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NAVIGATING THE TURBULENCE: UNRAVELING THE NEXUS BETWEEN TRANSPORT INFRASTRUCTURE, CONFLICT AND RESILIENCE

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Abstract*: This paper explores the intricate relationship between transport infrastructure, military operations, and national resilience in the context of today's interconnected world, highlighting the crucial role of transport systems in modern conflicts and the importance of building resilience through robustness, redundancy, resourcefulness, and rapidity in transport systems. In this respect, policymakers should consider integrating resilience considerations into national security and infrastructure development policies, emphasizing international collaboration and a holistic approach to address the complex challenges posed by disruptions in transport infrastructure.*

Keywords*: transport; infrastructure; resilience; determinants; costs; limitations.*

Introduction

In today's interconnected world, much like the circulatory system is indispensable for the well-being of a living organism, transport infrastructure serves as the lifeblood of a nation's economy. The intricate network of roads, railroads, ports, airports, pipelines, and grids parallels the veins and arteries that ensure the seamless flow of blood, oxygen, and nutrients throughout the body. In the economic context, these transport arteries enable the smooth movement of goods, people, and information, connecting various regions and sustaining the vitality of industries. The efficiency of this transport circulatory system is crucial for economic health, just as the optimal functioning of the circulatory system is essential for sustaining life. Disruptions in either system can have cascading effects, limiting the ability to nourish and sustain the broader organism – be it a living body or a national economy.

Transport infrastructure typically refers to the physical and organizational components that facilitate the movement of goods, people, and information from one location to another, encompassing a broad range of interconnected systems, facilities, and networks designed to support the efficient and effective transportation of goods and passengers. Key elements of transport infrastructure include "fixed installations including roads, railways, airways, waterways, canals and pipelines and terminals such as airports, railway stations, bus stations, warehouses, trucking terminals" (Yilmaz and Çetin 2017, 29). In order to operate smoothly and efficiently, these physical components of the broader transport system are complemented by soft infrastructure, such as policies, regulations, and institutions responsible for the planning, financing, operation, and maintenance of these systems.

The crucial importance of transport infrastructure and the increased interdependence between the hard and soft transport infrastructure constitutes at the same time its greatest vulnerability, as unforeseen events or crises (ranging from major technical failures, serious accidents, natural disasters or armed conflicts) can significantly disrupt these systems, particularly if they lack inherent resilience, with significant economic, societal and military

implications. As transport infrastructure plays a pivotal role in connecting regions, enabling economic activities, and ensuring the mobility of military forces during both peacetime and conflict, the development and maintenance of robust transport infrastructure are essential for fostering economic growth, national security, and overall societal well-being.

Throughout history, the significance of transport in warfare has been pivotal, in shaping the outcomes of conflicts by influencing the speed, flexibility, and strategic positioning of military forces. Ancient civilizations recognized the strategic advantage of well-developed road networks for the swift movement of troops and supplies. The Roman Empire, for instance, constructed an extensive system of roads, such as the famous Via Appia, which facilitated the rapid deployment of legions across its vast territories. In medieval times, the construction of castles and fortifications was often strategically positioned near key transportation routes to control and protect vital passages. During the Napoleonic era, the introduction of railways revolutionized military logistics, enabling the swift mobilization of large armies. In the 20th century, the importance of transport in warfare was evident in the success of Blitzkrieg tactics during World War II, where fast-moving armoured units capitalized on well-developed road and rail networks.

In the landscape of modern military operations, transport infrastructure stands as a linchpin, playing a pivotal role in shaping the success and agility of armed forces. The ability to swiftly mobilize and strategically position troops is contingent on well-developed road, rail, and air networks. Military mobility, a cornerstone of contemporary warfare, relies on efficient transportation systems for rapid deployment to theaters of operation, as airports, seaports, and logistical hubs serve as crucial points of entry and exit for forces and equipment. Furthermore, the seamless flow of supplies and equipment, essential for sustained military campaigns, hinges on the efficiency of transport infrastructure. For example, in "Desert Shield/Desert Storm operation, 85% of the dry cargo moved by sea and 15% moved by air and… at some point, 100% of the unit equipment, ammo, food, medicines [...] had to move by surface" (Gardner 1996, 16). No military, regardless of its size or logistic prowess, can ensure the required transport infrastructure on its own as most of the transport infrastructure is developed and operated by civilian agencies and companies. An effective military utilization of the civilian transportation system thus relies on a framework of partnerships between public entities (in the reals of critical infrastructure development and protection) and collaborations between public and private sectors, commonly known as public-public and public-private partnerships. The military depends on successful cooperation with national and local transportation agencies, as well as the collaboration with private sector entities such as railroads, airlines, and shipping lines to ensure a seamless and efficient integration of resources and capabilities (Meurer et al. 2016, 1-11).

The aim of this paper is to delve into the intricate web of relationships among transport infrastructure, military operations, and national resilience, seeking to provide a comprehensive understanding of the dynamics at play during conflicts. This research intends to shed light on the ways in which disruptions or enhancements in transport infrastructure can impact military strategies and influence national resilience, with the overarching goal is to contribute valuable insights for policymakers, military planners, and researchers, facilitating a more nuanced approach to conflict management and resilience-building in complex, interconnected systems.

1. Literature Review

The topic of transport infrastructure resilience has been the subject of numerous research papers in the past decade, but the literature review highlights that there is no common framework to approach the concept, as transport systems resilience is approached from a number of perspectives. Some authors have taken a more generic path, approaching transport infrastructure resilience as part of a broader framework tackling multiple areas, such as economic, environmental and social (Ayyub 2014, 925-936) or from a sustainable development, long term perspective (Walker, Deeming, Margottini and Menoni 2014, 925-936). Other studies

on the topic have focused on the impact of natural disasters, such as earthquakes (Bruneau et al 2003, 733-752), extreme weather events (Molarius et al 2014, 189-210; Croope and McNeil, 2011, 3-13) and climate change (Kong et al 2012 350-357; Taylor and Philip, 2010; Doll et all, 2010) on the transport infrastructure.

From the point of view of the connection between transport infrastructure and conflict, the literature approaches the importance of transport infrastructure from various perspectives. A broader approach considers transport infrastructure from the perspective of the armed conflict and the military and civilian implications of developing transport infrastructure in conflict areas (Gomez, 2018, 20). From a military perspective, the transport infrastructure is approached as a component of the critical infrastructure in the context of military operations in urban terrain, examining the various impacts the disruption of critical infrastructure may have on a military operation and on non-combatants (Patterson 2000). Other studies in the literature address the the impact of transportation infrastructure on military operations and its effect on power projection for NATO and US (Howell 2020), and the perspective of the impact of infrastructure on strategic mobility operations (Gardner 1996, 16; Kepe 2018).

Following the events unfolding in the war between Russia and Ukraine and its complex effects on numerous interrelated areas (military, economic, societal), the literature has been enriched with numerous studies related to the way the conflict has disrupted the transport routes in the area (David, Blasko and Ficzere 2023, 188-193), the potential scenarios for recovery of transport infrastructure (in particular aviation) after the end of the conflict (Kharazishvili et al 2022, 7-30) and assessing the transport and logistics support for grain supply chain in regional food safety (Rudyk, Bubela and Maciuk 2023, 223-233).

A broader perspective analyses the need for the development of the Trans-European transport and logistics system (TEN-T), in order to create a transport system capable of overcoming "weak spots" and improving the use of transport infrastructure, the effectiveness of cooperation between states and security issues (Smyrnov et al 2023).

2. The Significance of Transport Infrastructure in Modern Warfare

2.4 Control of transport infrastructure as a tool in grey zone conflicts

The globalized nature of today's world, the unprecedented interconnectedness of the world economies and the technological advances have made the world a smaller place and promoted development, but the downside of interconnected infrastructure means increasingly complex global supply chains, whose disruption can spread rapidly and may generate severe effects across the globe. The vulnerability of transport systems has increased along with the interdependence, making them more vulnerable to crises and disasters that may happen on the other side of the globe, and still rapidly affect numerous countries.

Nowadays, transport infrastructure plays a crucial role in grey zone conflicts, which typically involve ambiguous and non-traditional forms of aggression that fall below the threshold of open warfare. In these conflicts, transport infrastructure is increasingly being used as a tool of gaining influence and projecting power, but at the same time is becoming an attractive target for aggression.

Transport infrastructure, including roads, railways, ports, and airports, facilitates the movement of personnel, equipment, and supplies are an integral part of a country's critical infrastructure and as such, it has been traditionally considered a target in kinetic and asymmetric warfare alike, as controlling or disrupting these networks can have a significant impact on the ability of actors involved in conflicts to sustain their operations.

Mobility and flexibility have always been a crucial part of military operations, as they allow forces to rapidly respond to changing conditions, outmanoeuvre adversaries, seize strategic opportunities, and effectively engage in a dynamic and unpredictable battlefield

environment. Weakening or disrupting transport infrastructure is a common asymmetric tactic in grey zone conflicts, as non-state actors, insurgent groups, proxy forces or even state actors may target critical transportation links to destabilize regions or coerce governments without resorting to conventional military engagements.

A recent example is the manner in which the Houthi rebels, a Yemen based militia backed by Iran, has mounted what can be called a strategic ambush, targeting the vulnerable point for international trade that is the Red Sea area through attacks on ships from various countries, using drones and missiles. The declared purpose was to disrupt shipping links with Israel, in the context of Israel's military campaign in Gaza, but the consequences of the attack extended beyond that, as the Suez Canal was avoided by many shipping companies, that preferred to take a longer, but safer route, presuming an additional 4,000-mile journey around Africa. The impacts were first of all economical, as shipping companies have tripled container prices from Asia to Europe to cover the increased costs of the longer route, potentially exacerbating global inflation. At 26 October 2023, before the attacks, the FBX13 global ocean freight container pricing index, measuring 40′ container prices across key port pairs from China/East Asia to the Mediterranean, was of $1.371. The attacks started around the beginning of December 2023, with the result that at 22 December 2023 the FBX13 was at $2.524, while the escalation of the situation raised the FBX13 at $6.772 in 19 January 2024 (Freightos Data 2024). The effects of the attacks are not limited to commodities imported to Europe from China and other Asian countries, as the Red Sea and the Suez Canal have become also the main route of oil and liquefied natural gas cargoes, as following the conflict in Ukraine, Russia has significantly increased its oil exports towards India, while European countries have increased their imports of liquefied gas from the Middle East. Total oil shipments via the Red Sea Area (through the Suez Canal, the Bab el Mandeb strait and the SUMED pipeline) routes were in 2023 approximately 12% of total seaborne-traded oil in the first half, and approximately 8% of total world liquefied natural gas (LNG) shipments (U.S. Energy Information Administration 2023).

State actors are also using the disruption of critical trade routes, ports, or transit points in order to exert economic pressure on targeted entities, influencing their behaviour or policies. For example, during the dispute between Qatar and its Gulf neighbours (Saudi Arabia, the United Arab Emirates, Bahrain and Egypt) in 2017, there was an economic blockade imposed on Qatar, which disrupted maritime trade routes, impacting the flow of goods through key ports and affecting Qatar's economy on short term. Ironically, the blockade had positive medium term effects of increasing Qatar's economic independence from the Cooperation Council for the Arab States of the Gulf and its self-reliance and increased economic diversification (Kabanni 2021).

Another example is China, which is strategically leveraging the Belt and Road Initiative (BRI) as a tool in the realm of grey zone conflict. The BRI, initially presented as a global infrastructure development project, has increasingly become a means for China to extend its influence and pursue geopolitical objectives. Through BRI investments, China gains economic footholds and political influence in partner countries, effectively creating dependencies. According to the Council for Foreign Relations' database, there are currently in the world 101 port projects in which Chinese entities have acquired varied equity ownership or operational stakes, in 63 countries on all continents except Antarctica (Council for Foreign Relations' database, 2024). Ports constitute one among various strategic elements within the Belt and Road Initiative, which encompasses diverse forms of transportation infrastructure, including roads, railways, airports, as well as energy-related infrastructure like pipelines, dams and also digital and communication infrastructure. Despite concerns that China might convert its control over ports worldwide to military use, to project its naval power, the most present threat comes from its strong influence over the global supply chains and trade routes. Another manner in which transport infrastructure is used by China to advance its interests is also related to investments.

The construction of critical infrastructure projects, such as ports and railways requires vast amounts of money, which China has been willing to offer worldwide. The problems arise when the partner nations (especially developing countries) struggle to repay these debts, which makes them even more vulnerable to Chinese influence.

Disputes over transport infrastructure can escalate tensions and serve as potential trigger points for broader conflicts, as grey zone conflicts often involve a delicate balance, and any disruption to critical transportation can escalate the situation, pushing it closer to open warfare. In the Taiwan Strait, disputes over control and access to maritime routes and airspaces are potential trigger points for escalation. China's assertiveness in the region, including its military activities near Taiwan, involves a careful consideration of these transportation-related factors.

2.5 Control of transport infrastructure as a tool of warfare

Control of transport infrastructure can be also used as a potent tool of warfare, influencing both strategic and logistical dimensions of conflict. During times of war, dominating key transportation networks, such as roads, railways, ports, and airports, enables a belligerent force to dictate the movement of troops, supplies, and resources. By disrupting or controlling these critical arteries, an aggressor can impede the mobility of enemy forces, weaken their logistical capabilities, and isolate strategic targets. Moreover, gaining control over transport hubs can provide a tactical advantage, allowing for rapid deployment and maneuverability. In modern warfare, cyber-attacks on transportation systems also present a novel dimension, disrupting communication networks and compromising the functioning of automated transportation systems.

Although NATO considers ground mobility as a priority area, the situation of the transport infrastructure in Europe is far from satisfying, as "the rate of infrastructure development within NATO member nations in Central and Eastern Europe diminishes the ability of the Joint Force to penetrate and exploit the standoff generated by Russia" (Howell, 2020). As an example, historically, the M60 main battle tank was the reference on which NATO defense planners assessed the capability of bridge and rail networks in Europe in order to ensure future transportation infrastructure could support the tanks' weight (Clapp and Cassidy 2002). The introduction of the M1 Abrams meant an increase in the weight of the armored platform of reference with 75% since 1975 (US Department of the Army 2020), with the result of placing a significant strain on transportation networks in Central and Eastern Europe.

The conflict in Ukraine has brought again to the attention the importance of transport infrastructure in military operations, as both strategic asset and target. According to the World Bank, by the middle of 2022, 18.7% of total national highways and motorways and 3.8% of all local roads had been damaged or destroyed (World Bank et al. 2022), with bridges as primary target for both Russia (which destroyed 17% of the total bridges on main roads) (World Bank et al. 2022), and Ukraine (the Kerch bridge), due to their logistical importance and the slowdown of the enemy forces as bridges require more time to be rebuild. The air transport infrastructure has also been targeted (with almost half of the airports being damaged), together with the seaport infrastructure, 83.3% of the seaports being blocked or occupied (World Bank et al. 2022), generating a de-facto blockage of the cargo shipments and severely affecting the Ukrainian economy directly and indirectly. The situation has led to a food crisis half a world away, due to the increase in food prices caused by the drop in Ukrainian grain exports.

Beyond the military considerations related to mobility and logistics, the control and disruption of transport infrastructure and networks can also be used as an economic tool of warfare, alongside kinetic actions. The disruption of transport routes can also have serious indirect economic effects, with short term and medium term implications. Conflicts affecting transport routes have significant effects in terms of increase freight and insurance costs, as the transport distances and transit times increase, together with the risk for the insurers. For

example, following the conflict in Ukraine, the insurance costs for the ships navigating in the Black Sea have increased with 20%, due to the war risk premiums demanded by the insurers (Corbett 2023, 8). The impossibility to ship the usual quantity of cargo exported from Ukraine or imported to Russia also put increased pressure on the storage and warehousing facilities in various harbors, in Ukraine, Germany, Turkey or Netherlands, increasing the costs for other commodities (UNCTAD 2022, 14). The increase in the bulk freight rates following the conflict (for example, the Baltic Dry Index increased with 59% in just 4 months, between February 2022 and May 2022) contributes to an increase in the consumer good prices at global level (with 3.7% in 2022), generating an increase in the global inflation rate (UNCTAD 2022, 7).

The control over transport infrastructure can also be used in order to influence or manipulate the access to humanitarian aid. Disruption of transport infrastructure can hinder the delivery of humanitarian aid, exacerbating the humanitarian crisis in affected areas, presenting a complex challenge for international organizations and relief efforts. The Syrian conflict has seen deliberate targeting of transportation infrastructure, including roads and bridges, hindering the delivery of humanitarian aid and exacerbated the humanitarian crisis in various parts of the country (Relief Web 2023).

3. Building resilience through transport infrastructure

A well-developed and resilient transport infrastructure plays a pivotal role in bolstering national resilience by ensuring the smooth functioning of essential services, facilitating efficient logistics, and enhancing overall economic stability, especially in the modern world, where the interconnected nature of global systems amplifies the impact of even minor changes, surpassing initial disturbances in time, location, and scale. Robust transportation networks enable swift response and recovery in times of crises, including natural disasters, pandemics, or security threats. Efficient road and rail systems facilitate the timely movement of goods, emergency supplies, and personnel, aiding disaster relief efforts. Additionally, diversified and interconnected transportation modes contribute to reducing vulnerabilities associated with disruptions in a specific sector.

Extending the resilience model proposed by Bruneau (Bruneau et al 2003, 733-752) to transport infrastructure, four main areas of action can be identified in order to increase resilience:

- **Robustness** refers to measures aimed at improving the capacity of transport systems to withstand shocks without losing functionality. The robustness of the transport infrastructure starts with its status, as an old infrastructure, in need of repair or under the level of quality required has less chances to withstand shocks caused by natural disasters or to correspond to the requirements of moving troops in case of conflict. This is especially the case of Eastern Europe, as "while *Western* European infrastructure was often reinforced during the Cold War to handle the weight of 60-plus-ton NATO tanks, *Eastern* Europe couldn't afford to build as robustly and, in any case, only had to accommodate much lighter *Soviet* tanks, like the 45-ton T-72" (Freedberg 2020). According to the model, another component of robustness is the physical interdependence, meaning the degree to which a specific system is dependent on other components of these systems. For example, railway transport is critically dependent on the power networks, maritime transport is critically dependent on communication and navigation systems. Any disruption of these systems (for instance as a result of a cyber-attack) would have serious consequences on the robustness of the transport system. Geographical interdependency refers to the interdependencies along the whole system, and the international supply chain is a good example in this respect. Failure in one of the components can have ripple effects throughout the entire system, as we have seen recently during the Covid pandemic or the Ukraine conflict.
- **Redundancy** refers to putting in place, ahead of the onset of the crisis, alternatives or substitutions for the routes already available (for example, using air transport to compensate

for disruption in road transport). Redundancy in respect to transport infrastructure is constrained by the availability and capability to develop alternative routes (for example, the replacement of road and railway transport is not always possible by waterways, as the latter may not correspond in terms of geographical location or capability to allow a specific size of the cargo. Another constraint is related to the sizable costs generated by building redundancy, which cannot easily be justified by the potential risk.

- **Resourcefulness** refers to the availability of resources necessary to respond to a disturbance. These resources may refer to the workforce, expertise and abilities, financial resources, material resources, procedures, communication systems, equipment etc. Proper planning is crucial to ensure resilience, but ensuring funding, making contingency plans or constituting emergency stocks is costly, time consuming and is often relegated as a lower priority compared to current and more pressing demands.
- **Rapidity** refers to reducing the downtime of a system or the response time to a specific disruption or crisis, which is dependent on the previously mentioned aspects, as well as on the proper design of the system or the existence of clear procedures. For instance, the availability of a well-trained/equipped engineer's corps can significantly help with reducing the disruption in the event of the collapse/damage of a bridge or road.

Other authors (Thoroghi and Thomas 2020), propose a fifth dimension, **readjust-ability**, defined as the adaptation capacity of the system to its new environment, post-incident. Transport infrastructure can be damaged or destroyed in the aftermath of a crisis, but the ability to re-adjust the transport routes, re-divert traffic, find replacements for the damages infrastructure, find sources of financing for construction projects to replace the damaged infrastructure is also an important component of transport infrastructure resilience.

The main problem associated with building resilience derives from the trade-offs decision makers have to address, between short term and long term considerations, between efficiency and the costs of building resilience. Resilience, by its very nature, is associated with a crisis or an unforeseen event. This often means that in order to build resilience, new investments have to be made addressing emerging risks and threats (upgrade transport infrastructure, build new roads, railways or ports), often entailing significant additional costs, which are sometimes difficult to justify to the taxpayers. To revisit the previous example, European taxpayers will probably not be very thrilled at having to pay for the improvement of existing roads and building new ones capable of accommodating the increased weight of armoured platforms, as the normal demands of traffic in a business-as-usual scenario does not require such additional costs.

Another issue is that (as a lesson identified from the Covid pandemic, but also from the conflict in Ukraine), building transport resilience means also incorporating redundancy into transport networks to shield against disruptions in global supply chains or the damage/destruction of transport infrastructure. Although beneficial from the point of view of building resilience, the addition of routes and modes to sustain services during disturbances generates increase cost generated by idle resources and efficiency losses. Building additional roads/railroads that are not used at full capacity during normal times, developing back-up processing facilities, building additional warehousing facilities comes against the current model of optimized production and transport systems (such as Just-in-Time logistic model) that has brought increased profits at a global scale, but has also significantly increased the vulnerability of supply chains to risks.

A potential solution to this conundrum would be to link resilience to national security considerations, such as the pressing need (recognized by both NATO and the EU) of improving military mobility across Europe (NATO 2018). NATO's initiative "Enabling the Supreme Allied Commander Europe's Area of Responsibility" outlines four main domains of action to this end: ensuring than member countries authorities and legislation facilitate border crossing;

command and control to direct the logistic moves; adequate lift capabilities that can transport troops and their equipment; and an infrastructure that can cope with large quantities of heavy military transport (Williams 2018). Significant progress has been made recently in the first item mentioned above, through the signing of a declaration of intent between Germany, the Netherlands and Poland on the development of a military corridor aimed at facilitating the movement of troops and equipment between Europe's North Sea ports and NATO's eastern flank (Ruitenberg 2024), tackling infrastructure choke points, such as low bridges, and reducing bureaucracy around permits for cross-border transport of ammunitions and other dangerous goods. The lack of a mechanism similar to the Schengen initiative (the so called Military Schengen, aimed at streamlining and expediting the rules and procedures governing the movement of military assets within the EU) has already been identified as a challenge by NATO and the EU, as it makes the process of transferring troops and equipment between EU Member States complex and time-consuming. Ironically, the crucial importance of such military corridors and a good argument in the favour of a Military Schengen is the focus of the Russian state-owned news agency Sputnik on the matter, which conjures fears about the past, asserting that "that the last time we had a European Schengen of this sort was Hitler's Germany and it occupied Europe during World War II" (Blinova 2024).

The area of providing the required infrastructure capable of supporting the heavy military transport is also supported by the EU through the Action plan on military mobility 2.0, centered on the need to develop a well-connected military mobility network consisting of:

- multi-modal transport corridors, including roads, railways, air routes, and inland waterways with dual-use transport infrastructure capable of handling military transports;
- transport nodes and logistical centres that provide the required host- and transit nation support and sustainment to facilitate the deployment of troops and materiel;
- harmonised rules, regulations, procedures, and digitalised administrative arrangements;
- enhanced sustainability, resilience and preparedness of civilian and military lift and logistical capabilities (Action plan on military mobility 2.0, 2022).

From a resilience point of view, this is a major step forward, as it sets the framework for investing in dual-use transport infrastructure through co-funding from the Connecting Europe Facility (CEF) funding instrument and specifically underlines the importance of resilience of the military mobility network, including the transport infrastructure.

Such initiative is of utmost importance, as building and upgrading transport infrastructure is mainly a national matter, but which can benefit in a significant manner from EU cooperation and support. In this respect, the European Union has taken a series of very important steps, such as allocating up to 616 million EUR for 35 military mobility projects to support the transport of troops and equipment along the trans-European transport network (TEN-T), in order to facilitate a better, faster and sufficient response from the European members armed forces to crisis and conflicts outside the EU's borders (EU Commission Mobility and Transport, 2022). In this respect, the EU's trans-European transport network policy (TEN-T) is a crucial tool for the achievement of "coherent, efficient, multimodal, and high-quality transport infrastructure across the EU... comprised of railways, inland waterways, short sea shipping routes and roads linking urban nodes, maritime and inland ports, airports and terminals" (EU Regulation No 1315/2013).

Conclusions

The vulnerability of the national, regional and global transport infrastructure to disruptions, from technical failures to armed conflicts, underscores the far-reaching implications on economic, societal, and military aspects. Consequently, in light of the current trend of increased instability and emergence of multiple and potentially concurrent crises and even wars, the development of resilient transport systems is paramount. The conflict in Ukraine has served as a stark reminder of the

importance of military mobility in operations, but also of the need to enhance the resilience of civilian transport infrastructure, which is vulnerable to military attacks, but also to asymmetric warfare tactics. As a result, NATO and Eu are beginning to take concrete steps in this direction, especially in the framework of the Action Plan on Military Mobility. As an example of new developments in this matter, the EU Commission, together with the EEAS, "will carry out an analysis on how the physical EU military transport network meets the military requirements, in consultation with NATO, with the aim of prioritizing dual-use infrastructure development and funding at the EU level and to ensure the resilience of transport networks (EU Monitor, 2022).

Policymakers should integrate resilience considerations into national security and infrastructure development policies and the enhancement of international collaboration, exemplified by initiatives like the EU's military mobility projects and the trans-European transport network, is crucial for addressing complex challenges. A holistic, whole of society approach to resilience is required, incorporating robustness, redundancy, resourcefulness, and rapidity, underscored by the need for a framework of partnerships between public entities and collaborations between public and private sectors and emphasizing the importance of military cooperation with civilian transportation agencies.

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