No 347/2013	EU-D4
Joint Communication to the European Parliament and the Council - A new outlook on the climate and security nexus: Addressing the impact of climate change and environmental degradation on peace, security and defence (2023)	EU-D5
Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: European Union Disaster Resilience Goals: Acting together to deal with future emergencies (2023)	EU-D6
Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – Managing climate risks - protecting people and prosperity (2024)	EU-D7
Council Recommendation on a Blueprint to coordinate a response at Union Level to disruptions of Critical Infrastructure with significant cross-border relevance (2024)	EU-D8
Regulation (EU) 2024/1679 of the European Parliament and the Council of 13 June 2024 on Union guidelines for the development of the trans-European transport network (TEN-T), amending Regulations (EU) 2021/1153 and (EU) No 913/2010 and repealing Regulation (EU) No 1315/2013	EU-D9
Niinistö's report: Safer Together: Strenthening Europe's Civilian and Military Preparedness and Readiness (2024)	EU-D10
Joint Communication to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: - on the European Preparedness Union Strategy (2025)	EU-D11
Commission Guidelines and reporting template developed pursuant to Articles 5(5), 6(6) and 7(3) of Directive (EU) 2022/2557 on the resilience of critical entities (2025)	EU-D12

Proposal for a Regulation of the European Parliament and of the Council on a framework of measures for the establishment of the Union Civil Protection Mechanism (2025)	EU-D13
Joint Communication to the European Parliament, the European Council, and the Council - Preserving Peace - Defence Readiness Roadmap 2030 (2025)	EU-D14
Communication from the Commission to the European Parliament, The Council, the European Economic and Social Committee and the Committee of the Regions: on ProtectEU: a European Internal Security Strategy (2025)	EU-D15
Joint Communication to the European Parliament and the Council on Military Mobility (2025)	EU-D16
NATO Policy Documents	
NATO Parliamentary Assembly - Resolution 427 on Climate Change and International security (2015)	NATO-D1
NATO Parliamentary Assembly – Climate Change and International Security – NATO's Agenda – Resolution 480 (2015)	NATO-D2
NATO Strengthened Resilience Commitment (2021)	NATO-D3
NATO Parliamentary Assembly – Developing a Whole of Society, Integrated and Coordinated Approach to Resilience for Allied Democracies – Resolution 466	NATO-D4
NATO Strategic Concept Note (2022)	NATO-D5
NATO Climate Change and Security Impact Assessment (2022)	NATO-D6
NATO Climate Change and Security Impact Assessment (2023)	NATO-D7
NATO Climate Change and Security Impact Assessment (2024)	NATO-D8
The Hague Declaration (2025)	NATO-D9
EU-NATO Joint Documents and Communications	
Joint Declaration on EU-NATO Cooperation by the President of the European Council, the President of the European Commission, and the Secretary General of the North Atlantic Treaty Organization (2016)	EU-NATO-D1
Joint Declaration on EU-NATO Cooperation by the President of the European Council, the President of the European Commission, and the Secretary General of the North Atlantic Treaty Organization (2018)	EU-NATO-D2
Joint Declaration on EU-NATO Cooperation by the President of the European Council, the President of the European Commission, and the Secretary General of the North Atlantic Treaty Organization (2023)	EU-NATO-D3
EU-NATO Task force on the Resilience of Critical Infrastructure – Final Assessment Report (2023)	EU-NATO-D4

Appendix ll

List of Respondents to the Study

Respondent	**Stakeholder Type**	**Alias**
Respondent 1	Critical Infrastructure and Resilience Expert	Expert-1
Respondent 2	EU Official	EU-1
Respondent 3	National Stakeholder	National stakeholder-1
Respondent 4	EU Official	EU-2
Respondent 5	National Military Stakeholder	National stakeholder-2
Respondent 6	Critical Energy Infrastructure Expert	Expert-2
Respondent 7	NATO Official	NATO-1
Respondent 8	Defense and Security Expert	Expert-3
Respondent 9	National Stakeholder	National Stakeholder-3
Respondent 10	Private Sector Actor	Private Sector-1
Respondent 11	Private Sector Actor	Private Sector-2
Respondent 12	NATO Official	NATO-2
Respondent 13	National Stakeholder	National stakeholder-4
Respondent 14	NATO Official	NATO-3

Appendix lll

Examples of Construction of Key Themes and Sub-Themes

Theme	Excerpts	Unit of Code	Source
EU-NATO Cooperation	"A stronger NATO and a stronger EU are mutually reinforcing" "The EU is addressing all these challenges through its Military Mobility Action Plans, in close consultation and coherence with NATO".	Cooperation EU-NATO Military Mobility	EU-NATO D1 EU-D10
Sub-Themes			
Staff-to-Staff Exchanges	"Synergies with other EU-NATO dialogues on related areas will be explored as appropriate, e.g., EU-NATO Structured Dialogue on Resilience and the EU-NATO Taskforce on the resilience of critical infrastructure" "I don't know this tension and the people I talk with from either the EU Commission or NATO, they, I know they often	EU-NATO Structured Dialogues Informal Ties	EU-D5 National Stakeholder-1

	communicate with each other. They have meetings" "Synergies with other EU-NATO dialogues on related areas will explored as appropriate, e.g., EU-NATO Structured Dialogue on Resilience and the EU-NATO Taskforce on the resilience of critical infrastructure" "It is proposed to set up by end 2027 an EU-wide military mobility area, with harmonised rules and procedures and a network of land corridors, airports, seaports, and support elements ensuring unhindered transport of troops and military equipment across the Union, in close coordination with NATO, and boosting the availability of civ-mil transport capabilities"	EU-NATO resilience EU-NATO Military Mobility	EU-D5 EU-D14
Alignment on Threat and Risk Picture	"I guess if I were to go into the EU and NATO bilateral meetings that there will be a lot of common understanding about what we are talking about when we say we are feeling the effects of climate change". "Scenario-based expert exchanges should help to identify civilian-military and EU-NATO intersections and potential bottlenecks in major crisis situations"	Alignment Joint Planning	NATO-2 EU-D10
Divergent Roles & Responsibilities	"NATO is an organization from a deterrence and defensive perspective. It would be a supporting organization when it comes to the policies surround climate change and EU Nation's specifical role in action and policy that is linked to climate change." "Now the EU does and has the legal instruments to enact policies that are binding. EU drives forward implementation, while NATO can offer guidance to national contact points and military planners, etc."	Mandates & Obligations Divergent capacities and roles	NATO-3 NATO-1

	"It is also keeping within that new focus that we have had within the last few years to really make sure we can always trace back to the core priority of sustaining and shaping our deterrence and defense posture."	Core Task	NATO-2

Theme	Excerpts	Unit of Code	Source
Climate as Security Risk & Threat Multiplier	"Climate change is a defining challenge of our time, with a profound impact on Allied security"	Climate Security Risk	NATO-D5
	"…it can like undermine these vital functions and even multiple vital functions simultaneously, and then it's also seen as a threat multiplier, so something that would then intensify these other risks"	Climate Risk Multiplier	National Stakeholder-4
Sub-Theme			
Cascading Climate Impacts	"Well, when we talk about cascading climate impacts or risks, it really becomes Pandora's box of issues and effects. It becomes hard for a policymaker or a CI operator to take into account all combinations of risks they are exposed to."	Strong understanding	EU-2
	"policy coordination at the EU-NATO level on, as you say, the cascading climate impacts on critical infrastructure…that is a very good question. I honestly do not know if we have gone into that level of detail."	Limited Understanding	NATO-2
Implications for Critical Infrastructure Resilience	"...underscoring the growing interdependence of Allied societies and the vulnerabilities and risk of cascading failures that this can entail."	Critical vulnerabilities	NATO-D4
	"Currently, there are no reliable assessments of how well EU infrastructure will be able to function in the changing climatic conditions."	Transport Infrastructure Impacts	EU-D7
	"Energy is a big one as well. For example, you had the events in in Spain and Portugal	Energy Infrastructure impacts	Private Sector-1

	where they then suddenly had temporary blackouts locally" "the complexity of our system is such that you cannot prevent cascading failures from happening" "infrastructure projects under this Regulation should be resilient to the potential adverse impacts of climate change through a climate vulnerability and risk assessment, including through relevant adaptation measures."	 Cascading effects/failures TEN-T	 Expert-1 EU-D9
NATO Mainstreaming	"We will further develop the Alliance's ability to support civilian crisis management and relief operations and to prepare for the effects of climate change, food insecurity and health emergencies on Allied security. This will allow us to respond to any contingency at short notice." "I do know that when it comes, for instance, the work on the climate has been increasingly, over the last year and two in NATO, mainstreamed into a lot of the work that we do on resilience." "As you know, there are resilience guidelines that are applicable to NATO Allies and EU members. In the net context, climate considerations, extreme weather events, energy issues have been looked at with Allies" "We will pursue a more robust, integrated and coherent approach to building national and Alliance-wide resilience against military and non-military threats and challenges to our security, as a national responsibility and a collective commitment rooted in Article 3 of the North Atlantic Treaty".	NATO Policy Mainstreaming (Climate) NATO baseline resilience requirements NATO Coherence	NATO-D5 NATO-2 NATO-3 NATO-D5

EU Mainstreaming	"Climate change is having such a pervasive impact that our response to it must be systemic. The Commission will continue to actively mainstream climate resilience considerations in all relevant policy fields applicable to both the public and the private sectors"	EU Policy Mainstreaming (Climate)	EU-D1
	"We are now focused on the capitals, through the climate and security defense network. Bringing together the right people in the capital. Taking a bottom-up approach to issues like military mobility, critical energy infrastructure resilience…"		EU-2
	"The EU should scale up its engagement to facilitate and support Member States to address the growing magnitude, complexity and urgency of the challenges involved, in line with the objectives of the European Green Deal and the Strategic Compass."	EU Coherence	EU-D5
	"Now, with the Integrated framework, there is a potential to streamline climate resilience. But remember that, security is the number one focus of EU policies now. It needs to find synergies with that to be politically relevant"	Emerging Policies	EU-2

Appendix IV

Thesis Project Information Sheet

Title of the Project: *EU-NATO Policy Coordination on Cascading Climate Risks and their Implications for European Critical Infrastructure Resilience.*

Researcher: Tristan Norman, Lund University; MSc in Disaster Risk Management and Climate Change Adaptation; Research Intern, Stockholm Environment Institute (SEI), tr0756no-s@student.lu.se; tristan.norman@sei.org

Information about the study

The purpose of the research study is to develop a master's thesis on EU-NATO policy coordination on cascading climate risks and ascertain their consequences for critical infrastructure resilience in Europe. Cascading climate risks are climatic impacts that transmit across international borders and cascade through shared systems, sectors, and infrastructure. Sometimes, cascading climate risks and extreme weather events can intersect with non-climatic risks, producing compounding effects. While the cascading effects of climate change are acknowledged by climate and risk experts, this thesis is interested in how cascading climate risks are framed and addressed in the EU, NATO, and national thinking on resilience planning, civil preparedness, and critical infrastructure policies. Moreover, this thesis is interested in how the EU-NATO coordinate on these risks and imagine shared responses in these policy domains.

The goal of the thesis is to raise the visibility of cascading climate risks with EU, NATO, and national policymakers, officials, and practitioners, and encourage stakeholders to account for complex climate risks in relevant policy processes and domains. More specifically, a desired aim is that these risks are included in the guidance and implementation of national and shared policies across EU Member States and NATO Allies, related to resilience, preparedness, and critical infrastructure resilience. As a whole, their inclusion can be a critical area for EU-NATO cooperation on climate-related security risks across EU-NATO Structured Dialogues, and crucial to implementing climate-resilient policies in a changing security environment.

This research study is supported by the EU-COST Action CA24163, CROSS-CASCADE, which explores cascading climate impacts and coherent policy responses in Europe. Although you will not directly benefit from being in this study, others might benefit because study findings will be used to strengthen the awareness and management of cascading climatic risks and extreme weather events within Europe.

If you have questions about this study, you may contact the researcher at any time.

Information about your participation in the research

I aim to gather data about you and your experiences and perspectives as relevant to this research study. It is totally up to you to decide to be in this research study. You don't have to participate; taking part is entirely voluntary. Even if you decide to be part of the study now, you may change your mind and stop at any time. You do not have to answer any questions you do not want to answer. If you do decide to withdraw before this study is completed, I will delete all the data collected about you.

I might ask you to share information about other people whose experiences and perspectives you think are relevant for this research study. Sharing this information is also completely voluntary. The same principles will be applied to their data as articulated for yours, below. If you agree to take part in this study, you will be asked to participate in a semi-structured interview with Tristan Norman (details above). This semi-structured interview will take approximately **45-60 minutes.**

If you agree, the interview will be recorded by the researcher and later transcribed into a written document. You can also choose to use a different name in the recording. Please indicate your preferred approach in the 'recording' section of the consent form.

There are some risks you might experience from being in this study. For example, due to the sensitive nature of the topic, information may be unintentionally expressed in the thesis that may highlight gaps in resilience and preparedness planning for climate-related risks. It is your role as the informant to be sensitive and selective about what you disclose. As a researcher, I will refrain from highlighting specific cases, localities, and details that may compromise these gaps to an external actor. In case your information is accidentally or illegally shared with others, I will also remove your name and any identifying information from all research materials based on your selected level of attribution.

Your data

Your personal data will be managed and securely stored by the researcher. It will not be shared beyond the researcher unless you have granted permission. I plan to publish the results of this study as a master's student at Lund University, but only I will have access to your responses in their raw form.

You can choose how your responses will be stored and used by me. The two options are:

1. Anonymous: I save your response, and can cite it publicly, with an attribution to "Interviewee" (or equivalent wording)

2. Pseudo-anonymous: I save your response, and can cite it publicly, by using a group-based classification, such as your professional constituency, EU or NATO-affiliation and/or professional focus.

If you choose options 1 (anonymous) or 2 (pseudo-anonymous), I will make every effort to prevent unintentional identification, including where your identity could be inferred from your comments or how you are described.

During the interview, I will also request your consent before recording your participation in this study. A copy of the consent form will be provided. Protecting your privacy is important in this research. You can at any time ask me about what personal data I am holding about you in this research, how I am using or sharing your data, object to any further use or storing of your data, or help me to correct any inaccurate data, by sending an email to tr0756no-s@student.lu.se, and I will take action in accordance with your wishes. You can opt-out of any further communication about this project – or withdraw entirely from the project – at any time by contacting me at tr0756no-s@student.lu.se.

If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study, please contact me at the email provided.

Appendix V

Interview Guide

Hi, and thank you for joining today. This interview falls under a master's thesis research project at Lund University for the completion of a Master of Science in Disaster Risk Management and Climate Change Adaptation. This thesis is supported by the EU Cost Action CROSS-CASCADE. The thesis research aims to increase the visibility of cascading climate risks in relevant policy processes at the EU-level.

My research explores the level of EU and NATO policy coordination on cascading climate risks and their implementation in relevant policy domains like societal resilience, civil preparedness, and critical infrastructure resilience. In a moment, I'll run through some consent and attribution procedures, but do you have any further questions for me on the aims and goals of the wider project before we begin?

- I need your written consent to take part in this interview. You should have received an informed consent form. If you haven't already, please fill this out and pass it back to me.
- I would also like to ask right away if I can record and use transcription software for this interview. I will use the recording solely for note-taking and review, as a full transcript helps with comparing between interviews in the data analysis phase. The recording will not be shared with anyone outside this project. This recording will be anonymized and deleted after the conclusion of the thesis period.

Guiding questions

- In your role at ____, how do you engage with climate risks and extreme weather events?
- Based on your experience, how well prepared is the [security, preparedness, or critical infrastructure] community to manage cascading climate risks today and in the future?
- Do you think policymakers' awareness or understanding of cascading climate risks influences the design and implementation of preparedness and resilience policies? Or is climate change less prioritized than other pressing risks?
- How would you describe the quality and depth of coordination and coherence between the EU and NATO on cascading climate risks?
- Is this translating into guidance and implementation to address these risks for EU Member States and NATO Allies?
- In your opinion, how can the EU and NATO better support and prepare national governments to manage these risks in the future? How can Europe pursue strategic climate resilience and readiness?
- Based on your experience, what is necessary for effective policy coordination and response strategies to manage cascading climate risks? How can these be implemented coherently? (This can be at the EU-NATO level or down to the national level).