

ELIAMEP's PRESENTATION

DASKALAKIS EMMANOUIL

Earthquakes are a natural process related to ground vibrations caused by the release of energy inside the Earth. This energy is released when underground rocks break or move due to the stress applied to them. Earthquakes can have many consequences, ranging from small tremors that are only felt by people to severe destruction and even tsunamis in coastal areas.

The impact of an earthquake depends on its **magnitude**, the **area affected**, and the **characteristics of the region** where it occurs. Some main consequences include:

- Damage to buildings and infrastructure
- Loss of human life
- Injuries
- Economic consequences
- Environmental impact
- Psychological effects

The extent of the damage depends on factors such as the earthquake's location and depth, the type of ground, and the population density.

The state security forces, especially the Fire Service, have many responsibilities in dealing with the phenomenon:

- **Search and Rescue:** Firefighters locate and safely evacuate individuals who may be trapped or affected.
- **Firefighting:** If fires break out due to the earthquake, firefighters extinguish them and protect lives and property.
- **Removal of Hazardous Materials:** If dangerous chemicals or materials are released, the fire service cooperates with special teams to manage them.
- **Evacuation Support:** They help organize and carry out evacuation plans and ensure people move safely to secure areas.
- **Building Inspection:** Firefighters check the condition of structures and isolate or evacuate them if necessary.

Overall, the role of the fire service is to protect lives and property, provide emergency assistance, and help restore normal conditions after the earthquake.

The **Civil Protection Agency** also plays an important role during seismic events, protecting citizens and organizing the response. Their actions include:

- **Crisis Coordination:** They coordinate actions between different services, such as fire, police, and medical teams.
- **Public Information and Education:** They provide guidance on how to respond during an earthquake, including evacuation procedures and first aid.
- **Evacuation Planning:** They help design and carry out evacuation strategies.
- **Impact Management:** They work with various groups to manage injuries, firefighting needs, and reconstruction.
- **International Cooperation:** They collaborate with international organizations and neighboring countries for support and information exchange.

It is extremely important to define the core responsibilities of a search-and-rescue team and the wider network of agencies involved in an earthquake response.

Earthquakes represent the most extensively studied and documented natural hazard with respect to physical damage to **Critical Infrastructure (CI)** worldwide. Drawing from the Global Earthquake Consequences Database (GEMECD; So, 2014), a strong earthquake can trigger widespread and often cascading failures across multiple CI sectors:

- **Energy systems:** Collapse or severe damage to substations, collapse of transmission towers and poles, rupture of natural gas and oil pipelines, leading to prolonged blackouts lasting days to months and heightened risk of post-earthquake fires.
- **Transportation networks:** Cracking and subsidence of road surfaces, loss of functionality or collapse of bridges and tunnels, damage to ports and airports, and rail track deformation, severely disrupting emergency response and supply chains.
- **Water and wastewater systems:** Rupture of main and distribution pipelines, failure of pumping stations, storage tanks, and treatment plants, resulting in loss of potable water supply and increased public health risks from sewage contamination.
- **Telecommunications:** Collapse of antenna masts, damage to switching centers and buried/optical cables, causing partial to complete loss of mobile, fixed-line, and internet services – a sector identified as the most under-represented in current vulnerability literature (Nirandjan et al., 2024).
- **Healthcare and education facilities:** From non-structural damage (e.g. fallen ceilings, broken utilities) rendering buildings temporarily unusable, to partial or total structural collapse, directly impairing emergency medical care and increasing casualties in the crucial first hours and days.
- **Secondary effects:** Soil liquefaction, earthquake-triggered landslides, lateral spreading, and fire-following-earthquake dramatically amplify damage to buried networks and surface infrastructure, often producing cascading failures across interdependent systems.¹

¹ So, E. (2014). Introduction to the GEM Earthquake Consequences Database (GEMECD). GEM Technical Report 2014-14. GEM Foundation, Pavia, Italy.

Of all natural hazards, earthquakes have the highest rates of fragility and vulnerability in statistics derived from decades of research in the field of seismic engineering. Nevertheless, significant knowledge gaps persist, particularly for telecommunication infrastructure and for modern construction practices in low- and middle-income, high-seismicity countries.²

The Greek conditions

The rescue team must be capable of operating in challenging and unstable environments, conducting searches through its members, trained dogs, and technical means. It must identify hazards, adapt to different types of structures, provide basic medical assistance in confined settings, communicate effectively with other units, inform the public responsibly, and manage its resources efficiently.

Beyond the rescue team, several state bodies are mandated to take part. The Hellenic Police (ELAS) is responsible for securing access and evacuation routes, ensuring public safety, enforcing the law, managing area clearance, and recording the identity of all victims, whether injured or deceased. The National Emergency Medical Service (EKAB) provides first aid and transports casualties to hospitals. The Earthquake Planning and Protection Organization (OASP) deploys engineers to assess the safety of affected infrastructure.³

Public Utility Companies (DEKO), such as electricity and water providers, must deactivate damaged networks to allow safe rescue operations. Local Authorities (OTAs) are obliged to accommodate displaced citizens by establishing temporary shelters with adequate hygiene, food, and water supplies. The Hellenic National Defense General Staff (GEETHA) assists by setting up camps, distributing aid, and transporting affected individuals. In remote regions, specialized military units conduct aerial medical evacuations.⁴

If mass fatalities occur, the forensic service must certify the deaths. The National Atomic Energy Commission intervenes when there is a potential radiological or nuclear hazard. Volunteer groups contribute psychological and practical support, and private operators may assist with specialized machinery when needed.

Civil protection is essential to ensure the safety of the public during seismic events.

² Nirandjan, S., et al. (2024). Physical Vulnerability Database for Critical Infrastructure Multi-Hazard Risk Assessments – A systematic review and data collection. Natural Hazards and Earth System Sciences Discussions. <https://doi.org/10.5194/nhess-2023-208>

³ Hellenic Fire Service, Circular PS 116

⁴ General Secretariat for Civil Protection (2022) Second Edition of the General Emergency Response and Immediate/Short-Term Consequence Management Plan for Earthquakes: “ENKELADOS 2”. Ministry of Climate Crisis and Civil Protection, Greece.

The **military** also plays a major role in crisis response. First, they assist in rescue operations, searching for and freeing trapped individuals. Second, Armed Forces help maintain safety and order in affected areas, preventing disturbances. They also provide **medical assistance**, setting up mobile hospitals and offering care. Finally, they support **restoration efforts**, repairing infrastructure and helping communities recover. Their intervention strengthens crisis response and provides vital support to society.

Immediate Response (First Hours–Days)

1. Search and Rescue (SAR)

- Deploy specialized Urban Search and Rescue (USAR) teams
- Use sniffer dogs, thermal imaging cameras, fiber-optic cameras, and acoustic/seismic sensors to locate trapped survivors
- Manually dig or use heavy equipment (excavators, cranes) to remove rubble safely

2. Medical Support

- Set up field hospitals or mobile medical units
- Perform triage and emergency surgery on-site
- Evacuate critically injured people by helicopter (often called "medevac")

3. Security and Law Enforcement

- Prevent looting and maintain order in affected areas.
- Secure damaged prisons, banks, armories, and hazardous material sites
- Enforce curfews if declared by civil authorities.

4. Logistical Support

- Airlift food, water, blankets, tents, and medicine using transport helicopters and cargo planes.
- Build or repair temporary helipads in inaccessible areas.
- Distribute relief supplies to remote villages cut off by landslides or destroyed roads.

5. Engineering and Infrastructure

- Clear roads of debris with bulldozers and engineering vehicles
- Build temporary bridges (e.g., Bailey bridges) when roads/bridges collapse.
- Restore critical infrastructure (power, water pumping stations, etc.) if civilian engineers are overwhelmed.

6. Communication

- Set up satellite communication systems when cell towers are down.
- Provide radio networks for coordination between rescue teams and government⁵⁶

A major earthquake constitutes not only a humanitarian emergency but also a significant challenge to the structural resilience of the state. Such an event disrupts

⁵ Dixon, Timothy H. "Earthquake Science in Resilient Societies." *Tectonics* 36, no. 6 (June 2017): 1027–1030

⁶ Rossetto, Tiziana, et al. "Innovations in Earthquake Risk Reduction for Resilience: Recent Advances and Challenges." *International Journal of Disaster Risk Reduction* 58 (May 2021): 102148.

social and economic activity, places extraordinary pressure on public institutions, and reveals underlying weaknesses in governance. Among the most critical implications is its effect on military preparedness and strategic cohesion—factors that shape the broader vulnerability of the state.

From a military perspective, a large-scale seismic disaster imposes immediate operational burdens. Armed forces are routinely mobilized to provide emergency assistance, including search-and-rescue operations, medical support, transport, engineering services, and logistics. While indispensable for stabilizing affected regions, this diversion of resources necessarily reduces the military's ability to maintain routine readiness, conduct training, monitor borders, and sustain deterrent postures. As military units are redeployed from their primary missions, the state experiences a temporary but meaningful decrease in its overall defense capacity.

Earthquakes can also inflict direct damage on military installations, supply depots, transportation networks, and communication systems. Even moderate destruction to these infrastructures undermines the speed of mobilization and the effectiveness of command-and-control mechanisms. This erosion of operational functionality may alter external perceptions of the state's strength. In the realm of security and international relations, perception carries strategic weight: a state facing internal disruption may be viewed as less capable of managing simultaneous external pressures. Furthermore, prolonged emergency duties can negatively affect morale within the armed forces, reducing cohesion and organizational efficiency at a time when unity is essential.

These military challenges are compounded by broader institutional and administrative vulnerabilities. A major earthquake tests the capacity of public administration to respond coherently under pressure. When state institutions suffer from bureaucratic inefficiency, fragmented coordination, or slow decision-making, crisis management becomes inconsistent and delayed. Errors in the allocation of resources, miscommunication among agencies, and difficulties in delivering aid erode public trust. This loss of confidence undermines the legitimacy of state structures and can heighten social tension.⁷

Institutional weaknesses also impede effective civil–military coordination. Successful disaster response requires clear authority structures, streamlined procedures, and integrated operational planning. Where such frameworks are incomplete, the burden of crisis management shifts disproportionately on to the armed forces, further straining their capabilities and extending periods of reduced readiness.

Overall, a major earthquake increases state vulnerability by simultaneously weakening military preparedness and exposing institutional deficiencies. The convergence of operational strain, infrastructural damage, administrative shortcomings, and declining public trust creates a multidimensional environment of fragility that can compromise the state's resilience to future crises.⁸

⁷ Abrams, Daniel P., and Abbie B. Liel. "Earthquake Preparedness and Response: Comparison of the United States and Japan." *Leadership and Management in Engineering* 12, no. 3 (July 2012): 133–148.

⁸ Malešič, M. (2015). The impact of military engagement in disaster management on civil–military relations. *Cooperation and Conflict*, 50(4), 524–543

The asymmetric threat refers to unconventional strategies employed by adversaries—state or non-state—to exploit U.S. vulnerabilities, such as targeting unprotected civil infrastructure (e.g., bridges, power grids, data systems), using information operations, cyber-attacks, terrorism, or psychological manipulation, rather than engaging in direct, symmetric conventional warfare where U.S. forces hold superiority.⁹

An earthquake, as a natural destructive phenomenon, cannot be classified as an asymmetric threat within the established theoretical framework. Asymmetric threats presuppose the presence of deliberate hostile intent, the employment of a specific weapon, tactic or strategy, and an actor who consciously seeks to inflict significant consequences.¹⁰ A seismic event lacks all these characteristics: it has no perpetrator, it does not result from political or military choice, and it cannot be projected as an action that any state or organized entity would employ against another. It is, by definition, an impersonal occurrence of geophysical origin rather than an intentional threat. Nevertheless, the strategic significance of an earthquake lies not in the event itself but in the conditions it produces. The large-scale disruption of essential infrastructure, the erosion of public order, the fragmentation of emergency response mechanisms, and the temporary weakening of national resilience may together create an environment conducive to the activation of genuine asymmetric threats by hostile actors.

In the immediate aftermath of a major earthquake, adversarial groups may attempt to exploit the momentary degradation of situational awareness and response capabilities. One possibility is the deployment of asymmetric tactical actions such as suicide attacks or surprise assaults, which are tactics that organized states would not employ. When command, communication, and surveillance systems are functioning at reduced capacity—due to power failures, infrastructure damage or diverted emergency resources hostile non-state actors may perceive a unique opportunity to execute high-impact operations with a lower probability of detection or interception. The convergence of natural and hostile disruption increases the psychological and social impact of such tactics.

Moreover, large-scale social instability can facilitate indiscriminate attacks against civilian populations or even neutral areas. In moments when a state's authority appears weakened, targeted violence can amplify fear and uncertainty, producing effects far beyond the physical damage of the initial attack. The symbolic dimension of exploiting a population's vulnerability in the aftermath of a natural disaster may provide an added incentive for groups that seek political or ideological leverage through terror.

⁹ Steele, R.D. (1998-99) 'The Asymmetric Threat: Listening to the Debate', Joint Force Quarterly, Autumn/Winter, pp. 78–84

¹⁰ Asprey, R. B. (n.d.). Guerrilla warfare | Facts, Definition, & Examples. In Encyclopedia Britannica. Retrieved 21 November from <https://www.britannica.com/topic/guerrilla-warfare>

Another critical domain concerns the potential for cyber operations or attacks on satellite systems. Earthquakes can impair communications, energy grids, and data networks, leaving critical digital infrastructure in a fragile and partially degraded state. An adversary may use this window of vulnerability to introduce malware, disrupt information flows, or conduct broader cyber offensives that would normally be detected and countered more effectively. Similarly, interference with satellite-based services—navigation, communications, or observation—may be attempted at a time when ground-based systems are already compromised, thereby multiplying the operational impact.

Finally, the post-disaster environment may be exploited at the strategic level. Hostile actors could activate or fund armed groups, instigate widespread unrest, or employ tactics that intentionally expose civilian populations to harm in order to undermine confidence in governmental institutions. Under such circumstances, the earthquake functions not as an asymmetric threat in its own right but as a catalyst: a destabilizing event that opens pathways for asymmetric actions that would have been more difficult, less effective, or entirely infeasible under conditions of normal societal stability.

Vulnerability

A state can be highly vulnerable to **hybrid threats** when it lies in a tense geopolitical environment or has internal political weaknesses. Hybrid threats may include **cyberattacks, disinformation campaigns, economic pressure, and the exploitation of social or ethnic divisions**. Such threats often come from hostile external actors seeking to weaken democratic institutions, influence public opinion, or destabilize political processes. Vulnerability increases when society is polarized, media resilience is low, or critical infrastructure lacks protection. Strengthening cybersecurity, promoting media literacy, and reinforcing democratic institutions are essential for reducing exposure to these multifaceted threats.¹¹

A state's response to earthquakes is a complex and multi-layered topic. It requires coordinated efforts from many agencies and organizations. Key areas to consider when dealing with earthquakes include prevention, warning, emergency response, and reconstruction and restoration. It is important that the states cooperate with international organizations, apply best practices and invest in them research and technology to improve seismic safety.

¹¹ D. Schultz et al , 2025, Agnietė Žotkevičiūtė Banevičienė, *The Resilience of Baltic States to the Threats of the Political Security Sector*, in **Democratic Resilience in the Baltics**, D. Schultz et al. 43–57

