VREPO
Vulnerability, Resilience and Recovery Policies of the Physical Living Environment

Image: SWECO- Urban insight

SWECO

ECOSTACK INNOVATIONS LIMITED

BAULAND

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Intro

Supporting multistakeholder governance

Image: SWECO- Urban insight

Targeted analysis – double aim

- **Scientific Evidence:** Assess vulnerabilities of the physical living environment to support policy resilience strategies.
- **Policy Development:** Create resilience strategies (adaptation, mitigation, transformation) to manage risks and crises effectively.

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Purpose

- The geographical focus of this targeted analysis is on the **stakeholders' territories**. The project will conduct a territorial analysis covering governance practices and policy instruments by considering two types of regions
- **Analyze and compare a limited set of vulnerabilities** linked to hazards in the physical living environment of the regions, and the degree of resilience
- Give an opportunity to regions with emerging risks, to learn from regions that have already been affected, looking at cascading events, multiple crises, as a useful **tool for policymakers** in dealing with uncertainties
- Provide a **methodological framework and indicators** that can be used to build solid evidence regarding the vulnerability and degree of resilience of a region
- **Asses the strategies and instruments** related to crises in the stakeholder territories
- Formulate **recommendations**

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5 Territories

Lithuania

2.9 M Inh

65.300 km²

Enshede

158.542 Inh

142 km²

Flanders

6,8 M Inh

13.522 km²

Region SUD

5.17 M Inh

31.400 km²

Malta

552.747 Inh

316 km²

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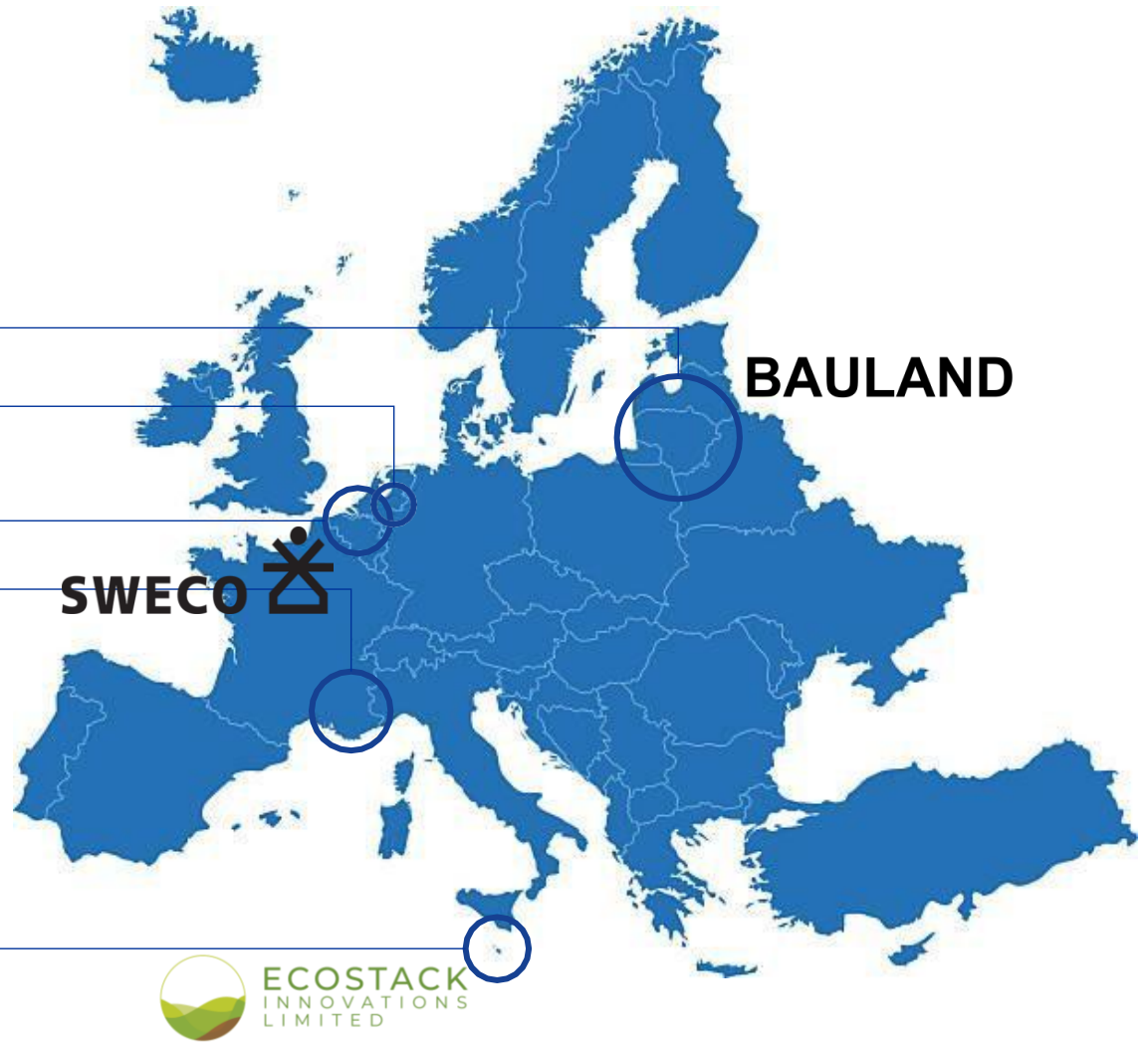
5 Territories

- Lithuania
- Enschede
- Flanders
- Region SUD
- Malta



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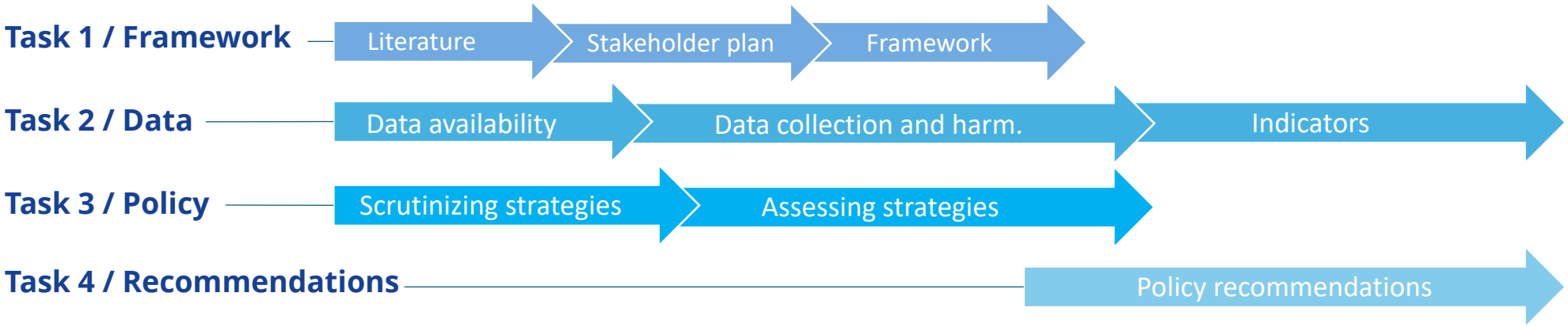
Approach

Iterative dialogue

Image: SWECO- Urban insight

Overview of tasks



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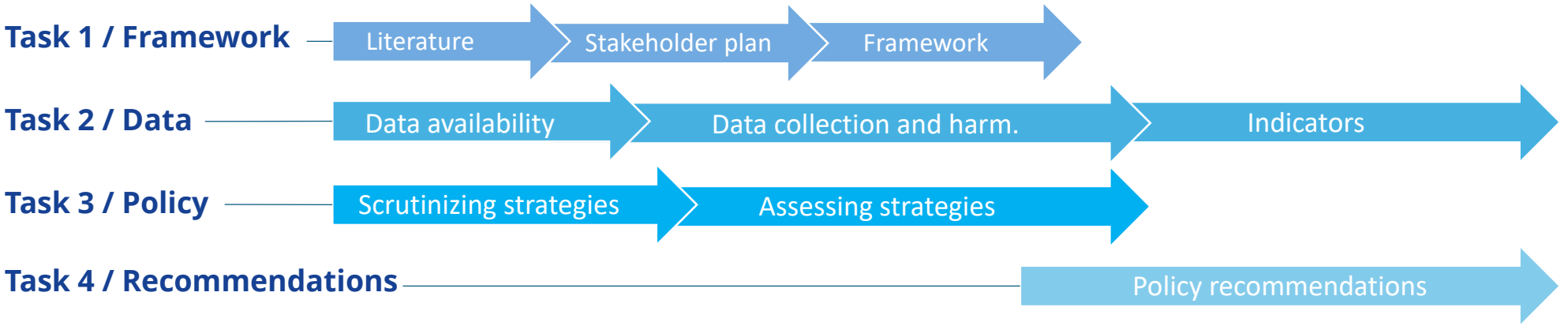
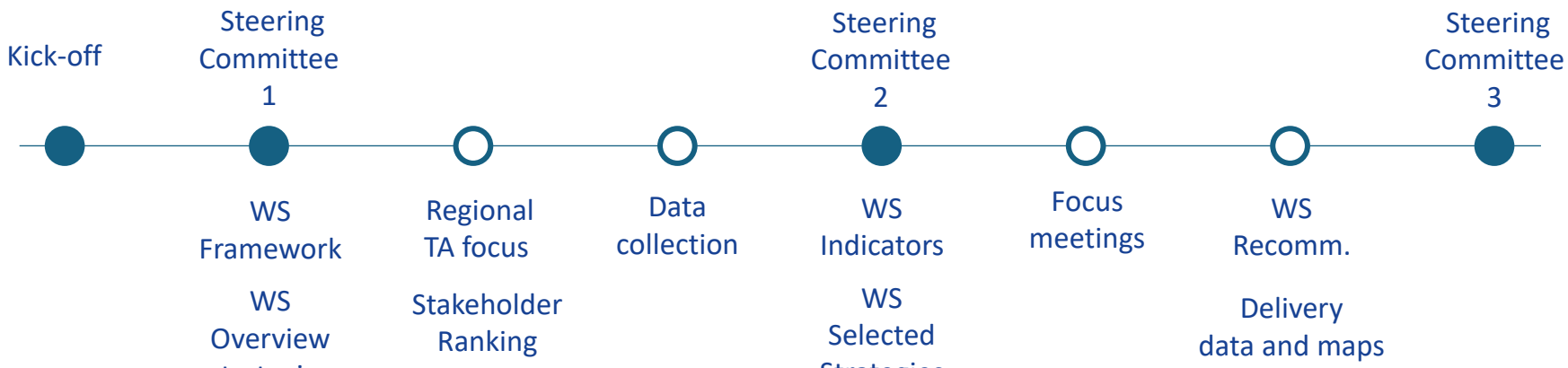
Stakeholder engagement





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Conceptual framework & Methodology

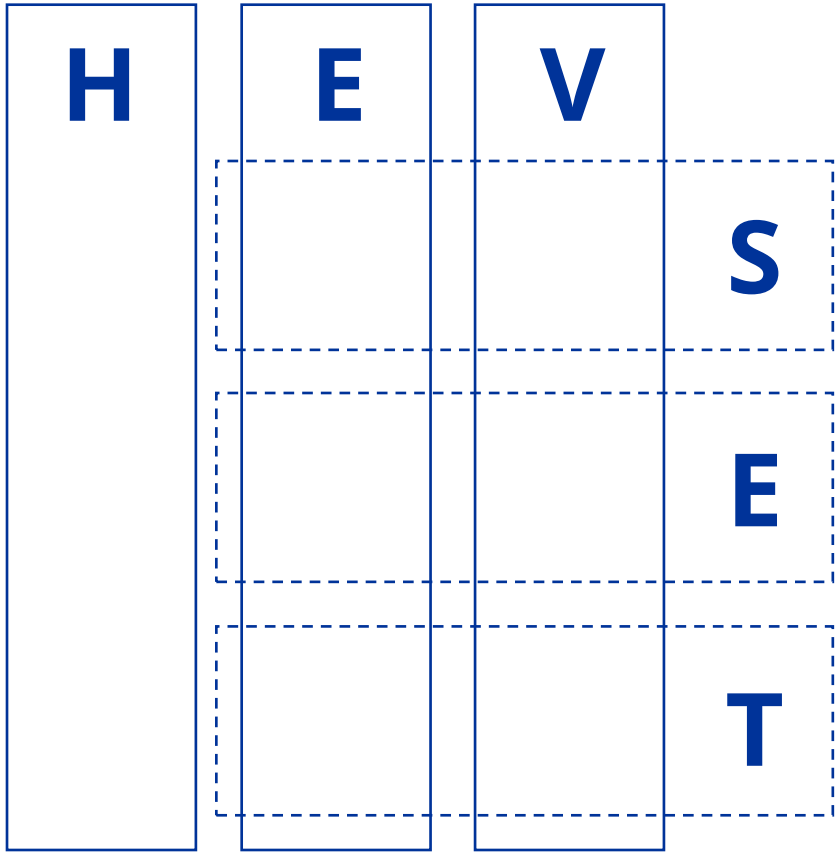
Common language and priorities

Conceptual framework

- Resilience: resilience as the ability of coupled **social-ecological-technological systems (SET)** to anticipate, absorb, recover from, and adapt to hazards while maintaining or improving their essential functions

- Risk: The combination of the probability of an event and its negative consequences, often referred to by the following function:

Risk = Hazard x Exposure x Vulnerability



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Risk

CLIMATE

GEOPOLITICAL

PUBLIC HEALTH

Hazard

1. Floods
2. Heat stress
3. Droughts
4. Storms
5. IAS
6. Coastline erosion
7. Nature fires
8. Extreme weather
9. Submarine landslides

10. Terrorism and cyber attacks
11. Armed conflict

12. Pandemics
13. CBRNe

Exposure

Communities and Urban Areas
Populations in flood-prone regions, coastal areas, valleys, basins, and urban centers (overdeveloped and densely built areas).

Natural and Agricultural Environments:
Agricultural zones, farms, forests, native flora and fauna, aquatic and marine ecosystems, and coastal dunes.

Critical Infrastructure and Strategic Locations:
Roads, bridges, hospitals, border regions, CBRNe installations, strategic targets, and financial sector (bank clients).

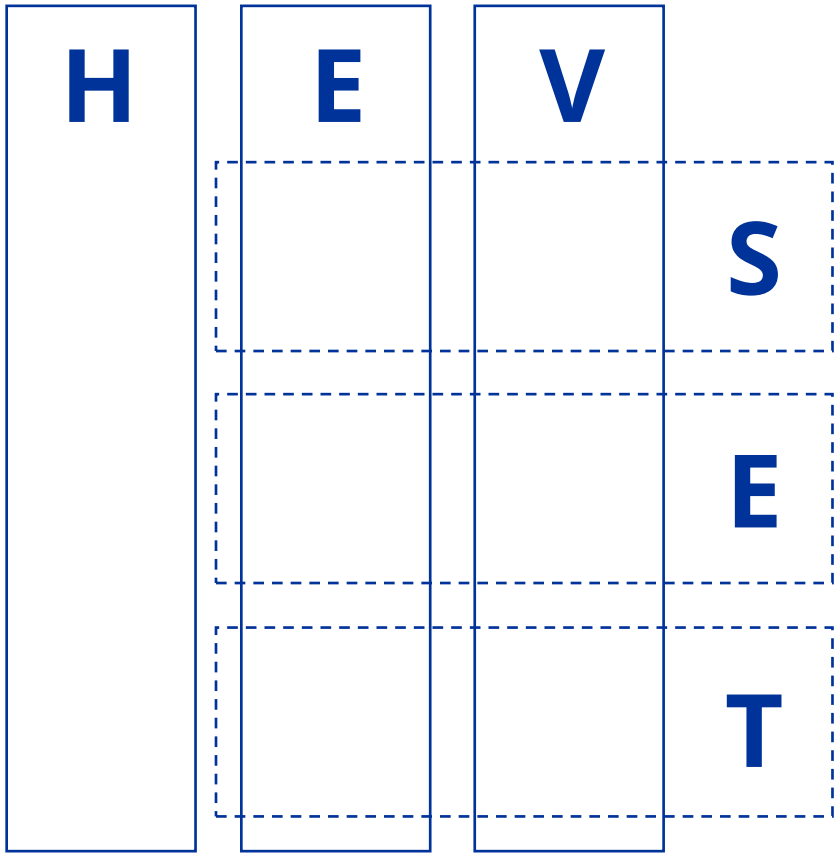
Vulnerability

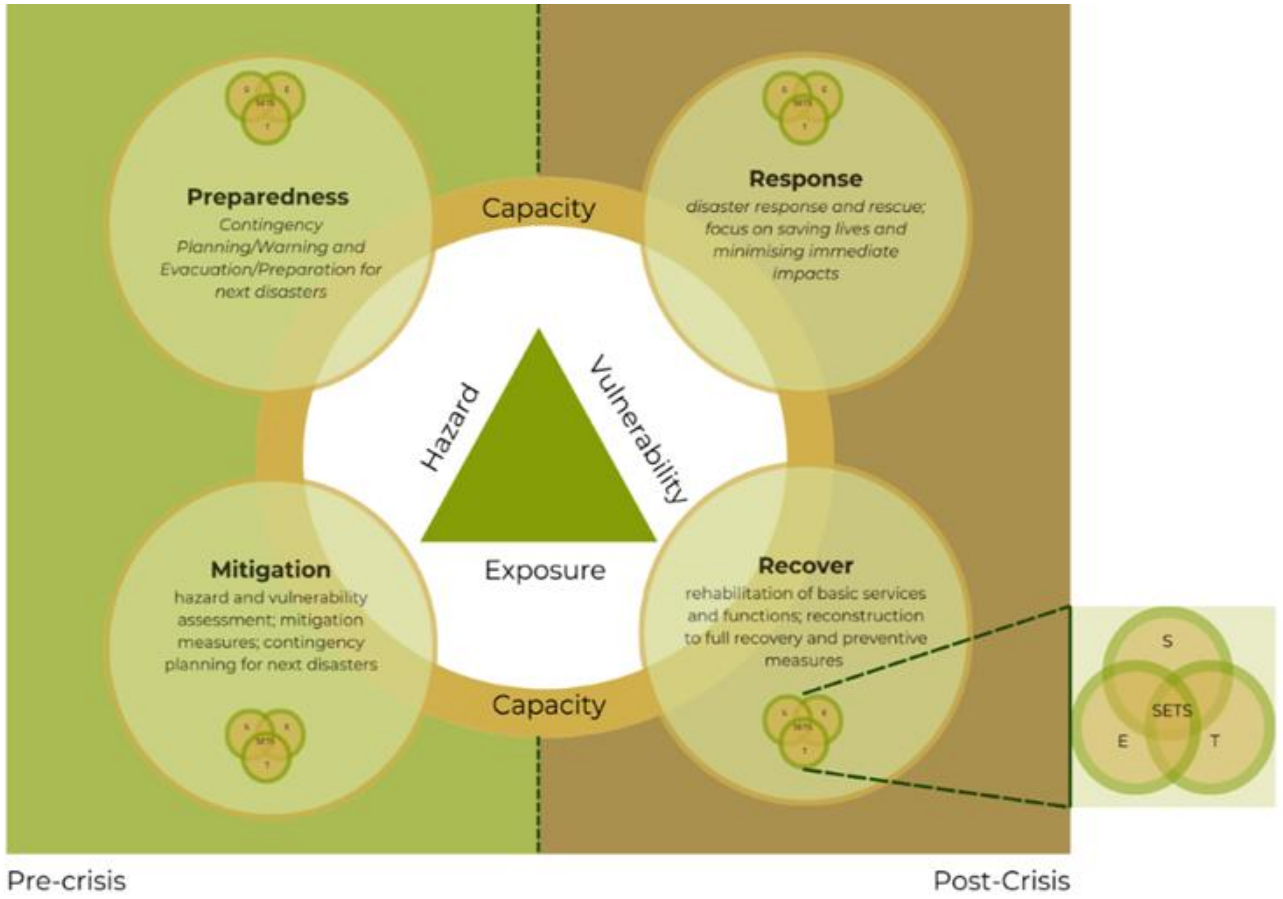
Social and Governance:
Communities, public health, social structures, and policy & governance

Economy and Environment:
Economic stability, land use, ecosystems, and natural resources.

Infrastructure and Technology:
Roads, buildings, public utilities, and technological systems.

Conceptual framework + Disaster Management Cycle (DMC)





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Data-sets

Development of territorial resilience data-sets

Image: SWECO- Urban insight

Data structure and the conceptual framework

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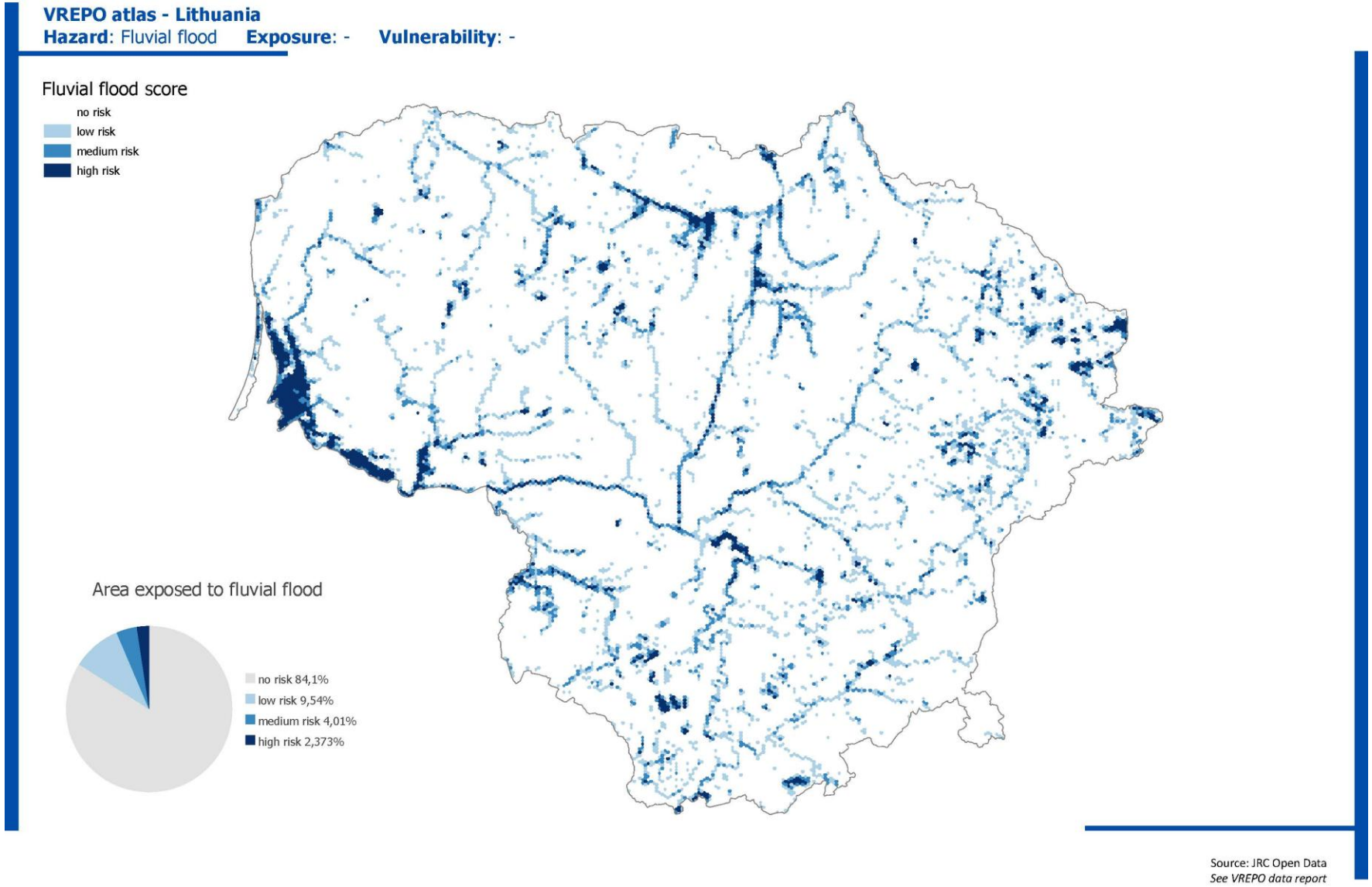
Indicator

Fluvial flood risk



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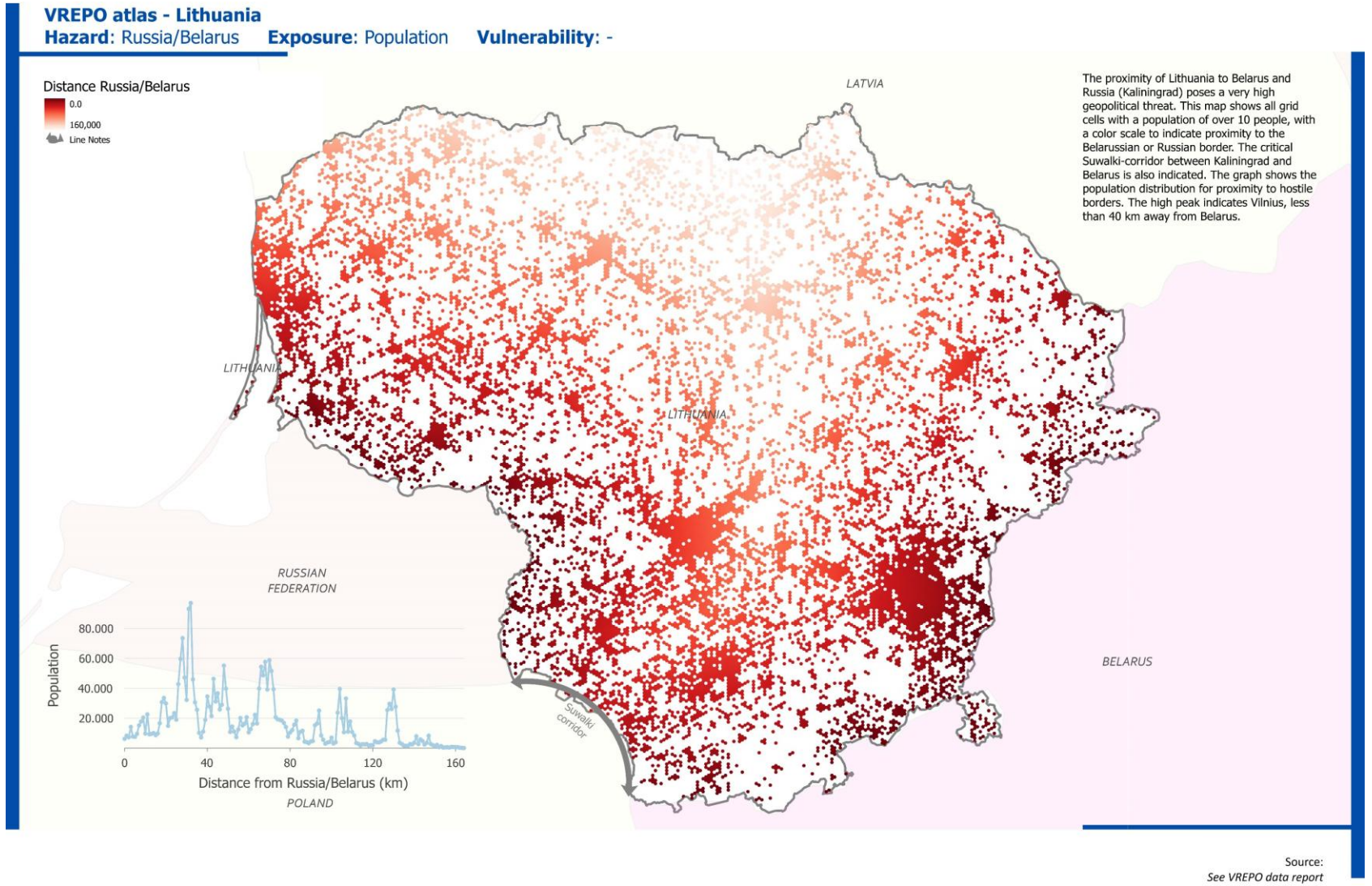
Metrics

Population density; Critical Geopolitical Zones; Proximity to Borders

Indicator

Population Distribution and Proximity to Belarus and Russia



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Metrics

Population

Distance from nuclear power plant

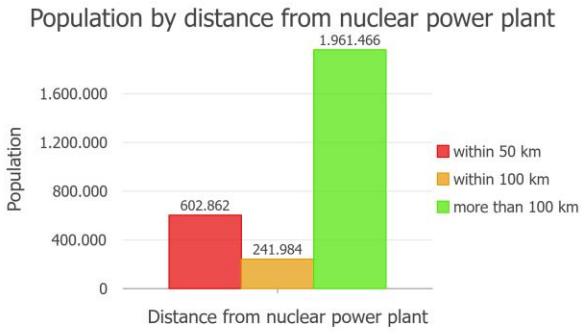
Indicator

Population living within 50 km of a nuclear power plant

Population living within 100 km of a nuclear power plant

VREPO atlas - Lithuania
Hazard: Nuclear power plant **Exposure**: Population **Vulnerability**: -

The Belarusian nuclear power plant of Astravets is situated near the Lithuanian border. This maps shows this power plant, with the population exposed within 50 km and 100 km radius. Vilnius largely falls within the 50 km perimeter, putting it at risk for nuclear accidents with this power plant.



Source:
See VREPO data report

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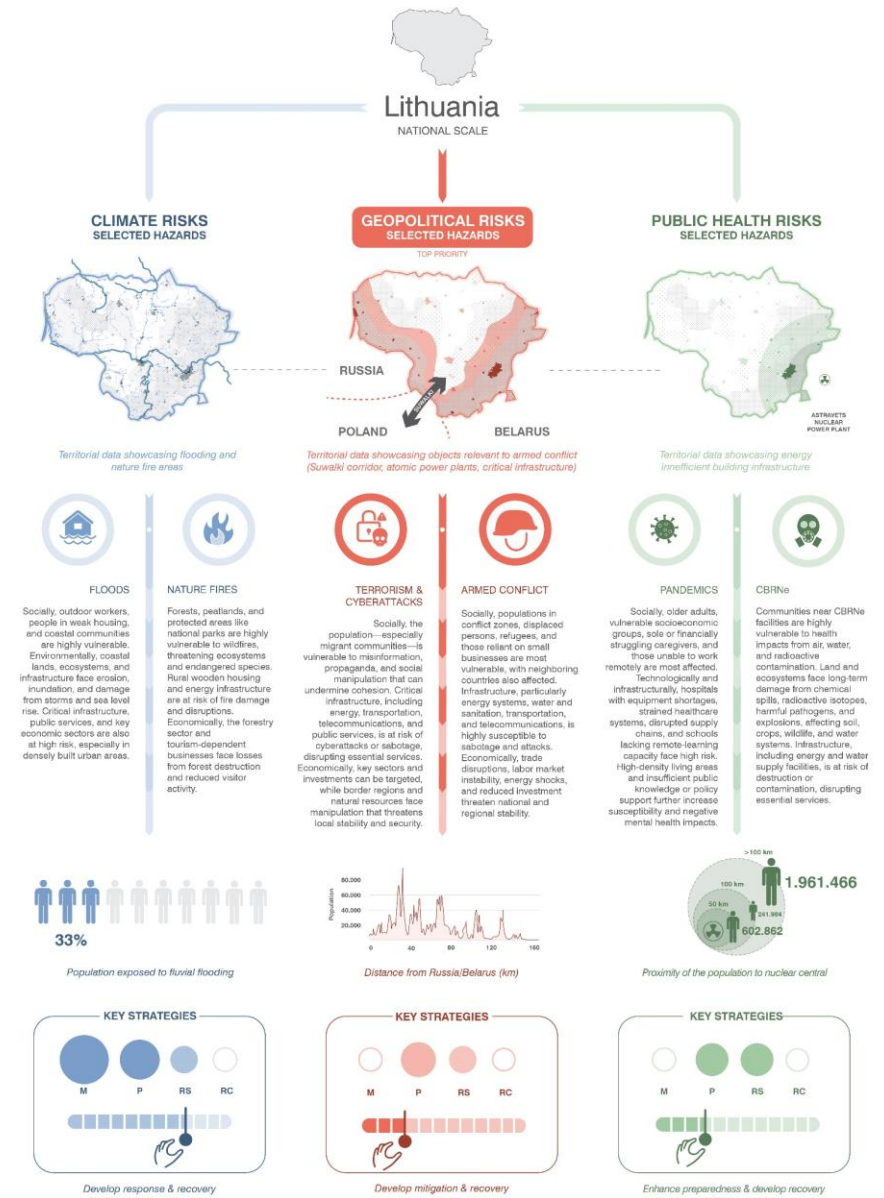

*Heatmap shows the distribution of proposed strategies across DMC stages and risk categories in the different territories Disaster Management Cycle (DMC): Mitigation (M), Preparedness (P), Response (RS), and Recovery (RC).

Lithuania

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FINAL DELIVERABLE

Regional Report - Lithuania

VREPO

Final Report // November 2025

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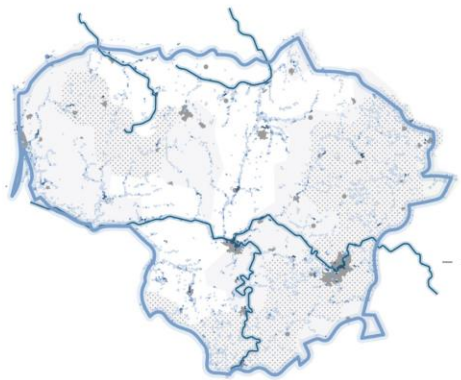
VREPO VULNERABILITY, RESILIENCE AND RECOVERY POLICIES OF THE PHYSICAL LIVING ENVIRONMENT

Lithuania

NATIONAL SCALE

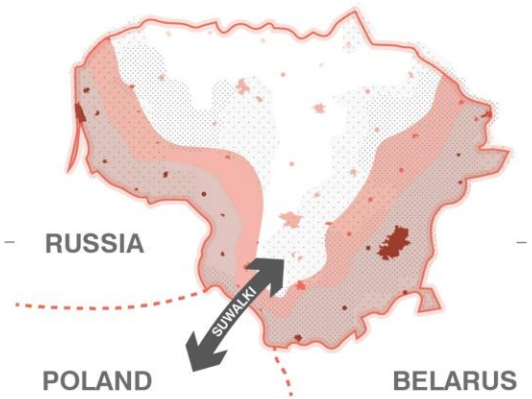
CLIMATE RISKS
SELECTED HAZARDS



Territorial data showcasing flooding and nature fire areas

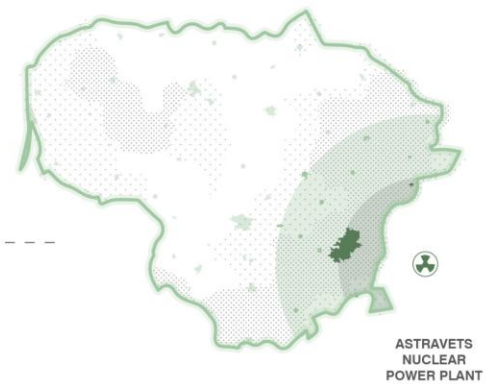
GEOPOLITICAL RISKS
SELECTED HAZARDS

TOP PRIORITY



Territorial data showcasing objects relevant to armed conflict (Suwalki corridor, atomic power plants, critical infrastructure)

PUBLIC HEALTH RISKS
SELECTED HAZARDS



Territorial data showcasing energy innefficient building infrastructure

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FLOODS

Socially, outdoor workers, people in weak housing, and coastal communities are highly vulnerable. Environmentally, coastal lands, ecosystems, and infrastructure face erosion, inundation, and damage from storms and sea level rise. Critical infrastructure, public services, and key economic sectors are also at high risk, especially in densely built urban areas.

NATURE FIRES

Forests, peatlands, and protected areas like national parks are highly vulnerable to wildfires, threatening ecosystems and endangered species. Rural wooden housing and energy infrastructure are at risk of fire damage and disruptions. Economically, the forestry sector and tourism-dependent businesses face losses from forest destruction and reduced visitor activity.

TERRORISM & CYBERATTACKS

Socially, the population—especially migrant communities—is vulnerable to misinformation, propaganda, and social manipulation that can undermine cohesion. Critical infrastructure, including energy, transportation, telecommunications, and public services, is at risk of cyberattacks or sabotage, disrupting essential services. Economically, key sectors and investments can be targeted, while border regions and natural resources face manipulation that threatens local stability and security.

ARMED CONFLICT

Socially, populations in conflict zones, displaced persons, refugees, and those reliant on small businesses are most vulnerable, with neighboring countries also affected. Infrastructure, particularly energy systems, water and sanitation, transportation, and telecommunications, is highly susceptible to sabotage and attacks. Economically, trade disruptions, labor market instability, energy shocks, and reduced investment threaten national and regional stability.

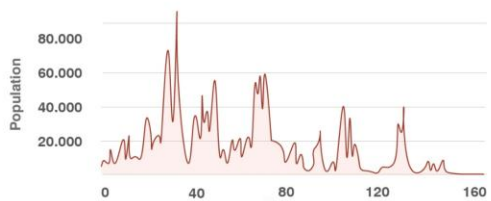
PANDEMICS

Socially, older adults, vulnerable socioeconomic groups, sole or financially struggling caregivers, and those unable to work remotely are most affected. Technologically and infrastructurally, hospitals with equipment shortages, strained healthcare systems, disrupted supply chains, and schools lacking remote-learning capacity face high risk. High-density living areas and insufficient public knowledge or policy support further increase susceptibility and negative mental health impacts.

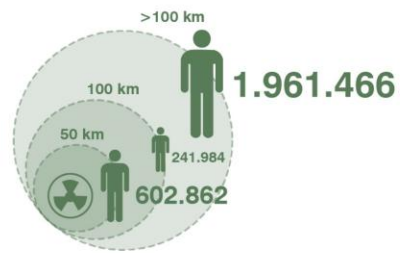
CBRNe

Communities near CBRNe facilities are highly vulnerable to health impacts from air, water, and radioactive contamination. Land and ecosystems face long-term damage from chemical spills, radioactive isotopes, harmful pathogens, and explosions, affecting soil, crops, wildlife, and water systems. Infrastructure, including energy and water supply facilities, is at risk of destruction or contamination, disrupting essential services.

Population exposed to fluvial flooding



Distance from Russia/Belarus (km)



Proximity of the population to nuclear central

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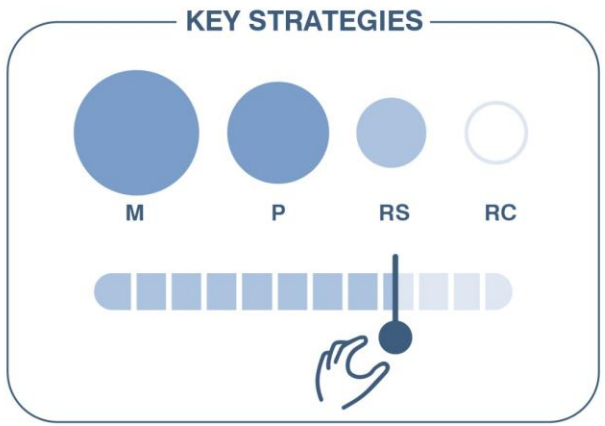
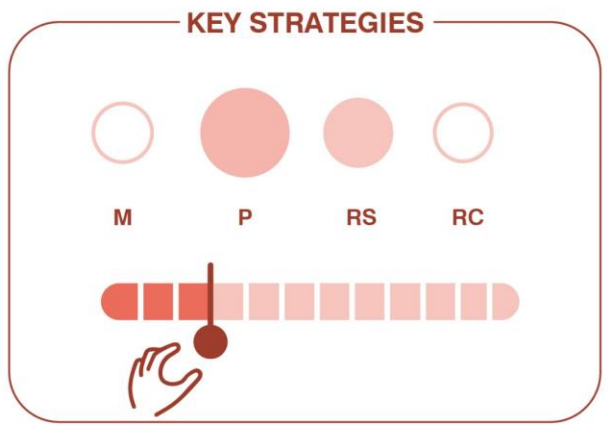
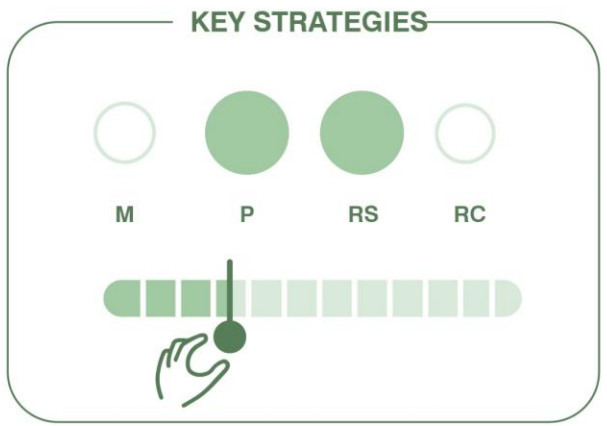


Develop response & recovery



Develop mitigation & recovery



Enhance preparedness & develop recovery

*Heatmap shows the distribution of proposed strategies across DMC stages and risk categories in the different territories
Disaster Management Cycle (DMC): Mitigation (M), Preparedness (P), Response (RS), and Recovery (RC).

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Recommendation

Analysis and recommendations

Image: SWECO- Urban insight

Climate Risks – Social Dimension

DMC Stage	Content (What)	Instruments (How)	Key Actors (Who)
Mitigation *(reduce risks before hazards happen)*	Lithuania should rehabilitate and expand urban drainage in **Vilnius, Kaunas, and Klaipėda** (Figure 4), combining sustainable drainage with nature-based retention. Rural areas such as **Šilutė district** need drainage upgrades for farmland and small-town protection. Green infrastructure in dense panel housing estates reduces heat stress, improves air quality, and boosts public health resilience.	Building codes should mandate permeable surfaces, green roofs, and cisterns. Hydrometeorological Service flood maps and urban heat maps guide planning. EU LIFE and Cohesion Fund support long-term projects, while **APVA should simplify applications and provide advance payments** to help municipalities overcome funding gaps (as short projects often crowd out ambitious ones).	The **Ministry of Environment** sets national standards. Municipal governments issue permits, implement retrofits, and maintain infrastructure. The **State Territorial Planning and Construction Inspectorate** enforces compliance. **APVA** manages EU funds and provides bridge financing. Universities (Vilnius, KTU) model risks; civil society co-designs local projects.
Preparedness *(ensure readiness before hazards occur)*	Equitable green corridors and shaded areas should be prioritised in **dense estates in Vilnius and Kaunas**. Rural preparedness should rely on volunteer flood groups to support elderly and isolated residents. Quality green space within 15 minutes' walk enhances resilience and reduces heat mortality.	GIS-based equity mapping identifies underserved areas. Vulnerability data are integrated into municipal emergency plans. Schools and clinics are retrofitted with shading and cooling. Reverse 112 SMS alerts, official apps, and multilingual campaigns ensure timely communication. EU RescEU can pre-position mobile units. **ESF+ should finance awareness and volunteer training.**	The **Ministry of the Interior** leads civil protection, with the **Fire and Rescue Department** running drills and planning evacuations. Municipalities adapt plans locally. NGOs (e.g. Caritas, Lithuanian Red Cross) reach migrants, elderly, and disabled residents. The **Ministry of Health** ensures health facilities implement preparedness.

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Climate Risks – Social Dimension

Response *(immediate actions during/after hazards)*	Response must address flash floods in **Kaunas and Vilnius suburbs** and storm surges in **Klaipėda**. Rapid logistics and mobile units should ensure food, water, and medical supplies reach isolated areas. Schools and cultural centres must serve as shelters with backup power and medical support.	Copernicus EMS and UNOSAT imagery feed into the National Crisis Centre. Amphibious vehicles and helicopters from the **Lithuanian Armed Forces** enable evacuation and supply. Municipalities invest in modular retrofits for schools as shelters. Funding comes from municipal reserves, EU Solidarity Fund, and national budgets. **Pre-approved EU frameworks should fast-track recovery money** directly to municipalities.	The **Ministry of the Interior** (Civil Protection Dept.) coordinates response. The **Fire and Rescue Department** leads operations, supported by the **Armed Forces** for logistics. The **Ministry of Health** secures hospital surge capacity. Municipalities run shelters and hotlines. The **National Crisis Management Centre** ensures cross-sector coordination.
Recovery *(rebuild stronger & more resilient)*	Recovery should prevent displacement of vulnerable groups (migrants, elderly in rural towns). Housing and infrastructure rebuilding must ensure equitable access to schools, clinics, and public transport.	Municipal approvals should require a **Social Vulnerability & Equity Screening Tool** adapted to Lithuania. This tool, replacing generic REIA, ensures vulnerable groups are not relocated to high-risk zones. ESF+ and RRF funds support vulnerable areas, while the EU Solidarity Fund backs relocations. To counter municipal funding shortages, EU allocations should reward municipalities that prioritise equity and resilience.	The **Ministry of Social Security and Labour** leads equity integration. The **Ministry of Environment** oversees land-use and housing policy. Municipalities apply vulnerability screening to project permits and consultations. The **Ombudsman for Equal Opportunities** monitors compliance and reports to Parliament/EU. NGOs facilitate community involvement to ensure legitimacy.

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Geopolitical Risks – Ecological Dimension

DMC Stage	Content (What)	Instruments (How)	Governance (Who)
Mitigation **(reduce risks before hazards happen)**	Lithuania must identify ecological infrastructures at risk of sabotage or hybrid attacks, such as wetlands used for water treatment, biodiversity reserves, and green-blue corridors. These sites should be safeguarded with both physical barriers (perimeter security, controlled access) and digital protections, given the country's exposure to hybrid threats from hostile actors.	A **national vulnerability assessment** should use GIS mapping and threat modelling to catalogue ecological infrastructures at risk. Physical protections include perimeter fencing, CCTV, and access controls; cyber protections include SCADA system upgrades, intrusion detection, and encryption. Funding can be sourced from the EU Internal Security Fund (ISF), Digital Europe Programme, and the National Defence Investment Plan. To overcome limited municipal capacity, the state should set up matching funds for local authorities to co-finance upgrades.	The Ministry of Environment and Ministry of National Defence co-lead. The National Cyber Security Centre (NCSC) provides digital protection standards, while the State Border Guard Service supports on-the-ground security. The Environmental Protection Department and municipal environmental units implement local protections. The National Crisis Management Centre coordinates interagency exercises with ENISA and EU cybersecurity partners.
Preparedness (ensure readiness before hazards occur)	To prevent delayed detection of eco-terrorism or cyber sabotage, Lithuania should build integrated environmental monitoring systems capable of real-time anomaly detection. This includes embedding cybersecurity in environmental data platforms and training local administrators.	Deploy IoT sensor networks with encrypted telemetry for water quality, air pollution, and habitat monitoring. Data should be integrated into secure national hubs with AI-driven anomaly detection. Standards such as ISO 27001 should be made mandatory for municipal systems. Financing comes from Horizon Europe, Digital Europe, and EU RRF, with technical support under the Smart Specialisation Strategy (S3). Soft instruments include staff training, standard operating procedures, and EU-backed cyber drills. To avoid long procurement delays, Lithuania should adopt fast-track digital equipment acquisition rules for ecological monitoring.	The Ministry of Environment leads technical deployment with the NCSC embedding cybersecurity requirements. The Environmental Protection Agency (EPA) and Hydrometeorological Service oversee calibration and data validation. Municipalities integrate systems locally, with oversight from the National Digital Security Council. Cross-border data exchange is enabled through ENISA and EU4Digital, ensuring Lithuanian data feeds into EU early-warning platforms.

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Public Health Risks – Technological Dimension

Response *(immediate actions during/after hazards)*	On trigger, auto-activate case investigation, targeted messaging (Reverse-112, SMS, social), and priority vaccination/therapeutics at pre-mapped sites; deploy modular isolation/decon units to hotspots; use the dashboard for bed/WASH status, staff redeployment and resource routing; maintain multilingual risk communication for urban high-density and remote communities.	Use incident command (ICS) to task NVSC field teams and hospital leads; push API-based tasks to vaccination sites and mobile clinics; spin up telehealth triage to offload emergency rooms; roll out CBRNe decon with negative-pressure tents and waste protocols; issue Do Not Drink/Boil Water and plume guidance from fused CBRNe + met data. Finance immediate needs via contingency lines and pre-cleared call-offs on CPO LT contracts; request UCPM surge assets where needed.	Incident Commander under NCMC leads; NVSC runs epidemiology and site ops; PAGD manages field logistics and decon; RSC leads radiological zoning and public protection advice; hospital networks execute surge and cohorting; municipalities manage crowd flow and vulnerable-group access; water utilities isolate and restore WASH; NCSC monitors cyber threats to hospital/utility IT.
Recovery *(rebuild stronger & more resilient)*	Operate a **digital resilience dashboard** to track restoration of **healthcare, WASH and sanitation systems**, backlog clearance and vaccination coverage; conduct **after-action reviews** and publish lessons; **build back better** by hardening clinical IT, ventilation, and backup power at priority facilities and codifying adaptive standards for future waves/incidents.	Integrate claims, repair status and KPIs (TTR for beds/WASH, backlog days, staff resilience) in the dashboard; use **performance-based contracts** for repairs; migrate critical apps to **redundant hosting**; update **building standards** for infection-safe retrofits (ventilation, UVGI, pressure zoning); fund capex with **Cohesion/RRF/EIB** blends and co-financing rules that favour high-impact facilities; run **AARs** within 30 days and update SOPs and training accordingly.	**MoH** and **NCMC** co-chair a Recovery Taskforce; **HIC** maintains the dashboard and data quality; **hospital associations** and **municipal owners** deliver facility upgrades; **Ministry of Environment / water utilities** certify WASH restoration; **Ministry of Finance/APVA** assemble financing packages and monitor milestones; **State Audit Office** oversees transparency; **academia/NGOs** support evaluation and community feedback.

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Key Policy Takeaways

- **Build systemic resilience:** Integrate climate, geopolitical, and public health risks across infrastructure, communities, and ecosystems.
- **Foster cross-sector collaboration:** Public and private actors must coordinate on infrastructure protection, social equity, monitoring, and dual-use facilities.
- **Adopt strategic, no-regret measures:** Implement crisis-proof policies, cross-dimensional solutions, and institutionalized partnerships, following the **Build Back Better** logic.
- **Leverage European best practices:** Adapt lessons from Belgium, Malta, and Enschede to ensure evidence-based, feasible resilience strategies.
- **Embed resilience in governance:** Strengthen laws, spatial planning, and cross-border cooperation to safeguard Lithuania against current and future shocks.

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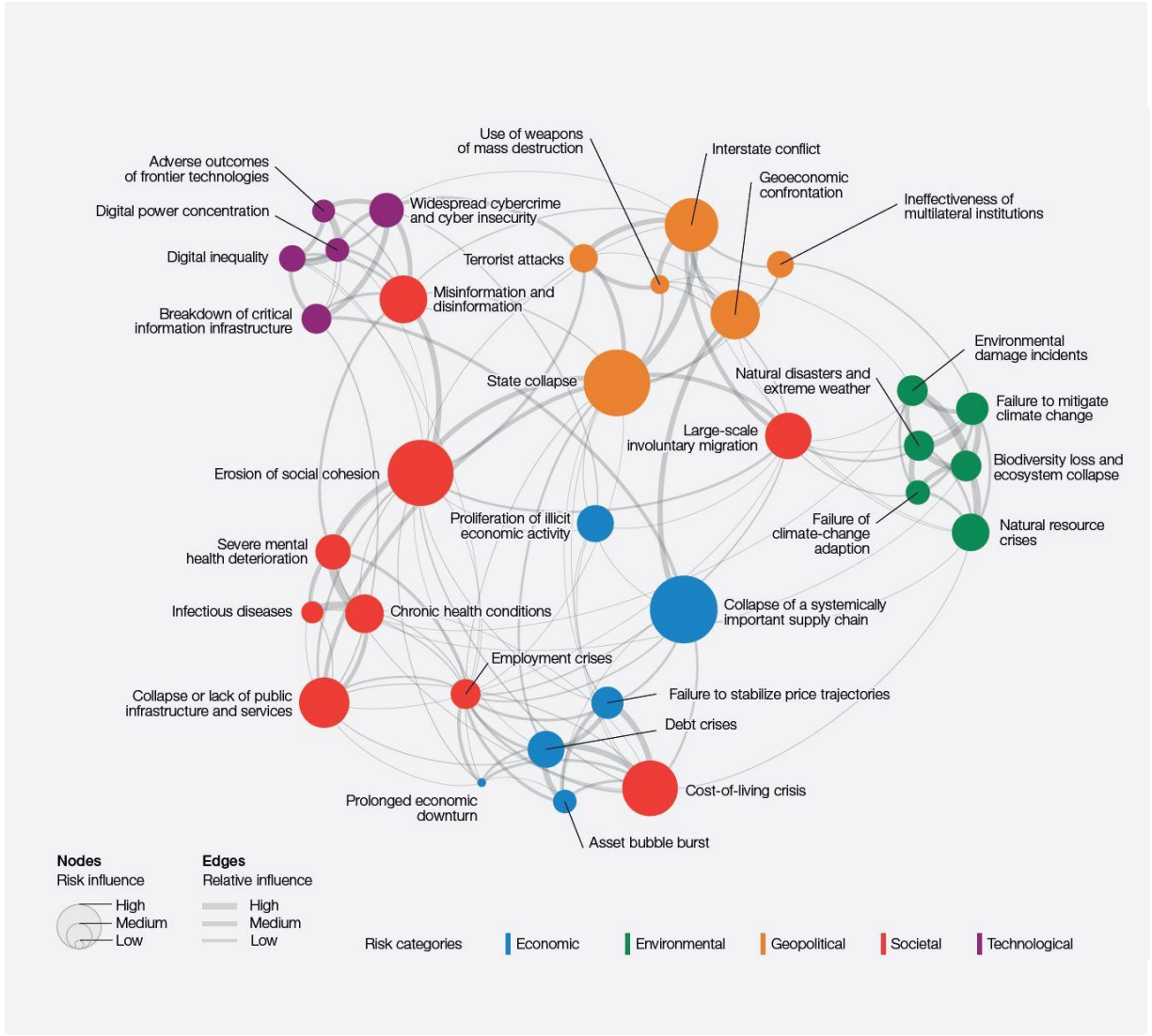
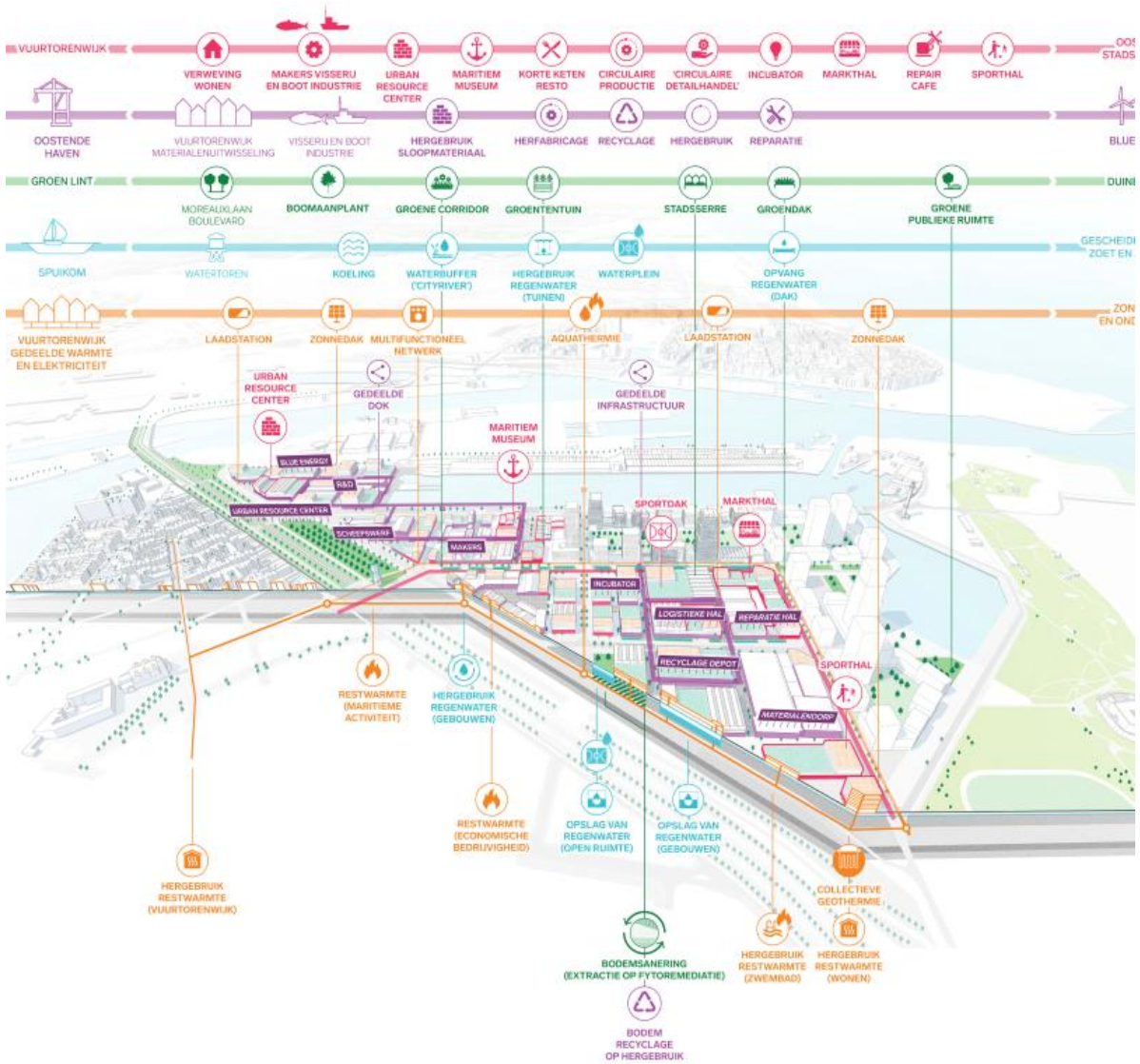
Conclusions



Polycrisis (WEF Global Risks Perception Survey)



Systemic approach (Oosterover Circulair)

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Systemic approach

- **Strong Analytical Evidence**
  - Data management: comparable indicators, maps, and cross-regional insights
  - Well informed decision making
  - Solid base for prioritization and action

- **Multi-stakeholder engagement framework**
  - Multidisciplinary co-creation models
  - Common analytical resilience framework

- **Creative and complementary territorial strategies**
  - Innovative, place-based approaches across all DMC stages
  - Placed based policy in systemic synergies
  - Coherent resilience strategies
  - Beyond risk management: transformative recovery

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Key take aways

- **Innovative forward looking approach**
  - Focused on mitigation and preparedness.
  - Limited recovery-oriented measures.
  - Gap in “building back better” approaches.
- **Well informed and transparent decision-making**
  - Inter-agency coordination, participatory planning, and transparent decision-making.
  - Data-driven support anticipatory approaches that allow policymakers to act before crises escalate
- **Integrated frameworks**:
  - The collective interest in diverse measures
  - Resilience cannot be achieved through fragmented or siloed policies
  - Integrated resilience frameworks are required to align environmental, social, security, and infrastructural objectives.
- **Implementation**
  - Resilience is not only about what to do, but also about when and where to start.

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Thank you!

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