

Earthquake Risk Management in Europe

Challenges, Good Practice and Priorities Going Forward

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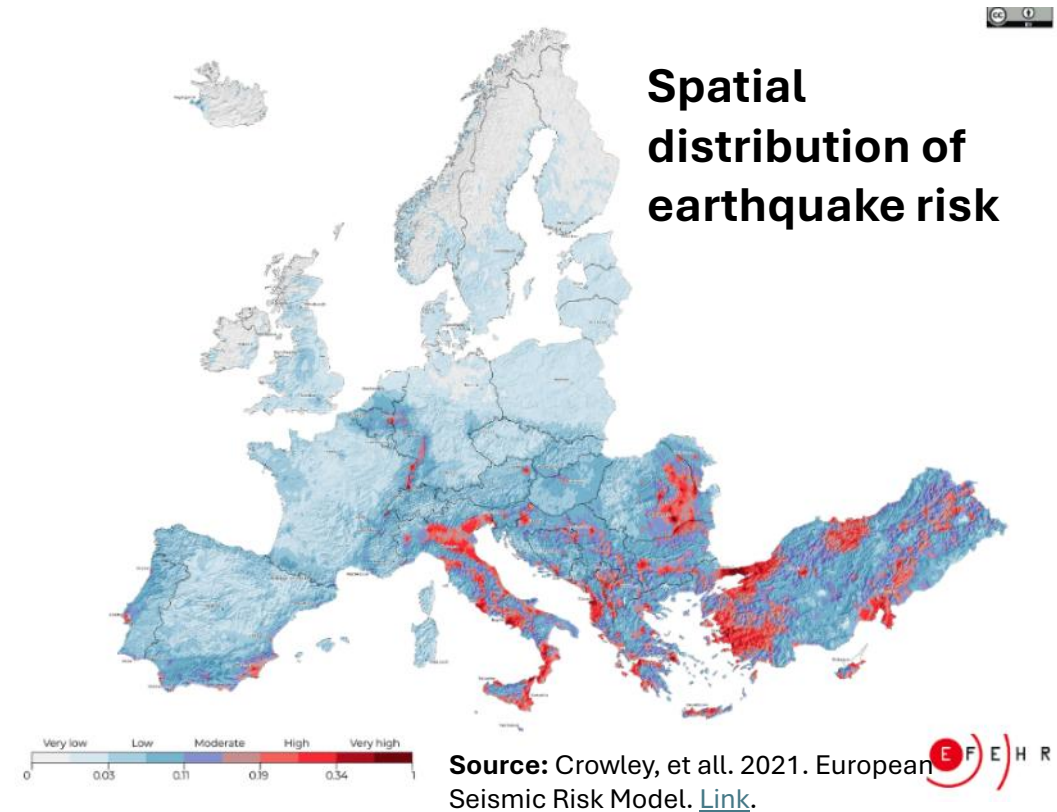


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Why Focus on Earthquake Risk Management?

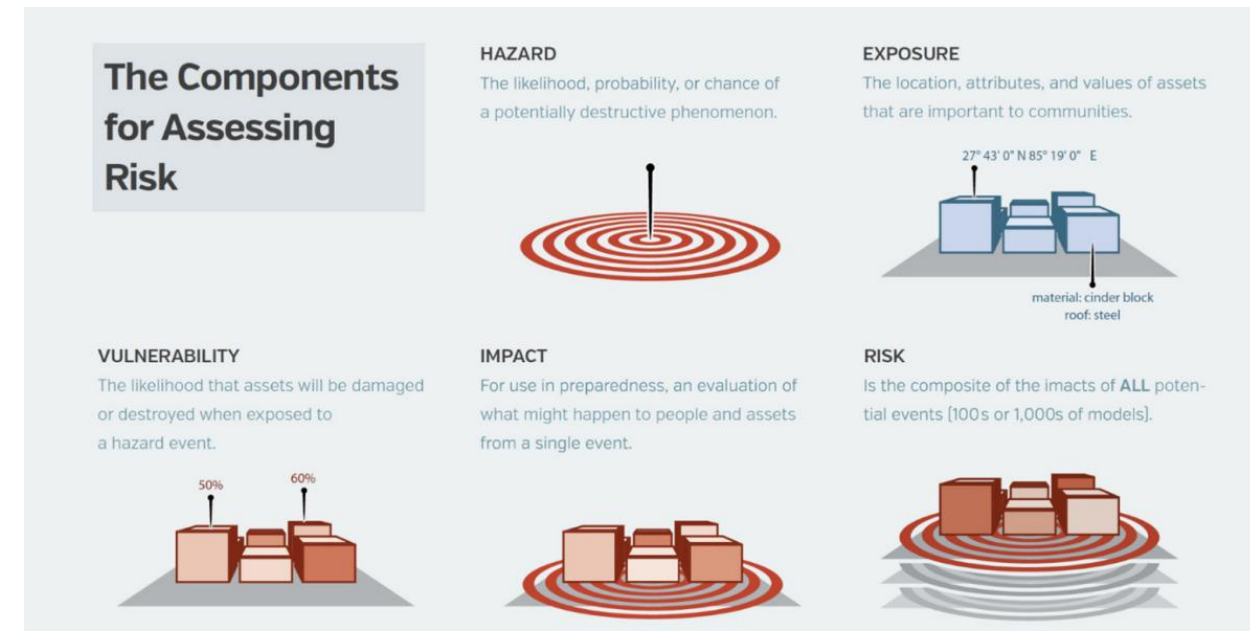
- **Seismic risk is uneven across Europe.** Exposure and capacity differ greatly between Member States.
- **One in three EU citizens are at seismic risk, yet only 13% feel exposed to earthquakes.**
Earthquakes still receive less attention than more frequent hazards, making long-term strategic planning essential at national and EU levels.
- **Aging infrastructure is a big problem, with many buildings still highly exposed.** 40% of housing is pre-code. Public buildings, utilities, remain vulnerable.
- **Earthquakes trigger secondary hazards.**
Tsunamis, liquefaction, and landslides can worsen impacts.



- In the last three decades, earthquakes have caused **at least 700 fatalities** across Italy, Greece, Croatia, Spain, and Slovenia
- Between 2000 and 2020, it is estimated that earthquakes caused **over €60 billion in direct damage** within the EU Member States

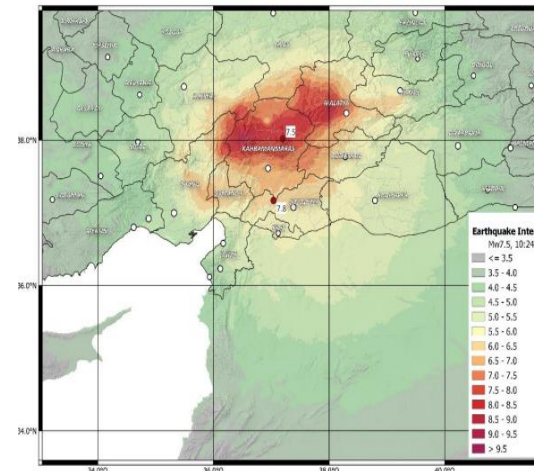
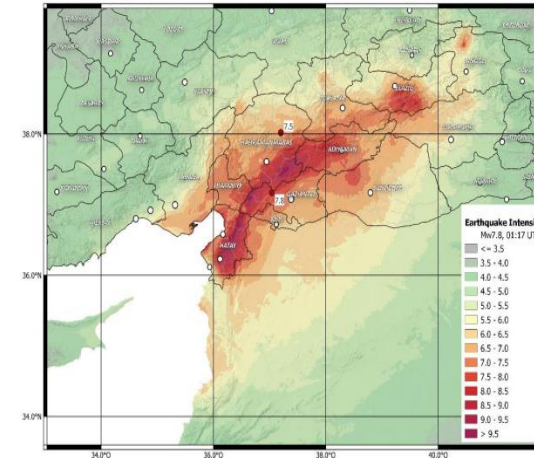
Challenges: Earthquakes often receive less attention

- Around **35% of Europe's** population is exposed to moderate to high seismic hazard, yet only **13% feel at risk**, highlighting a gap in public awareness.
- Earthquakes receive less attention from **both policy makers and the public**, despite their potential for catastrophic damage.
- The **low perceived risk undermines preparedness efforts**, even in regions with a history of destructive seismic events.
- **Decades** can pass between large **earthquakes**, leading to a **decline in public awareness** and policy attention to the risk.



Challenges: Aging Building Stock

- **40% of Europe's housing stock was built before modern seismic codes**, with many buildings aging beyond their design life and poorly maintained, posing serious risk.
- Prioritizing decisions between **retrofitting or transforming** aging building stock remains a major challenge, as it requires **balancing structural vulnerability, social value, and resource constraints** across diverse urban contexts.
- Critical infrastructure such as **hospitals, utilities, and police stations** remain vulnerable, especially in high-risk cities like **Istanbul, Bucharest, Athens, Naples**, and others across Southern and Eastern Europe.
- The **2023 Kahramanmaraş earthquake in Türkiye** exposed the consequences of unenforced building codes and rapid urbanization, resulting more than **50,000 deaths, \$34.2B in damages**, and widespread destruction of **houses, schools, hospitals, and water infrastructure**.



Challenges: Critical Public Infrastructure are exposed to EQ Risk

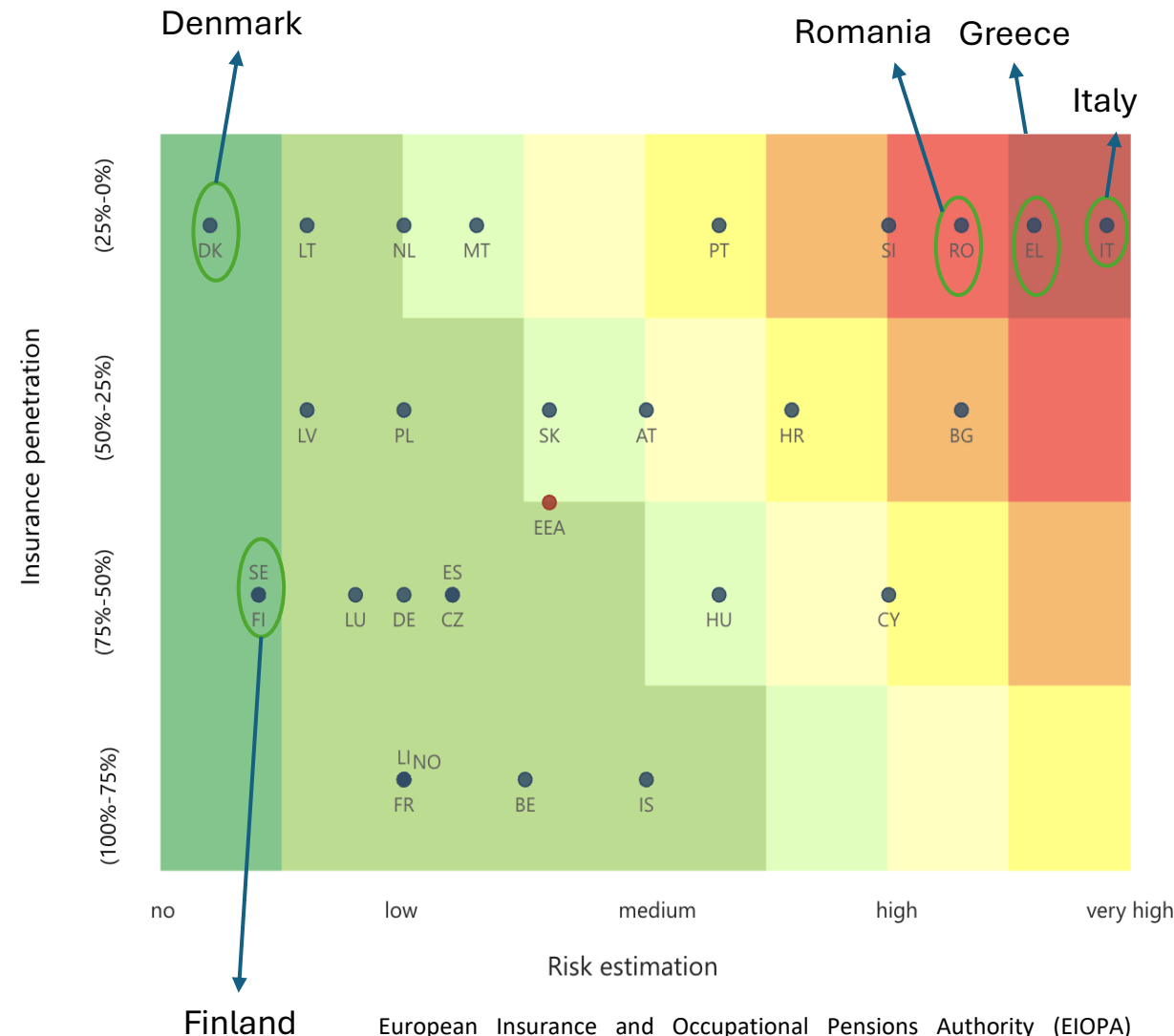
- In **Croatia (2020)**, earthquakes damaged **214 health buildings**, with **25% suffering moderate to severe structural damage**, followed by further damage to civil protection facilities and equipment. (*Economics for Disaster Prevention and Preparedness, 2024*)
- The **2023 Türkiye earthquakes** severely affected **42 hospitals**, numerous fire stations, emergency coordination centers, and response vehicles like ambulances and fire trucks.
- **Half of EU Member States** have fire stations located in multi-hazard zones, increasing vulnerability to earthquakes, floods, wildfires, and landslides. (*Economics for Disaster Prevention and Preparedness, 2024*)



Collapsed firestation during 2023 EQ, Hatay, Türkiye

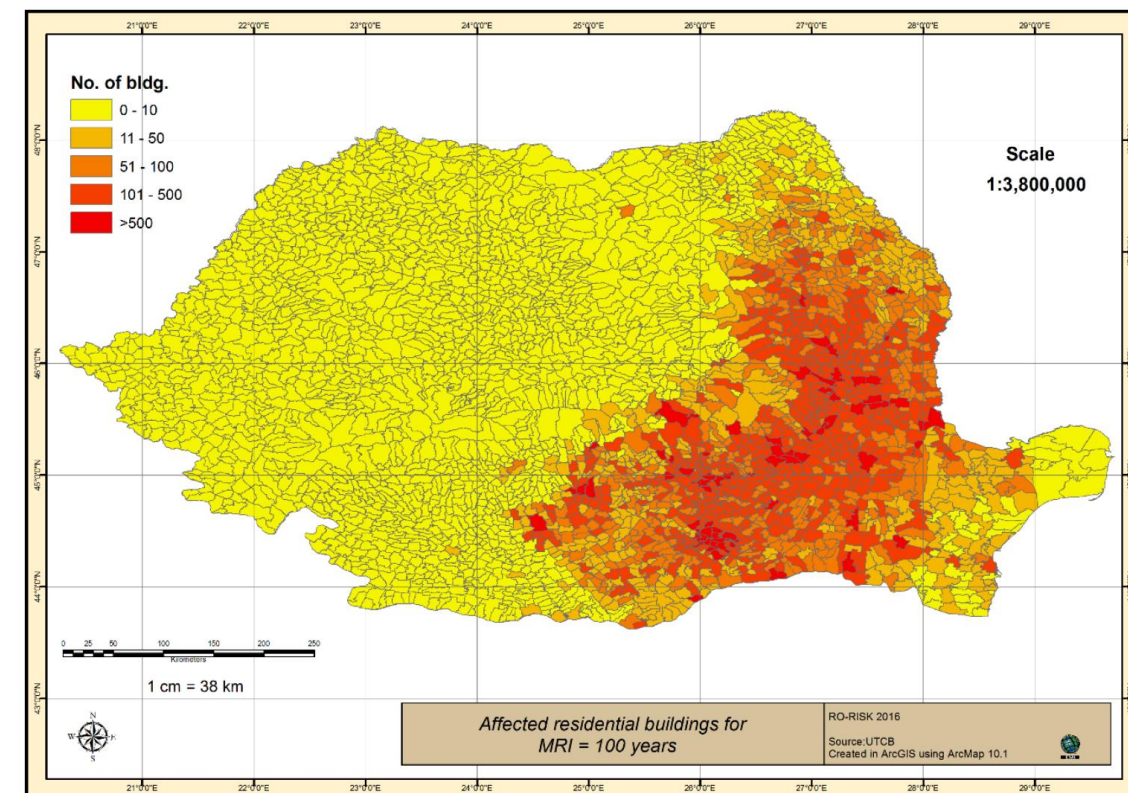
Challenges: Financial Challenges

- Prioritizing **disaster risk financing** is **complex**, as it must balance funding for both **risk reduction** and **recovery**, with potential contributions from **government**, **private sector**, or **insurance**, making strategic allocation a major challenge.
- **Penetration rates of insurance** for public and residential assets are **low**, **reserve funds** are **limited**, and other types of risk transfer and contingency funding are lacking
- **Low insurance penetration** across the **EU**, especially in **high-risk countries**, increases fiscal vulnerability. For example, only **14% of losses** were insured after the **2009 L'Aquila** earthquake in Italy, compared to **80% in New Zealand's** 2010–2011 events.
- Only **30 percent of EU member** states have more than half the population covered by catastrophe insurance.
- In **Türkiye**, mandatory earthquake insurance covers only residential buildings, with **56% coverage as of 2024**, but recent 2023 earthquake showed that government still bears **most reconstruction costs**, highlighting the need to strengthen financial protection mechanisms.



Priorities Going Forward: Introducing Integrated National Risk Reduction Strategy

- **Romania** is an example of a country with a **national seismic risk reduction strategy** and plan. Some national actions include:
 - Establishment of national risk data system & decision support
 - Mobilizing financing for seismic risk reduction of private buildings
 - Mainstreaming risk management in urban and regional planning and sectoral strategies
 - Improving the capacity to recover from a disaster
 - Bundle seismic + energy upgrades

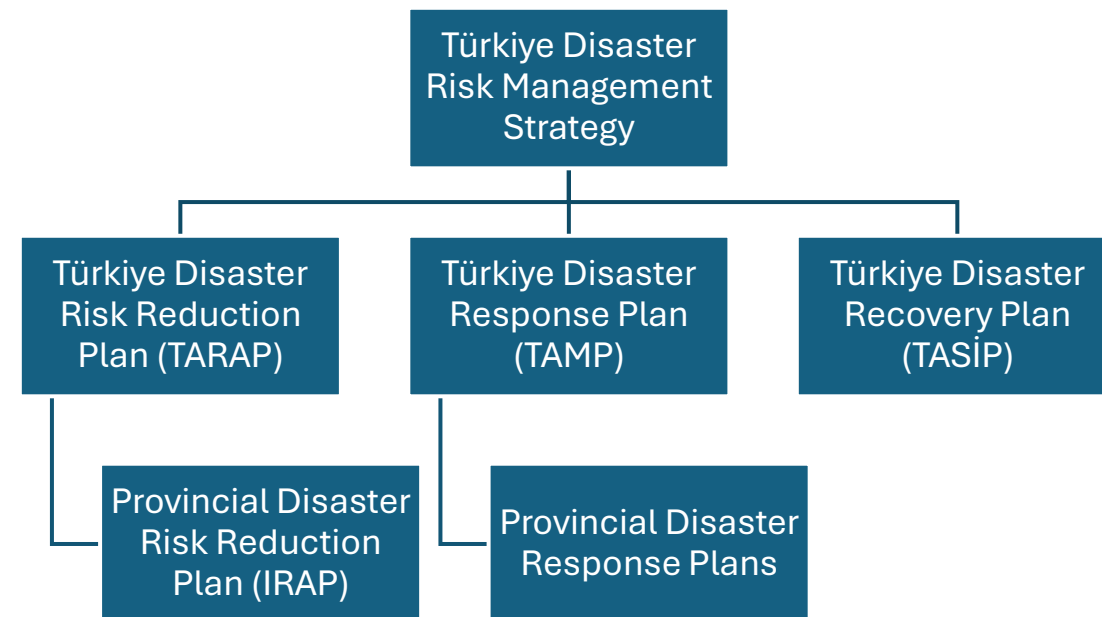


WB contributed via RAS services for the 'Consolidation of the Strategic Planning Capacity of the Ministry of Development, Public Works and Administration for Renovation of the National Building Stock for Energy Efficiency and Seismic Risk in Romania (P169420)

Priorities Going Forward: Türkiye's Disaster Risk Management Strategy

Türkiye has a long-standing history on development and implementation of disaster risk management strategies.

- **Disaster and Emergency Management Presidency (AFAD) coordinates national disaster preparedness, response, and recovery efforts**, engaging institutions across Türkiye.
- **Türkiye Disaster Risk Reduction Plan (TARAP)** and **Türkiye Disaster Response Plan (TAMP)** have provincial plans focuses on specific actions in provincial level.
- **AFAD** also conducts **humanitarian aid operations** both **domestically** and **internationally**.
- **Strategy and Budget Office of the Presidency** provides guidance on budgeting the disaster risk management investments



Priorities Going Forward: How to Deal with Improving the Resilience of Buildings

- **Retrofitting critical public infrastructure and housing** is essential to improve resilience against seismic and other hazards, especially for **schools, hospitals, and public facilities**.
- Effective implementation requires **national planning, local government empowerment, and central coordination**, as demonstrated by Japan's integrated approach combining retrofitting, drills, and education.
- **Energy retrofitting and water saving practices** should be considered alongside seismic upgrades to maximize benefits and leverage ongoing renovation efforts. (Croatia, Italy)
- Since the **1999 Marmara Earthquake**, over **1,500 schools, hospitals, dormitories, and social service buildings** have been retrofitted in Istanbul to improve seismic resilience and energy efficiency.



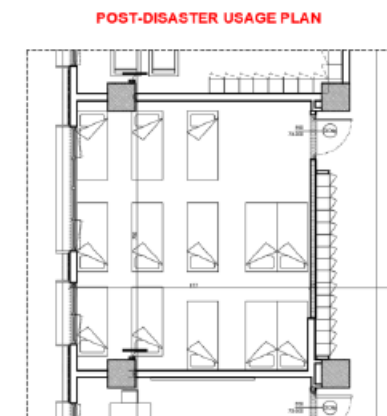
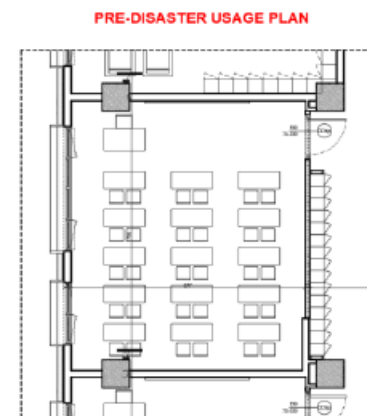
Priorities Going Forward: Examples from Türkiye

- The World Bank-financed ISMEP project significantly strengthened Istanbul's resilience to earthquakes and other hazards between **2006 and 2015**.
- Over **1,700 public buildings**, including schools, hospitals, and administrative facilities, were retrofitted or reconstructed, targeting **vulnerable pre-2000 structures**.
- The project also established emergency coordination centers on both sides of Istanbul and **trained 1.8 million people in emergency preparedness** and response.



Priorities Going Forward: Examples from Türkiye

- **Istanbul Resilience Project (IRP) approved in August 2025**, objective is to enhance the capacity of the emergency preparedness and response system and increase resilience to disaster and climate risks in Istanbul Province.
- Project will start with urgent investments in **emergency preparedness and response** and integrating **disaster risk reduction measures in key public buildings and facilities** enhancing their functionality to serve as **temporary shelters in post-disaster situations**



Priorities Going Forward: Examples from Türkiye

- **Seismic Resilience and Energy Efficiency in Public Building Projects** aims to **strengthen disaster resilience** and **reduce energy use** in selected central government buildings across Türkiye.
- **250 public buildings** will be **retrofitted** for **seismic safety**, upgraded to **higher energy efficiency classes**, and equipped with solar panels.
- **Two** hospitals will be reconstructed to meet high energy efficiency standards, improving both safety and sustainability.
- **Disaster Risk Management in Schools Project** aims to increase the safety of students, teachers and staff in selected schools in high-risk seismic zones in Türkiye.
- **42 education facility** will be reconstructed in Türkiye to enhance seismic resilience



Priorities Going Forward: Prioritization for the continuity of life

- Collect detailed **data** on **critical infrastructure** at risk to enable targeted and effective resilience planning.
- **Conduct multi-hazard risk assessments** to ensure critical infrastructure can sustain essential services after an earthquake.
- **Prioritize the resilience of hospitals, schools, and emergency buildings** to maintain continuity of operations during and after seismic events.



Priorities Going Forward: Examples from Türkiye

- **Resilient Izmir: A Strategic and Inclusive Initiative for Multi-Hazard Preparedness and Risk Reduction (TAFF Grant)**
- Launched in **September 2025** to **strengthen İzmir's multi-hazard preparedness** and resilience.
- Focuses on risk profiling, including assessments of **critical infrastructure, early warning systems, and industrial/tourism zones.**
- Aims to **develop a strategic roadmap, enhance response capacity, and raise public awareness** through training and communication.



Priorities Going Forward: Smart investments to focus on multi-hazard resilience

- Move beyond **single-hazard approaches**, recognize that risks like **earthquakes, floods, storms, heatwaves**, and **health emergencies** are often interconnected.
- Use **integrated strategies** to ensure infrastructure, systems, and communities are robust across **multiple hazards**, not just one.
- As **climate change, urbanization**, and **environmental degradation** intensify risks, multi-hazard resilience becomes essential for sustainable development.



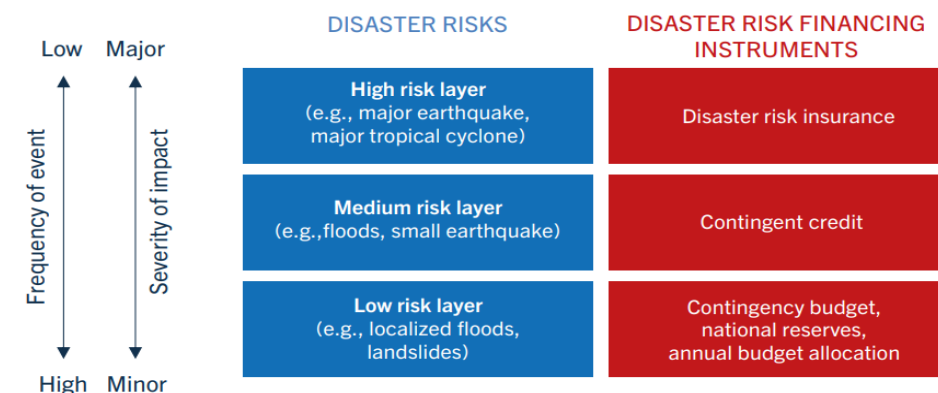
Priorities Going Forward: Examples from Türkiye

- **Climate and Disaster Resilient Cities Project** aims to improve access to **resilient housing, infrastructure, and municipal services** in project provinces across Türkiye.
- **Finance resilient environmental infrastructure** for the **municipalities under climate and disaster risk**
- Will finance **urban transformation for 10,000 housing units** to meet **seismic and climate resilience** standards.

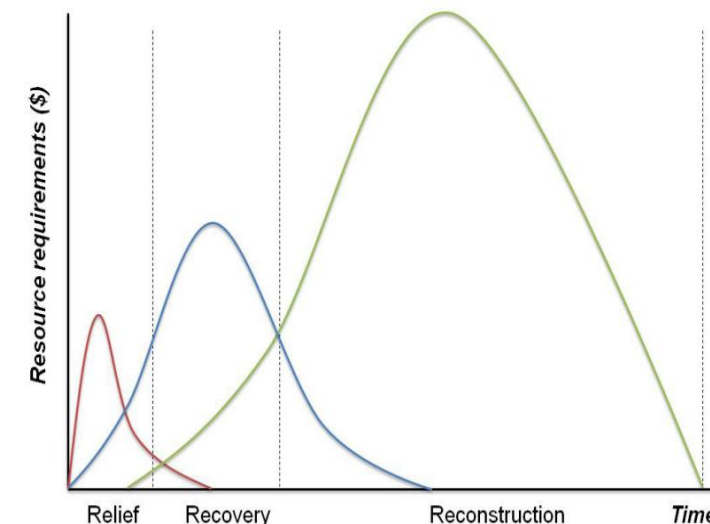


Priorities Going Forward: Disaster risk financing

- **Low insurance coverage** forces governments to rely on **budget reallocations, borrowing, and external aid**, increasing fiscal strain and delaying recovery.
- The **insurance protection gap** undermines **macroeconomic stability** and slows down **reconstruction efforts** after disasters.
- **Scaling up insurance solutions** can protect households and businesses, reduce fiscal volatility, and incentivize **proactive risk reduction**, making it a key pillar of resilient disaster risk management in the EU.
- **Why not spending earlier rather than later for less recovery burden on government's shoulders?**

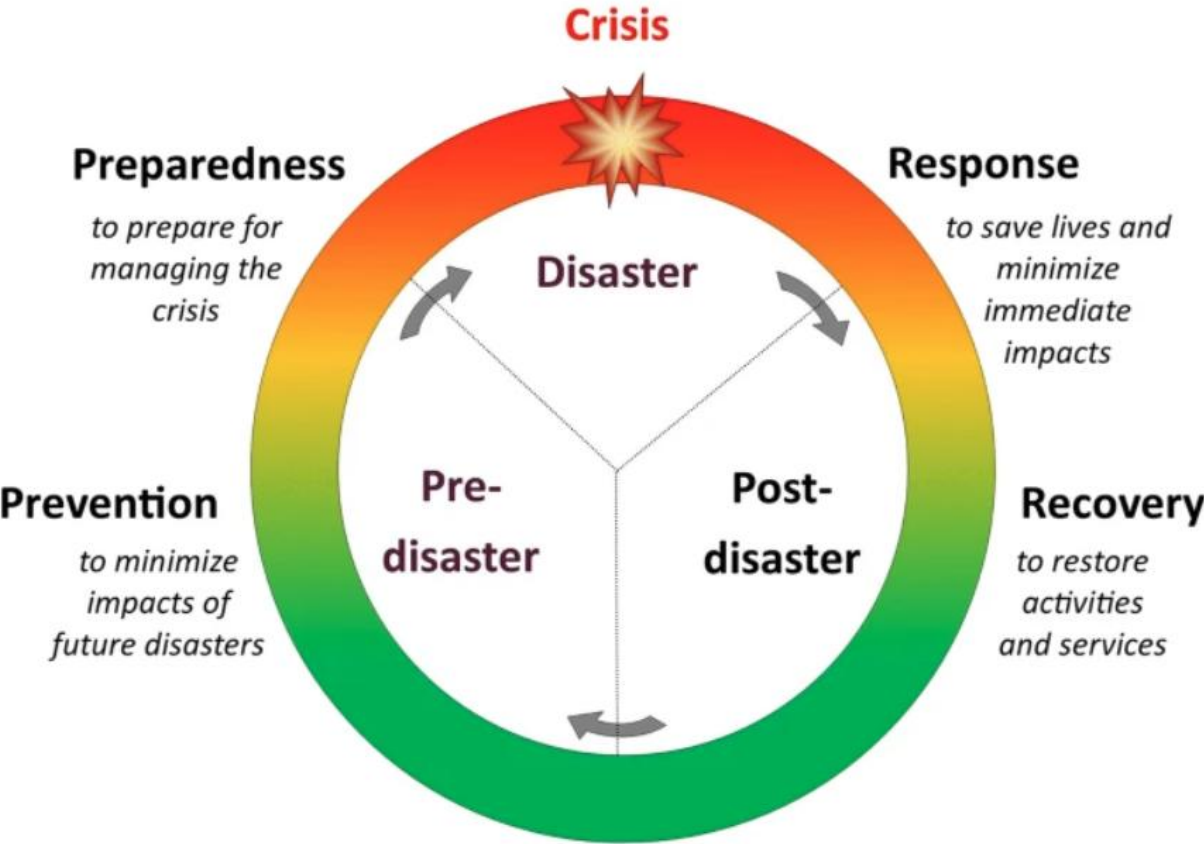


Three-tiered disaster risk financing strategy



Funding requirements for post-disaster phases and their duration

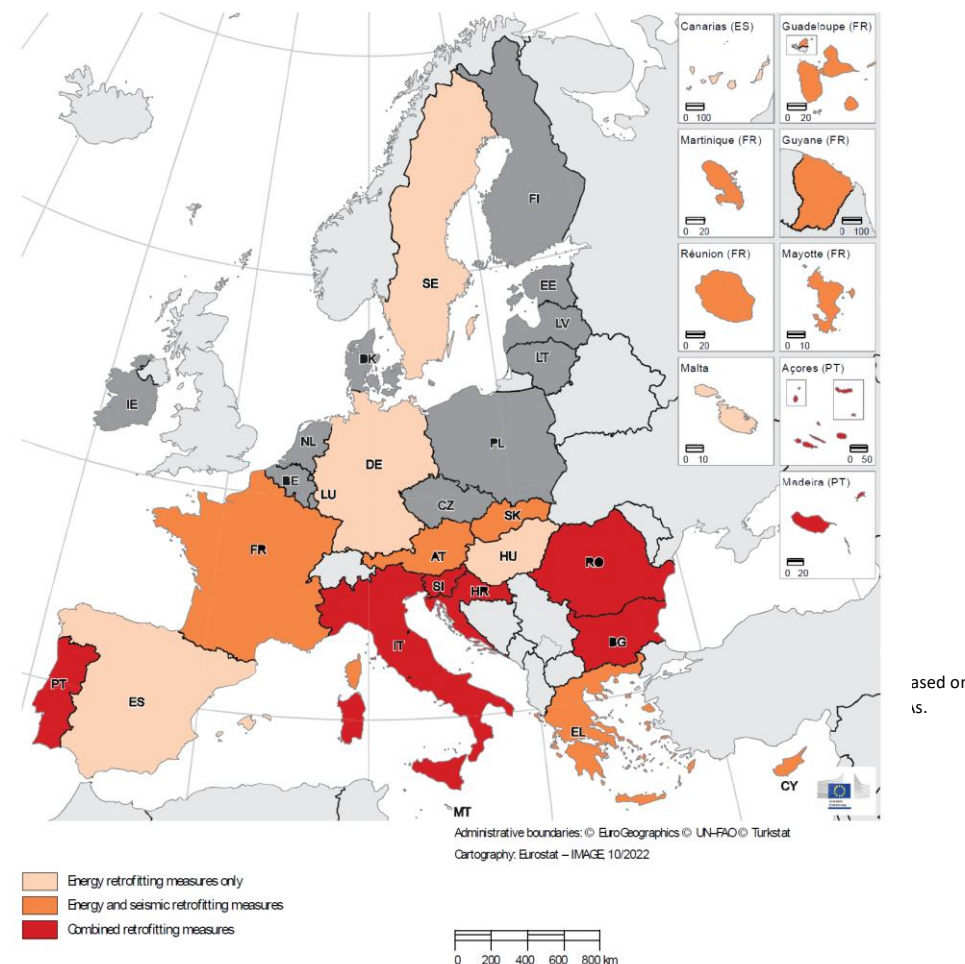
Disaster Risk Management Cycle and Resilience Pillars



Challenges: Action but constrained capacity and strategies

- **Only a few countries have dedicated EQ strategies, and local action is limited.** Romania's national strategy and Italy's Seismic Prevention Plan illustrate what structured frameworks can achieve. Türkiye, on the other hand, is notable for the speed of its recovery efforts.
- Local administrations often lack resources and **technical capacity to assess, prioritize, and upgrade vulnerable buildings.**
- **Strengthening local financing, planning, and monitoring systems** is essential for **effective** and **sustainable** resilience efforts.

Existing building renovation measures identified for earthquake-prone countries



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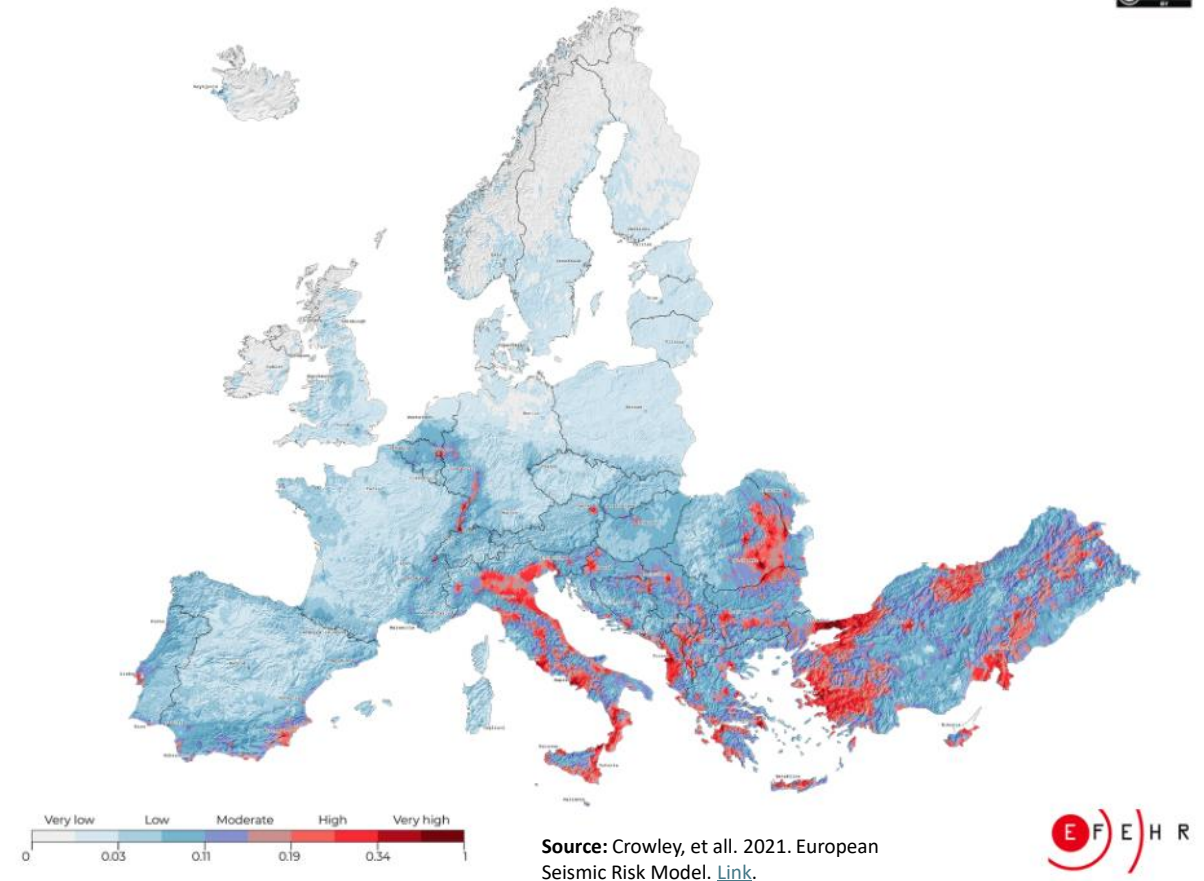
Risk Profile of EU Against EQs

- In **four** EU countries, the **Average Annual Loss (AAL)** from earthquakes exceeds **0.1% of total building stock value**, indicating notable long-term risk.
- **AAL represents average yearly losses**, but **extreme events** can cause significantly higher damage to building stock.
- In **Italy**, a **1-in-100-year earthquake** could result in **1.1% loss**, and a **1-in-500-year event could cause 2.5% loss** of the total building stock value. (*Financial Risk and Opportunities to Build Resilience in Europe, 2021*)

SEISMIC RISK		
Rank	Country	AALR
1	Cyprus	0.19%
2	Greece	0.18%
3	Romania	0.12%
4	Italy	0.11%
5	Bulgaria	0.07%
6	Croatia	0.05%
7	Slovenia	0.04%
8	Austria	0.02%
9	Portugal	0.02%
10	Slovakia	0.01%

Risk Profile of EU Against EQs

- Natural disasters in the EU (1980–2020) affected **nearly 50 million** people and caused **€12 billion in annual economic losses** on average. (*Financial Risk and Opportunities to Build Resilience in Europe, 2021*)
- Earthquake risk in Europe, especially in **Southern and Eastern regions**, remains significant despite advanced seismic codes and engineering practices.
- **Between 2000 and 2020**, earthquakes caused an estimated **€60 billion in direct damage across EU Member States**. (*EM-DAT, 2024*)



Priorities Going Forward: Observing the potential implications of Early Warning Systems

- A feasibility study showed that **44% of target sites in Europe** could benefit from sufficient warning times to **enable critical interventions like shutting down industrial equipment or moving vehicles**. (*Investment in Disaster Risk Management in Europe Makes Economic Sense-Background Report*)
- EEWS can be a powerful tool for supporting **earthquake-related disaster risk reduction (DRR)** across a significant portion of Europe.
- Investing in **EEWS** enhances preparedness and response capacity, **helping protect lives**, and **essential services** before shaking begins.
- **EEWS** may not always provide sufficient lead time to save lives, especially when **fault lines are located close to urban centers**; therefore, EEWS should be viewed as a **complementary investment, not a standalone solution**.

