



ADVISORY REPORT ON RESILIENT RECOVERY FRAMEWORK FOR GRINDAVÍK

March 2026

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Key terms and definitions¹

Acceptable risk: Defined by the United Nations Office for Disaster Risk Reduction (UNDRR) as the extent to which a disaster risk is deemed acceptable or tolerable. It depends on existing social, economic, political, cultural, technical, and environmental conditions. In engineering terms, acceptable risk is also used to assess and define the structural and nonstructural measures that are needed in order to reduce possible harm to people, property, services, and systems to a chosen tolerated level, according to codes or “accepted practices,” which are based on known probabilities of hazards and other factors. Acceptable level of risk will normally differ across countries and communities.

‘Build back better’ (BBB) principle: The use of the recovery, rehabilitation, and reconstruction phases after a disaster to increase the resilience of nations and communities by integrating disaster risk reduction measures into the restoration of physical infrastructure and societal² systems and into the revitalization of livelihoods, economies, and the environment.

Building code: A set of ordinances or regulations and associated standards intended to regulate aspects of the design, construction, materials, alteration, and occupancy of structures necessary to ensure human safety and welfare, including resistance to collapse and damage.

Coping capacity: The ability of people, organizations, and systems, using available skills and resources, to manage adverse conditions, risks, or disasters (Mysiak et al. 2021).

Damage: Total or partial destruction of physical assets existing in the affected area. Damage occurs during and after the disasters and is measured in physical units (that is, square meters of housing, kilometers of roads, and so on).³

Early warning systems (EWS): Integrated systems that disseminate timely and meaningful information to users threatened by a hazard. These systems can enable protective actions to reduce harm posed by the hazard. Some examples of EWS include sirens, text messages/SMS, TV, or radio broadcasts. Additionally, different hazard types may require different technical capabilities and infrastructure. For earthquakes, EWS typically provides post-event information such as earthquake details, impact estimations, and aftershock potential, as well as public advisories. EWS can also include earthquake early warnings, which are alerts that give imminent notice before shaking begins, but these are not widely implemented.

Earthquake magnitude: A quantitative measure of the size or energy released by an earthquake at its source. It is determined using seismic data and reflects the amplitude of seismic waves recorded by seismographs. The most common magnitude metric used today is the moment magnitude scale (Mw), which largely replaced older scales such as the Richter scale. Unlike intensity, which measures the observed effects of an earthquake at specific locations, magnitude provides a standardized measure of an earthquake's overall strength, regardless of where it is measured.

Earthquake risk: The combination of seismic hazard (for example, the frequency of earthquake occurrence, the strength of ground shaking given an earthquake), exposure (for example, the number of people exposed, the value of assets exposed), and vulnerability (for example, the susceptibility of assets to damage, the ability of populations to cope with earthquake effects).

Exposure: The situation of people, infrastructure, housing, production capacities, and other tangible human assets located in hazard-prone areas.

¹ These terms reflect general international knowledge. It is noted that Icelandic legislation also provides specific definitions, such as for *Staðaráhætta/local risk*: Annual probability of death due to avalanches and landslides if an individual lives in an unsupported detached house at all times, in line with Regulation No. 505/2000 for hazard assessment for avalanches and landslides (*Ofanflóð*).

² The term ‘societal’ should not be interpreted as a political system of any country.

³ World Bank. 2021. *Investing in Disaster Risk Management in Europe Makes Economic Sense, Background Report. Economics for Disaster Prevention and Preparedness*. [Link](#).

Fissure: An elongated fracture or crack in the Earth's surface through which lava can erupt, forming a linear volcanic vent as for the Sundhnúkur crater row in Iceland. Fissures may be several meters wide and extend for many kilometers and are common in rift zones such as the Reykjanes Peninsula in Iceland.

Hazard: A potentially destructive physical phenomenon, such as natural hazard (e.g., earthquake, wildfire).

Hazard assessment is a distinct analytical step within the broader process of disaster risk assessment. A hazard assessment considers the likelihood of a particular type and magnitude of a hazard event occurring in a specified area. This means determining, for a given phenomenon, the probable intensities of the event (for example, ground shaking from earthquakes, wind speed from tropical cyclones, or flood depths), as well as the probable recurrence and the geographic areas that could be affected.

Jökulhlaup: Glacial outburst floods triggered by subglacial eruptions.

Lava flow: An outpouring of molten rock that erupts and moves across the Earth's surface, cooling as it advances. Lava flows may form multiple flow units or lobes and can branch or thicken depending on the terrain and the lava's physical properties. Although typically slow-moving, they can destroy land, vegetation, and infrastructure along their path.

Loss: In damage and loss methodologies, loss refers to indirect quantifiable losses (declines in output or revenue, impact on well-being, disruptions to flow of goods and services in an economy), or additional operational costs associated with response and initial repairs.⁴ In the insurance sector, loss has a different meaning, namely it refers to the reduction in value, damage, or financial injury sustained by an insured person or property due to a covered peril (hazard e.g., fire, theft, accident). It is the foundation of a claim, representing the financial consequence of an event that triggers the insurer's duty to indemnify, or pay for, the loss.

Reconstruction: The medium- and long-term rebuilding and sustainable restoration of resilient critical infrastructures, services, housing, facilities, and livelihoods required for the full functioning of a community or society affected by a disaster, aligning with the principles of sustainable development and BBB to avoid or reduce future disaster risk.

Recovery: The UNDRR defines recovery as the restoration and improvement of livelihoods, health, and assets (economic, physical, social, cultural, and environmental) of disaster-affected communities. It aligns with sustainable development and "build back better" principles to reduce future disaster risk. Recovery includes early (temporary) and long-term phases.

Redundancy: In general, this refers to the existence of spare capacity, backup systems, or alternative pathways that ensure continuity of service or function when a primary system is disrupted or overwhelmed. This applies both to physical networks (e.g., multiple transit routes) and to emergency operations procedures (e.g., backup plans if first responders are incapacitated).

Rehabilitation: The restoration of basic services and facilities for the functioning of a community or society affected by a disaster.

Residual risk: UNDRR defines this as disaster risk that remains even when effective disaster risk reduction measures are in place, and for which emergency response and recovery capacities must be maintained. The presence of residual risk implies a continuing need to develop and support effective capacities for emergency services, preparedness, response and recovery, together with socioeconomic policies such as safety nets and risk transfer mechanisms, as part of a holistic approach.

Resilience: The ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including ensuring the preservation, restoration, or improvement of its essential basic structures and functions (World Bank 2021).

⁴ Global Facility for Disaster Reduction and Recovery, "Post Disaster Needs Assessments," [link](#).

Risk assessment: A process that combines hazard, exposure, and vulnerability information to assess expected infrastructure and human losses (and/or losses for any asset of interest such as crops or ecosystems) after an event. Typically, this involves probabilistic calculations considering a range of hypothetical hazard scenarios.

Secondary perils: Hazards that are triggered by the primary earthquake event and are also known as earthquake-triggered perils. These include landslides, soil liquefaction, tsunamis, and fire. They can significantly increase the overall damage, losses, and disruption.

Tephra: Volcanic particles ejected into the atmosphere during an eruption. The finer ash fraction (<2 mm diameter) can travel thousands of kilometers downwind from the volcano, as in the 2010 Eyjafjallajökull eruption in Iceland.

Volcanic risk: The combination of volcanic hazard (for example, the probability of lava flows inundating an area within a certain time frame), exposure, and vulnerability. Volcanic events are typically multi-hazard and multi-phase, meaning that the range of potential hazards should be considered along with the range of potential time frames.

Vulnerability: The conditions determined by physical, social, economic, and environmental factors or processes that increase the susceptibility of an individual, a community, assets, or systems to the impacts of hazards.

List of Acronyms

ALARP	as low as reasonably practicable
BBB	build back better
CPC	Civil Protection Committee
DRE	Dense Rock Equivalent
EWS	early warning system(s)
GDP	gross domestic product
GEC	Grindavík Executive Committee
ICESAR	Icelandic Association for Search and Rescue
IMO	Icelandic Meteorological Office
ISK	Icelandic króna
LCA	latent class analysis
LiDAR	Light Detection and Ranging
NTÍ	Natural Catastrophe Insurance of Iceland
OR	odds ratio
PTSD	post-traumatic stress disorder
SISZ	South Iceland Seismic Zone
SMEs	small and medium enterprises
TAFF	Technical Assistance Financing Facility for Disaster Prevention and Preparedness
UNDRR	United Nations Office for Disaster Risk Reduction
VAT	value added tax
VEI	Volcanic Explosivity Index

EXECUTIVE SUMMARY

This report presents the findings of analysis and recommendations for resilient recovery planning in Grindavík, affected by multiple evacuations and ongoing volcanic and seismic activity. This work was led by the World Bank team of experts and is based on desk research and analysis of international experience and is underpinned by consultations with stakeholders, including representatives of central government agencies, local authorities, civil society, and the private sector. The purpose of this report is to inform the deliberations of the Grindavík Executive Committee and decision-makers in Iceland. This report is structured across four key areas: policy and governance, safety and preparedness, people and social infrastructure, and critical infrastructure and economic activities.

A central recommendation is that a resilient recovery framework should enable authorities and stakeholders to recover in a manner that is risk-informed, gradual, and inclusive and that contributes to public safety, trust, and social cohesion. The analysis identifies immediate policy priorities in the housing, insurance, and social policy sectors: policy actions should reflect a focus on risk analysis, communication, and preparedness; should embed flexibility; and should be aligned with a framework/roadmap that clearly articulates key principles, activities, and arrangements. In the medium to long term, recovery will require a focus on decision-making under uncertainty, revitalization of Grindavík as part of a broader Reykjanes Peninsula approach, and strengthening of resilience—through risk-informed investments and actions to enhance societal resilience, institutional resilience (via recovery planning), physical resilience (particularly of critical infrastructure), and economic/financial resilience (in anticipation of future emergencies in the peninsula and in the country as a whole). Focusing on the immediate and medium-term priorities could generate important results for the government and the society; specifically, it could meet key immediate needs of the Grindavík community, improve governance for recovery planning, and contribute to economic growth and improved resilience at scale.

In the Reykjanes Peninsula context, continuous geophysical monitoring and updated hazard assessments are not only technical inputs to recovery planning but active drivers of decisions related to access, regeneration, hazard zoning, infrastructure operation, and public communication. Recovery and monitoring should therefore be understood as closely coupled and iterative processes, rather than sequential phases, with evolving scientific information continuously informing policy and operational choices.

Grindavík's unique situation needs to be reflected in the recovery framework and guide risk-informed actions by different stakeholders.

Since 2021, renewed activity across two interacting volcanic systems has resulted in repeated fissure eruptions, tectonic deformation, and persistent seismicity. Grindavík remains an area of considerable risk and uncertainty linked to volcanic and seismic activity. Prolonged uncertainty over these hazards, extends to long-term habitability and economic viability, affecting household decision making, mental health, education continuity, and local economic recovery. Repeated evacuations between 2023 and 2025 have led to community stress, temporary outmigration, and business disruption. Critical assets near the Svartsengi Power Plant and the Blue Lagoon, such as geothermal/pipe and power line infrastructure and tourism hubs, are susceptible to volcanic and earthquake impacts, while more broadly the area is subject to disruptions in road access and telecommunications. Grindavík's recovery framework needs to reflect

the unique situation of ongoing risk and uncertainty, and needs to guide risk-informed actions by public institutions and the private sector, including utilities, businesses, households, tourists, and workers.

The government has demonstrated strong leadership and commitment to the people of Grindavík.

In the context of high exposure to natural hazards, Iceland has established disaster risk governance structures with strong institutional and fiscal capacity to manage the associated risks. These structures are evident in emergency response to events in Grindavík, including evacuation, coordination among the institutions involved, monitoring of and research into the hazards, and investments in protective infrastructure, as well as housing support, fiscal and social protection support provided to the affected population and businesses. To support inter-institutional coordination and the affected population, the government established the Grindavík Executive Committee (GEC).⁵ This dedicated mechanism has a multifaceted mandate focused on supporting the Municipality of Grindavík following the volcanic and seismic activity in the area and supporting the recovery of the community; its different service teams provide housing/displacement support, participate in developing a recovery framework, and oversee immediate repair work of infrastructure and other assets. The municipality has continued its efforts to promote recovery and restore municipal service provision, and the people of Grindavík have shown great resilience—not only adapting to the situation, but also showing determination to sustain their community.

While substantial efforts have resulted in progress toward recovery, the road ahead is long and includes risks as well as opportunities.

The recovery process will require sustained commitment across different government authorities and other stakeholders, all working toward a long-term vision for the community's future and guided by a recovery framework. This framework will help define overall guardrail for recovery and direct the actions of public and private sector actors, strengthen public trust, clarify governance arrangements, and align risk communication with evolving scientific information. In preparing and adopting the framework, stakeholders will need to consider a multitude of elements, including overall governance (policy, mandates, coordination, financing), public safety and quality of life, opportunities for livelihoods and economic sustainability, and continuity and resilience of critical infrastructure and services. Decision-makers will have to balance existing frameworks and rules with the need for changes and reforms. They will also need to account for the varying preferences and needs of societal groups; the physical safety and mental health of the population, particularly children and youth; economic and fiscal incentives and basic rules to ensure the economic and financial sustainability of the city; and implications of risk and recovery in Grindavík for investments in preparedness and long-term resilience for the broader Reykjanes Peninsula. International experience from Japan, New Zealand, and Hawaii illustrates that communities can coexist with volcanic risk when supported by clear risk governance, transparent communication, differentiated land use rules, and sustained social monitoring and engagement.

The recovery framework provides an opportunity to improve, build back better, and increase resilience in the Grindavík area and beyond.

Work on the recovery framework is an opportunity to assess available information, consider international and national examples, agree on the direction of actions, and commit to needed

⁵ The GEC was established under the Act on the Grindavík Executive Committee, Act no. 40/2024; see [link](#).

investments. The recovery process will need to be gradual, phased, and tailored to different scenarios, given that different groups of people will require different recovery pathways. Recovery will need to take place over the medium to long term and reflect the evolving risk situation and the community's needs and priorities.

Beyond Grindavík, there are implications and lessons for the broader Reykjanes Peninsula area. The central government needs to remain deeply engaged in Grindavík's recovery, given not only public safety considerations but also the obligations created by the proximity of critical infrastructure, essential services, and key economic activities as well as the implications for the greater area and even the country as a whole. Existing regulatory and institutional frameworks and systems may warrant review—including those related to housing, spatial planning and development, disaster risk financing and insurance, and municipal finance—to ensure that they align with current and evolving risk conditions, reflect lessons learned, and in turn increase resilience and preparedness for future events in Grindavík and beyond. Some policy areas, such as social policy, will need to be carefully monitored; in other areas, there is a need for new insights, coordination mechanisms, and policies to support decision-making under uncertainty, foster economic revitalization, and strengthen the resilience of critical infrastructure and society in Grindavík and the Reykjanes Peninsula.

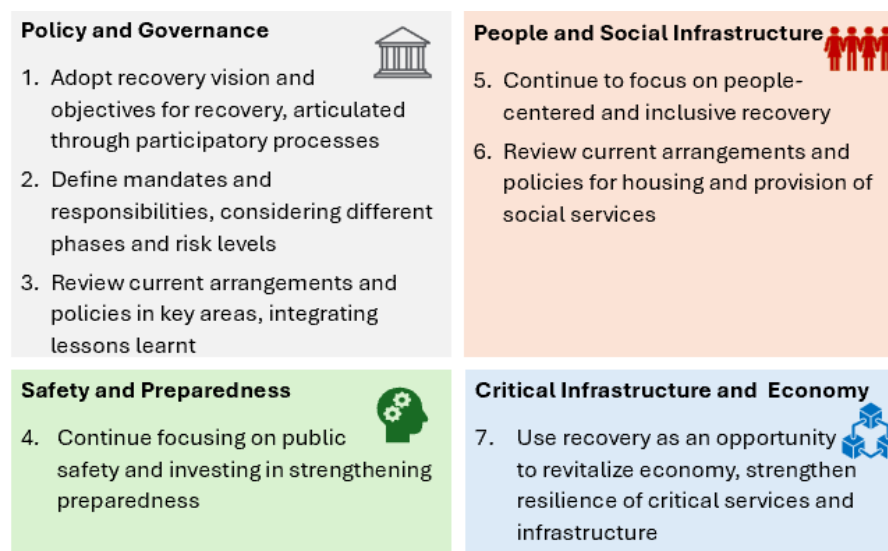
Recommendations for consideration span four key areas of recovery: Policy and governance, safety and preparedness, people and social infrastructure; and critical infrastructure and economy.

This report is an advisory and analytical input to ongoing decision-making on recovery in Grindavík. It does not replace statutory processes, scientific hazard assessments, or legal and fiscal decision-making by Icelandic authorities. Recommendations are framed to support dialogue, sequencing, and risk-informed choices under uncertainty and should be read alongside future technical studies, consultations, and policy deliberations.

The recommendations presented below are intended to support risk-informed decision-making. They reflect desk research, consultations with stakeholders, and a review of some 30 international examples as well as examples from Iceland (see **Annex 1**). The examples were selected to illustrate approaches and considerations relevant to recovery planning, without implying direct transferability to the uniqueness of Grindavík's situation. The recommendations consider the current risk environment and available information.

Seven key recommendations are organized across four key areas: (i) policy and governance; (ii) safety and preparedness; (iii) people and social infrastructure; and (iv) critical Infrastructure and economy (Figure 1). As presented below and summarized in Table 1, each recommendation is broken down into specific actions for realizing that recommendation. The remaining chapters of this report provide technical recommendations to support the implementation of specific areas of the recovery framework.

Figure 1. Recovery framework: Key areas considered and seven recommendations

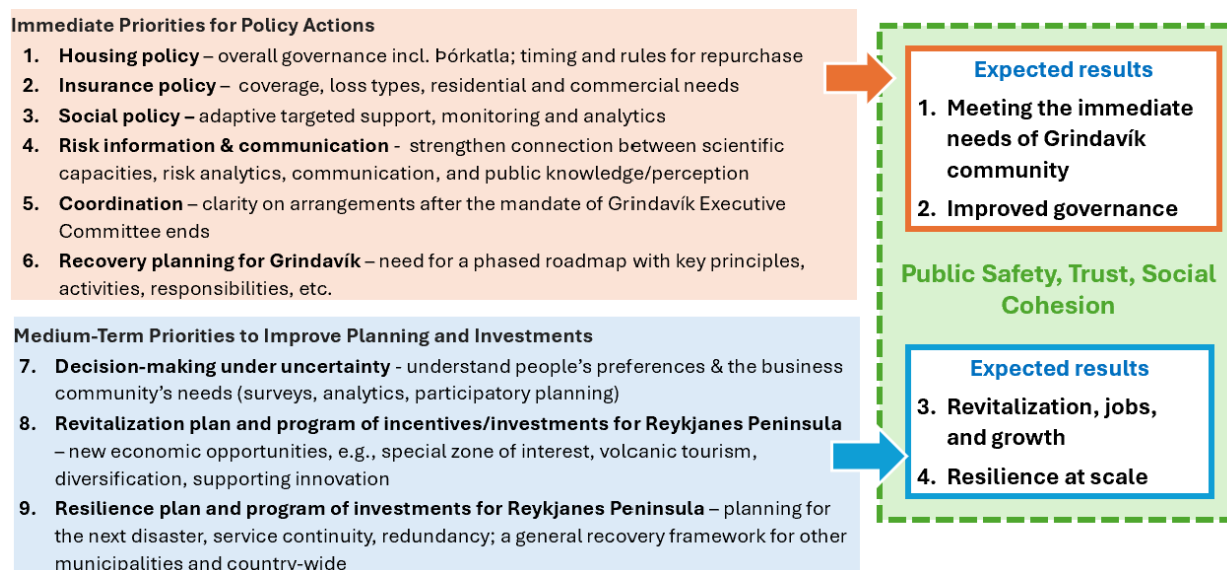


Source: World Bank team.

Key policy priorities for decision-makers are divided into needs for the immediate (shorter) term and medium (longer) term, are shown in Figure 2, along with the expected results and broader developmental objectives.

- **Immediate policy priorities were identified in the housing, insurance, and social policy sectors.** Across these sectors, policy actions should focus on risk analysis, communication, and preparedness; should embed flexibility; and should align with a framework/roadmap that clearly articulates key principles, activities, and arrangements.
- **In the medium to long term, areas for attention include decision-making under uncertainty, revitalization of Grindavík within the broader Reykjanes Peninsula, and strengthening of resilience through risk-informed investments and actions.** This approach aims to enhance societal resilience, institutional resilience (via recovery planning), physical resilience (particularly of critical infrastructure), and economic/financial resilience (in anticipation of future emergencies in the peninsula and the country as a whole).
- **Focusing on immediate and medium-term priorities could generate important results for the government and society within both time frames.** That is, they could address the Grindavík community's immediate needs, improve governance for recovery planning, and contribute to economic growth and improved resilience at scale.

Figure 2. Immediate and medium-term policy priorities for decision-makers



Source: World Bank team.

Note: Þórkatla is a private limited real estate company established by law to address housing issues in Grindavík.

POLICY AND GOVERNANCE

1. *Adopt recovery vision and objectives for recovery, articulated through participatory processes*

Develop a dedicated disaster recovery framework to complement Iceland's well-established emergency response system. Such a framework should clarify leadership, sequencing, and responsibilities across response, recovery, and reconstruction phases, while enabling earlier and more systematic planning for medium- to long-term revitalization and resilient development.

Adopt a unified vision and guiding principles for recovery. International experience shows that recovery frameworks are most effective when grounded in explicit principles. For example:

- Life safety first
- People-centered decision-making
- Social cohesion and trust; economic and financial sustainability
- “Build back better” (across different dimensions, institutions, infrastructure, society, economy)
- Flexibility under uncertainty
- Transparency
- A culture of preparedness.

In Grindavík’s context, this vision may be framed as managed coexistence with volcanic risk, which preserves safety while maintaining the option for community life where conditions allow. Recovery planning should aim for a flexible strategic framework that can adapt as new risk knowledge emerges and should avoid adopting a rigid implementation plan. Accordingly, return to Grindavík should be framed as a monitored and supervised recovery process extending over time, supported by continuous monitoring, defined thresholds, and clear contingency arrangements, rather than as a single declaration that the volcanic crisis has ended.

Adopt strategic recovery objectives that translate guiding principles into measurable outcomes. These objectives might include preventing avoidable physical and psychological harm to people, particularly children and youth; enabling safe continuation of economically critical activity in Grindavík; preserving government credibility under scientific uncertainty; safeguarding critical services; and sustaining municipality and community identity.

Use a participatory approach that engages the community and public and private stakeholders in articulating the recovery vision and objectives. Structured engagement with residents and stakeholders will support legitimacy across the different population groups in Grindavík. The participatory approach should extend across all areas of the planned recovery framework and ensure that different groups can support the overall direction and identify with specific elements of it based on their roles, preferences, and needs. Surveys, analysis, and a meaningful exchange of information and feedback are critical to understand and integrate the views and needs of different groups.

Box 1. Select international experience related to recovery planning

Recovery efforts in New Zealand (Canterbury earthquakes), the US state of Hawaii, (Kīlauea 2018), and Japan (Great East Japan Earthquake) illustrate how recovery frameworks are anchored in explicit, shared visions that combine community priorities with scientific risk assessments and lessons from past events. In Canterbury, the Recovery Strategy for Greater Christchurch defined a long-term vision structured around economic, social, built, and natural recovery pillars, developed through extensive public engagement. In Hawaii, recovery planning was guided by volcanic risk assessments that informed land use and investment decisions. In Japan, community-based planning played a central role in shaping relocation and rebuilding strategies under ongoing hazard conditions. Across these cases, structured and sustained community participation was a defining feature, with residents actively involved in shaping recovery priorities and trade-offs. These experiences demonstrate how recovery visions are operationalized through clear objectives, institutional frameworks, and participatory processes that support decision-making in complex and evolving risk environments.

2. Define clear responsibilities and coordination mechanisms, considering different phases and risk levels

Define institutional coordination arrangements that support recovery actions. Strong vertical coordination between national and municipal authorities is essential, as is horizontal coordination across ministries, utilities, the private sector (including critical infrastructure and services), insurers, and civil society. As the GEC's mandate ends in May 2026,⁶ arrangements for continued coordination and oversight of longer-term recovery will require clarification and decisions on mandates. Under the current framework, arrangements between public and private sector actors, utilities, businesses, civil society, and population groups may need to be reviewed and, as relevant, adjusted, in order to ensure clarity on responsibilities and the coordination structure.

Further strengthen a structured interface between scientific monitoring and risk-informed decision-making. Coordination arrangements and institutional responsibilities need to be clear to ensure a solid interface between analytical and operational decision-making bodies. Several institutions, including the Icelandic Meteorological Office (IMO), provide information and analytics. Several types of hazard, risk, engineering, and insurance-related assessments are available; these create the opportunity to strengthen the exchange, leverage information, and improve clarity of information to inform zoning, infrastructure

⁶ According to Act no. 40/2024, GEC's mandate ends 15 days after the next municipal election (set for May 16, 2026).

investments, insurance, occupancy decisions, monitoring of compliance, and so on. Data and information platforms, dedicated communications strategies, and other tools can support these efforts. International experience shows that public trust can be easily eroded if risk information is not clear and well-communicated.

Adopt transparent communication, monitoring, and learning mechanisms to underpin the recovery framework. Policy and rules should be clearly communicated to the public. Public dashboards linking specific hazard or risk levels to policy decisions, regular multilingual briefings, and periodic technical reviews can strengthen trust. Training programs, scenario-based exercises, and institutional capacity development can support the transition from emergency governance to structured coexistence planning. As part of the effort to identify lessons, regulatory reviews could be initiated in specific areas, such as housing policies for the Grindavík area and the affected population, land use planning, disaster risk financing and insurance, and municipal finance and rules of residence, with a view toward potential future events on the Reykjanes Peninsula.

Box 2. Select international experience related to coordination and communication

International experience highlights the importance of clearly defined institutional mandates and coordination mechanisms across recovery phases and risk levels. Dedicated recovery agencies (e.g., Canterbury Earthquake Recovery Authority in New Zealand, Queensland Reconstruction Authority in Australia, or the Reconstruction Agency of Japan) have been able to connect scientific hazard monitoring to operational decisions, such as risk-based zoning, access restrictions, and reoccupation rules, in turn providing clarity for residents, insurers, investors, and planners while maintaining consistent governance. The Reconstruction Agency of Japan was set up under the Great East Japan Earthquake Recovery Law; it is still managing recovery in Fukushima and has been providing one-stop service to affected local governments. These experiences demonstrate how dedicated recovery structures can operationalize risk-informed frameworks, maintain coherence across sectors, and support decision-making in complex and evolving risk environments.

3. Review current arrangements and policies in key areas, integrating lessons identified

Review and as relevant adjust financial and funding mechanisms, rules, and responsibilities. Recovery investments, monitoring costs, protective works, and housing interventions should be tracked and reported on an ongoing basis and should be reviewed for long-term fiscal sustainability and objectives. Responsibility for financing should be clarified among stakeholders (at the public, private, and individual level) and should reflect relevant recovery (or emergency) phases and risk levels.

Review and as relevant adjust arrangements for disaster risk financing and insurance. Iceland's compulsory natural catastrophe insurance system provides a solid institutional foundation for disaster risk financing, but the Grindavík situation has exposed material gaps in coverage scope, reinsurance protection, and the treatment of indirect and consequential losses. Addressing these gaps—for example, through regulatory reform, enhanced risk modeling, and clearer government contingency arrangements—can help build a more resilient and equitable risk financing framework for communities facing prolonged volcanic hazard.

Review and as relevant adjust arrangements for Grindavík's municipal fiscal base. Preserving Grindavík's fiscal base is essential to maintain the municipality and could include review of current arrangements and introduction of special measures. For example, new mechanisms could be established to allow displaced

residents to keep their legal residency in Grindavík (even if they lived somewhere else), so that a portion of municipal tax revenues and equalization transfers continued to go to the town.⁷ Mechanisms could provide displaced people the option to keep legal residence in Grindavík and incentive to pay less in residency tax than they would in the place where they actually reside. Such arrangements could provide the local administration in Grindavík with much-needed resources for the reconstruction of the town, and they would also allow people displaced from Grindavík to stay connected to the town and the community. The local administration could use some of the resources thus collected to organize periodic daytime community events in Grindavík, which would help maintain and strengthen community ties. At the same time, the state could provide financial compensation to host municipalities to ensure they are not disadvantaged in delivering services to displaced residents. In connection with this approach, decision-makers could consider the feasibility of joint provision of certain municipality-specific services (civil protection, firefighting services, education), drawing on experiences with collaboration during emergency response and the general possibility of joint (merged) service provision.

Box 3. Select international experience related to financial arrangements

International experience shows the importance of clear financing responsibilities and sustained public funding in prolonged hazard contexts. Following the 2021 eruption of Tajogaite on the (Spanish territory) island La Palma, the government mobilized national and regional funding to finance housing compensation, reconstruction of infrastructure, and extensive CO₂ and air-quality monitoring networks—efforts supported by a dedicated volcanic compensation framework beyond standard insurance coverage. After the Great East Japan Earthquake in 2011 and during the long-term evacuation of the Japanese island of Miyake-jima, national and prefectural authorities financed collective relocation, infrastructure rebuilding, and long-term municipal support. These responses show how public fiscal measures can sustain communities where private insurance is insufficient.

SAFETY AND PREPAREDNESS

4. *Continue prioritizing public safety and investing in strengthening preparedness*

Promote evidence-based and risk-informed decision-making. Monitoring, early warning, and risk assessments need to continue to underpin decision-making. This includes continued analytical capacity to provide short-term alerts, outlooks, and scenario analyses that could trigger predefined operational responses. To inform policy decisions, risk analytics should consider social vulnerability (as relates to different groups and numbers of people), temporal factors (time of day/year), economic impacts, and infrastructure performance, as well as cascading and compound risks. Digitalization, along with sharing and coordination of risk data across agencies, can enhance situational awareness and foster social trust. Given the evolving nature of the Reykjanes crisis, hazard and risk assessments should be treated as adaptive tools—regularly updated as new monitoring data become available—rather than as fixed or static products. In the medium-long-term, learning from this prolonged and complex situation, there may be also an opportunity to review institutional capacity and arrangements for prevention, preparedness, and recovery processes, building on the demonstrated excellence in monitoring and response.

⁷ According to the Law no. 80/2018, secondary residence is not allowed, though exemptions apply to the elderly in homes, disabled persons in special care institutions, registration of temporary residence because of natural catastrophe, prisoners, etc. See [link](#).

Consider adopting a multi-tiered 'acceptable level of risk' approach to guide resilient recovery and spatial planning. While Iceland has successfully integrated "acceptable risk" into legislation for avalanches, no equivalent exists for volcanic hazards or the specific, prolonged uncertainty facing Grindavík. The development of long-term national standards is recommended, encompassing a general societal risk threshold (as low as reasonably practicable or ALARP) to benchmark volcanic risk against other life risks, alongside probabilistic, hazard-specific metrics to guide national infrastructure placement and development. Another critical component involves determining short-term operational thresholds for Grindavík through participatory processes with authorities, businesses, and residents. These local thresholds must be activity-specific, applying strictly protective criteria for schools and residential occupancy while allowing more operational flexibility for daytime economic activity at the harbor. Guidance would need to be clear about what low, medium, and high risk mean, and about what actions these risk levels should prompt among which members of the population. If reflected in national legislation, this integrated framework could provide clear, adaptive guidance for permitting and planning, underpinned by "if-then" protocols that link real-time alert levels to specific zoning updates and safety actions.

Review and as relevant introduce reforms for risk-informed spatial and development planning. Hazard and risk assessments should guide planning, specifically by identifying different risk zones and steering recovery and development. In Grindavík, for example, limited, light, or daytime activity might be permitted in designated areas under defined evacuation and safety protocols, while higher-risk zones would remain restricted or kept as open-space areas. Zoning, recovery, and development should reflect up-to-date risk information.

Continue investing in risk communication and emergency preparedness. Continued focus on preparedness, civil protection, and firefighting services is critical in light of underlying risk. Ensuring robust civil protection and firefighting services should continue to be a priority. Supported by visible multi-agency drills, evacuation routes should meet and demonstrate the established performance standard (e.g., worst-case evacuation time). Protocols for various evacuation modalities (e.g., vehicle and pedestrian) and the designation of temporary assembly points must be predetermined to ensure rapid response under short warning times. Evacuation exercises, business continuity planning, sheltering arrangements, and scenario-based operational planning for varying hazard intensities are necessary components of a broader risk mitigation strategy. Regular multi-agency drills involving residents, workers, and visitors reinforce readiness and public confidence. Public awareness campaigns, media engagement, and inclusive outreach strategies should explain acceptable risk in accessible terms, and should make clear that coexistence involves managed residual risk supported by mitigation and rapid evacuation capability. Transparent, consistent communication strengthens trust even when decisions are restrictive.

Box 4. Select international experience related to risk-informed decision-making

International experience demonstrates how risk-informed approaches are translated into clear operational rules for safety, land use, and access under prolonged hazard conditions. Following the Christchurch earthquakes in New Zealand, authorities established residential red zones where rebuilding was prohibited, thereby linking hazard assessments to enforceable zoning and clear communication. In Türkiye, post-2023 earthquake recovery combined large-scale microzonation with strengthened legal frameworks to guide settlement, relocation, and redevelopment. In Miyake-jima (Japan), continuous gas monitoring and defined exposure thresholds were used to manage

evacuation and phased return, while La Palma (Spanish territory) has relied on integrated monitoring systems and civil protection exercises to support ongoing risk management. In Ecuador, co-developed risk communication tools and training with local leaders improved public understanding of volcanic risk and supported more-informed decision-making. The importance of clear and transparent risk communication is underscored by the 2009 L'Aquila earthquake in Italy, where the translation of scientific uncertainty into simplified, reassuring public messaging failed to convey underlying risk and contributed to reduced preparedness. Germany's nationwide cell broadcast system and EUAlert in the Canary Islands demonstrate how multilingual, geotargeted alerts can reach diverse populations, including tourists and non-native speakers. In St. Vincent, post-eruption evaluations emphasized the need for clearer, targeted communication and preparedness measures for vulnerable groups, while recovery following the Fuego eruption in Guatemala underscored the importance of integrating psychosocial and community-based support into recovery efforts.

PEOPLE AND SOCIAL INFRASTRUCTURE

5. *Continue to focus on people-centered and inclusive recovery*

Ensure people-centered and inclusive recovery that is reflected in engagement, social policy, and programs. Maintaining social cohesion and trust requires ongoing stakeholder engagement and analytics, communication in multiple languages (including Icelandic, English, and Polish), and targeted outreach to different societal groups, in particular those with increased vulnerabilities (including elderly residents, low-income households, immigrants, and persons with disabilities). Recovery efforts should also account for individuals with invisible disabilities, including those with chronic health conditions requiring medication and those facing mental health challenges. Children and youth also require special care due to their unique developmental and psychological needs. The focus on specific groups should be reflected in the social policies and specific programs to be financed in the coming years. Continued surveys, research, and analytical tools can support targeting of policies and programs and help track their effectiveness.

6. *Review current arrangements and policies for housing and provision of social services*

Review and as relevant adjust arrangements for housing. The extraordinary housing interventions adopted in the emergency phase could be reviewed. Such review could consider the interventions' objectives, design, conditions/obligations, and deadlines vis-à-vis current risk information and uncertainty, as well as the overall recovery vision, general principles, and objectives. Þórkatla was set up as a private limited company with financial obligations to the state and to banks for recovering initial investment by the state and private banks (even if only partially). The current legal framework for buyback—under which residential properties sold to Þórkatla since March 2024 are eligible for repurchase by its original owners—is valid through March 1, 2027.⁸ This framework may not reflect the volcanic and seismic risk and uncertainty. While the government's original purchase price would have reflected market values prior to the evacuations, a buy-back anchored to those pre-disaster values is set to be a difficult proposition for many residents given current risk environment, and weak or non-existing market activity. Þórkatla's commercial architecture, however necessary at the time, now may pose constraints in the

⁸ Under Act No. 16/2024, owners of residential houses who sold their properties to Þórkatla are expected to have priority in buying back their properties at the purchase price until March 1, 2027. The specific conditions of the buyback program have not been decided yet and may allow homeowners to reconsider their initial commitment to buy back or return their property within a certain period, and may allow them to pay the full amount over time in installments.

context of prolonged uncertainty, non-functional mortgage market, and complex insurance conditions. An eventual alignment with the overall recovery framework may require adjustments to its governance mechanism for housing solutions, including the structure of Þórkatla, and should involve prioritizing a gradual, risk-informed, and people-centric recovery for the Grindavík community and economy. Communication on the specific terms and conditions of housing solutions—and how they align with the overall resilient recovery framework and approach—needs to be clear to ensure transparency and trust.

Ensure housing policies reflect acceptable risk levels. Housing policies broadly, and the repurchase program once developed, should provide clarity on interim occupancy conditions, maintenance responsibilities, and potential phased reengagement mechanisms such as conditional rent-to-buy schemes in designated zones. Where state-supported property acquisition mechanisms have played a central role, governance models should prioritize transparency, equitable treatment, and long-term community stabilization. In line with the overall recovery objectives and acceptable levels of risk, resale of homes may be permitted only in areas of the town that are deemed safe, and general rules in line with the broad threshold levels (as noted above) would need to be established (for example, only adults and workers without families would be allowed to live in or rent certain houses until acceptable levels of risk are agreed and achieved). Some buildings could also be converted to accommodate daytime activities (e.g., for businesses or public/community functions). The continuity of maintenance of vacant properties, including ventilation, heating, and fire and mold prevention, is critical to protect public investment and mitigate risks.

Ensure safe education services. Schooling arrangements in Grindavík should follow agreed acceptable risk levels and rules, and these should be clearly communicated. At the same time, to prevent adverse impacts on children and families, support for access to education for those living outside of Grindavík should be continued. Current arrangements, under which other municipalities support the provision of education services for former Grindavík residents, could be reviewed for lessons to inform future plans.

Box 5. Select international experience related to housing policies

International experience shows that housing and social service policies in prolonged hazard settings are most effective when they align public asset management and reoccupation decisions with risk-based rules and long-term community stability objectives. Following the 2021 Tajogaite eruption on La Palma (Spanish territory), authorities combined state-financed compensation, modular temporary housing, and phased recovery strategies that prioritized rebuilding in safer areas while managing prolonged displacement. In Türkiye, post-2023 earthquake reconstruction applied a structured legal framework distinguishing between risky buildings, risk zones, and reserve areas for resettlement, thus enabling coordinated housing transitions at scale. Other cases highlight complementary approaches to managing displacement and housing continuity. On the island of Fogo (Cabo Verde), a “light footprint” approach has been adopted following eruptions in 2014-2015 restricting permanent housing in high-risk zones while allowing continued economic activity. In Tonga, following the Hunga Tonga–Hunga Ha’apai eruption and evacuations, dual land ownership arrangements (in the new and resettlement areas) enabled displaced households to retain rights to original properties while accessing new housing; this approach reduced the sense of permanent loss associated with relocation. Key lessons from Hurricane Katrina (US) highlight the importance of transparent valuation methods, efficient administrative procedures, and clear communication with residents to support trust in the compensation process. A public-public-purpose nongovernmental organization was set up to ensure the safe return of the community in New Orleans; a goal closely aligned with broader objectives of the recovery framework.

CRITICAL SERVICES AND ECONOMIC ACTIVITIES

7. Use recovery as an opportunity to strengthen resilience of critical services and infrastructure, as well as economic sustainability

Rebuild resilient critical infrastructure, utilities, and lifelines. Recovery investments in energy and electricity, water, heating, communications, roads, and protective barriers should consider defined performance standards under alert conditions and acceptable level of risk, as well as building back better principles. While immediate investments focus on safety and immediate restoration of services, long-term investments should focus on utility redundancy, such as redundancy in power/electricity provision, development of a backup cold water source at Vatnsheiði, and strengthening of communications lines.⁹ Temporary service hubs with dual purpose could also be established in safer northern areas to ensure both community and infrastructural resilience. They would back up infrastructure sites housing redundant systems such as power, water, and communications to guarantee the continuity of essential services. They could also function as service centers that support long-term community stabilization by providing office space for municipal operations.

Stabilize the existing economic base and enable safe workforce reentry and job recovery. Economic stabilization requires sustained support to viable enterprises and continuity of basic; these are critical for economic activities in Grindavík and the Reykjanes Peninsula as a whole. Regular surveys (business pulse) can help identify specific needs and potential instruments and/or adjustments to existing programs. Clear compensation mechanisms, structured engagement with banks and insurers, and working capital instruments where necessary can prevent credit contraction and investment hesitation. Phased workforce reentry should be gradual, transparent, and risk-based; it should also prioritize essential infrastructure personnel and critical services and be aligned with acceptable risk levels and rules—e.g., permit overnight stays for adults only, and under specific conditions defined by alert levels, zones, etc. Clear communication of entry conditions, employer duty-of-care requirements, and insurance coverage expectations will reduce liability uncertainty and enable informed decisions by firms and workers.

Revitalize and diversify the economy for long-term resilience. There may be opportunities to take a strategic outlook and further develop geoheritage and volcanic tourism by linking Grindavík to regional tourism and main attractions, and by promoting innovation among small and medium enterprises (SMEs) in these areas. In the long term, workforce training and skills development aligned with tourism and SMEs can reinforce long-term viability. In the medium to long term, economic resilience may be strengthened by deepening fisheries value chains, expanding environmentally safeguarded aquaculture, adapting tourism, and diversifying SMEs.

Promote resilience of people and services. Investment in preparedness, drills, and continuity planning (considering different languages, etc.) should continue across all businesses, and emerging good practices should be shared. Business continuity planning should be systematically linked to alert levels and evacuation protocols. Tourism management should be risk-based and incorporate safety routing, signage,

⁹ Over 95 percent of the tap water in Iceland is untreated groundwater from springs, boreholes and well; and most is used as drinking water, a part runs through heat exchanges for central heating. Iceland relies almost fully on geothermal energy for central heating and hot tap water, mostly directly pumped from the ground, with a small part generated in geothermal power plants through heat-exchangers heating cold water. Iceland relies almost entirely on renewable resources for electrical power generation. About 70-75 percent of the electrical power is generated in hydropower plants, and the rest mostly generated in geothermal power plants. Heavy industry uses around 80 percent of the electrical power.

visitor communication aligned with alert levels, and crowd management planning. Protecting visitor safety while preserving Iceland's international reputation requires careful integration of multilingual hazard communication into tourism operations. Furthermore, managing the scale of tourism is critical to protect local resources, culture, and quality of life and to ensure a sustainable balance between economic development and local well-being in the long-term.

Box 6. Select international experience related to critical infrastructure and services policies

International experience shows that recovery can strengthen the resilience of critical infrastructure and local economies by embedding higher standards, redundancy, and risk-based operations into reconstruction. In Hawaii (US), recovery after the 2018 eruption of Kīlauea was guided by the United States Geological Survey (USGS) Lava Hazard Zone system, which informs land use planning, critical infrastructure siting, and housing buyouts in areas repeatedly exposed to lava flows. Countries with long-term experience of coexistence with volcanic and seismic risk, such as Japan, Chile (Villarrica region), and New Zealand, have rebuilt infrastructure with greater redundancy and have integrated hazard awareness into tourism and economic planning. For example, Kagoshima's Sakurajima-Kinkowan Geopark (Japan) has promoted managed volcano tourism while maintaining strict safety protocols; Chile has prioritized hardened transport and utility infrastructure through measures such as fortified bridges, armored road embankments, and strategic rerouting of essential utilities (water, electricity, telecommunications) to avoid repeat impact corridors and maintain emergency access during eruptive phases in areas repeatedly affected by volcanic activity. These approaches illustrate how recovery can enable continued economic activity under persistent risk while reducing future disruption.

Table 1 provides a summary of the key recommendations across the four areas considered.

Table 1. Summary of seven key recommendations for recovery framework

Recovery area	Seven key recommendations	Checklist points
Policy and governance	<i>1. Adopt recovery vision and objectives for recovery, articulated through participatory process</i>	• Shared vision, guiding principles, objectives, outcomes • Participatory approaches
	<i>2. Define clear responsibilities and coordination mechanisms, considering different phases and risk levels</i>	• Clear mandates and coordination arrangements • Structured interface between science and decision-making for adaptive, risk-informed decisions • Transparent communication, monitoring, and learning
	<i>3. Review current arrangements and policies in key areas, integrating lessons identified</i>	• Financial commitments and funding mechanisms • Disaster risk financing and insurance • Municipal finance, housing
Safety and preparedness	<i>4. Continue prioritizing public safety and investing in strengthening preparedness</i>	• Evidence-based and risk-informed decision-making • Acceptable level of risk approach • Risk-informed spatial and development planning • Risk communication and preparedness
People and social infrastructure	<i>5. Continue to focus on people-centered and inclusive recovery</i>	• Sustained engagement, social policy, and programs
	<i>6. Review current arrangements and policies for housing and provision of social services</i>	• Housing program and policies • Safe education and social services • Focus on children and vulnerable groups
Critical infrastructure and economy	<i>7. Use recovery as an opportunity to strengthen resilience of critical services and infrastructure, as well as economic sustainability</i>	• Resilient critical infrastructure, utilities, and lifelines • Safe workforce re-entry, job recovery • Revitalization, diversification for long-term resilience • Resilience of people and services

Source: World Bank team.

INTRODUCTION AND CONTEXT

This chapter starts with a short introduction and a summary of the report's objectives, methodology and limitations. The general country context and specific Grindavík context are presented next, complemented by a country risk profile (Annex 2 provides additional information). This is followed by a summary of available information on the risk profile for Grindavík, including a short timeline of events affecting Grindavík between 2019 and 2026.

Introduction

Grindavík is located on Iceland's Reykjanes Peninsula, an area that has entered a new and unprecedented phase of volcanic unrest. Since 2021, renewed activity across two interacting volcanic systems has resulted in repeated fissure eruptions, tectonic deformation, and persistent seismicity. While earlier eruptions in 2021 were largely contained within uninhabited valleys, activity associated with the Svartsengi–Sundhnúkur system has proven far more disruptive, with eruptive fissures extending up to 20 km in length and occurring near critical infrastructure and settled areas.

The escalation of the volcanic unrest in late 2023 marked a turning point. On November 10, 2023, significant tectonic changes and ground deformation signaled an imminent threat to Grindavík, prompting the evacuation of the entire town. This was followed by an eruption in December 2023. The last comparable eruptive episode had occurred roughly 800 years before and had persisted in the Reykjanes Peninsula from Reykjanestá to Hengill (east of the municipal area) for decades, underscoring the potential longevity of current activity. Since then, eruptive activity has continued in repeated cycles, with short warning times and limited precursory signals, reflecting a weakened crust that allows magma to propagate rapidly along existing fissures.

By early 2024, approximately 3,800 residents had been displaced, fragmenting the social and economic fabric of Grindavík. In addition to damage to housing and commercial assets, the eruptions caused damage to essential infrastructure, including powerlines, heating pipes, and road infrastructure. Gas pollution, volcanic steam, and air quality impacts have emerged as localized but recurring public health concerns. Indirect damage from seismic and volcanic activity is also substantial and relates (for example) to damage due to loss of energy, including district heating, as well as damage to plumbing systems. Moreover, additional losses are expected for potential demolition costs and debris removal. At the same time, the crisis has extended beyond the town itself and is affecting regional transport networks, energy systems, and major economic assets such as the Svartsengi geothermal power plant and the Blue Lagoon tourism area.

The government has led several emergency response and immediate recovery efforts related to governance, public safety, social and business support, and infrastructure. These efforts have included legal and regulatory changes in different policy areas to enable support for Grindavík, such as establishment of the Grindavík Executive Committee (GEC),¹⁰ direct funding and management of lava protective actions, residential real estate management through Þórkatla Ltd.,¹¹ different forms of financial

¹⁰ The GEC is a multi-disciplinary and independent government body, responsible for projects related to the natural hazards in Grindavík.

¹¹ Þórkatla is an entity created to support the population of Grindavík by purchasing, managing, and disposing of housing in Grindavík; see the entity's website at [link](#).

support for individuals and businesses,¹² and management of the assessment of the area in cooperation with the Icelandic Meteorological Office (IMO) (conducting volcanic hazard mapping), Natural Catastrophe Insurance of Iceland (Náttúruhamfaratrygging Íslands, NTÍ) (overseeing damage assessment of property in the area), and the geotechnical area mapping conducted by engineering companies (overseen by the GEC). Activities have also included supporting emergency response in Grindavík (including evacuation), supervising site safety, helping social support centers, and providing relocation support in coordination with the relevant national and local authorities and other stakeholders in emergency response.¹³ (More information on government support is included in the next chapter).

Over the longer term, uncertainty remains high. Scientific assessments indicate that repeated eruptions are likely to continue along the same fissure or crater row, even as there are early indications that magma inflow rates may be declining. Similar processes could affect other towns and infrastructure corridors in the Reykjanes Peninsula.

Within this context, recovery in Grindavík cannot be understood as a conventional post-disaster reconstruction process. Instead, it is unfolding under conditions of persistent hazard, evolving scientific understanding, and managed but unavoidable risk. Decisions about rebuilding, return, or longer-term relocation need to account for repeated disruption, high uncertainty, and the psychological and economic toll of prolonged displacement. Recovery planning is therefore inseparable from risk governance, public trust, and adaptive decision-making, and must balance the desire to restore community life with the realities of living in an active volcanic landscape.

Objectives of report, methodology, scope, and limitations

This report provides a strategic and analytical contribution to ongoing discussions on resilient recovery in Grindavík. It synthesizes available information, international examples, and technical recommendations to support a shared understanding of the recovery environment and to inform ongoing and future recovery planning. The report can serve as a reference document for national and local authorities and other relevant stakeholders by providing a consolidated overview and insights from international experience that can inform ongoing recovery planning and coordination in Grindavík.

The report is based on desk research, expert analysis, and in-person and online consultations. It provides an overview of key recovery challenges facing Grindavík and identifies issues and considerations relevant to recovery planning under conditions of persistent hazard and uncertainty. The report draws on relevant international experience from post-disaster recovery in complex and cascading risk environments, while recognizing the unique characteristics of the Grindavík context. Fully acknowledging the uniqueness of Grindavík's situation, the selected international examples are referenced with the main purpose to illustrate approaches and considerations relevant to recovery planning, without implying direct transferability. The recommendations consider the current risk environment and available information.

There are several limitations to the findings and recommendations elaborated in the report. This rapid analysis does not constitute a full disaster risk management system assessment, nor does it provide a

¹² These include loans, grants, deductions, etc.

¹³ These authorities include national and local police commissioners and police forces, national and local civil protection bodies, multiple local fire protection services in the south and southwest of Iceland, the Icelandic Red Cross, and the Icelandic Association for Search, Rescue and Injury Prevention (ICESAR).

comprehensive institutional, legal, or financial audit of existing arrangements. In particular, the analysis of recovery governance, housing solutions, and the role of special-purpose instruments such as Þórkatla is based on available information, stakeholder consultations, and international experience, and should be understood as indicative rather than exhaustive. Impact information draws on available information. The report does not include detailed technical analysis, hazard modeling, economic appraisal (costs and benefits, etc.), investment prioritization, or detailed analysis and comparison of different policy options. While certain elements may offer insights for broader regional application, the analysis and proposed measures focus primarily on the risk, social, physical, institutional, and economic conditions affecting Grindavík.

Given the prolonged and evolving nature of volcanic risk in the Reykjanes Peninsula, deeper technical assessments, legal analysis, surveys with various population groups and types of businesses, and structured consultation with affected stakeholders will be required to inform final policy decisions, including those related to long-term disaster risk management coordination mechanisms, housing market interventions, and the future governance and mandate of recovery institutions. These areas are highlighted in the report to inform deliberation—not to prejudge outcomes.

General country context

Iceland is a high-income, advanced economy with strong institutional capacity, robust social welfare systems, and high levels of human development. The country's economy has diversified from historic reliance on fisheries, tourism, manufacturing, and services. Iceland's total gross domestic product (GDP) was approximately ISK 5 trillion in 2025 (US\$40 billion), with a GDP per capita by purchasing power parity (PPP) of roughly US\$81,000—among the highest in the world. Unemployment and inflation reach around 4 percent, while GDP is expected to grow by 3.6 percent in 2027, driven by robust private consumption and an increase in exports. Iceland is a parliamentary democratic republic with a multiparty system; the president is the head of state and the prime minister is the head of government. Executive power is exercised by the government; legislative power is vested in government and the Parliament; judiciary power is independent of the executive and the legislature. Iceland is highly decentralized. It has eight regions with populations ranging from around 7,000 to 250,000. Currently there are 62 communities, with populations ranging from 53 to around 140,000.

Civil protection

The Civil Protection Act No. 82/2008 establishes the governance framework for disaster risk management in Iceland.¹⁴ At the central level, the Department of Civil Protection and Emergency Management (DCPEM), operating under the National Commissioner of the Icelandic Police and the Ministry of Justice, is responsible for coordinating preparedness, response, and recovery to protect public safety, property, and the environment. Iceland's civil protection system combines national coordination with decentralized implementation, reflecting the country's exposure to hazards such as volcanic eruptions and earthquakes. Strategic direction is provided by a government/ministerial body, the Civil Protection and Security Council, while operational responsibility rests largely with local police chiefs and municipal Civil Protection Committees (CPCs), which assess risks and coordinate emergency response.

¹⁴ It should be noted that the Civil Protection Act is under revision and a new law is being discussed in the Parliament.

Municipalities oversee the appointment of their CPCs, and Iceland currently has nine police districts and 21 CPCs.

Firefighting services are provided and financed by the municipalities, following requirements set by the Housing and Construction Authority (HCA). Most municipalities have a voluntary search and rescue group on call for emergencies; many municipalities also have their own Red Cross Departments, in addition to volunteers. The Icelandic Association for Search, Rescue and Injury Prevention (ICESAR) takes an active part in the civil protection system. The Icelandic Red Cross finances the ambulance services, which are run either by the firefighting services or by health care centers. Volunteers of the Red Cross are trained and on call for emergency response. This structure enables Iceland to manage complex hazards through strong national coordination paired with locally driven preparedness and response.

Disaster risk financing and insurance

Iceland's approach to disaster risk financing is anchored in a compulsory national natural catastrophe insurance system. This system was established in 1973 following the Westman Islands volcanic eruption. NTÍ serves as the primary mechanism for covering losses from natural hazards across the country. NTÍ operates as a compulsory, state-backed insurer covering direct physical losses from a defined set of named hazards: earthquake, volcanic eruption, riverine and coastal flood, avalanche, rockfall, and storm surge. Fire insurance for buildings is mandatory in Iceland and provided by four private insurers, while NTÍ exclusively provides natural catastrophe coverage for buildings. Private insurers collect NTÍ premiums and remit them, with NTÍ directly managing claims. Where contents are insured against fire, natural catastrophe coverage for contents also becomes mandatory. Policyholder deductibles are set at approximately 2 percent of each loss, with minimums of ISK 400,000 (approximately US\$3,300 or €2,800) for buildings and ISK 200,000 (approximately US\$1,650 or €1,400) for contents. NTÍ's reinsurance structure consists of two layers totaling ISK 30 billion (approximately US\$219 million or €209 million), providing a degree of financial resilience against large-scale events.

Municipal finance

Local administrations in Iceland operate with a relatively high degree of fiscal autonomy compared with many European peers. Municipalities are recognized under national law as independent authorities that manage their own affairs, including finances. Municipal budgets are built on a mix of own-source revenues and intergovernmental transfers, with the largest shares typically coming from the following:

- **Municipal income tax (*útsvar*).** This is the main source of revenue for local administrations in Iceland. It is collected based on an individual's registered legal residence (*lögheimili*) as opposed to place of work.¹⁵ Individuals pay municipal income tax to the municipality where they are legally registered as a resident on December 1 of the tax year. Commuting does not matter for tax allocation. This is the principal revenue source for local governments, accounting for the majority of their income (around 60–65 percent or more of total municipal revenues). Municipalities have the statutory authority to set local income tax rates within limits defined by law.

¹⁵ Someone can work every day in Grindavík but live (and be registered) in another municipality—in that case, the tax goes to the home municipality, not Grindavík.

- **Fees and charges.** Service charges, municipal service fees, and user charges are a significant secondary source (often around 15–20 percent of revenue).
- **Property taxes.** These are another key own-source revenue stream, though smaller than income tax, typically around 10–12 percent.
- **Other income.** This includes revenues from municipal assets and occasional one-off receipts.
- **Intergovernmental transfers:**
 - **Icelandic municipalities are less dependent on central government transfers than many European counterparts.** Transfers typically account for a smaller share of local revenues (on the order of roughly 8–12 percent depending on the source and year), with the rest financed through own taxes and charges. This contrasts with many member countries of the Organisation for Economic Co-operation and Development (OECD), where transfers can make up a significantly larger share of local budgets. However, central transfers play an important redistributive role and can be critical for smaller municipalities with limited tax bases.
 - **The Municipality Equalization Fund (Local Authorities’ Equalization Fund) is a fiscal equalization mechanism.** It is designed to redistribute funds among local authorities to help ensure basic public service capacity across municipalities (including traditionally education services but also others), with regard to expenditure needs and tax revenues.¹⁶ In the past, it operated according to the Act on Municipal Revenue Sources No. 4/1995, but since January 1, 2026, it has operated under the Act on Municipality Equalization Fund No. 56/2025. Transfers from this fund represent a modest share of total municipal revenues (often cited as around 8–10 percent).

With respect to spending responsibilities, municipalities fund a wide range of local public services. These include education (pre-school through lower secondary), social services, local infrastructure, and planning and community amenities, with local spending on education and social protection generally accounting for a large share of subnational expenditure. Table 2 provides a typical municipal expenditure structure in Iceland, according to the World Observatory on Subnational Government Finance and Investment.

Table 2. Typical municipal expenditure structure in Iceland

Expenditure category	% of total municipal expenditure	Notes
Education (preschool through lower secondary)	~34.4%	Largest single spending area; includes salaries, operations of schools.
Social protection/welfare	~23.8%	Child, disability support, some pension-related supports.

¹⁶ The fund has operated since 1937. Following a shift in the responsibility of projects managed by the state and the municipalities, a thorough review of the fund’s operation was carried out. As a result, there was a significant increase in its equalization role, and it also took on support for the merger of municipalities. The fund also supports the National Association of Local Authorities. Since 1996, municipalities have had responsibility for the provision of educational services and since 2011 for the provision of services for people with disabilities. There are specific acts and regulations in place regarding the different issues of support, i.e., schooling, housing, pensions, services for people with disabilities, and music education, to ensure consistent quality across the country.

Recreation, culture, & religion	~15.1%	Sports, cultural centers, libraries, community programs.
Economic affairs/transport	~10.9%	Local roads, transport services, support for local economic infrastructure.
General public services	~9.3%	Administration, governance, planning and regulatory functions.
Housing & community amenities	~3.2%	Local housing services, community facility maintenance.
Environmental protection	~1.7%	Waste management, environmental programs.
Health	~0.7%	Limited municipal involvement (central government runs most health).
Public order & safety	~1.0%	Local fire protection and civil defense roles.

Source: World Observatory on Subnational Government Finance and Investment, “Iceland,” [link](#).

Spatial planning

Planning falls under the jurisdiction of municipalities, while strategic guidance and oversight is provided at the national level through the Ministry of Social Affairs and Housing, and specifically through entities such as the National Planning Agency. Municipal governments are responsible for preparing various plans, including municipal plans and detailed development plans that guide zoning, infrastructure, and building permits within their jurisdictions. They also prepare regional plans jointly with others. The process requires a public proposal, followed by at least six weeks of public consultation before adoption.

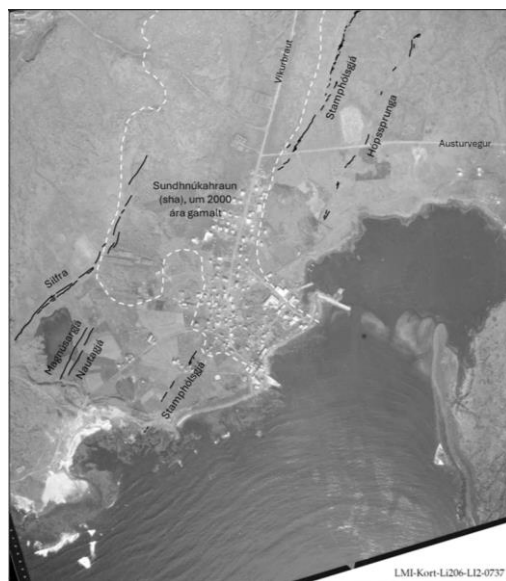
Grindavík context

Background

The Reykjanes Peninsula functions as a distributed volcanic system characterized by interacting hazards—including fissure eruptions, ground deformation, faulting, gas exposure, seismicity, and weather-dependent impacts—rather than a single, centralized volcanic source.

Grindavík is a coastal town on Iceland’s Reykjanes Peninsula, traditionally rooted in fishing and maritime industries. Settlement in the area dates back to the early Icelandic Commonwealth period (from the 10th century), with fishing and small-scale farming forming the basis of local livelihoods for centuries. The modern town developed mainly in the 20th century, particularly after the construction of a harbor in the 1930s and 1940s, which enabled year-round fishing and economic growth. In 1954, only a few buildings were existent in Grindavík, and these avoided the areas with fissures present at the time (Figure 3).

Figure 3. Aerial photo of Grindavík from 1954



Source: Grindavík Executive Committee.

Note: Figure highlights open fissures and fissures before the 2023 eruption, as well as the outline of the Sundhnúkahraun lava field (white dashed line).

In 1974, Grindavík received municipal status and became one of Iceland's key fishing ports, known especially for saltfish production and fish processing. It had a population of around 1,800 at that point, which grew to around 2,400 by 2005, and to around 3,800 in 2023, before the eruption. In recent decades, Grindavík diversified its economy through tourism and services, benefiting from nearby attractions such as the Blue Lagoon geothermal spa. By the early 21st century, the town developed strong community institutions centered on fisheries, sports, and culture. Around 2,100 people were working in Grindavík before the eruption. Grindavík Municipality's essential services included basic social services, a kindergarten, a school for ages 6 to 16, a health care center, a nursing home for the elderly, a sports center, a swimming pool, a golf course, a search and rescue team, and a local fire brigade. Several clubs have also been active in Grindavík, the Grindavík Youth Association (Ungmennafélag Grindavíkur) - a sports club for all ages; a golf club, and others. Grindavík is around a 20- to 30-minute drive from Keflavík, and a 50- to 60-minute drive from the capital, Reykjavík. Figure 4 shows the territorial distribution of land uses in Grindavík before the eruption and identifies the main economic areas in the town and wider area.

Figure 4. Land uses in Grindavík before the eruption



Source: World Bank team.

Economic dimension

Prior to the eruption, Grindavík had a thriving business community with an estimated workforce of around 2,100 people and low unemployment. Grindavík's economy was predominantly anchored by (i) fishing and seafood processing, (ii) tourism and hospitality, (iii) local services and retail, and (iv) small and medium enterprises (SMEs). The fishing industry was the backbone of the town's economy, accounting for just under 35 percent of employment income; in recent years, an average of 40,000–50,000 tons of fish landed at Grindavík harbor annually.¹⁷ Several processing plants historically operated in Grindavík, as part of the broader Icelandic seafood sector.

Prior to the onset of the recent volcanic activity, Grindavík played a nationally significant role in Iceland's fisheries sector. Over the period 2015–2022, the port of Grindavík consistently accounted for approximately 6–8 percent of Iceland's total fisheries landing value, with a long-term average of around 7 percent. In peak years, this share exceeded 8 percent, underscoring Grindavík's importance as one of the country's key fishing ports. In direct economic terms, this level of activity translated into a substantial contribution to the national economy. Given that fisheries account for an estimated 8–12 percent of Iceland's GDP, Grindavík's pre-eruption fisheries activity is estimated to have represented approximately 0.6–0.9 percent of national GDP through direct effects alone.¹⁸ These figures are based on first-sale (dockside) landing values and therefore represent a conservative proxy, as they do not capture downstream processing, logistics, export margins, or broader supply-chain effects. Beyond its direct GDP

¹⁷ Statistics Iceland, fish brought to Grindavík harbor in a 2010–2021 (Afla eftir fisktegundum og löndunarhöfnum, janúar 2010 - febrúar 2026), [link](#).

¹⁸ *ibid.*

contribution, the fisheries sector plays a strategic role in Iceland's economic system that is not fully captured by output shares alone. Fisheries account for a disproportionately large share of export revenues, estimated at around 25 percent of total exports, and are therefore critical to Iceland's balance of payments, particularly given the country's reliance on imported goods. The sector is also characterized by high labor productivity and generates significant economic value with a relatively small share of national employment. From this perspective, the disruption of fisheries activity in a concentrated hub such as Grindavík has implications that extend beyond the local economy.

Export revenues are central to a country's balance of payments, and particularly important for an import-dependent island economy. Tourism accounts for around 8 percent of Iceland's GDP but nearly 40 percent of export revenues (as tourism is classified as an export), while fisheries contribute approximately 6 percent of GDP and generate about 25 percent of export earnings. Together, tourism and fisheries play a critical role in financing Iceland's imports. These sectors are also distinct from an employment and productivity perspective: tourism is one of the country's largest employers, accounting for roughly 10–16 percent of the workforce, whereas the fisheries sector employs only about 3 percent of workers but is a high-productivity sector that generates substantial economic value and a quarter of Iceland's export revenues.

Within this national context, Grindavík occupies a strategically important position, particularly through tourism assets linked to the Blue Lagoon. Although the Blue Lagoon contributes just an estimated 0.3 percent of Iceland's GDP, it is arguably the country's single most important tourism attraction: Iceland receives around 2.5 million tourists per year, and approximately 50 percent of them visit the Blue Lagoon. Any prolonged disruption or incapacity of this site could therefore have impacts extending well beyond Grindavík, affecting the wider tourism sector and Iceland's overall ability to attract visitors, with potential implications for export revenues, employment, and the balance of payments.

Some of the main employers in the region include the following:

- **Thorfish** is made up of **Grindavik Seafood**, **Granti**, and **Þorbjörn**. These companies are part of the local seafood ecosystem with historical roots in fishing and processing, and they own vessels and primarily do seafood wholesale and fishing.
- **Vísir hf.** This fishing and fish processing company specializes in frozen, fresh, and salt fish products. It owns vessels and processes catch locally, serving markets in Europe and North America.
- **Einhamar Seafood.** This fresh fish producer owns vessels and processes catch locally, serving markets in Europe and North America.
- **Stakkavík.** This fish processing and fishing company specializes in fresh fish for export. It owns vessels and processes catch locally, serving markets in Europe and North America.
- **Industrial services.** Several industrial companies operate in Grindavík, mainly servicing the fishing industry, such as machine and steel shops, carpentry and other crafts, as well as services related to plumbing, electricity, and so on.
- **Local services, retail, and hospitality.** Before the eruption, Grindavík supported a range of small businesses such as cafés and restaurants (e.g., Café Bryggjan, Fish House Bar & Grill, Papas'

Restaurant; bakery), accommodation providers (e.g., guest houses, campsite), and service businesses (gas stations, local retail). The current status is mixed with some businesses operating intermittently or with reduced hours due to population decline and access challenges, while others remain temporarily closed.

- **The Blue Lagoon.** This major tourism anchor contributes significantly to local supply chains, including sourcing goods and services locally. It remains one of the most economically significant entities tied to Grindavík. Despite closures due to volcanic evacuation, it has repeatedly resumed operations and continues to attract visitors, making it a core economic stabilizer for the region.

Iceland country risk profile

This section provides a quick overview of Iceland's risk profile (with additional information provided in Annex 2). It is noted that risk is understood as the combination of hazard, exposure, and vulnerability. Accordingly, this section includes information on volcanic, earthquake, and other hazards; exposure and vulnerability elements; and risk trends and drivers.

Iceland is one of the most volcanically and seismically active countries in the world. Located on the MidAtlantic Ridge, a spreading boundary between diverging tectonic plates, it is one of the only places on Earth where a mid-ocean ridge rises above sea level. In addition to the ridge, a mantle plume (hotspot) is located beneath the island, producing extra magma and heat. Active volcanic systems are located along the tectonic plate boundary, which cuts through Iceland roughly from southwest to northeast.

The active geology creates a high-hazard environment dominated by volcanic and seismic activity, with emerging hazards driven by climate change. Alongside the hazards that contribute to risk in Iceland, population and critical infrastructure exposure is relatively low but concentrated. Economic and infrastructural dependencies cause systemic vulnerabilities, meaning that a single failure caused by a natural hazard can escalate into a complex societal crisis. Iceland's strong social protection systems and low inequality mitigate vulnerability at the population level, although long-term psychosocial effects from previous disasters in Iceland suggest that long-term monitoring and care are key to a healthy disaster recovery.¹⁹

Volcanic hazard

Post-glacial volcanism in Iceland is concentrated within ~15–50 km wide neo-volcanic zones, belts of active faulting and eruptions that host ≥30 volcanic systems and cover about one-third of the country. Each system may include a central volcano, a fissure swarm, or both, with eruptions occurring at the central edifice and/or along fissures. The East Volcanic Zone has produced ~80 percent of Holocene eruptions and ~60 percent of erupted magma, whereas the Reykjanes belt where Grindavík lies has historically been the least productive of the main zones. Iceland's activity spans nearly the full spectrum of eruption styles and sizes (Volcanic Explosivity Index [VEI] 0–6; ~10 percent are ≥VEI 4), with eruptions on average every three to five years. Most eruptions are small (<0.1 km³ dense rock equivalent [DRE]), while rare flood-basalt events (>10 km³ DRE) recur on ~500- to 1,000-year timescales, and the largest explosive eruptions (VEI 6) occur once or twice per millennium (last in 1362 CE). Principal hazards include

¹⁹ Þórðardóttir et al. 2016. Risk factors for posttraumatic stress symptoms among avalanche survivors: A 16-year follow-up. *Journal of Nervous and Mental Disease*, 204(4), 298–305. [Link](#).

jökulhlaup (glacial outburst floods) from subglacial eruptions, tephra fall (typically affecting air quality and grazing but with the potential to cause infrastructural and structural damage), and volcanic gases, as well as lava flows, seismicity, and ground deformation. Airborne tephra and gases can extend across Europe, as in the 2010 Eyjafjallajökull eruption. Pyroclastic density currents and volcanic tsunamis are rarer, tied to the largest events. Two scenarios are thought to pose the greatest risk: (i) a prolonged, high-volume effusive eruption like Laki, generating widespread gas/aerosol pollution, and (ii) a large (VEI 6) explosive eruption near populated zones (e.g., 1362 Öräfajökull), capable of pyroclastic density currents and heavy tephra deposition. Historically active volcanoes in Iceland are comprehensively monitored to detect such threats early. **See Annex 2** for more details.

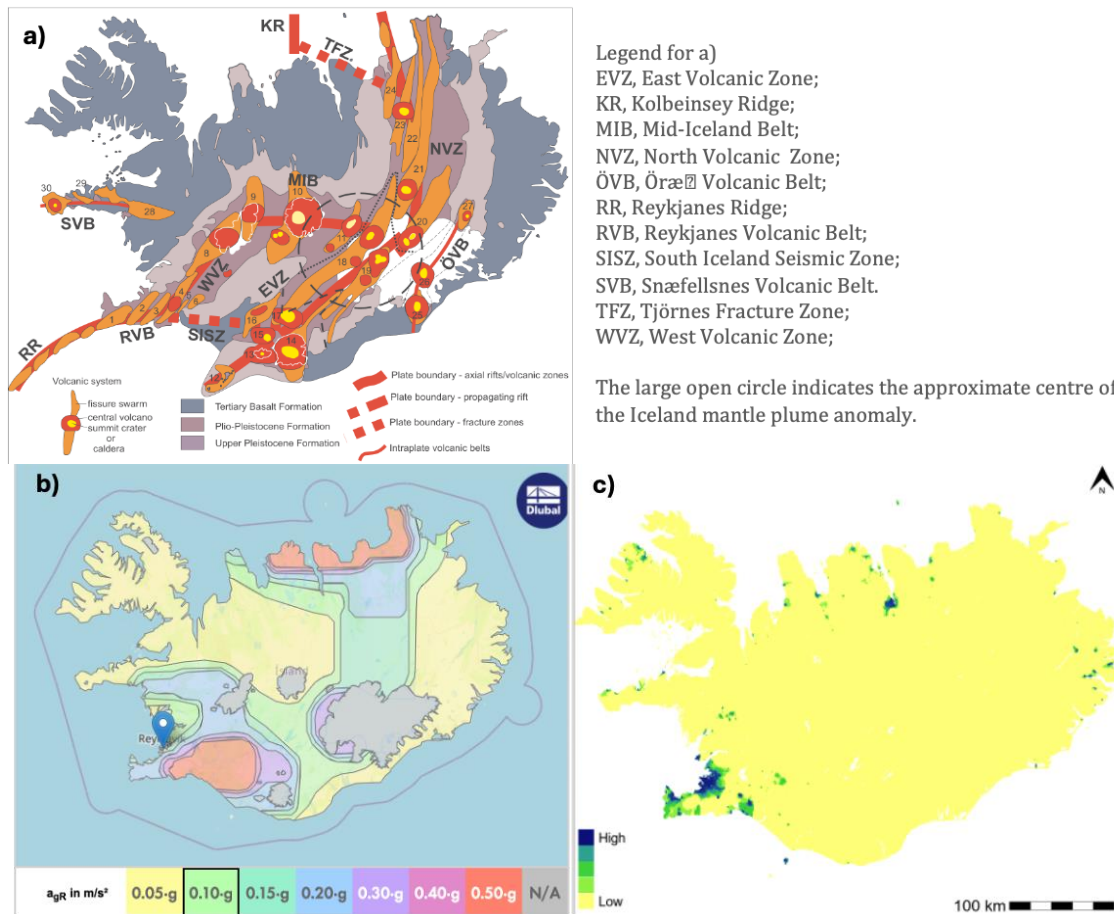
Seismic hazard

Iceland faces a high seismic hazard level, primarily driven by its location on the Mid-Atlantic Ridge. Seismic hazard in Iceland is concentrated in the South Iceland Seismic Zone in the south and the Tjörnes Fracture Zone in the north (Figure 5), which have produced the country's largest earthquakes (up to magnitude 7.2). Recent shocks like the 2008 magnitude 6.3 Ölfus earthquake caused substantial structural damage, although modern building standards prevent human fatalities. A third important hazard area is the Reykjanes Peninsula, where the Mid-Atlantic Ridge comes ashore. This region hosts earthquakes of mixed tectonic and volcanic origin. During the ongoing volcanic and seismic crisis triggered severe ground deformation through the town of Grindavík. In terms of historical direct damages due to natural hazards, based on NTÍ data for period of 1987 until 2025, earthquake comprised 73 percent of total damage compensation, avalanche 11 percent, floods 9 percent, rockfall/mudflow 5 percent, and volcanic eruption 2 percent. **Annex 2** provides further information.

Other hazards

Jökulhlaup (glacial outburst floods) represent a major hazard, particularly from the Vatnajökull (Grímsvötn) and Mýrdalsjökull (Katla) glaciers. They are triggered by either subglacial volcanic eruptions or geothermal melting. Landslide susceptibility is high in mountainous regions due to steep terrain, specific soil types, and triggers such as heavy rainfall or earthquakes. Wildfire (bush/forest) is increasingly important given climate change, a significant shift for a country historically protected by its cool, wet climate (World Bank, 2025). Tsunami risk is considered low (2 percent chance in 50 years; ThinkHazard [2020]), while water scarcity and extreme heat are currently very low to non-existent.

Figure 5. Visualization of select information on volcanic hazard, seismic hazard, and population exposure



Sources: Thordarson and Höskuldsson 2008 for distribution of active volcanic systems among volcanic zones and belts in Iceland; Dlubal Software, [link](#), for peak ground acceleration (m/s^2) in Iceland for a 475-year return period; WorldPop, [link](#), for estimated 2020 population density).

Exposure and vulnerability

Iceland is sparsely populated (three to four people per km^2), with most residents living in southwest Iceland (Figure 5 c). Nearly two-thirds of the total population (411,500) live in the Capital Region around Reykjavík, which sits just outside the higher hazard volcanic and seismic zones. Approximately 2 percent of the population live within 10 km of a Holocene volcano location as defined in the Smithsonian Institution's Global Volcanism Program (which doesn't account for spatially disparate eruption sources like fissures). Around 27 percent live within 30 km and 92 percent within 100 km of a Holocene volcano.

Critical infrastructure is concentrated in the southwestern, more densely populated region of Iceland.

Some key infrastructure, such as the Keflavík International Airport, and the Svartsengi and Reykjanes Power Plants, are located on the Reykjanes Peninsula, an area currently experiencing high volcanic unrest. Critical infrastructure—such as the Route 1 Ring Road and its bridges, and hydropower plants draining from glacier-covered volcanoes—are exposed to volcanic flows and *jökulhlaup*, which can cause total isolation for remote communities like Vík, and potentially disrupt the tourism, fisheries, and other industries upon which Iceland's economy is strongly dependent.

In terms of vulnerabilities, economic and infrastructural dependencies in Iceland lead to fragilities within the system, such that a single failure can escalate a natural hazard into a complex societal crisis.

Iceland, like many volcanic islands, is highly reliant on a small number of economic sectors (e.g., tourism, fishing, aluminum exports) and relies heavily on critical infrastructure that, if damaged, can cause rapid GDP drops and/or disruptions to community functioning. Modern populations in Iceland are highly dependent on services of critical infrastructure (e.g., electricity, geothermal district heating).²⁰ New residents, foreign workers, and non-Icelandic speakers are particularly vulnerable socially due to language barriers.

Risk trends and drivers

Globally, Iceland is considered a very low-risk country, because of its very high coping capacity and institutional strength, which offset its high physical exposure to geophysical and other hazards (JRC, 2025). Geophysical hazards pose the greatest risk for Iceland, with land-use changes exacerbating the risks.

Persistent high geophysical risk: Renewed volcanic activity in the Reykjanes Volcanic Belt after 780 years of quiescence has shifted the primary threat from remote areas to one of the country's most densely populated and industrially vital regions. Following the 12 distinct volcanic events between March 2021 and August 2025, there remains a continued potential for eruptions in the Reykjanes Peninsula because of magma accumulation and ongoing uplift around Svartsengi. The economy of Iceland is particularly sensitive to disruptions from natural hazards. The most sensitive sectors are tourism, as evidenced by repeated evacuations affecting access to the Blue Lagoon and Grindavík, and fisheries and aluminum exports, which make up a large part of all exports (see also in section on Impacts).

Land use change: In the longer term, land use changes affect potential hazards and risk in Iceland. Rapid urbanization, tourism growth, and the placement of infrastructure on relatively young lava fields can create unsafe conditions where social systems intersect with active geological hazards. Afforestation and a significant reduction in sheep grazing have increased the fuel load (bushes and trees), heightening the risk of wildfires in formerly safe areas.

Climate change: Wildfire risk is also exacerbated by drier vegetation as a result of climate change, with moss and vegetation fields more frequently ignited by volcanic activity. Projected warming for Iceland is 0.47°C per decade (World Bank 2025b), nearly three times the global average. This warming also contributes to long-term glacial retreat, which may trigger eruptions as ice mass pressure on volcanoes decreases; however, it may also reduce the size, frequency, and threat from *jökulhlaup* as availability of melt water reduces.

²⁰ Over 95 percent of the tap water in Iceland is untreated groundwater from springs, boreholes and well; and most is used as drinking water, a part runs through heat exchanges for central heating. Iceland relies almost fully on geothermal energy for central heating and hot tap water, mostly directly pumped from the ground, with a small part generated in geothermal power plants through heat-exchangers heating cold water. Iceland relies almost entirely on renewable resources for electrical power generation. About 70-75 percent of the electrical power is generated in hydropower plants, and the rest mostly generated in geothermal power plants. Heavy industry uses around 80 percent of the electrical power.

Grindavík risk profile

This section focuses on Grindavík's risk profile, including a description of hazard, exposure, vulnerability, and risk drivers and trends. It also provides a timeline of events affecting Grindavík between 2019 and 2026.

Grindavík's current risk profile is dominated by the continued potential for seismic and volcanic hazards following the reactivation of volcanism in the Reykjanes Volcanic Belt, with associated crustal rifting and the presence of extensive fissure swarms within Grindavík. The town is situated within a tectonic belt featuring six distinct volcanic systems arranged in a north-northeast to south-southwest orientation, including the Svartsengi system, which is at least 30 km long and the site of ongoing uplift that is indicative of continued magma recharge.

Hazards

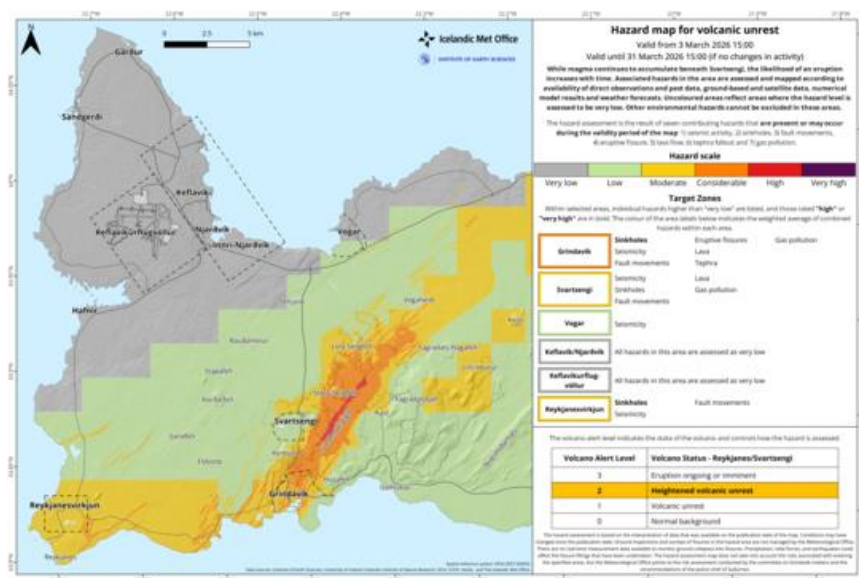
Historical data indicate that eruptive episodes on the Reykjanes Peninsula are periodic, with active cycles typically lasting decades or even centuries. Volcanic hazards in Grindavík are driven by magmatic processes within a reservoir located 4 to 5 km beneath the Svartsengi region, with repeated eruptions along the Sundhnúkur crater row the most likely outcome. The threat from these eruptions is inherently dynamic because as magma accumulates, the probability of an eruption increases until a critical system pressure is reached, triggering a new event. Warning times for these events are dangerously short, typically ranging from under 30 minutes to five hours. Primary volcanic hazards include fissuring, ground deformation, and lava flows, which for specific eruption scenarios, such as activity south of Hagafell, can travel rapidly enough to close all land-based evacuation routes in as little as six hours, isolating neighborhoods and emergency services while also posing a direct threat to the northern built-up area. Furthermore, if lava reaches the sea east of Grindavík, which scenarios suggest it can in 1.5 to 3 hours of the eruption starting, it poses risks of local explosive activity and dangerous conditions within a ~500 m radius of the contact point. Subsurface *gjávellar* (lava tube breakout) in the recent Reykjanes crisis allowed lava to travel beneath diversionary barriers, something that is hard to capture in hazard modeling. Hazardous gas pollution (primarily sulfur dioxide) can affect air quality, mobility, and ecosystems and is typically most dangerous within a 3 km radius of eruptive vents.

Tectonic instability is a persistent feature of the Grindavík landscape. It is characterized by the formation of rift valleys (grabens), ground subsidence, and open cracks/voids within the urban area following the reactivation of volcanic activity at Sundhnúkur in November 2023. These fault zones create an inherent ground instability risk during a future event, as tectonic movements can open hidden voids or displace existing crack fillings without warning. Furthermore, the formation of grabens and the associated land subsidence, which has reached up to 1.5m, pose long-term threats to coastal stability and the functionality of the town's harbor.

On March 3, 2026, the IMO issued the most recent hazard (not risk) map (Figure 6), which shows the cumulative level of hazard from seven hazards that are present or may arise. These include (i) seismic activity, (ii) sinkholes, (iii) fault movements, (iv) eruptive fissure, (v) lava flow, (vi) tephra fallout, and (vii) gas pollution. The map reflects that the eruption has ended, but dangers from recent lava, sinkholes, and potential gas pollution are still present. The highest near-term hazard is due to the potential for fissure opening. The main hazards expected from the active fissure systems (Sundhnúkur) are ground

deformation (graben), lava flows, and volcanic gases, which create the potential for local destruction of property and utilities, air quality episodes, access constraints, and reputational effects on tourism.

Figure 6. IMO hazard map issued on March 3, 2026



Source: IMO, [link](#).

Note: The map is valid until March 31, 2026, unless conditions change and an earlier update is required.

A future reactivation of volcanic zones offshore and to the southwest of the Reykjanes Peninsula cannot be ruled out should the current intrusion propagate offshore. However, there is no indication of an offshore magma intrusion in current monitoring data. Rather, recent offshore earthquake swarms suggest stress release related to activity on the peninsula. Should offshore activity happen in the future, the interaction of magma with seawater would lead to an explosive eruption, with the potential to cause rapid sea-level changes, tephra, air pollution, and more. However, offshore eruption scenarios are well prepared and rehearsed for because of the potential threats to aviation safety and disruption to the Keflavík airport.

Exposure and vulnerabilities

Critical assets near the Svartsengi Power Plant and Blue Lagoon include geothermal/pipeline infrastructure and tourism hubs, which are susceptible to lava/gas/tephra impacts and disruption to access. Regional transport links to the Reykjanes Peninsula may face periodic closures from fissures/lava, in turn affecting mobility and emergency logistics. Protective barriers have helped divert lava but require sustained adaptation.

The town's overall vulnerability is compounded by its high dependency on interconnected critical infrastructure, specifically the Svartsengi Power Plant, which provides electricity and geothermal district heating for the entire Suðurnes region, as well as fresh water supply from the Lágir wellfield. This systemic fragility means that a single volcanic or seismic event can escalate into a complex societal crisis if these vital utilities. Repeated events have already destroyed power lines and central heating pipes, and while nearly 14 km of deflection barriers have been constructed to protect critical assets, their effectiveness depends on the exact location and volume of future lava flows. As the volcanic crisis is

ongoing and its eventual end unpredictable, large-scale physical reconstruction is currently deemed unwise. The town remains in a "prolonged uncertainty" phase that requires constant reassessment of the geological and social assumptions underpinning all recovery decisions.

Socially, the risk profile is differentiated; significant vulnerability remains for the fishing industry and related services, which are now heavily dependent on foreign labor. These non-Icelandic-speaking groups, along with new residents and children, are classified as high-risk populations because they often lack experience with local evacuation procedures or have limited access to hazard information in their native languages. Repeated access restrictions and air quality advisories affect tourism and local commerce, amplifying recovery uncertainty. Consequently, the risk profile is dynamic rather than stable, requiring short-term and long-term response plans with warning times that can be as short as 30 minutes or as long as five hours, as well as continuous professional reassessment to inform long-term recovery and safety planning under uncertainty.

Risk trends and drivers

Monitoring data from the Sundhnúkur crater row reveal an intensifying trend where successive eruptions have grown in total lava volume and exhibited higher initial effusion rates, which increases the speed of lava propagation and the severity of gas pollution. However, monitoring suggests that the magma supply rate to the reservoir area beneath Svartsengi is declining. A simple linear projection of this decline suggests at least one to two years before the magma supply becomes too low to maintain recharge and thus trigger an eruption, although there is considerable uncertainty in this projection and the magma supply rate at depth could instead increase. For context, the volume of magma accumulating beneath the Svartsengi Power Plant is estimated at approximately 23 million m³. This is equivalent to around 9,200 Olympic-size swimming pools (assuming 2,500 m³ each) or 1,150,000 large fire tank trucks (at 20 m³).

Urban and socio-economic drivers further exacerbate Grindavík's vulnerability, as modern infrastructure and residential areas have historically been placed on relatively young lava fields, creating unsafe conditions at the intersection of social systems and active geology. The town's current recovery is complicated by a rising social vulnerability linked to a growing reliance on foreign labor for the fisheries sector; as indicated above, these residents can lack familiarity with national evacuation procedures and face significant barriers to accessing hazard information in their native languages. Finally, the high level of systemic dependency on centralized critical infrastructure, specifically the Svartsengi Power Plant, ensures that even a localized geological event can rapidly escalate into a complex, region-wide societal crisis.

Timeline of most recent events affecting Grindavík (2019–2026)

The current episode ended ~780 years of volcanic quiescence on the peninsula and began with a period of seismic unrest in December 2019 (see Box 7). Between 2021 and 2025, the Reykjanes Peninsula experienced 12 volcanic eruptions of varying intensity and impact. After centuries of dormancy, the first three eruptions occurred over a 2.5-year period, from March 2021 until August 2023 within the Fagradalsfjall system. The lava flow was moderate to small and resulted in minimal structural damage, as the eruptions occurred in an uninhabited valley away from towns or critical infrastructure. Following increasing seismic activity in the area, the town of Grindavík was evacuated in November of 2023. A few

weeks later, on December 18, 2023, the first major eruption in Svartsengi, a part of the Sundhnúkur crater row, occurred. Repeated cycles of eruptive activity continued until August 5, 2025.

Box 7. Key episodes in the ongoing Reykjanes crisis affecting Grindavík

- **December 2019–March 2021:** The crisis began with pre-eruption seismic unrest focused near Svartsengi. Minor damage to homes was reported following the magnitude 5.7 earthquake on February 4, 2021.
- **March 19, 2021–November 10, 2023 (Fagradalsfjall phase):** Three eruptions occurred in the remote Fagradalsfjall area, beginning respectively on March 19, 2021, August 3, 2022, and July 10, 2023. While these caused minimal infrastructure damage, they placed immediate strain on the national emergency response system due to massive tourist interest.
- **October–November 10, 2023 (turning point):** Strong earthquake swarms accompanied by large uplift began in October 2023 in the area between Þorbjörn and Sundhnúkur. On November 10, seismic activity associated with the large magmatic intrusion triggered the emergency evacuation of the town's 3,790 residents and caused a widespread network of open fractures that dissected the town. Tens of houses and streets were destroyed, and all vital utilities were affected.
- **December 2023–February 2024:** Two eruptions occurred along the Sundhnúkur crater row. The January 14 eruption was particularly devastating, as the fissure passed through barrier L7, reached inside the town limits, destroyed three houses, and disrupted heat and power. In February, lava overran the main hot water pipeline, leaving 30,000 people on the peninsula without heat.
- **March 2024–August 2025:** A sequence of high-intensity eruptions continued (nine total on the Sundhnúkur row by late 2025). These events repeatedly destroyed transmission lines and roads, requiring the construction of nearly 14 km of deflection barriers to maintain utility corridors.
- **August 2025–early 2026:** Tectonic instability and land uplift at Svartsengi remain ongoing as of early 2026, suggesting that a future eruption is a credible scenario.

Source: Public information.

Note: For a list of eruptions, see Visindavefur 2024.

Impacts

This section summarizes available information on damage, as well as human and economic impacts.

Damage

Physical damage to buildings has been concentrated in Grindavík, resulting from a combination of tectonic rifting and lava inundation. In addition to direct damage, several dozen reports of indirect damage have been received, both in Grindavík and elsewhere in Reykjanes. The main causes of indirect damage during this crisis were the lack of energy, including district heating and electricity for heating, as well as damage caused when water was poured into the plumbing systems of houses that had suffered frost damage.

Tectonic and ground damage: The November 10, 2023 event fundamentally altered the town's geological stability, forming two distinct rift valleys, or grabens, separated by a central ridge, and activating seven major fault belts. The largest belt, Stamphólsgrjá is the most significant, reaching widths of 3 m and depths exceeding 30 m. Ground surveys have identified 3.9 km of open cracks, ground subsidence up to 1.5 m, and hidden voids within the urban area, rendering many plots permanently unstable. While 1.3 km of cracks in open areas were repaired by late 2025, many remaining fissures require complex, long-term remediation.

Buildings: As of early 2026, NTÍ had received 800 reports of damage in the town, had inspected 400–500 properties, and had identified approximately 75 buildings as total losses (*altjónshús*). Many buildings remain structurally standing but are uninhabitable due to safety issues, infrastructure disruption, or ongoing volcanic risk. Most total losses occurred where structures stood directly on or adjacent to active fractures, causing severe structural tilting or collapse. Total compensation for the event is estimated to reach ISK 12 billion (or almost €84 million).

Critical infrastructure: Repeated eruptions destroyed overhead transmission lines, underground power cables, and central heating pipes, with major damage to municipal sewers, water supply, and street lighting as well. Over 11 km of temporary roads have been laid over fresh lava to maintain essential access. Land subsidence of up to 1 m at the harbor has necessitated significant engineering work to raise sea defenses against coastal flooding and restore functionality to the port.

Human impact

Population impacts: The majority of the population in Grindavík moved after the November 2023 eruption, to either the larger Reykjavik Metropolitan Area or to main population centers in the Reykjanes Peninsula. The town's population of approximately 3,800 has been fragmented and rehoused across the country. On February 16, 2026, there were 893 people legally registered in Grindavík, of which only around 100 actually lived in Grindavík. Of the 893 legally registered people, 267 were foreign citizens, and 73 were under the age of 20. The overnight population is estimated at only 400 people. One person was killed on January 10, 2024, falling into a crevasse. Multiple episodes of gas pollution and volcanic haze have affected populations across South and West Iceland.

Psychosocial impacts: While the impacts are being studied and more information is expected to emerge, existing information and consultations suggest that the evacuations and prolonged uncertainty have had significant psychosocial impacts on the affected population. Repeated disruptions to daily activities, combined with limited visibility on future conditions, have contributed to sustained stress and reduced sense of stability. Housing uncertainty emerged as a central factor shaping residents' ability to plan for the future, with prolonged displacement straining support systems originally designed for short-term disruption. This instability is closely linked to employment and livelihood decisions, reinforcing the notion that economic impacts are not isolated, but directly influence broader well-being and recovery trajectories. At the same time, the dispersal of residents has weakened social ties and disrupted community cohesion, undermining informal support networks that play a critical role in coping during crises.

These impacts are not evenly distributed. Consultations highlighted barriers faced by vulnerable and underserved groups, including non-Icelandic-speaking residents, in accessing information, services, and support. Unequal access to communication channels has limited the reach of recovery efforts for some populations, exacerbating existing vulnerabilities. Taken together, these dynamics point to a set of interconnected impacts across psychosocial well-being, housing stability, livelihoods, and social cohesion, where uncertainty, displacement, and uneven access to support continue to shape recovery outcomes. Given the importance of informal social networks in coping during crises, the erosion of these connections represents a critical impact with potential longer-term consequences for both individual well-being and community recovery.

Children and youth have been also particularly affected. Prior to the 2023 eruptions, over 800 children of preschool and primary school age and about 260 students of secondary school age resided in Grindavík. Today, an estimated 400 people reside overnight in Grindavík, including residents (includes 14 children) as well as tourists and foreign workers. Evacuations and prolonged uncertainty have caused an increase in mood disorders, post-traumatic stress disorder (PTSD), and trauma, particularly among children, who are experiencing school avoidance and behavioral issues. The *Icelandic Youth Study 2025* indicating that relocated children show lower life satisfaction, weaker school connections, and higher rates of psychophysical symptoms compared to peers. Research notes that while students who moved prior to the evacuation also demonstrate increased psychosomatic complaints and risk behaviors, they do not show comparable declines in overall life satisfaction or school connectedness. Research by the Social Science Research Institute highlights that the disaster creates conditions for long-term psychosocial risk and notes the compounding effect of repeated evacuations, financial stress, and prolonged uncertainty.

Economic impact

Businesses operations were impacted throughout the evacuation period and previous interruptions. Some businesses have continued operations, often through temporary adaptations, partial relocation, or modified working arrangements.²¹ Others have reduced activity, temporarily closed, or experienced sustained financial stress. Reduced workforce availability, uncertainty over access conditions, and the relocation of certain business functions have further constrained the ability of firms to operate at scale. These pressures have been particularly acute for SMEs, which tend to have more limited financial buffers and flexibility than larger firms.

The fisheries sector has been affected, especially in the immediate period of repeated eruptions and associated disruptions; although years 2025 and 2026 have been generally positive for the industry. While the port itself was not directly damaged by the lava, in the immediate period, there was a decrease in port activity; with periods with no vessels, or only a few fishing boats, are present, and few (or no) arrivals are scheduled, as fishing vessels that typically land their catches in Grindavík have been forced to redirect to other, unaffected ports. Major seafood companies had to temporarily stop processing in Grindavík and/or find alternative arrangements and bore increasing production costs. For example, one company reported major damage to its processing factory, resulting in a loss of aquaculture and financial loss seriously threatening its operations. In 2024, Grindavík's share of national landing value had fallen to approximately 3.3 percent, less than half of its long-term average; while the direct contribution of Grindavík's fisheries activity to national GDP declined to roughly 0.3–0.4 percent, representing a 50–55 percent reduction in direct fisheries-related economic exposure compared to before the eruption.

Workforce and municipality budget: While many firms have adapted, the workforce regularly operating in town has shrunk to 750–800 people. Overall, Grindavík has experienced a material loss of economic function, with downstream effects on employment, municipal revenues, export activity, and the overall economic base of the community. The municipality's finances have suffered impacts with decreased tax revenues, leaving the city unable to meet statutory obligations (more on this in next chapter) without state support. To meet the obligation of the three-year average of zero or higher, they would need

²¹ For example, one company's barley production greenhouse was destroyed and the firm moved production to Hafnarfjörður.

government support of ISK 400–500 million (€2.75–3.5 million), or a specific waiver due to disaster from this obligation.

Broader area – Blue Lagoon: Despite recurring operational disruptions, the Blue Lagoon has largely sustained revenues at or near pre-eruption levels, reflecting strong underlying demand and an ability to maintain pricing despite reduced operating days. However, these disruptions have reduced visitor volumes and interrupted booking continuity, limiting the region’s capacity to fully benefit from the post-pandemic recovery in tourism. This impact is particularly significant in the context of Iceland’s broader tourism rebound, with international arrivals exceeding 2 million in 2023, approaching pre-COVID levels. In the absence of such disruptions, the Blue Lagoon would likely have captured a larger share of this recovery, translating into renewed growth in both visitation and revenue.

Broader area – utilities: The HS Orka power company and HS Veitur utility company (distributing electricity, heating, and drinking water in Reykjanes) suffered some losses and disruption of services due to the eruptions. The total loss of HS Veitur because of the seismic activity in Grindavík is yet to be determined. An initial estimate of HS Veitur drawing on insurance information, including direct and indirect loss could amount to a total of ISK 1.1 billion (some €7.7 million). That includes direct loss of ISK 348 million (about €2.4 million) and indirect estimated loss of ISK 752 million (about €5.3 million) including reduced lifetime, unresolved damages, and so on. Though functioning today, the system has suffered damage that as of March 2026 is yet to be repaired and renewed because of the events.

ANALYSIS AND RECOMMENDATIONS

This section comprises four subsections. First, it provides a short description of response and recovery efforts taken as of 2026. Second, it provides a short analysis of current risk information and its implications for recovery and response. Third, it includes a short review of key challenges identified across several interconnected areas—policy and governance, safety and preparedness, people, jobs, and the economy, as well as infrastructure and economic activities. The final section includes key recommendations in these categories that can be considered in the recovery framework.

Response and recovery efforts taken as of 2026

Following the 2023 eruptions, the Government of Iceland enacted a number of extraordinary support measures for Grindavík, which required the coordinated intervention of multiple ministries and agencies along with extraordinary fiscal measures. Total government crisis response and recovery expenditures were estimated at over €550 million.²² Table 3 provides a breakdown of main costs incurred. Support measures spanned six broad areas: civil protection and emergency response; infrastructure protection and repair; housing support; psychosocial and educational support; financial and business support; and governance and legal measures. In addition to the information presented in the table, the 2025 support plan of ISK 250 million (€1.75 million) includes business consultation, support grants, and campaign plan (see section government support for businesses).²³

Table 3. Estimated expenditures for crisis response and recovery after 2023 eruptions

Action	Total cost (€, millions)
Payments from budget appropriations in the Budget and Supplementary Budget Act	
Construction of protective walls at Svartsengi and Grindavík	€69
Support for wage payments (for workers/employees)	€31.79
Specific housing support	€ 13.93
Operational support	€5.16
Icelandic Meteorological Office	€1.10
Interest and indexation on mortgages with pension funds	€0.96
Interest subsidy on the purchase of housing through the rental company Bríet (temporary rental)	€0.92
Executive Committee of Grindavík	€0.67
Grindavík Product Fund ^a	€0.00
Total payments from budget appropriations in the Budget and Supplementary Budget Act	€123.19
Payments from general reserves	
Civil protection	€44.81
Low-temperature exploration in Reykjanes	€7.20
Operating expenses for the real estate company Þórkatla	€4.04
Lava cooling	€3.16
Icelandic Meteorological Office	€2.68
Icelandic Road Administration	€2.19
Þórkatla purchase of right-of-occupancy/grant for right-of-occupancy holders	€1.76

²² This does not include the loans that Þórkatla overtook (€150-200 million). Total investment of ISK 73 billion includes mortgages fr. financial institutions (ISK 22 billion), Loan from the Treasury (ISK 10.5 billion), share capital from Treasury (ISK 40.5 billion).

²³ See the Federation of Municipalities in Suðurnes (Reykjanes), *Úthlutun Uppbyggingarsjóðs til fyrirtækja í Grindavík*, [link](#).

Action	Total cost (€, millions)
Administrative costs of the rental company Bríet for the purchase of apartments for rent to the people of Grindavík	€1.75
Executive Committee of the Grindavík	€1.72
Suðurnes Health Institute	€1.58
Additional costs for specialist ministries in connection with operations in Reykjanes	€0.83
Digital solutions ^b	€0.52
Support for Ungmennafélag Grindavíkur (Grindavík Youth Association)	€0.46
Advice and administration in housing matters	€0.45
Customer service team	€0.34
Psychology team	€0.14
Total payments from the general reserve fund	€73.64
Investment (Article 6 authorization in the Budget)	
Treasury's contribution to the real estate company Þórkatla ^c	€354.32
TOTAL EXPENSES AND INVESTMENT	€551.14

Source: Grindavík Executive Committee. Notes:

a. No compensable damage has occurred during the year; it is difficult to estimate whether compensable damage will occur.

b. Of this amount, €3 million will be capitalized and will also be used for other projects.

c. Þórkatla has also taken on loans from the private sector in addition to the contribution from the Treasury of €150–200 million which are not included in the total.

Emergency response

The events on the Reykjanes Peninsula have required an extensive emergency response with coordinated efforts across the whole system. There has been effective coordination among scientific monitoring organizations, civil protection authorities, and local governments. Preemptive evacuations of the community of Grindavík (during 2023–2025), road closures, and the rapid deployment of emergency response teams illustrated strong institutional preparedness and responsiveness. When the eruptions began in November 2023, the government mobilized quickly to evacuate Grindavík and declared a state of emergency; roads were closed and formal evacuation procedures implemented by the Department of Civil Protection and Emergency Management and the National Police.

As of 2026, the Grindavík fire department is on 24/7 watch, with additional staff on call as needed.

Police are present during daytime hours, and law enforcement from Reykjanesbær are available after hours, with an estimated 15-minute response time. Ambulance services are on call from Reykjanesbær (30 minutes) and Reykjavík (40–60 minutes), while the fire department in Grindavík maintains personnel with ambulance rights on shifts. Mitigation efforts include visible and well-labeled escape routes, and an updated evacuation map published by the municipality. The civil protection on-site safety officer is no longer based in Grindavík but is on call from the Capital Region if events escalate. The search and rescue team maintains a warning horn for evacuation that is tested regularly. Emergency messaging to mobile phones has increased considerably since 2023, and authorities are assessing the adoption of a cell broadcast system, which would improve capacity and reduce barriers for non-resident and foreign populations.

Since the events, Icelandic authorities are investing in and updating short-term risk assessments, hazard maps, and evacuation planning, thereby maintaining a comprehensive real-time volcanic monitoring system. The IMO publishes regular hazard assessments that integrate multiple layers, including likelihood,

severity, and scenario-based impacts, and that are updated frequently as conditions evolve (the most recent one is from March 3, 2026). Hazard information and projections from the IMO inform risk assessments published by the GEC in coordination with the National Civil Protection Department. These assessments inform coordination meetings between scientists, Civil Protection, national road authorities, geothermal operators, and other critical stakeholders. More than 800 monitoring stations, combining space-based and ground-based observations, and real-time analysis of seismic, deformation, gas, and telecommunications data, are used across the country, part of which monitor the Reykjanes Peninsula. All data sets are publicly available. In addition, the IMO is working on a peninsula-wide volcanic hazard assessment and longer term (6–12 month) hazard scenarios. Iceland’s institutional arrangements—particularly the role of the IMO as a single, trusted national monitoring authority working in close coordination with civil protection, utilities, and local authorities—constitutes a critical enabling factor for managing prolonged volcanic risk and supporting informed recovery decisions.

Public communication is centralized, cautious, and consensus-based, relying on regular national scientific consultation meetings that bring together universities, government experts, and international partners. The consistent message conveyed to the public is one of high uncertainty, with preparedness prioritized over prediction. Information about the events and government response are available through different sources. The national portal [Ísland.is](https://www.island.is) houses applications for housing support, loan moratoriums, and a financial aid calculator. The Grindavík municipality website²⁴ has general guidance for inhabitants on seismic hazard response, an updated evacuation plan and map of Grindavík in Icelandic, English, and Polish (November 2025), the official civil protection volcanic emergency response plan (February 2026), and evacuation plans for institutions in Grindavík (issued in 2020-2023). The official contingency plan for volcanic eruptions in Reykjanes was published in February 2026 by the Chief of Police in Suðurnes, the Suðurnes Civil Protection Committee, and the Grindavík Civil Protection Committee.

Infrastructure protection

The government has also invested heavily in substantial lava defense infrastructure to protect critical assets.²⁵ Nearly 14 km of protective earth barriers were constructed around key infrastructure, including the Svartsengi Power Plant, the Blue Lagoon, and the town perimeter, for around €69 million, with additional budgets raised through temporary property taxation to finance volcanic defense. Since November 2023, this network of defense walls has successfully deflected lava flows from more than five eruptions.

Repair of damaged infrastructure is ongoing. Roads have been laid out on fresh lava fields, supporting the restoration of central heating, hot-water pipes, cold-water pipes, and power lines. Immediate needs include remediation of 3.9 km of open cracks and the installation of safety fencing to prevent accidents. Long-term needs focus on utility redundancy, such as the development of a backup cold-water source at Vatnsheiði and the procurement of reserve power generators for the port.

Housing support

Role and constraints of Þórkatla in the recovery context

²⁴ Náttúruvá - Grindavíkurbær, [link](#).

²⁵ For reference, see Visit Grindavík, [link](#). See also the Department of Civil Protection and Emergency Management, [link](#).

Following the November 2023 evacuation, the government established the real estate company Þórkatla as an extraordinary, time-bound instrument to stabilize the residential property market in Grindavík under conditions of extreme uncertainty. Þórkatla's primary mandate is to enable households to exit ownership without immediate financial distress, prevent disorderly market collapse, and safeguard the value of public and private investment while longer-term recovery pathways are assessed.

Þórkatla operates as a limited liability company owned almost entirely by the Treasury (99.9 percent ownership share), with financial institutions (banks) acting primarily as creditors rather than equity holders. The company is not on the state budget, does not benefit from a sovereign guarantee, and does not receive regular budget transfers. Its operations are governed by loan agreements that prioritize partial recovery of capital, particularly for banks. As such, Þórkatla does not have the mandate or discretion to decide on the closure or reopening of Grindavík, nor to pursue purely social or relocation objectives independent of its financial and legal framework.

In February 2024, Parliament passed legislation authorizing the state to acquire eligible residential real estate in Grindavík, initially projected at €420 million and later estimated at €520 (including unpaid mortgages). The overwhelming share of the necessary sum required for the home purchases was provided by the Treasury, and the rest was obtained through loans from private banks. This program, implemented by Þórkatla under government supervision, allowed residents to sell to the state and retain rights to repurchase within two years of the act's entry into force, pursuant to Article 4 and Provision II of Act No. 16/2024, with a statutory review within that period to determine whether conditions exist to extend the right of first refusal. Applications opened March 8, 2024, and the repurchase option is in place until March 1, 2027.

As of March 2026, approximately 959 residential purchase agreements have been signed by Þórkatla, representing the majority of eligible owner-occupied housing stock.²⁶ The total investment amounts to approximately ISK 73 billion (equivalent of €511 million), financed through a combination of Treasury equity, Treasury loans, and loans assumed from financial institutions. It is expected that ISK 20–25 billion (about €140–175 million) of this investment will not be recoverable; bank claims rather than the state's equity contribution are prioritized for recovery. Þórkatla's annual operating expenses are approximately ISK 500–700 million (about €3.5–4.9 million) costs for 2024 and 2025 were just under ISK 5 million (about €35 million).²⁷ The buy-back program is under preparation.

Other support

In addition to the buyout, different types of housing support have been provided. The government coordinated temporary accommodation for displaced residents, including holiday homes and underused properties, as part of early emergency housing efforts. In late 2023 and early 2024, the government introduced specific housing supports, including the purchase of new apartments (around 210 units) for displaced households and monthly housing cost support estimated at around €1.6 million per month in its initial phase. Pursuant to Article 13 of the applicable legislation, support was tiered by household size:

²⁶ Thirty-two parties did not apply for sale; some applications were rejected if the conditions—such as legal residence in Grindavík—were not fulfilled. The number of people who are eligible is 1,001.

²⁷ ISK 500–700 refers to direct payable cost, excluding interest payments which will occur in the future. ISK 5 million refers to amount with interests.

ISK 150,000 (about €1,050) per month for single-person households; ISK 198,000 (about €1,380) for two-person households; ISK 232,500 (about €1,620) for three-person households; and ISK 252,000 (about €1,760) for households of four or more members. Under Article 14, support in all cases was capped at 75 percent of actual rental costs. Eligibility required a registered legal domicile in Grindavík on November 10, 2023, and a valid lease for residential property outside the town. A platform was launched to provide information and connect residents with rental properties across the Reykjanes Peninsula and the Capital Region. To meet the housing needs of Grindavík residents who have had to evacuate their homes, two nonprofit property rental companies have purchased new apartments in Suðurnes, the capital area, and its surroundings for rent to Grindavík residents; Bríet Rental Company, which is fully owned by the state, has 150 apartments, and Bjarg Rental Company, which is labor union—owned, has up to 60 apartments.²⁸

Psychosocial support

Psychosocial support has been a distinct and sustained component of the response. Immediately following the November 2023 evacuation, aid stations were opened in Kópavogur, Keflavík, and Selfoss, followed by the establishment of service centers in Reykjavík (November 2023) and Reykjanesbær (January 2024) to provide social counseling, psychosocial support, and a space for residents to stay connected. These centers operated until June 2024, when they were succeeded by a dedicated service team of seven specialists, including two psychologists, three social workers, a public health specialist, and a school affairs specialist, established under Act No. 40/2024. This team provides integrated and targeted psychosocial support, with a particular focus on vulnerable groups, including the elderly, low-income households, and persons with disabilities. It makes proactive outgoing calls to senior citizens and parents to assess needs. As of its reporting period, the team had received nearly 700 requests for assistance, of which almost 300 were for psychosocial support, with housing, senior citizen services, and employment-related financial problems cited as the main challenges. The Health Service of Suðurnes has also maintained dedicated children's and adult psychosocial teams throughout the crisis.

Support was also provided to minimize education disruption. At the time of the November 2023 evacuation, over 800 children of preschool and primary school age and approximately 260 secondary school students were among the 3,790 registered residents of Grindavík. The Ministry of Education and Children activated a cross-ministry coordination team, and the national team of the Directorate of Education was mobilized to provide support across school levels. "Collection schools" were established in Reykjavík to temporarily group Grindavík preschool and primary school children together; a temporary exception to compulsory schooling legislation was granted in December 2023, with compulsory schooling reactivated at the start of 2024. By early December 2023, 74 percent of preschool-age children had received placement in a new school, and primary school attendance across museum and district schools ranged between 91 percent and 100 percent by year group. A special intermediate enrollment process was created for secondary students transferring schools in the spring 2024 semester. In March 2024, following a report by an expert committee on children, social needs, and schooling in the wake of natural

²⁸ Bríet and Bjarg are nonprofit organizations helping low-income persons to acquire housing. Bríet is owned by the Housing and Construction Authority; see the organization's website at [link](#). Bjarg Housing Association is a housing self-ownership organization founded by ASÍ (Icelandic Confederation of Labour—the federation of trade unions for workers in the general labor market) and the BSRB (Federation of Public Service and Municipal Workers). See the organization's website at [link](#); see also mbl.is (2023).

disasters, the Town Council decided that children would transition to neighborhood schools starting from the 2024–2025 school year. Statutory responsibility for education was subsequently transferred from the Town Council to the GEC under the Acts on Primary Schools (No. 91/2008), Preschools (No. 90/2008), and Integration of Services for the Welfare of Children (No. 86/2021). As of the reporting period, students are distributed across 71 schools nationwide; with 51 students at Njarðvíkurskóli and 40 at Stóru-Vogaskóli in Reykjanesbær represent the largest concentrations. Of 10 secondary students not in school, four are inactive and six are employed.

Financial and business support

A package of financial relief measures was also provided to households and businesses to ease immediate cash flow pressures caused by the crisis. Banks waived interest rates and indexation on mortgages for a six-month period (November 2023 to April 2024), covering approximately ISK 740 million (about €5.2 million) in deferred payments. The Treasury separately compensated holders of pension fund mortgages across 12 pension funds, amounting to approximately ISK 140 million (about €979,000). For businesses, three temporary tax measures were enacted: a deferral of payments for deducted tax at source and social security contributions; authorization to postpone advance income tax payments for 2024; and a waiver of surcharges on unpaid value added tax (VAT) for accounting periods from September 2023 to December 2024. As of October 2024, 21 employers had made use of tax deferrals (totaling ISK 78 million or about €545,450), and 43 parties had utilized the VAT surcharge waiver.

Social and economic support was also provided through wage support and business grants to protect livelihoods and maintain economic activity. The Directorate of Labor, under a special law approved by the Minister of Social Affairs and Labor, provided temporary wage support for people who could not work due to the Grindavík crisis. Pursuant to Articles 7 and 8 of Act No. 87/2023, support was capped at ISK 633,000 (about €4,430) per individual per month, with an additional 11.5 percent to cover the employer's pension fund contribution, bringing the total maximum to ISK 705,795 (about €4,940) per month. For individual and self-employed claimants, the support was calculated based on the average salary on which social security contributions were paid during August to October 2023. The measure covered the period from November 11, 2023, to August 31, 2024.

For businesses, the government introduced two instruments. First, pursuant to Articles 4 and 5 of Act No. 15/2024, operating support grants were available to businesses experiencing a drop in income of at least 40 percent in a given calendar month compared to the same month the prior year. The grant was calculated at ISK 600,000 (about €4,200) per full-time equivalent and capped at 10 full-time equivalents, yielding a maximum of ISK 6 million (about €42,000) per month. Support was available for each calendar month from November 2023 to April 2024, and entities paying dividends or disposing of funds to owners before May 1, 2025, were required to repay the grants received (Article 9 of Act No. 15/2024). Second, pursuant to Articles 4 and 5 of Act No. 130/2024, support loans with a 90 percent state guarantee were available to businesses experiencing a 40 percent or more income drop. Loan amounts were capped at 20 percent of the operator's 2022 income and could not exceed ISK 49 million (about €341,000) per operator. Loans carried a maximum term of 72 months, with repayment in equal instalments over the final 36 months and could be used only to cover operating costs or to build operations outside Grindavík. In April 2025, the government signaled a shift toward tailored support for individual businesses through consultations with business owners via the Grindavík Executive Committee.

As a targeted government support measure in response to the ongoing natural hazards, the Grindavík Municipal Product Fund (Afurðasjóður Grindavíkurbæjar) was established by Icelandic Act No. 74/2024, enacted on July 1, 2024. The aim of the legislation was to support the continuation of business activity in Grindavík. Specifically, the fund provides financial assistance to operating entities and self-employed individuals whose commercial activities are affected by indirect economic losses due to natural hazards (including impacts on essential inputs such as fresh food and animal feed), or by disruptions resulting from government-ordered evacuations or safety measures connected to the volcanic and earthquake activity. Pursuant to Article 5 of Act No. 74/2024, total contributions from the State Treasury to the Fund could not exceed ISK 400 million (about €2.8 million). Under Article 6, grants were conditional on the damage qualifying as major indirect losses within the urban boundaries of Grindavík, on the losses not being covered by general insurance or other state funds, and on the applicant having taken reasonable precautions to prevent damage. The fund's three-member board, appointed under Article 4, was responsible for determining grant rates and assessing the proportional risk borne by the operator on a case-by-case basis. Applications were required within two months of the damage event, pursuant to Article 9. The fund ends in 2026. Eligible entities include individuals and companies that conduct taxable business or self-employment in Grindavík and suffer damage in the statutory period defined by the law. The fund was designed as an emergency intervention to bridge the gap between immediate revenue losses and longer-term recovery, thereby helping firms cover costs outside normal insurance arrangements. Originally, the legal provisions regarding the Fund applied through December 31, 2024. Subsequent legislation (Act No. 133/2024) extended aspects of the law into 2025, reflecting recognition by policymakers that the period of economic disruption for the community extended beyond the initial timeline. Until now, no company in Grindavík has applied for the support from the fund, but its existence guarantees compensation for possible loss of fresh produce, which may be important to some firms that store fresh produce/fish.

Insurance

NTÍ has received around 800 damage reports and identified approximately 75 buildings in Grindavík as total loss in insurance terms. Losses (physical damage) were mostly linked to the November 10, 2023, magma intrusion, earthquakes, and ground deformation, but a few tens of cases were linked to volcanic eruptions on January 14, May 29, and November 21 of 2024. The estimated total insured cost will be ISK 15 billion (about €104.6 million), with ISK 10.1 billion (about €70.26 million) paid to date. Of the processed cases, 71 percent relate to residential housing, yet these account for only ~42 percent of total compensation (ISK 4.2 billion, or about €29.3 million). Commercial/other real estate represents 15 percent of cases but ~38 percents of payouts; infrastructure/structures accounts for just 3 percent of cases yet ~17 percent of payouts; liquid assets make up 11 percent of cases and ~3 percent of payouts. Estimated average compensation per case is highest for infrastructure at ISK 109.1 million (about €760,809), followed by commercial (ISK 39 million about €273,000), residential (ISK 9.1 million about €63,500), and liquid assets (ISK 3.7 million about €25,900).

It is noted that there are also uninsured and indirect losses. Uninsured losses were largely driven by costs associated with evacuation and long-term uninhabitability, which led to disruption of livelihoods and economic activity (business interruption). There were also instances of underinsurance due to unreported modifications, and some costs were related to ~30 percent of buildings without contents insurance.

Several dozen reports of indirect damage have been received, both in Grindavík and elsewhere in Reykjanes. The main causes of indirect damage during this crisis were the lack of energy, including district heating and electricity for heating, as well as the effects of water pouring into the plumbing systems of houses that had suffered frost damage.

Governance and legal framework

The governance response was underpinned by a series of special legislative acts that gave the government the legal authority to act quickly and at scale. Key legislation included Act No. 84/2023 (authorizing lava barrier construction), Act No. 94/2023 (temporary housing support), Act No. 16/2024 (residential property buyout by Þórkatla), Act No. 40/2024 (establishing the GEC), Act No. 15/2024 (operating support grants for businesses), and Act No. 74/2024 (Grindavík Municipal Product Fund).

In 2024, legislation was advanced to create a special GEC, involving ministers from the Ministries of Infrastructure, Education and Children, and Justice, to coordinate infrastructure repair, social services, and recovery projects in cooperation with the municipal government. A service team linked to GEC was established to provide advice and support for the residents of Grindavík including psychological and social support, advice on employment and housing issues, and school and leisure activities for children and youth (Government of Iceland 2024). An overview of the main roles and projects implemented is included in Box 8.

Box 8. Executive Committee of Grindavík

The GEC is a multi-disciplinary and independent government body that is responsible for a wide range of projects related to the consequences of the seismic activity in Grindavík. The committee shall have an overall overview of Grindavík Town's projects related to the issues arising from earthquakes in the municipality, in cooperation with Grindavík Town, other authorities, and other relevant parties. The committee's objectives are to ensure efficient and cost-effective resolution of projects related to earthquakes in Grindavík Town, to care for the residents, to promote their future prosperity, and to support a strong business community in Grindavík Town. In this way, the foundation is laid for Grindavík Town to become a safe community with solid infrastructure and services that are geared toward the needs of the community. Projects of the GEC as stated in the relevant Act include the following:

- (a) The operation of service teams that integrate services for the residents of Grindavík, including school and leisure activities, social services, child protection services, services for the elderly, disabled people and other vulnerable groups, and support in the areas of housing and labor market issues. The tasks of the service teams include developing proposals and plans for supporting the residents and consulting with host municipalities, government and other parties about services for them.
- (b) Making decisions about the operation of a service center for the residents of Grindavík Town and its operation as appropriate.
- (c) Conducting a risk assessment for urban areas in Grindavík in collaboration with the National Commissioner of Police.
- (d) Overseeing the implementation of necessary repairs to ensure the functionality, operation and delivery security of infrastructure, as appropriate and falling under the responsibility of the Municipality of Grindavík
- (e) Soil survey.
- (f) Overseeing the implementation of necessary repairs to streets, paths and open areas for which Grindavík Town is responsible.
- (g) Overseeing the protection of movable property in Grindavík as appropriate, in the opinion of the Executive Committee.
- (h) Implementation of access control in Grindavík town in cooperation with the police.
- (i) Disseminating information to residents of Grindavík and stakeholders about the status and progress of projects carried out by the committee.

Source: Grindavík Committee website, [link](#).

To ensure the continuity of local democratic governance in the context of displacement, on February 19, 2026, a special Law was passed by the Parliament, to allow special local election in Grindavík. The Act no. 13/2026 made change to the law of municipal elections No. 112/2021, allowing both the current legally registered residents in Grindavík and the people who were legally resident before November 2023 to vote in the local elections.

Hazard spatial distributions and levels of certainty

This section highlights key implications considering risk projections and level of uncertainty, based on information available as of March 2026.

The hazard landscape is dominated by ground deformation in Grindavík. A complex network of seven separate fissure belts intersects the town in a north-northeast to south-southwest orientation. The most significant, Stamphólsgjá, has reached widths of 3 m and depths exceeding 30 m. Tectonic activity has formed two distinct rift valleys (grabens): a western graben 3 km wide and an eastern graben 800 to 1,000 m wide, separated by a central horst ridge.

There is a high level of scientific certainty regarding the location and extent of existing fractures, supported by LiDAR measurements, drone surveys, and over 1,200 ground-based observations. However, significant uncertainty remains regarding the timing and exact location of future eruptions, seismic activity, or ground deformation. The current eruptive crisis is confirmed to be part of a cycle that could last for decades or centuries, and it is currently impossible to definitively know the style, timing, or location of future activity. Planning certainty is further constrained by the dynamic nature of magma accumulation beneath Svartsengi. Scientific models (4 km depth Mogi model) have identified a threshold of 11–23 million m³ of magma accumulation required to trigger a new event, and approximately 23 million m³ have accumulated since the last eruption. However, uncertainty in the timing of a future eruption increases as the rate of magma influx rate fluctuates, challenging eruption forecasting communication.

To manage this uncertainty, the IMO has been developing scenarios for planning (Figure 7). These cover windows of several weeks to three months in the short term and 6 to 12 months in the longer term. As quiescence progresses, short-term scenarios are being incorporated within the longer-term scenarios.

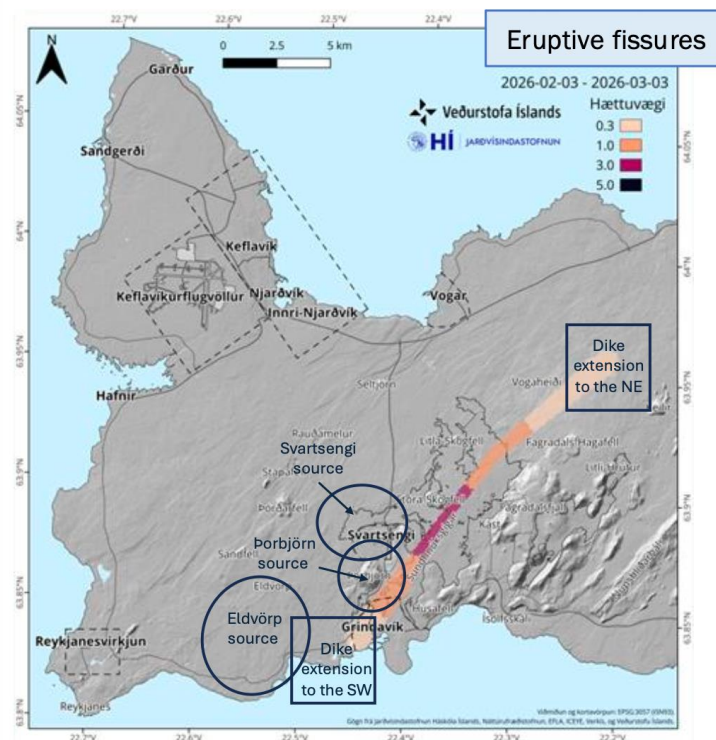
Four scenarios, A to D, assume that magma accumulation continues beneath Svartsengi, and describe possible evolutions in the volcanic system within the next 6 to 12 months. Scenarios A and C are shown in Figure 7.

- **Scenario A** is considered the most likely and considers an eruption or dike propagation along the current dike area, approximately 20 km long, that extends from Grindavík in the south to northwest of Keilir. An eruption south of Hagafell would pose the most direct threat to the town and carries the threat of lava cutting off all land-based evacuation routes in approximately six hours and reaching the sea east of the town in 1.5 to 3 hours. An eruption between Sundhnúkur and Stóra-Skógfell would allow dangerously short notice (under 30 minutes) and could overtop Svartsengi's defensive embankments in less than three hours. Activity northeast of Stóra-Skógfell is more likely to cause lava to flow north toward Reykjanesbraut rather than threatening Grindavík directly. A future eruption

along the current dike area could be larger than any seen so far because of the substantial amount of magma that has accumulated beneath Svartsengi.

- **Scenario B**, the next most likely scenario after A, considers that the magma accumulation slowly continues with no eruption or dike propagation. This would challenge existing forecast models, which assume that a certain threshold range of magma accumulation would trigger an event.
- **Scenario C**, deemed unlikely, considers that an eruption or dike propagation may occur outside of the current dike area, either by extending the dike to the northeast or southwest or by using old magma pathways at Eldvörp (most likely), near Þorbjörn, or Svartsengi. This scenario, because it requires magma to create new or open old pathways, would give clear warning signs in the monitoring data, although the warning time could still be short (several hours to days).
- **Scenario D**, regarded as the most unlikely while magma continues to accumulate under Svartsengi, considers a simultaneous eruption from another volcanic system on the Reykjanes Peninsula. As the unrest continues, it becomes increasingly possible that a crisis will occur at another volcano outside of the Reykjanes Peninsula, requiring a division of staff, monitoring systems, emergency response, management capabilities, and more.

Figure 7. Longer-term planning scenarios being developed for a 6-to-12-month timeframe for the possible location of the next eruption in the Reykjanes crisis



Source: IMO, March 13, 2026. Figure modified from IMO.

Note: This schematic shows Scenario A (eruption or dike propagation along the current dike area) and Scenario C (eruption or dike propagation beyond the current dike area, as shown by the boxes and circles).

There are regular risk assessments for seismic activity in Reykjanes carried out by ÖRUGG Consulting Engineers ehf., for the executive committee for earthquakes in Grindavík. The last one is from March 9,

2026, which considers the risk high in the eruption area (Figure 8 for the definition of risk levels and Figure 9 for the risk assessment results). The civil protection alert level remains “uncertain”.²⁹

Figure 8. Definition of risk level

Risk level	Risk residue
Unacceptable	Not enough protection to ensure people's safety
Very high	Defences in place but high risk of serious events
High	Defences in place, but considerable uncertainty
Medium	Good protection against dangers, but some uncertainty
Low	Very good protection against dangers, low uncertainty

Source: Risk Assessment conducted by ÖRUGG Consulting Engineers ehf and delivered to GEC and the Office of the National Commissioner of the Icelandic Police on March 9, 2026; see [link](#).

Figure 9. Results of risk assessment- risk Level

Eruption Area/ Bomb Zone	Very high	-	-	-	-	-	Unacceptable	
Svartsengi	Medium	-	-	-	-	Medium	Medium	Medium
Grindavík	Medium	Medium	Medium	High	High	Medium	Medium	High
	Responders Consultants Contractors	Day	Night	Day	Night	Company	Day	Night
		General Population		New residents and people in vulnerable positions			External parties and tourists	

Source: Risk Assessment conducted by ÖRUGG Consulting Engineers ehf and delivered to GEC and the Office of the National Commissioner of the Icelandic Police on March 9, 2026; see [link](#).

The left-hand side of Figure 10 left shows fissures that have been mapped in Grindavík, and it can be seen that most of the eastern part of the town has been impacted. Following the mapping of these fissures, several areas in Grindavík were fenced off, to prevent potential accidents. The areas that were fenced off are shown on the right-hand side of Figure 10.

Figure 10. Fissures mapped in Grindavík (left) and fenced areas as of February 2025 (right)



Source: Grindavík Executive Committee.

Note: The left-hand image is based on the interpretation of aerial photographs, LiDAR measurements, and optical observation. In the right-hand image, the red grid lines show areas fenced off with 2 m high fences; the grid yellow grid lines show areas marked with a flag line.

²⁹ For the civil protection alert level, see [link](#); see also the IMO map at [link](#).

Challenges and potential gaps

This section highlights some of the key challenges identified across several interconnected areas of policy and governance, safety and preparedness, people and social infrastructure, and critical infrastructure and economic activities. This should not be considered a comprehensive review.

Policy and governance

The governance-related challenges discussed below reflect system-level pressures typical of prolonged, high-uncertainty disasters rather than an evaluation of individual institutions or actors. Observations are intended to highlight areas where clarification, continuity, or additional coordination mechanisms may be needed over time, particularly as emergency arrangements transition toward longer-term recovery governance.

Framework, coordination, policy objectives

- **Recovery framework.** The central government, local government, and local stakeholders have not yet presented a unified recovery framework. A recovery framework is being developed by the GEC and will likely be presented before the municipal elections in May 2026. It is important to note that Iceland does not have a general framework to guide long-term recovery, relocation, infrastructure decisions, or land use planning when faced with a prolonged and highly uncertain event.³⁰
- **Recovery vision:** Local administration, businesses, and some community representatives, are eager to move with resettlement, as soon as possible. Recovery of Grindavík city is premised on the community, which ensures a solid tax base. Their interest is primarily to quickly restart business as usual, and the opening of schools is a key priority (with initial activities starting in autumn 2026). At the same time, the central government considers that risk in the area remains high, making Grindavík unsuitable for permanent habitation, as before.
- **Recovery governance.** The GEC mandate is set to expire,³¹ creating a potential gap in institutional capacity just as the new Town Council takes office. This transition period poses a potential challenge for ensuring stakeholder coordination across different levels (including national, local, utilities, private sector, etc.), continuity of assessments, especially as the recovery process is expected to take considerable time.
- **Potential tension between financial design and recovery objectives.** While Þórkatla is owned by the government to 99.9 percent and with a board members nominated by the Minister of Finance, its financial design (a commercial entity) may be perceived or have become at odds with the broader recovery objectives once they are set and agreed as part of broader social dialogue and political decision-making. Recovery planning which emphasizes gradual, people-centered, and risk-informed decision-making, will require adjusting financial expectations from Þórkatla (e.g. timelines for capital recovery, financial terms and obligations on recovery). Addressing this issue will require explicit policy choices regarding governance arrangements, mandate alignment, and the appropriate role of

³⁰ This challenge is also noted with respect to wildfire risk; see World Bank (2025b).

³¹ According to the Law on GEC No. 40/2024, the GEC mandate ends 15 days after the next municipal election, which is on May 16, 2026.

public-purpose instruments in prolonged disaster recovery (More on housing policy is under the subsection “People and social infrastructure/services”).

Disaster risk financing and insurance framework

The prolonged volcanic crisis on the Reykjanes Peninsula, and the near abandonment of the town of Grindavík, has also exposed potential gaps and limitations in Iceland’s disaster risk financing and insurance framework. In general, Iceland has strong institutional and fiscal capacity to manage the associated risks. For the Reykjanes crisis, there is a significant gap between the economic and insured loss. This was not the case for most past catastrophic events in Iceland, where physical destruction and insured losses were more closely aligned. Indirect damage does not fall under NTÍ’s liability but has the potential to be costly and disruptive. NTÍ’s coverage is strictly limited to direct physical damage from listed hazards. Losses arising from evacuation, long-term uninhabitability, business interruption, and disruption to livelihoods are not compensable without direct physical damage. This exclusion has left many residents and businesses without recourse for what are, in practice, the most significant financial impacts they have experienced.

Critically, from January 1, 2025, Grindavík has been excluded from NTÍ’s reinsurance contracts for the 2024–2026 period, a decision taken to maintain manageable reinsurance costs given prevailing risk conditions. NTÍ’s statutory obligations toward policyholders in Grindavík remain unchanged, meaning the organization bears full retention of any future (direct) losses in the town. Additionally, NTÍ no longer provides contents insurance in Grindavík. A review of fire insurance valuations following the state’s purchase of properties in the town also found that housing was significantly underinsured, with rebuilding costs underestimated by up to 8 percent. Public and high-value assets, such as the Blue Lagoon, fall under NTÍ’s statutory framework, though some large assets may be covered under international “all risks” policies outside the NTÍ system.

Municipal finance sustainability

- **Financial sustainability** is one of the key prerequisites for all reconstruction; yet the municipality’s financial position has deteriorated significantly following the evacuation. Without central government support, all scenarios indicate that cash reserves will be depleted during the next term. The municipality has been estimated to require an annual state contribution of ISK 400–500 million (about €2.8-3.5 million) to meet its statutory obligations. Without a tax base, the municipality does not have the means to collect revenues for public service delivery. The Town council in Grindavík has taken various measures to reduce expenses, including the layoff of a large part of the municipality’s employees. Currently, wage payments are by far the largest expense item in the municipality, and the local budget is around 50 percent of what it was pre-eruption.
- **The municipal income tax rules have major fiscal consequences for Grindavík.** If a person is working in Grindavík but has legal residency in another municipality, the municipal income tax goes to the municipality where the person is resident. After the evacuations, many residents changed or temporarily moved their legal residence to other municipalities. Even if people continued working for Grindavík-based employers or returned intermittently, municipal income tax revenue shifted away from Grindavík once legal residence changed. As a result, the municipality experienced a sharp drop in income tax revenue, while still facing ongoing service, infrastructure, and recovery costs.

There were some 2,100 people working in Grindavík before the November 2023 eruption, with the fishing and tourism industries providing for two thirds of employment. In February 2026, there were 893 people (compared to 3,800 before) who continued to have legal residency in Grindavík and thus paid municipal income tax to Grindavík.³² Per data from 67 firms, as of March 18, 2026, it is estimated that some 1,418 people are employed (on payroll) by companies in Grindavík, with some 833 coming to work on any given day (not including sailors, shift workers, etc.); about 173 living in Grindavík. Only a small part of the workers has legal residence in Grindavík, meaning they do not pay taxes in Grindavík. There are also people with legal residence Grindavík that work elsewhere.

Key financial pressures on Grindavík Municipality include the following:

- **Dramatic reduction in tax base.** With a large proportion of residents temporarily or permanently relocated—many registering their legal residence outside of Grindavík—the municipality’s traditional revenue streams (e.g., property and local business taxes) have sharply declined. This has strained the capacity to fund basic services and local operations.
- **Rising costs of recovery and service delivery.** The need to maintain critical infrastructure, social services, and community support is now more important than ever, but the municipality’s revenue base is eroding. Costs related to addressing damage, providing services, and coordinating with state recovery efforts have added pressure to an already fragile municipal budget.
- **Dependence on central government support.** The central government has provided different types of support as noted above (including lava barrier construction, temporary housing support, residential property buyout by Þórkatla, support through the GEC, support grants for businesses, the Grindavík Municipal Product Fund, and social protection/wage support program). The central government is expected to continue providing financial support to Grindavík as relevant. This dependency underscores the municipality’s inability to self-finance recovery and highlights uncertainty about long-term fiscal autonomy.
- **Uncertainty over future support.** Local leaders have repeatedly called for clarity and extension of support measures, warning that gaps in funding frameworks—especially as initial support expires—could worsen economic insecurity and jeopardize the rebuilding process. Some business owners have even signaled intentions to pursue legal action against the state, citing prolonged closures and inadequate compensation arrangements.
- **Broader socioeconomic implications.** The financial strain on the municipality intersects with access to housing, provision of essential services, and the return of residents and businesses. Without stable revenue and predictable funding pathways, political and social confidence in both local governance and higher-level institutional support is being tested.
- **Service delivery.** Without continued government support, the Municipality of Grindavík will likely be unable to deliver the services needed. A possible option is to merge Grindavík with other

³² Of the 893 legally registered people, 267 are foreign citizens, some of whom may no longer be present in Grindavík.

municipalities to ensure financial sustainability so that statutory obligations towards residents can be met; but it seems there is strong resistance to this proposal from Grindavík Municipality.

Safety and preparedness

The IMO and the Institute of Earth Sciences assessed that a new eruption period has begun on the Reykjanes Peninsula. Continued volcanic activity in the area can cause fissure movements, lava eruptions, gas pollution, destruction of public infrastructure (water, wastewater, heat, electricity), and disruption of public services delivery. This situation will require continued analysis, alerting, preparedness, communication, and awareness activities. Key potential challenges include the following:

Risk analytics and capacities

- **Sustaining funding and human resource capacity over the medium to long term.** While surge funding is effective during acute phases, long-term volcanic crises require stable, multidecadal financial and staffing commitments. Maintaining dense monitoring networks, frequent modeling, and repeated hazard and risk assessments cannot rely on short-term emergency budgets; they require predictable resources capable of supporting elevated preparedness levels for years or decades, not months.
- **Operational fatigue and complacency risk.** A prolonged crisis increases the risk of both institutional fatigue among agencies and public complacency. As the sense of immediate danger declines (even when the hazard does not), communities, especially those just outside delineated hazard zones, may develop a false sense of security, potentially eroding the political will for long-term risk reduction.
- **Data-processing overload.** The rapid expansion of monitoring networks on the Reykjanes Peninsula has generated unprecedented real-time data volumes, placing sustained pressure on IT infrastructure and the IMO staff responsible for processing, modeling, and interpreting these data streams under time constraints.
- **Hazard scope.** Current legislation and formal warning structures focus on traditional volcanic hazards. Secondary hazards such as wildfire ignition from lava, or novel risks such as subterranean lava transport through fissures (lava tube breakouts), are not yet fully incorporated into national monitoring and alerting protocols.
- **High-resolution long-term ground surveillance.** While the IMO monitors regional deformation and seismicity, systematic monitoring of individual fissures, cracks, and hidden voids inside the urban footprint remains the responsibility of the GEC, whose mandate as noted ends in the coming months. This separation creates potential blind spots in daily risk assessment and requires continuity after June 1, 2026.
- **Hazard–risk maps misinterpretation:** The IMO hazard maps are often understood as synonymous with risk maps, i.e., they represent the severity of impact, not just the hazard. However, the variable vulnerability of assets such as buildings and infrastructure, as well as the potential for cascading impacts that can affect communities outside of the hazard zone (for example through disruption to power) means that there is confusion in the understanding of these hazard (and projections) maps. It has been noted among the public that the existing maps are not granular enough. The IMO hazard maps do not account for mitigation measures taken within Grindavík such as fencing and ground/fissures repairs.

- **Risk assessments:** The risk assessment (produced based on the IMO hazard maps) for people in Grindavík due to seismic activity seems to also be subject to different interpretation by different stakeholders. The assessment is primarily qualitative, i.e. describes emergency response, strengths and vulnerabilities of different groups, and their risk levels. It does not state clear definitions of risk limits for risk levels or for the different concepts describing them i.e. what is to be understood as very good, good, sufficient or considerable defense, or considerable, some or small uncertainty.
- **Incomplete systemic multi-hazard and cascading risk analytics.** Despite ongoing research, knowledge gaps remain regarding interactions between volcanic, seismic, hydrological, coastal, and weather hazards, including how one hazard may trigger or amplify another and how this result can affect the associated risk.
- **Fragmented social vulnerability data.** While geological data are robust, information on non-Icelandic speakers, foreign workers, and other vulnerable groups is dispersed across institutions, potentially limiting preparedness and multilingual alerting for these vulnerable groups.
- **Incomplete national-scale integration.** Advances made on Reykjanes have not yet been scaled to create a nationwide multi-hazard risk assessment.
- **Absence of a unified real-time data-sharing protocol.** Interagency cooperation is strong, but IMO, civil protection authorities, ICESAR, utilities, and municipalities do not share a single integrated data platform, potentially hindering fully aligned situational awareness and the development of near-real-time risk assessments.
- **Economic loss modeling.** Methods to quantify economic losses or evaluate cost-benefit trade-offs for major mitigation investments (e.g., barriers, buyouts, relocations) are valuable tools for planning recovery during a crisis, or for planning for future crises. Their absence constrains evidence-based resource allocation. They should be consistent and agreed across agencies; for example, the hazard scenarios used by IMO and NTÍ for short-term eruption planning differ, and it's not clear why or if they should.

Risk-informed land use planning

The situation in Grindavík highlights specific vulnerabilities as well as potential regulatory gaps in land use and development planning.

- **Acceptable level of risk.** Iceland has already defined certain levels of risk as acceptable and has regulatory experience with respect to avalanche risk (see Box 9).³³ However, acceptable level of risk frameworks for volcanic and seismic hazards are currently missing across societal, technical, and local operational levels.
- **Limited use of risk knowledge.** Currently, communities are not legally required to follow risk assessment recommendations, and there is no mechanism for accountability if development decisions contradict scientific advice. Longterm land use and municipal planning lacks enforceable risk-based criteria and a framework for informed consent and acceptance of risk for those relocating to the area.

³³ Regulation No. 505/2000 (Article 11) on avalanche risk as regulatory anchor; IMO 2022.

- **Regulatory frameworks for land use.** For volcanic and multi-hazard environments, Iceland lacks regulatory equivalents to its avalanche risk zoning system that accounts for “acceptable risk.” Without clear thresholds, planners have limited guidance for restricting development or prioritizing asset protection in zones of recurrent lava or deformation.
- **Scenario-based forecasting without probabilistic complements.** Current assessments rely on scenario logic, which is valuable for planning but not sufficient for long-term, national-scale risk governance. Probabilistic risk metrics (e.g., average annual loss, exceedance probabilities) are not yet fully integrated for long-term planning. See also the chapter on “Opportunities for Recovery” - Safety and Preparedness section, including Box 15 which includes several international examples.

Box 9. Legal framework: Acceptable level of risk (Regulation No. 505/2000)

Article 11 of the Icelandic Regulation No. 505/2000 on risk assessment due to avalanche and landslide (ofanflóð) and the classification and utilization of hazard areas states the following: “The local risk of an individual in residential buildings, schools, children's homes, hospitals, community halls and similar buildings is considered acceptable if it is less than 0.3 per 10,000 per year (individual risk). In commercial buildings where work is carried out on a regular basis, the risk is considered acceptable if the individual local risk is less than 1 in 10,000 per year. In holiday homes, the risk is considered acceptable if the individual local risk is less than 5 per 10,000 per year. In determining these limits, 75% occupancy in a residential building, 40% occupancy in commercial property and 5% occupancy in a leisure house have been taken into account. In addition, it has been taken into account that children do not stay in commercial buildings, other than schools and kindergartens, on a regular basis. It is permissible to assess the presence of people in a manner other than that stipulated in paragraph 1, provided that this assessment is substantiated. Such an assessment applies, for example, to commercial buildings where there is no constant presence of people. There may also be reasons to make greater demands on safety than stipulated in paragraph 1, for example if a large presence of people is expected in the winter in a leisure centre or if workplaces are crowded.”

Source: Government of Iceland, Regulation No. 505/2000; version in effect from March 7, 2017; date of document February 26, 2026.

Alerting

- **Short lead times.** Eruptions along the Sundhnúkur crater row can initiate with little warning. Observed precursors offer lead times ranging from under 30 minutes to approximately five hours, and in some scenarios lava could intercept major escape routes in less than 90 minutes. This places heavy pressure on forecasting, alerting, and evacuation systems.

Communication and awareness

- **Language and accessibility.** Official emergency alerts (112) are primarily issued in Icelandic, creating communication barriers for non-Icelandic-language speakers, foreign workers, temporary residents, and tourists in the region. Warnings (mostly for travelers) provided by the ICESAR, (Safe travel) are available also in English.³⁴
- **Misaligned public perception.** Public understanding of volcanic hazard, especially among tourists, can be limited and may over- or underestimate the risk. Hazards such as gas pollution, tephra, and rapid

³⁴ Safetravel - Be safe in Iceland, website, [link](#).

lava migration can receive uneven attention (be either overemphasized or underemphasized), in turn undermining the effectiveness of warnings.

- **Risk communication.** Information publicly available is often too technical and not easily translated into practical guidance for residents, limiting people's ability to understand risks and make informed decisions. The lack of localized, user-oriented information, such as neighborhood-level assessments and clear action-oriented guidance, further reduces the effectiveness of communication efforts information. Communication efforts are considered infrequent, difficult to access, and not always trusted by residents. Limited visibility of ongoing monitoring efforts has led some residents to rely on informal observations, highlighting the need for more regular, transparent, and clearly communicated updates. Maintaining a clear distinction between scientific assessment and policy or operational decisions—while communicating uncertainty transparently—is essential for sustaining public trust during what may be a prolonged period of elevated hazard. The importance of clear risk communication as highlighted in Box 10.

Box 10. Importance of risk communication

During the L'Aquila (Italy) earthquake in 2009, over 300 people were killed, and tens of thousands were displaced. In the months before the earthquake, a swarm of small tremors raised public concern. Authorities convened the national risk commission (Commissione Grandi Rischi), whose public messaging was widely interpreted as reassuring citizens that a major earthquake was unlikely and that there was no need to take special precautions. The scientists did not claim earthquakes could be predicted, but the way institutional risk assessments were translated into public statements was perceived as minimizing danger rather than encouraging preparedness. Many residents later stated that these reassurances influenced their decision to stay indoors, contributing to casualties. The case severely eroded trust in institutions, not only because the disaster occurred, but because people felt misled and insufficiently prepared. It highlighted how lack of precautionary guidance, gaps in risk communication, and unclear responsibility between scientific advice and political messaging can undermine public confidence.

People and social infrastructure/services

Differentiated impacts and recovery paths

Analysis of survey data from displaced Grindavík residents (n ≈ 1,030) indicates that social recovery trajectories are highly differentiated and shaped by uncertainty, social ties, housing tenure, and family composition (see Annex 3).³⁵ Among respondents not planning to return, 63 percent cited uncertainty related to volcanic activity, 36 percent cited potentially missing services, and 35 percent reported that their children had already settled elsewhere. In contrast, among those leaning toward return (n ≈ 200), motivations were primarily social rather than economic or safety related: 74 percent cited place attachment, 50 percent attachment to their home, and 45 percent expectations that family and friends would also return. These findings suggest that return intentions are not necessarily aligned with reduced risk exposure or improved service provision but are strongly influenced by social and emotional factors.

Advanced statistical analysis identified five distinct social groups among displaced residents, ranging from those well adapted elsewhere (12 percent) to a sizable group of distressed and poorly adapted residents (29 percent) who express the highest inclination to return. Importantly, individuals reporting poor community adaptation in relocation areas were significantly more likely to express return intent

³⁵ Survey-based analysis was conducted between December 2025 and January 2026 and is not intended as a comprehensive review, but rather as a synthesis of priority social considerations relevant to recovery decision-making.

(odds ratio 1.56, $p < 0.001$), while renters were approximately half as likely as homeowners to consider returning (odds ratio 0.47, $p < 0.001$). Demographic characteristics such as age, gender, education, and nationality were not statistically significant predictors, underscoring that social context and practical circumstances, rather than personal attributes, drive recovery decisions. This raises a key challenge: potential return may disproportionately involve individuals with higher psychosocial support needs, placing pressure on social services, health systems, and preparedness arrangements.

Children and youth represent a particularly critical gap in current recovery considerations. Households with children consistently report lower return intent, and reopening schools was notably not identified as a driver for return. International experience highlights that premature resettlement of families in high-uncertainty environments can generate long-term harm. These lessons underline the risk of creating policy path dependency through early reopening of compulsory schooling, which can anchor permanent family settlement before risk conditions are sufficiently resolved.

Discussions with stakeholders further highlighted a potential disconnect between economic recovery objectives and social outcomes. While economic activities (e.g., tourism, infrastructure services) may resume under controlled conditions, survey results indicate that families with children are unlikely to return under current risk levels. This raises questions about the sustainability and purpose of reinstating full residential services, particularly education, when demand may remain limited. At the same time, future recovery pathways are likely to involve newcomers, potentially attracted by employment opportunities or lower housing costs. Experience from Iceland and other volcanic contexts suggests that, without proactive planning, this dynamic may introduce new social vulnerabilities, language barriers, and preparedness gaps, further complicating social cohesion and governance.

Finally, prolonged uncertainty itself emerges as a structural challenge. Stakeholders emphasized that uncertainty around hazard evolution, rebuilding timelines, and policy direction contributes to social fatigue and impedes both adaptation elsewhere and informed decision-making about return. International experience from Japan, New Zealand, and Hawaii illustrates that communities can coexist with chronic volcanic risk when supported by clear risk governance, transparent communication, differentiated land use rules, and sustained social monitoring. In the absence of such clarity, uncertainty risks becoming a long-term driver of psychosocial stress and fragmented recovery outcomes (see Box 11).

Housing uncertainty is a critical driver of psychosocial stress. Consultations and survey findings consistently indicate that prolonged housing uncertainty is a central driver of psychosocial stress among displaced residents. The absence of a clear and credible pathway, whether toward return, trial reentry, or longer-term relocation, has constrained households' ability to plan, contributing to anxiety, decision paralysis, and erosion of trust. In this context, Pórkatla's principal contribution lies less in enabling immediate return than in preserving optionality. However, without clear communication of its mandate, constraints, and limitations, expectations risk diverging from what the mechanism can realistically deliver, potentially undermining public confidence in recovery governance.

Box 11. Social risks and mitigation measures for recovery under prolonged uncertainty

International experience, for example, Plymouth, Montserrat, demonstrates that premature resettlement of families during ongoing volcanic uncertainty can lead to repeated evacuations and significant long-term psychological harm to children, even in the absence of fatalities. These risks are compounded by the potential creation of policy path dependency if compulsory schooling is reopened before risk conditions stabilize.

A further emerging risk concerns future newcomers, who were not captured in the current survey but are likely to shape Grindavík's medium-term social composition. Experience from other volcanic contexts (Japan, New Zealand, Hawaii) indicates that post-disaster economic recovery may attract mobile working-age adults, often without children and sometimes with limited local language proficiency. Without proactive planning, this dynamic may introduce new vulnerabilities, strain preparedness systems, and complicate social cohesion.

Mitigation and policy-relevant considerations: Mitigating these risks requires sustained attention to the social dimension alongside physical and economic recovery. Key considerations include the following:

- Aligning residential resettlement decisions with risk-informed principles rather than economic recovery timelines
- Prioritizing psychosocial support and community-based services for distressed groups likely to consider return
- Adopting a child-centered approach that avoids repeated disruption and minimizes avoidable harm
- Anticipating newcomer dynamics through inclusive communication, preparedness outreach, and service planning.

Children and youth

Observed impacts from the 2026 study on youth well-being after the evacuation point to a set of complex recovery challenges that extend beyond restoring access to education and services.³⁶ In the Grindavík case, displacement has functioned as a compound and prolonged disruption, simultaneously affecting social ties, schooling continuity, housing stability, and perceptions of safety. The wide dispersal of students across dozens of schools, combined with repeated relocations and ongoing uncertainty about return, has fragmented peer networks and weakened the relational foundations critical for adolescent development. A key challenge lies in the disruption of school belonging, which emerges as a central pathway through which evacuation affects well-being. Even where schooling continues, students face difficulties integrating socially in new environments, particularly when transitions are staggered and incomplete, highlighting that restoring access does not equate to restoring connection.

At the same time, the impacts are broad-based and persist over time, complicating recovery efforts. Evidence shows that declines in well-being remain visible more than a year after evacuation, a finding that suggests prolonged and potentially nonlinear recovery trajectories. The fact that these effects are not strongly mediated by socioeconomic status challenges conventional targeting approaches, while gendered differences (particularly the heightened vulnerability of girls) point to the need for more tailored interventions. Further complexity arises from the difficulty of disentangling the effects of displacement from those of prolonged pre-evacuation stress and ongoing uncertainty. Together, these dynamics reveal a critical gap between system-level recovery and lived experience: while services may be restored, less visible disruptions to social integration, emotional security, and community cohesion continue to constrain recovery outcomes.

Housing sector

As noted in the previous chapter, Þórkatla was set up as a private entity, although it was understood at the time that it would be difficult to resell the acquired homes (959 in total, of which 296 sustained

³⁶ Reimer, D., J. Repo, and K. P. Pálsdóttir. 2026. "Volcanic Eruption and Disruption: Youth Well-Being after the Grindavík Evacuation in Iceland." OSF.

significant damage) at the purchase price (95 percent of estimated market value before the 2023 eruptions). Moreover, Þórkatla was assumed to cover the maintenance costs of these properties.³⁷

- **Status and limits of potential buy-back framework.** Þórkatla is working on a potential buy-back framework, but this should not be understood as a finalized or comprehensive housing solution. While the current legal framework provides previous owners with a right to repurchase their property until March 1, 2027, the buy-back mechanism remains under development and subject to regulatory and political decisions. Key elements—including eligibility beyond original owners, financing arrangements, duration, and potential extension—are yet to be determined. The buy-back approach is expected to be designed as a risk-limited trial mechanism, allowing households to test reentry over a defined period and providing the option to return the property to Þórkatla if safety conditions, market functionality, or financing constraints do not improve. This design reflects recognition of prolonged uncertainty and aims to avoid forcing premature, irreversible household decisions. The inherent challenge is that any duration that could be embedded in the buyback program is not likely to overlap risk scenarios.
- **Nature of the housing market failure.** The housing market in Grindavík is currently non-functional—not due to lack of interest, but due to the absence of mortgage financing, meaning that transactions cannot occur even where there is interest from potential buyers. Financial institutions are unwilling to provide loans under prevailing risk conditions, regardless of transaction price. As a result, even households willing to return cannot complete purchases. This distinction is critical for policy design: price reductions alone will not restore market activity. Recovery of the housing market depends on resolving insurance constraints, allocating credit risk, and determining acceptable risk thresholds—issues that lie beyond the remit of Þórkatla as a commercially structured entity. Þórkatla's role is not to restart the housing market, but to prevent irreversible damage while uncertainty persists, and to facilitate return.
- **Real estate market.** Given that the stock of available housing has been significantly reduced, real estate prices could bounce back if demand is high enough, even in this phase. One of the elements of accessible loans is the availability of insurance. If premiums remain high or coverage is limited (currently not available for contents), the market value of housing may remain permanently suppressed compared to nearby safe locations (e.g., Keflavík).
- **Speculation risk.** The ongoing risks, the uncertainties about potential buyback programs, and the community's willingness or unwillingness to take binding action could create the risk of speculation. After the 2018 Kīlauea eruption, there were a lot of speculative buys of impacted homes in Puna, Hawaii; those who bought the homes were betting on a real estate market bounce-back after the eruptions ended. It should be noted that Puna is a known tourism spot, and thus more amenable to a speculative real estate market.
- **Potential negative externalities on neighboring regions.** With the inflow of people from Grindavík, real estate prices in Keflavík, Vogar, and even the Reykjavik Metropolitan Area have increased. With

³⁷ As part of maintenance provision, Þórkatla has four employees and work with many local contractors.

a return of people to Grindavík, these neighboring communities may be faced with short and medium-term negative externalities.

- **Communication with affected population.** According to a survey conducted by Þórkatla in March 2025, the majority of Grindavík residents were satisfied with the purchase process (56 percent). However, in the survey with the affected population, the majority of respondents did not want to come back. Consultations conducted during the report's preparation show that some people hoping to return to their homes feel underrepresented in decision-making processes. This may link to the ongoing uncertainty over the possible extension of the buyback option beyond March 1, 2027, and lack of details on the buyback conditions. During consultations, community members noted the absence of direct representation from the affected community on the Þórkatla's board of directors and highlighted perceived limitations given the commercial focus of the company.

Critical infrastructure and economic activities

While housing and critical infrastructure in Iceland are generally resilient and designed with hazard exposure in mind, there may be some potential gaps or areas to consider for improvement:

- **Fragile telecommunications infrastructure.** Key components of the warning system—e.g., mobile networks, fiber-optic lines, evacuation sirens, and radio transmission sites—remain vulnerable to lava, ground deformation, and seismic damage. Recent activity has demonstrated that critical communications infrastructure can fail during peak hazard periods. This possibility has implications for warning systems, emergency coordination, and business continuity.
- **Utility infrastructure:** While access to key utilities was restored quickly, there are underlying vulnerabilities and single points of failure. For example, Grindavík has only one freshwater source, one hot water pipe, and only one power line. There is one fresh water source at Lágur and one heating source at Svartsengi. Progress is being made in finding another water source at Vatnsheiði east of Grindavík.
- **Repairs and resilience.** Critical repairs in infrastructure are not a challenge, and repairs are generally conducted very quickly as noted in previous sections. Utilities have continuity plans in place. What may be a potential need is ensuring that resilient recovery, investments in redundancy, investment in business continuity, etc. are sustained at a high level and continuously monitored. Private sector providers of critical services need to be part of coordination arrangements, have access to the latest risk information, and be represented in the recovery planning process.
- **Risks involved in large-scale physical reconstruction.** Uncertainty about the development of future activity places clear constraints on the timing of reconstruction, the scope of construction projects, and decisions regarding residency, planning, and investment.

Economic activities

As noted in the previous chapter, since the eruption and repeated closures, some businesses have continued operations (often with adaptations), while others have reduced activity, temporarily closed, or faced financial stress requiring government support measures.

- **Negative impacts on businesses.** The ongoing seismic risk and repeated evacuations have reduced the available workforce, caused temporary or partial business closures, and forced some firms to shift operations or relocate. While the larger and more established firms have proved to be quite resilient, the smaller companies (particularly those providing services to an active population) have closed or temporarily/permanently moved to other locations. According to report from March 2025, of the 40 largest employers in Grindavík, 27 were still operating (Deloitte 2025).³⁸ The resilience shown by businesses that have continued to operate, often at significant cost and effort, deserves recognition. At the same time, reduced workforce availability, uncertainty over access conditions, and the relocation of certain business functions have constrained the ability of firms to operate at scale.
- **Government support for businesses:** Different forms of government support have been initiated for companies in Grindavík because of the consequences of the natural disaster. Among these initiatives in 2023–2024 were **operational support** (*Viðspyrnustyrkir*) to make up for loss of income, **wage support** (*launastuðningur*) from the Directorate of Labour for people who were prevented from working because of the situation, **deferral of tax payments** and **cancellation of surcharges**, as well as **support loans** (*Stuðningslán*) at a special interest rate. The first two support measures were also rendered during the COVID-19 pandemic. The offer of support loans was extended until 2026.

While government wage-support program, paid out through firms was widely used and helped to retain workers, Government support loans for businesses were not used widely among businesses. Government operational support related to a decrease in revenue – however, some firms didn't see a major decrease in revenue, rather major increase in the operational costs – due to relocation, duplicated facilities, logistics, staff housing, backup power, and disrupted supply chains. Many businesses continued operating specifically to preserve jobs and community stability, yet absorbed substantial losses not reflected in headline revenue figures, leaving them effectively penalized for remaining open. This gap between the design of support measures and the actual cost structure of operating under crisis conditions has been a persistent source of financial stress, particularly for small and medium-sized enterprises with limited financial buffers.

The present support from 2025 (Government of Iceland 2025a, 2025b) involves mainly three issues and is aimed at assisting companies to adapt to changes in the business environment in Grindavík. **Consultation assistance** is meant to help companies implement solutions, restructure operations, and where appropriate apply for financial support for development, transformation, and adaptation to changing circumstances as well as financial and general business advice. **Support grants or support loans** from a campaign fund (*Sóknarsjóður*) handled by the Regional Development Agency is for smaller companies, where grants will be in the form of matching contributions for equipment purchases, transportation of equipment, installation of facilities, or production equipment, or in the form of temporary operational support as a step in the development of sustainable operations. A **campaign plan** (*Sóknaráætlun*) acts in cooperation with the Federation of Municipalities in Suðurnes and assists mainly smaller companies and sole proprietorships with marketing, product development, and innovation. The Federation of Municipalities in Suðurnes (Reykjanes) also funds some projects in Grindavík. Finally, there is possible support through Afurðasjóður (Product Fund), which is valid until

³⁸ The report identified 760 employers in Grindavík at that time: 43 percent in tourism, 37 percent in fishing industries, 17 percent in industry and services, and 3 percent in public services.

the end of 2026 and aims at reimbursing food production companies for damaged production (for example, due to evacuation). This support has not been tried until now.

- **Access to finance.** Access to finance poses a challenge to business recovery and future investment in Grindavík. There is a degree of complexity in insurance coverage and uncertainty. As noted in the “Policy and governance” subsection above, NTÍ covered limited direct damage but did not account for prolonged disruption and indirect losses. For example, it is possible to obtain insurance for a new house, but not for the current event. Also, operations and contents (furniture, etc.) cannot be insured. Related to new investments, while replacements (such as equipment) can be insured; new (additional) investments (such as equipment) cannot be insured. The cost of capital in Grindavík relative to other areas is higher and the complexity and uncertainty have created a situation where even economically viable businesses face constraints in medium-term planning. Bank financing and equity is restricted which prevents firms from rebuilding, upgrading infrastructure or equipment. Participants in consultations stressed that this is a systemic issue requiring central government action.
- **Coordination and governance.** Businesses reported confusion over roles and responsibilities among utilities, transmission operators, regulators, and government entities during non-emergency phases. Delays caused by institutional disputes over mandates and financing resulted in prolonged outages and real economic losses. The absence of a dedicated recovery framework, systematic business surveys, and a standing coordination mechanism for recovery, as distinct from emergency response, has limited the ability to design targeted, timely, and proportionate support. Private sector providers of critical services need to be part of coordination arrangements, have access to the latest risk information, and be represented in the recovery planning process.
- **Recovery planning.** While emergency repairs and short-term adaptations have generally been feasible, ongoing hazard exposure and the absence of a clear stabilization timeline increase risk for businesses considering reinvestment, relocation back to Grindavík, or long-term capital commitments. The partial relocation of landings and operations to other ports raises the risk of longer-term structural displacement, as economic activity may not easily return even if conditions stabilize. Ongoing uncertainty related to volcanic risk further constrains reinvestment and forward planning, limiting the sector’s recovery potential. At the same time, reduced economic activity places pressure on local employment and municipal revenues, weakening the financial and institutional capacity needed to support recovery. Recovery pathways are shaped less by immediate physical damage and more by uncertainty-driven behavioral responses and hesitation among firms, investors, and workers.

Opportunities for recovery

This section discusses some of the key opportunities to be considered by decision-makers and technical experts as part of the development of the recovery framework across several interconnected areas—policy and governance, safety and preparedness, people and social infrastructure, and critical infrastructure and economic activities.

Policy and governance

Key takeaways:

Adopt recovery vision and objectives for recovery, articulated through participatory processes

Adopt a unified vision and guiding principles for recovery

- Ground recovery in clear principles, such as life safety, people-centered decisions, transparency, build back better, preparedness, etc.
- Frame the vision as managed coexistence with volcanic risk
- Use a flexible strategic framework that can adapt as risk knowledge evolves

Adopt strategic recovery objectives, translating principles into outcomes

- Prevent avoidable physical and psychological harm, particularly for children and youth
- Enable safe continuation of economically critical activities
- Safeguard critical services, government credibility, and community identity

Use a participatory approach in defining the vision and recovery objectives

- Ensure the framework/strategy fits needs and priorities of different groups
- Engage residents, businesses, and public institutions in shaping recovery priorities
- Use structured consultation to strengthen legitimacy, trust, and long-term implementation

Define mandates and responsibilities, considering different phases and risk levels

Define institutional coordination arrangements supporting recovery actions

- Strengthen coordination between national and municipal authorities
- Clarify mandates and oversight, as the GEC mandate ends in May 2026
- Review coordination arrangements across ministries, utilities, private sector, and civil society

Further strengthen a structured interface between scientific monitoring and decision-making, to ensure risk-informed decisions, planning, and investments

- Ensure monitoring data informs zoning, infrastructure, and occupancy decisions
- Develop risk criteria for societal risk and other natural hazards beyond avalanches and landslides (see also under ‘Safety and preparedness’ section).
- Strengthen links between analytical and operational decision-making bodies, experts etc.
- Use shared data platforms and communication tools to support coordination

Adopt transparent communication, monitoring, and learning mechanisms

- Clearly communicate policies, rules, and risk information
- Use public dashboards, regular briefings, and technical reviews to maintain trust
- Support preparedness through training, exercises, and institutional learning

Review current arrangements and policies in key areas, integrating lessons identified

Review and adjust financial and funding mechanisms, rules, and responsibilities

- Track and review recovery investments, monitoring costs, and housing interventions
- Clarify financing responsibilities across public, private, and individual actors
- Ensure funding arrangements support long-term fiscal sustainability

Review and adjust arrangements for risk financing and insurance

- Strengthen Iceland's natural catastrophe insurance framework
- Address gaps in coverage scope, reinsurance protection, and indirect losses
- Improve resilience through regulatory updates, better risk modeling, and contingency planning

Review and adjust arrangements for Grindavík's municipal fiscal base

- Review use of mechanisms allowing displaced residents to retain legal residency in Grindavík
- Preserve municipal tax revenues and equalization transfers to support recovery
- Consider compensation for host municipalities and potential service consolidation

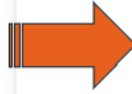
Governance

- **Framework.** Moving forward, there is a need to adopt an overarching unified framework to guide recovery and relocation decisions, aligning them with the latest science and eruptive cycle scenarios. The framework should include several elements: a clear long-term vision, guiding principles, and objectives; stakeholder engagement mechanisms; and arrangements related to institutional roles and coordination, financing, monitoring and evaluation, reporting, communication, and lessons learned. The framework would set the guardrails for risk-informed decisions, public safety and preparedness, and social and economic activities, as well as infrastructure restoration and future development. **Annex 1** provides examples from global frameworks.
- **Vision and principles.** Different stakeholders—central and local authorities, the private sector, utilities, businesses, investors, and the community—need to agree on a common vision and follow the underlying set of clear guiding principles. A unified, long-term vision is essential to provide predictability for families and businesses as they decide whether to reinvest in the community or relocate permanently. In Grindavík's context, the vision and principles may be framed as managed coexistence with volcanic risk—preserving safety while maintaining the option for community life where conditions allow. Figure 11 suggests guiding principles that could be considered moving forward and that could inform the recovery efforts of all involved stakeholders.
- **Participatory approaches.** Participatory approaches can help ensure deep engagement of the community and public and private stakeholders in the articulation of the vision and recovery principles. They can also support legitimacy across the different population groups linked to Grindavík.

Figure 11. Sample guiding principles for Grindavík recovery efforts

Recovery is most effective when grounded in explicit principles such as...

- safety first
- people-centered decision-making
- social cohesion and trust
- sustainability including economic and financial
- “build back better”
- flexibility under uncertainty
- transparency
- and culture of preparedness



Source: World Bank team.

- **Objectives.** In addition to guiding principles, a number of strategic objectives should be set to help organize efforts, define the pace of recovery, and align expectations. For example:
 - Enable safe continuation of economically critical activity in Grindavík
 - Prevent avoidable physical and psychological harm to children
 - Preserve government credibility under scientific uncertainty
 - Avoid path dependency that forces premature normalization
 - Maintain optionality for future resettlement or transformation of the town
- **Flexibility/phased approach.** Recovery planning should avoid adopting a finalized implementation plan and instead adopt a flexible strategic framework that can adapt as new risk information emerges. Recovery will most likely happen in stages and needs to be guided by a long-term vision. In a first phase, there may be managed return of adults and workers to Grindavík, with a focus on the areas deemed safe. Recovery will take time and requires predictable, long-term funding to sustain monitoring, modeling, IT infrastructure, and workforce planning; to enable monitoring, reporting, and evaluation; and to draw lessons from Grindavík’s recovery process that are relevant for the Reykjanes Peninsula and the country as a whole.
- **Roles and coordination.** Comprehensive recovery will require sustained commitment at the national, regional, and local levels and among different stakeholders. Governance, coordination, and stakeholder engagement arrangements need to be clearly spelled out. It will be essential to have strong continued vertical and horizontal coordination between national and municipal authorities, as well as horizontal coordination across ministries, utilities, the private sector (including critical infrastructure and services), insurers, and civil society. A clear administrative transition plan could help address the risk of potential governance gap, as the GEC’s mandate expires in June 2026, coordinating with the newly elected Town Council; or some alternative could be considered to ensure that there is necessary institutional capacity and clear arrangements are in place. Some countries have for this purpose adopted a dedicated recovery authority (e.g., Canterbury Earthquake Recovery Authority in New Zealand, the Queensland Recovery Authority in Australia, or the Reconstruction Authority in Japan; see Box 2). Such an authority (e.g., “Reykjanes Recovery and Resilience Authority”)

could follow on from the work of the GEC to coordinate funding, land use decisions, risk assessments, and communications across agencies. Coordination arrangements should ensure strong interface between research (by the IMO, NTÍ, and others) and operational decision-making to ensure that monitoring outputs consistently inform zoning, infrastructure, and occupancy decisions and that they integrate quality review. Iceland has strong experience in this area that could be leveraged (Box 12).

- **Enabling tools.** Analytics and tools, such as data platforms, and dedicated communications strategy can support recovery efforts and need dedicated resources. Public dashboards linking hazard indicators to policy decisions, regular multilingual briefings, and periodic technical reviews can strengthen trust. Training programs, scenario-based exercises, and institutional capacity development will help the transition from emergency governance to structured coexistence planning.

Box 12. Experience from Iceland

Supported by centralized hazard monitoring and adaptive crisis response, Iceland has developed strong institutional coordination—particularly between scientific institutions, civil protection authorities, and communities—and earned the public trust. Previous events show the importance of several elements:

- Clear and timely risk communication, flexible resettlement and compensation approaches, and sustained national support
- Integration of mental health and social support into recovery efforts, given long-term psychosocial impacts of disasters, alongside economic and infrastructure measures
- Risk-informed, sector-specific preparedness, particularly for communities whose livelihoods are concentrated in specific sectors (such as fishing, tourism, etc.)
- Sustained engagement between authorities, scientists, and affected populations
- The role of social capital and community networks as critical assets for recovery, even in contexts of displacement
- Clear and transparent legal and institutional frameworks to guide recovery decisions, including public safety/compensation
- Importance of cooperation between all stakeholders, government, municipality and other stakeholders, cooperation with the local government.

It should be noted that many past events in Iceland, such as the 1973 Vestmannaeyjar eruption, the 1995 avalanches in Súðavík and Flateyri, the 2000 and 2008 earthquakes, the 2010 Eyjafjallajökull eruption, and the 2020 landslide in Seyðisfjörður, were relatively short-lived; recovery and/or resettlement began within a year, and populations largely returned to pre-event levels. However, many of the general lessons identified have relevance also in Grindavík context.

Policy framework

- **Policies.** The response and recovery process in Grindavík creates opportunities to improve the regulatory, institutional coordination, and operational framework to continue improving resilience and preparedness of the society to future crises. These opportunities may arise in multiple areas—housing, safety, preparedness, municipal finance, land use planning, resilience of utilities and critical infrastructure, etc. Some particular areas of focus could be clarifying the financial responsibilities across public, private, and individual actors; ensuring that recovery efforts continue to be closely monitored and tracked; and using analysis of costs and benefits in decisions about investments and sustainability. Iceland has a tradition of improving its legal framework following past disaster events as highlighted in Box 13.

- **Disaster risk financing and insurance.** The regulatory framework for catastrophe insurance may require review to better address prolonged or evolving hazard conditions, where the classification of events can affect deductibles, eligibility, and financial exposure. In parallel, risk modeling for crustal cracking and prolonged compound hazard environments presents ongoing challenges, and improved alignment between NTÍ and the IMO) on scenario planning could enhance understanding of the underlying financial risks. Addressing these gaps — for example through regulatory reform, enhanced risk modeling, and clearer government contingency arrangements — will be essential to building a more resilient and equitable disaster risk financing framework for communities facing prolonged volcanic hazard.
- **Municipal finance and sustainability.** Preserving Grindavík’s fiscal base is essential to maintain the municipality. The Act no.13/2026 allowing both the currently registered residents as well as residents before November 2023 in Grindavík to vote in 2026 local elections is an important step in this direction. Next steps could include a review of current arrangements and introduction of special measures, such as a new arrangement allowing displaced residents to keep their legal residency in Grindavík (even if they live somewhere else), so that municipal tax revenues and equalization transfers continue to go to the town.³⁹ Giving people displaced from Grindavík the option to keep their legal residence in Grindavík (for example, by allowing them to pay a lower residency tax than they would in the place where they currently reside) could provide the local administration in Grindavík with much-needed resources for the reconstruction of the town, and it will also allow people displaced from Grindavík to stay connected to the town and the community. Some of the resources thus collected could also be used by the local administration to organize periodic daytime community events in Grindavík, to help maintain and strengthen community ties. At the same time, the state could provide financial compensation to host municipalities to ensure they are not disadvantaged for delivering services to displaced residents. In connection with this approach, decision-makers could consider the feasibility of joint provision of specific services. The merger of municipalities is a common practice in Iceland. In 1990, there were 204 municipalities in Iceland, but over the years these have merged to form 62.

Box 13. Improving legislative framework after disaster events

Major natural hazard events in Iceland—including the **1973 Vestmannaeyjar eruption, the 1995 avalanches in Súðavík and Flateyri, the 2000 and 2008 earthquakes, the 2010 Eyjafjallajökull eruption, and the 2020 Seyðisfjörður** landslides—have shaped the evolution of Iceland’s disaster risk management system, including the development of civil protection legislation, hazard mapping and zoning, catastrophe financing mechanisms, and sector-specific preparedness planning. Notably, following the 1995 avalanches in Súðavík and Flateyri, the legal framework was adjusted to include an acceptable level of risk (as described in Box 9). The risk levels and avalanche risk information have been since used to guide spatial planning. Funding programs were also set up and made available for municipalities to finance avalanche risk assessments and mitigation measures.

³⁹ According to Law No. 80/2018, secondary residence is not allowed. Exemptions from the general rule apply (for example) to the elderly in homes, disabled persons in special care institutions, registration of temporary residence because of natural catastrophe, prisoners, etc.

It should be noted that risk analytics, risk-based decision-making, and risk-informed spatial planning are covered under the “Safety and preparedness” section, while housing policy is covered under the “People and social infrastructure” section.

Safety and preparedness

Key takeaways:

Continue focusing on public safety and investing in strengthening preparedness

Promote evidence-based and risk-informed decision-making

- Monitoring, early warning, and risk assessments should guide decisions
- Scenario analysis and alerts should trigger predefined operational responses
- Clear communication of risk information is essential to maintain public trust

Consider adopting acceptable level of risk approach

- Develop participatory risk thresholds for housing, economic activity, schools, events, tourism, etc.
- Apply clear “if–then” protocols linking alert levels reflecting an acceptable level of risk and activity permissions

Review and introduce reforms for risk-informed spatial and development planning

- Use hazard assessments to guide land use planning and development decisions
- Allow limited or daytime activities (e.g., in designated zones) under safety protocols

Continue investing in emergency preparedness and risk communication

- Maintain strong civil protection and evacuation readiness
- Conduct regular drills and public awareness campaigns

- **Capacity for disaster risk management:** Iceland has well-established disaster risk governance structures as well as high response and coping capacity, world class risk analytics, monitoring and alerting capabilities. However, given risk levels and uncertainty, the government needs to remain vigilant and stay focused on strengthening its risk analytics, use of risk information for policy and decision-making, spatial planning and development, warning and alerting practices, and preparedness and response capacities. Doing so will help ensure the safety of society through risk communication, risk awareness, and community-led activities. Learning from this situation, there may be also an opportunity to review Iceland’s general disaster risk management institutional capacities and arrangements for prevention, preparedness, and recovery processes, especially considering multi-hazard, multi-sectoral, complex/hybrid, and prolonged crises. Such diagnostic could review key elements – such as the national framework, institutional capacities, investments, and priorities across different phases and elements of risk management, including risk analytics, planning, prevention, preparedness (warning, communication), response, recovery, and cross-cutting topics – such as whole of society approach. Such review could potentially build on existing analytics (see, for example, World Bank 2025b).
- **Risk-informed decision-making, monitoring, and hazard/risk assessments.** Continued and long-term investment in monitoring systems, analysis, and interpretation, along with investment in associated hazard and risk assessments, is needed to inform planning, preparedness, and mitigation. Risk

analytics should consider social vulnerability (as relates to different groups and numbers of people), temporal factors (time of day/year), economic impacts, infrastructure performance, emergency response capacity, and cascading as well as compound risks, and these should all inform policy adjustments. Risk assessments should be multi-stakeholder such that all relevant data and perspectives are accounted for.⁴⁰

- **Warning.** People-centered early warning systems (EWS) comprise an integrated set of capabilities that enable authorities and communities to detect emerging hazards, interpret risk, and act in time to reduce harm. In Grindavík, where the current volcanic crisis is marked by prolonged uncertainty and rapid-onset events, the EWS must function across four interconnected components: (i) monitoring and forecasting; (ii) risk knowledge; (iii) dissemination and communication; and (iv) community response capability. Iceland’s multi-agency EWS is highly advanced, yet the speed and complexity of the Sundhnúkur volcanic activity have exposed operational gaps, such as data fragmentation, communication and infrastructure limitations, and community-based preparedness (see *‘Challenges and potential gaps’*), which present opportunities for targeted modernization, detailed further in *‘Opportunities for recovery’*.
- **Continued improvements and sustained efforts for preparedness.** Recovery also provides the opportunity to “build back better” by incorporating improvements to all aspects of crisis management and preparedness. Examples include public communication campaigns after long periods of quiescence, regulatory frameworks to inform land use planning, and efforts to better support institutions, staff, and residents experiencing prolonged crisis fatigue.
- **Promoting awareness across all of society.** The rising social vulnerability of non-Icelandic speakers and foreign workers in different sectors necessitates the implementation of multilingual early warning systems and accessible hazard guides. The public understanding of risk could be improved by developing clear impact-based risk maps, differentiating them from hazard maps, and organizing explanatory campaigns. Special attention needs to be given to evacuation planning, drills, and continuity planning.

The following sections provide more technical details for the key elements highlighted above.

Opportunities for strengthening risk analytics to guide decision making and development

- **Analytical and data engineering capacity.** Staffing and infrastructure should be expanded to manage large data volumes, real-time modeling, repeated and ongoing surveys of the rifting, and long-term trend analysis.
- **National risk information system.** Iceland has the opportunity to develop a consolidated national risk information system platform to identify, assess, and visualize disaster risks across all sectors and across all of Iceland. This effort would include a unified real-time data-sharing platform that implements a shared digital system to provide consistent baseline and live hazard, exposure, and infrastructure data across IMO, civil protection authorities, ICESAR, local authorities, and other relevant stakeholders.

⁴⁰ The IMO is currently undertaking a national risk assessment across Iceland related to the volcanic hazard.

- **Probabilistic forecasting and hazard and risk assessments, ideally at national scale.** Operational forecasting and long-term hazard assessments currently make use of scenario-based approaches, which are relatively easy to communicate and plan for while still capturing some of the uncertainties inherent in forecasting hazard events. However, outside of a volcanic crisis (that is, in “peacetime”), there exists an opportunity to align with the Sendai Framework for Disaster Risk Reduction (2015–2030), which emphasizes that disaster risk management should be based on an understanding of vulnerability, capacity, exposure, and hazard characteristics, and which promotes a shift from reactive, hazard-by-hazard management to a proactive, “all-hazard” approach. This approach uses probabilistic risk assessment and is based on probabilistic models (that is, it does not depend on the occurrence of a disaster within a specific, short time frame) to estimate risk indicators (e.g., average annual economic losses and fatalities) and to understand systemic, cascading risks. These probabilistic models could be combined with a national approach to identify risk hotspots.
- **Multi-hazard and cascading impact research.** Models that capture volcanic–seismic interactions, subsidence–flood interactions, lava–wildfire ignition potential, and combined volcanic–weather crises should be built.
- **Multiphase realistic disaster scenarios.** Crisis scenarios should explicitly reflect the dynamic and potentially prolonged nature of volcanic crises, including the possibility for multiple, discrete phases of activity. Understanding how crises may evolve over time, and how transitions between phases can occur, requires both detailed understanding of the volcanic system and the deliberate development of dynamic scenario frameworks to support effective planning and response.
- **Integration of economic loss and cost-benefit modeling.** Systematically quantifying economic impacts and return on investment can point to mitigation options that support transparent, evidence-based decision making.

Opportunities for adopting acceptable level of risk and risk-based land use planning and recovery

- **Development and management of long-term risk thresholds, to guide risk-informed spatial planning.** Develop a national acceptable level of risk framework based on the ALARP (As Low As Reasonably Practicable) principle, drawing on and expanding upon what is in place for avalanche risk. **Annex 4** provides a more detailed description of the development of risk thresholds. Identifying risk thresholds requires a participatory approach, which requires consultation between government officials, scientists, and stakeholders to determine a baseline that allows the risks from natural hazards to be evaluated alongside other societal risks, such as transport accidents or industrial hazards. Hazard-specific risk thresholds can serve as the technical foundation for risk-informed spatial planning, ensuring that future reconstruction and critical infrastructure placement avoids high-hazard areas.
- **Determining acceptable levels of risk for Grindavík.** Use a participatory approach to identify short-term acceptable levels of risk given the dynamic situation at Grindavík. **Annex 4** provides a more detailed description of how risk assessment and acceptable level of risk can inform decision-making in various policy areas. A participatory process can allow different stakeholders to consider elements such as: available risk assessments and scenarios, acceptable level of risk for different segments such as people (fatalities, injuries, vulnerable groups, evacuation implications, etc.), infrastructure and

services (utilities like heating, water, roads, telecommunications, medical, emergency and firefighting services), the economy (business interruption, tourism, etc.), as well as intangible elements (like trust, reputation, political risk). Also, population types/groups need to be carefully considered in this process (residents, vulnerable groups, workers, tourists, displaced population), as well as the type of activity conducted (residential, commercial, leisure, family or children-centered, critical infrastructure and service provision). Each stakeholder group would need to articulate their implicit tolerance and priorities. During an interactive process, areas of agreement and divergence are identified, and discussion of tradeoffs between life safety, infrastructure continuity, economic stability, and social legitimacy, are discussed, especially in terms of value differences Box 14 for an example of part of such interactive process. **Annex 5** provides a more detailed summary of an exercise conducted during the preparation of this report for Grindavík-specific definitions of acceptable risk.

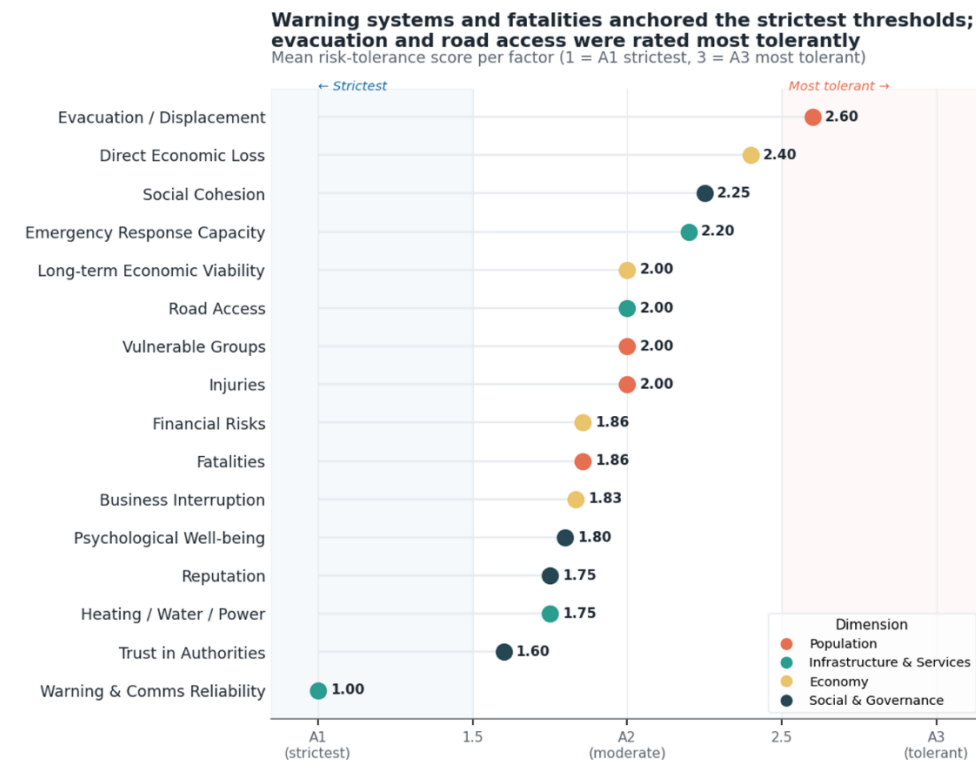
Box 14. Example of participatory engagement on acceptable levels of risk

During preparation of this report, a short workshop was held as an example of a participatory approach to support a structured dialogue on acceptable risk with a community. This rapid group exercise was not designed to define formal thresholds or produce binding conclusions. Rather, it sought to make visible where stakeholders converge, where they diverge, and which conditions they treat as least negotiable. As part of the workshop, 30 participants from 15 organizations, spanning local leadership, scientific and technical and scientific agencies, emergency and police actors, national ministries, and civil-society organizations worked in four mixed groups focused on residential return, commercial and industrial activity, tourism, and schools. The exercise used a five-step acceptability scale, A1 to A5, with factor-specific descriptions for each of the 16 questions formulated across the four dimensions of risk, such as fatalities, injuries, evacuation burden, and vulnerable groups; energy, transport, telecommunications, and emergency capacity; business interruption, asset damage, and insurability; and trust, psychological well-being, and community reputation.



The exercise showed that no stakeholder group accepted high-risk outcomes. Also, across all groups, warning and communication reliability, trust in authorities, and emergency response capacity were treated as foundational conditions for acceptable risk (Figure 12). The exercise showed that different activities require differentiated thresholds or decision rules, because they expose different groups, depend on different services, and imply different levels of protection for vulnerable people. For example, schools and residential return formed a clearly protective posture, while tourism and commercial activity formed a more operational posture. The exercise showed that acceptable risk needs to be approached through a multi-hazard, multi-dimensional lens, and that “acceptable” risk may differ across groups and activities. More information is available in **Annex 5**.

Figure 12. Mean risk tolerance score (1/A1 as the strictest and 3/A3 as the most tolerant)



Source: World Bank team..

- **Adopt risk-informed spatial planning, recovery, and development.** Following disasters, countries normally review their land use planning and integrate the newest risk information available to ensure people are out of harm's way (e.g., through resettlement or zoning, separation of economic recovery from family resettlement), to ensure harm is away from people (through mitigation measures), and manage the residual risk (through preparedness, risk communication). Box 15 provides several examples across different countries. Given risk levels and uncertainty in Grindavík, spatial planning and territorial interventions need to reflect risk information and agreed acceptable levels of risk. The GEC has undertaken an extensive analysis of safety and seismic zoning in Grindavík, which—along with other information available— could inform future zoning considerations. The Grindavík Town Council has commissioned a vision of urban regeneration, which would also need to be aligned with the overall approach on risk-based spatial planning.⁴¹

Box 15. International examples related to recovery and spatial planning

New Zealand uses quantified life-safety thresholds to classify land for development near active volcanoes and lahar paths (e.g., Ruapehu, Tongariro). Authorities combine hazard frequency and distribution with population exposure/occupancy, vulnerability, and evacuation feasibility (time to safety versus warning lead time) to determine whether a zone is safe for occupation and what mitigation is required, and these calculations are embedded in land use/access rules. This model demonstrates that quantified life-safety calculations can directly guide land use and

⁴¹ The urban regeneration vision combines several elements. For example: (i) evidence of the recent disasters, such as fissure lines, lava formations, and building remnants, will be preserved and repurposed in innovative and safe ways; (ii) walking paths, exhibitions, and signage will be introduced to highlight the forces of nature and their effects in a visible and accessible manner. Particular emphasis will be placed on safeguarding historic structures like Hópið, the Salt House, and the Workers' House on Víkurbraut, while some damaged buildings will be removed as part of the renewal process. See Batteríð Architects, "Framtíðarsýn fyrir Grindavík," [link](#).

access, provided that there are clear thresholds, engineered systems matched to the numbers, and regular drills and exercises. However, applying this approach would require establishing national risk thresholds for volcanic risk, strengthening legal frameworks, and ensuring coordinated data systems and public trust to support implementation.

In Hawaii, recovery after major volcanic events (including Kīlauea) is guided by long-term hazard zonation, which informs decisions on where to rebuild, limit development, and prioritize infrastructure investment. This approach shifts recovery from restoring pre-disaster conditions to aligning rebuilding with long-term risk, supported by tools such as housing buyouts and land use conversion to reduce future exposure. For Grindavík, this model highlights an opportunity to adopt forward-looking, risk-informed spatial planning, using hazard modeling to guide decisions on housing, infrastructure siting, and design standards. However, implementation would require managing more complex multi-hazard risks, establishing clear governance and update mechanisms, and securing political and community support—particularly where relocation or development restrictions are involved.

Following Hurricane Sandy in 2012, recovery efforts in the United States introduced risk-informed planning approaches that link hazard data directly to spatial and infrastructure decisions. Through initiatives such as Rebuild by Design, multidisciplinary teams combined flood modeling, engineering, and land use planning to develop and test concrete solutions—such as protective infrastructure layouts and zoning strategies—that reduce exposure and guide long-term investment. For Grindavík, this experience highlights an opportunity to use structured approaches that integrate hazard data, engineering, and spatial planning to develop and test practical solutions, particularly for infrastructure siting, protective measures, and future land use under uncertainty. However, the approach relies on high technical capacity, sustained funding, and well-defined risk parameters—conditions that may be more constrained in Grindavík’s smaller-scale and evolving volcanic context.

The Soufrière Hills volcanic crisis in Montserrat, which began in 1995, led to the development of a hazard level-based zoning system linking risk levels to access restrictions. Zones range from unrestricted and daytime-only access to controlled entry and exclusion areas limited to essential personnel. This flexible system allows authorities to adjust access as conditions evolve, thereby enabling partial reoccupation of safer areas while maintaining protection in high-risk zones. For Grindavík, this approach demonstrates that graduated, risk-based access regimes can support incremental reoccupation without binary “return or abandon” decisions, specifically by linking occupancy and access rules to evolving hazard conditions. However, such systems require continuous monitoring and clear communication and may create uncertainty for residents in conditional zones. Maintaining transparency and public trust is critical, as dynamic zoning can be complex to understand and apply.

More information is available in **Annex 1**.

Suggestions for strengthening early warning systems and population preparedness

- **Deploy cell broadcast warning technology.** Transitioning from location-based SMS to EU standard cell broadcast would increase reliability, reduce network congestion, and ensure all mobile devices in a defined zone receive alerts simultaneously, including roaming phones used by tourists.

Box 16. Example of Germany’s nationwide cell broadcast system

Germany rolled out its nationwide cell broadcast system on February 23, 2023, and used it successfully more than 240 times that year, including 10 alerts over the Christmas period to warn residents about high water and flooding. These alerts were delivered rapidly to people in affected areas and formed part of the country’s upgraded disaster warning system after the deadly 2021 floods. Their use in this instance is one of the most widely documented European cases demonstrating cell broadcast alerts being used effectively in an actual crisis, not just tests or pilots (JRC 2024). A review of flood EWS and preparedness initiatives in Germany shows that every €1 invested yields median benefits of €6–9 in avoided damages (World Bank 2025a).

- **Expand audible warning systems.** Fixed loudspeaker networks in public spaces, in high-risk zones, and along popular hiking routes would provide immediate alerts to individuals without mobile access or in areas where telecommunications may fail or zones vulnerable to sudden hazard escalation. Research from the November 2023 evacuation highlights communication challenges during sudden escalations, indicating that expanding audible warning systems would strengthen Iceland's resilience (Sigurðardóttir and Möller 2025). While evacuation alarms are periodically tested in Grindavík and Svartsengi, there is no fixed loudspeaker network in public spaces or along popular hiking routes. Several examples of audible warning systems are provided in Box 17.

Box 17. Audible warning systems: Global examples

Countries such as Japan, Germany, the Netherlands, and the United States use fixed loudspeaker networks to provide immediate alerts in areas where mobile coverage may be limited or hazards escalate rapidly. In Japan, these systems are widely deployed in coastal zones, public spaces, and active volcanic areas to support rapid warning for residents and visitors, including hikers in high-risk environments. For Grindavík, expanding audible warning systems in public spaces and high-risk areas could strengthen emergency communication, particularly during sudden events or telecommunications disruptions. However, implementation would require investment in infrastructure, clear integration with existing alert systems, and regular testing to ensure reliability and public trust.

- **Use multilingual alerting and signage.** All digital alerts, physical signs, and public warnings could be issued in multiple languages, including English and Polish, to minimize life-safety risks linked to language exclusion. Iceland already recognizes the need for multilingual hazard communication in areas with high tourist exposure, e.g., rock or glacier ice fall hazards at Jökulsárlón, hot springs danger posed by geysers, or waves at Reynisfjara beach. There is a clear precedent for expanding multilingual alerting (digital and physical) in volcanic risk areas like Grindavík, especially given the increasing numbers of non-Icelandic-speaking workers and visitors.
- **Align EWS with the Sendai Framework for Disaster Risk Reduction (2015–2030).** Iceland has strong hazard-specific early warning systems, but it does not yet operate a national EWS that is fully aligned with the Sendai Framework, combines all hazards, links real-time hazard data with exposure and vulnerability, produces impact-based and people-centered warnings, and fully integrates all warning channels (e.g., cell broadcast, signage, outdoor sirens, multilingual systems). Several examples from other countries are included in Box 18.

Box 18. International experience in integrating warning channels

Countries such as Japan, New Zealand, and several EU member states have already implemented Sendai-aligned multi-hazard early warning systems for volcanic regions, integrating real-time seismic, geodetic, and environmental data with population exposure and infrastructure vulnerability. Japan's national alerting system issues mobile warnings for volcanic, seismic, and weather hazards; New Zealand's Eruption Response and Lahar Warning System (ERLAWS) links lahar detection directly to downstream infrastructure risk pathways; and EU-Alert provides multi-hazard, geotargeted volcanic alerts in places such as Spain's Canary Islands.

- **Improve real-time data sharing.** Iceland has close operational cooperation across agencies, but not a single unified data-sharing framework. A formal, unified data-sharing protocol involving IMO, civil protection authorities, ICESAR, and local stakeholders would facilitate consistent situational awareness and reduce delays in operational decision-making.

Opportunities for improved dissemination and communication

- **Enhance community-based preparedness.** Iceland's response during the Reykjanes crisis has remained largely institutional rather than community-based. Because of the strong institutional response and support during the crisis, those at risk may feel only a minor responsibility to protect themselves. Research on the November 2023 Grindavík evacuation shows gaps in operational readiness and trust, which could be addressed through stronger, bottom-up resilience initiatives (Sigurðardóttir and Möller 2025). Examples include regular evacuation drills, training of local volunteers to support visitors during emergencies, and establishment of neighborhood-level response groups to complement instrument-driven alerts when communications infrastructure is stressed. Evacuation planning remains central, with worst-case evacuation times estimated at approximately 20 minutes and response protocols designed to mobilize verification, Coast Guard readiness, and on-site scientific assessment within minutes of triggering events. Several examples from other countries are included in Box 19.

Box 19. International experience with community-based preparedness

At Merapi volcano (Indonesia), community-managed disaster risk reduction, local volunteer networks (e.g., Jalin Merapi), and practiced mutual assistance evacuations (pairing volunteers with vulnerable residents) enabled rapid, trusted, bottom-up action during the 2010 crisis. Around Sakurajima (Japan), sustained community learning and neighborhood drills—through the *kyojo* (mutual help) framework—complement official alerts. At Ruapehu (New Zealand), a decade of multi-agency planning and exercises with communities led to an effective response during the 2007 lahar event, underscoring the value of repeated drills and clear roles.

- **Align public risk perception with scientific evidence.** Risk understanding and trust in the scientific assessments in Iceland is very strong; however, during prolonged crises and for non-Icelandic visitors or migrants, this can be tested. Training for journalists, local leaders, and community groups can help maintain appropriate public awareness levels, thereby preventing undue alarm, misinformation, and/or hazard complacency. Iceland has taken several steps toward ensuring public awareness of risk, through coordinated information management and the creation of a media center, but no structured training initiative has been implemented. Box 20 provides several examples of initiatives to improve communication and engagement with media.

During the 2010 Eyjafjallajökull eruption, Iceland's civil protection and scientific agencies held frequent open townhall meetings, had direct communication with local residents, and coordinated messaging between scientists and authorities. This approach built strong trust, helping residents correctly interpret scientific information and make informed choices despite unfamiliar hazards (tephra fall after >60 years of quiescence). This case is often cited as a best-practice example for aligning public risk perception with real hazard conditions (Bird et al. 2017).

Box 20. International experience with communication and media engagement

In **Japan**, reforms following the blue-sky (unexpected) eruptions at Ontake and Kusatsu Shirane included improved public information materials that provided clearer explanations of uncertainty, and targeted communication efforts aimed at helping the public develop more realistic expectations of eruption predictability. In **Italy**, studies around Etna showed that media portrayals can significantly distort public understanding, a finding that prompted calls for stronger collaboration between scientists and journalists, with training to reduce sensationalism and ensure accurate reporting of volcanic hazards. Similarly, in **New Zealand**, the development of interactive volcanic hazard

visualization tools was specifically designed to help scientists communicate more clearly with stakeholders and community leaders, improve public comprehension of complex hazard information, and reduce gaps between expert assessment and local perceptions. In **Ecuador**, work around Cotopaxi demonstrated that co-developed communication tools and training with local experts improved community understanding of vulnerability and volcanic risk, enabling more-informed public responses. Studies from **Merapi, Indonesia**, showed that community leaders and trusted local communicators play a critical role in translating scientific warnings into actionable public behavior.

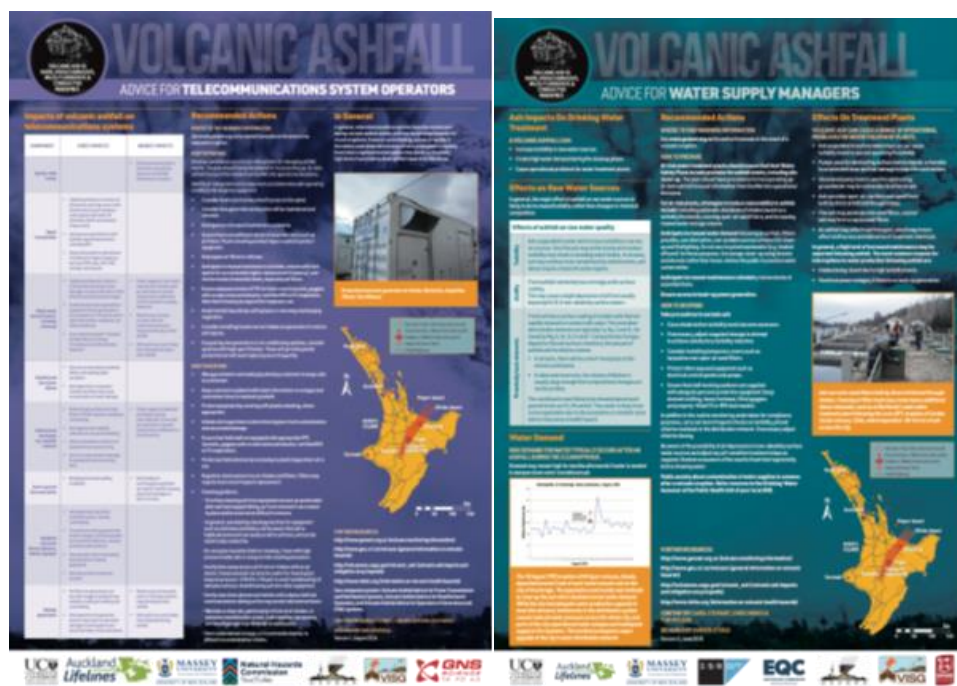
- **Update evacuation (and other) protocols based on lessons learned:** Public instructions should be revised to reflect new rifting data (2023–2025) and recent scientific insights. International experience, as noted in Box 21, highlights the need for continued focus on evacuation planning.

Box 21. International experience on evacuation planning

More than 24,000 residents were successfully evacuated ahead of the explosive phase of the **2021 La Soufrière eruption in St. Vincent and the Grenadines**, but post-event evaluations highlighted the need for clearer instructions, earlier triggers, and better-prepared shelters, as well as more routine drills to ensure that people would know where to go and what to bring. The lessons learned from this crisis were used to refine evacuation cards, strengthen communication, and reinforce readiness, especially for transient and vulnerable populations.

- **Enhance communication for non-Icelandic speakers.** There is a need to improve multilingual messaging, signage, and alerting for tourists, temporary residents, and foreign workers, informed by consolidated vulnerability data. Targeted information should be used to improve the risk perceptions of these groups, with regular checks (e.g., surveys, focus group discussions) to ensure their efficacy.
- **Produce sector-specific, multilingual risk products.** A range of materials—posters, quick guides, and hazard impact sheets tailored to tourism operators, infrastructure managers, fishery workers, and international labor groups—should be developed, similar to New Zealand’s multilanguage ash impact guides (Figure 13). Such guides could be created for any hazard and any audience. Multilingual communication should be considered as a life-safety priority, along with the development of sector-specific multilingual risk products to ensure all residents and workers can access critical information.

Figure 13. Communications materials used in New Zealand for telecommunication system operators (left) and water supply managers (right)



Source: GNS Science, “Volcanic Ash,” [link](#).

Note: The figure shows posters created by GNS Science (now Institute of Earth Sciences NZ) for telecommunication system operators (left) and water supply managers (right) to provide industry-relevant advice on the impacts and suggested mitigation actions for ash fall.

People and social infrastructure

Key takeaways:

Continue to focus on people-centered and inclusive recovery

Continue/expand ongoing stakeholder engagement

- Use a long-term approach to monitor social impacts to ensure understanding of different needs
- Provide information to different groups with targeted outreach to vulnerable groups
- Focus on mental health and invisible disabilities, with special focus on children and youth

Adopt specific programs

- Provide dedicated support with sustained financing
- Define clear mandates and responsibilities

Review current arrangements and policies for housing and provision of social services

Review and adjust arrangements for housing, as needed

- Review emergency housing arrangements and rules to ensure alignment with long-term recovery objectives, including clarity over timelines and rules of the buy-back program
- Consider adjusting the governance of Pórkatla, including the option of a public-purpose entity focused on resilient recovery as its primary objective

Ensure housing market policies reflect acceptable risk levels

- Align housing policies with agreed acceptable risk thresholds
- Establish clear rules for occupancy, resale, and phased reengagement

- Maintain vacant properties to protect public investment and prevent deterioration

Ensure safe education services

- Ensure that schooling arrangements follow clearly defined safety thresholds

- **Adopt an inclusive approach that promotes community cohesion.** Recovery planning needs to continue to focus on people and promote an inclusive approach. As noted under the “Policy and governance” subsection above, this can be done by explicitly adopting a participatory approach and ensuring that community representatives are informed, that feedback is sought in a regular and meaningful way, and that engagement continues irrespective of people’s settlement or livelihoods choices. Dispersed residents can be supported through platforms and initiatives that sustain social networks, cultural identity, and participation; recognizing that social recovery can occur even in the absence of large-scale repopulation will help maintain community cohesion beyond physical return.
- **Consolidate social information (including vulnerability data sets).** A central data set could provide analytical support for targeted support, preparedness, multilingual communication, and equitable evacuation planning and activities. Data should be regularly collected on different groups over the time of recovery. For example, it is common after major events to conduct regular social impact studies that span a whole decade.⁴² A practical opportunity is the planned multiyear longitudinal study of affected Grindavík residents, expected to follow individuals and households over approximately three years.⁴³ This future data collection effort provides a critical window to shape survey design now so that it captures policy-relevant indicators, including mental health outcomes, social adaptation, service access, children’s well-being, and evolving risk perception. Universities play an important role in data collection and research.
- **Plan proactively for newcomer dynamics with data collection and analysis.** Data collection and analysis should capture newcomers or those interested in living in Grindavík so that data can guide and anticipate the social, linguistic, and preparedness needs (i.e., risk information availability in different languages) of potential newcomers through inclusive communication strategies, access to services, and social integration measures to support cohesion and risk awareness. Newcomers should also be integrated into data systems and surveys.
- **Invest in analytics to inform policy decisions as well as targeting and effectiveness of programs.** Analytics can support decision-makers in reviewing and adjusting social policies and programs. (Annex 3 provides an example of such analysis conducted as part of this report development). Analytics can draw on various data sources, such as administrative health data, social service utilization records, and household surveys, to track the long-term human impact, i.e., to track mental health outcomes (e.g., stress trauma, including PTSD, mood disorders), social adaptation, and the specific needs of vulnerable groups such as children, elderly residents, and non-Icelandic speakers. Integrating these insights into recovery governance can help ensure that policies remain adaptive, evidence-based, and

⁴² For example, in Myanmar, the World Bank–facilitated Post-Nargis Social Impact Monitoring was a longitudinal study that carried out four rounds of research between 2008 and 2013 to assess the recovery of communities following Cyclone Nargis. It highlighted significant long-term social upheaval, rising household debt, and a paradigm shift in Myanmar from crisis management to risk management.

⁴³ The study will be conducted by the University of Iceland.

responsive to changing social conditions over time. Social vulnerability data and analytics can also feed into preparedness, multilingual communication, and equitable evacuation planning.

- **Adopt a risk-informed approach to family resettlements.** As noted in the previous section, planning of family resettlement should be aligned with risk-informed principles. This may include separating economic recovery from family resettlement decisions, for example by allowing controlled economic activities to resume while maintaining a cautious, differentiated approach to residential return, particularly for families with children.
- **Embed psychosocial support into recovery planning.** Given impacts of evacuations and resettlements, as well as ongoing risk levels and uncertainty, psychological support should be continued for displaced families and persons. Priority should be given to targeted mental health and community-based support for distressed groups and those willing to return (if this includes older populations with specific medical or social care needs), in order to avoid compounding vulnerability in any resettlement scenario.
- **Continued focus on children and youth, elderly, and vulnerable groups.** Of particular importance will be the safeguarding of children's safety and preventing avoidable physical and psychological harm they may incur. Iceland's experience with natural hazards, including avalanches, earthquakes, and volcanic eruptions, has generated a robust evidence base on the long-term social, psychosocial, and health impacts of disasters, as well as on the role of institutionalized psychosocial support in mitigating these impacts. Longitudinal research following affected populations over periods of up to 16 years highlights that disaster impacts extend well beyond the immediate emergency phase and can persist across the life course, particularly for children and socially vulnerable groups. Box 22 provides highlights from experience in Iceland in addressing social and psychosocial dimensions following major events. It is important for the local administration to understand the risks of reopening compulsory schooling within Grindavík during the current risk phase. Options should be provided for schooling outside Grindavík; hybrid or satellite solutions should be identified and assessed, while also providing psychological support services for displaced children.

Box 22. Addressing the social and psychosocial dimensions: Highlights from experience in Iceland

Iceland's experience demonstrates that the social and psychosocial dimensions of hazard events are integral to disaster risk management and recovery, particularly in contexts of repeated or prolonged hazard exposure. The evidence underscores the importance of early and sustained psychosocial support, attention to children and families, mitigation of financial and social stressors, and the role of community cohesion and social support in shaping long-term recovery trajectories.

Avalanche disasters have provided some of the strongest evidence on long-term psychosocial impacts. Long-term follow-up studies of survivors of catastrophic avalanches in Iceland show that approximately 16 percent of adult survivors continued to report avalanche-specific post-traumatic stress disorder symptoms 16 years after exposure, alongside elevated risks of hyperarousal, sleep-related disturbances, musculoskeletal and nervous system problems, and gastrointestinal symptoms compared with non-exposed controls.⁴⁴ Subsequent analyses identified lack of social support and post-disaster financial hardship as key predictors of persistent PTSD symptoms, while providing help to

⁴⁴ Þórðardóttir et al. 2015. Posttraumatic stress and other health consequences of catastrophic avalanches: A 16-year follow-up of survivors. *Journal of Anxiety Disorders*, 32, 103–111. [Link](#).

others and receiving assistance after the disaster were associated with lower long-term PTSD risk, underscoring the protective role of social engagement and community support.⁴⁵

Evidence from childhood avalanche survivors further highlights the intergenerational and developmental dimensions of disaster risk. A 16-year follow-up of individuals exposed to avalanches during childhood found that PTSD symptoms persisted into adulthood and were associated with lower educational attainment, poorer financial status, and higher rates of unemployment or disability, particularly among female survivors.⁴⁶ Caregivers' traumatic reactions and limited social support during childhood were significant predictors of adverse long-term outcomes, indicating that disaster impacts on children are shaped not only by exposure but also by the broader family and social environment. Additional research shows that sleep disturbances linked to trauma vary by age at exposure, with childhood exposure associated with higher odds of PTSD-related sleep disturbances in adulthood.⁴⁷

Following the 2008 South Iceland earthquakes, longitudinal cohort studies documented that, within two months of the event, 5.2 percent of exposed individuals reported PTSD symptoms, 6.7 percent depression, and 6.4 percent anxiety. While anxiety symptoms declined over time, PTSD and depression symptoms remained relatively stable over a 12-month follow-up period, indicating that a subset of the population experienced sustained mental health impacts beyond the acute phase.⁴⁸

Research on volcanic eruptions, particularly the 2010 Eyjafjallajökull eruption, demonstrates that children are especially vulnerable to prolonged impacts. Prospective studies found that children living in exposed areas experienced persistent physical and mental health problems for up to three years, including increased respiratory symptoms, anxiety and worries, headaches, and sleep problems, compared with children in nonexposed areas.⁴⁹ Population level analyses using prescription data did not show an overall increase in medication use following the eruption, suggesting that while significant impacts occurred at the individual and subgroup level, they were not always visible in aggregate health system indicators.⁵⁰ In response to these experiences, Iceland has progressively institutionalized psychosocial support as a core component of disaster management since the mid-1990s. Evaluations of psychosocial support programs implemented after avalanches, earthquakes, and volcanic eruptions show increasing levels of satisfaction over time, reflecting improvements in service design and delivery. Utilization of psychosocial support ranged from approximately 16 percent after earthquakes to 37 percent after avalanches, with higher uptake associated with more severe and disruptive events.⁵¹ Importantly, utilization of psychosocial support was associated with lower levels of PTSD symptoms, highlighting its role as a key mitigating factor rather than an optional add-on to emergency response.

⁴⁵ Þórðardóttir et al. B. 2016a. Risk factors for posttraumatic stress symptoms among avalanche survivors: A 16-year follow-up. *Journal of Nervous and Mental Disease*, 204(4), 298–305. [Link](#).

⁴⁶ Þórðardóttir et al. 2016b. Sixteen-year follow-up of childhood avalanche survivors. *European Journal of Psychotraumatology*, 7(1). [Link](#).

⁴⁷ Þórðardóttir et al. 2016c. The manifestations of sleep disturbances 16 years post-trauma. *Sleep*, 39(8), 1551–1554. [Link](#).

⁴⁸ Þórðardóttir, E. B., Gudmundsdóttir, H., Gudmundsdóttir, B., Hrólfssdóttir, A. M., Aspelund, T., & Hauksdóttir, A. 2019. Development and predictors of psychological outcomes following the 2008 earthquake in Iceland: A longitudinal cohort study. *Scandinavian Journal of Public Health*, 47(2), 269–279. [Link](#).

⁴⁹ Hlodversdóttir et al. 2018. Long-term health of children following the Eyjafjallajökull volcanic eruption: A prospective cohort study. *European Journal of Psychotraumatology*, 9(sup2). [Link](#).

⁵⁰ Guðmundsdóttir et al. 2022. Medication use in populations exposed to the 2010 Eyjafjallajökull eruption: An interrupted time series analysis. *BMJ Open*, 12(5), e059375. [Link](#).

⁵¹ Þórðardóttir et al. 2018. Psychosocial support after natural disasters in Iceland—implementation and utilization. *International Journal of Disaster Risk Reduction*, 27, 642–648. [Link](#).

- **Review of emergency housing arrangements.** Emergency housing arrangements should be reviewed to ensure alignment with long-term recovery objectives. Housing policies and programs, like any other efforts, need to be fully aligned with the overall recovery framework, including the application of the acceptable-level-of-risk approach and risk-based land use planning and development, as well as considerations of social dimension and participatory approaches.
- **Acceptable level of risk.** Decisions will have to be made on how to align public safety and preparedness with housing policies. Based on acceptable levels of risk, and how these translate into spatial planning (e.g., zones for specific types of activities, exclusion of development in specific areas, etc.), homes may be resold only in areas of the town that are deemed safe, and certain general rules should be put in place in line with threshold levels. etc. For example, only adults and workers without families could be allowed to live in or rent these houses until “acceptable risk” levels are achieved. Some buildings could also be converted to house daytime activities (e.g., for businesses, public/community functions). Maintenance of vacant properties, including ventilation, heating, and fire and mold prevention, is critical to protect public investments and mitigate risks.
- **Clarity of rules and principles.** Housing policies should provide clarity on interim occupancy conditions, maintenance responsibilities, and potential phased reengagement mechanisms. There is a need to clarify the scope and principles of the buyback program, as well as the timing of the purchase-back option (currently in place until March 1, 2027), to ensure that people have sufficient time to make informed decisions.
- **Review of current arrangements.** The extraordinary housing interventions through Þórkatla were adopted during the emergency phase to ensure full alignment with public-purpose objectives. In some countries, governance of housing programs was left to the management of a public-purpose nongovernmental organization with a mission to ensure the safe transition of the community back into town, closely aligned with broader objectives of the recovery framework. This option could reduce the pressure for cost recovery of the initial investment in the purchase program, and would put the focus on the safety and well-being of the community. See an example in Box 23.

Box 23. Housing Compensation and Buyout Programs: Hurricane Katrina (USA)

Following **Hurricane Katrina**, which occurred in 2005 and damaged over 800,000 homes, the United States implemented the Road Home Program, providing compensation based on pre-disaster property values. This enabled homeowners to rebuild or relocate, while voluntary buyouts in high-risk areas allowed governments to convert land to open space and reduce future exposure. For Grindavík, this example illustrates how transparent compensation mechanisms and property acquisition programs can support household decision-making and long-term risk reduction. Iceland’s Þórkatla program reflects a similar approach, highlighting the importance of clear valuation methods, efficient administration, and consistent communication to maintain public trust. However, Katrina was a

⁵² The discussion of housing solutions and the role of Þórkatla reflects an analytical perspective on recovery pathways under prolonged uncertainty. It is not a legal, financial, or operational assessment of Þórkatla, nor does it imply a recommendation to alter its mandate or governance outside applicable law. The analysis highlights policy considerations and trade-offs observed in comparable international contexts and through consultations, recognizing that final decisions on housing arrangements, buy-back mechanisms, and institutional design require further legal review, fiscal analysis, and structured engagement with affected residents and authorities.

sudden flood event followed by reconstruction under improved protection systems, whereas Grindavík faces ongoing and uncertain hazard conditions, complicating decisions around permanent rebuilding and land use.

Education

- **Safe and resilient schools.** Schools anchor permanent family settlement, but prematurely reopening schools creates political and logistical path dependency, and international experience shows repeated evacuation of children causes long-term harm. For example, experience of Plymouth (Montserrat) shows that when families and children are resettled prematurely, subsequent evacuations, even if they are victimless, cause great psychological trauma as noted above. Reopening of schools connects with the resettlement of families and should be based on an acceptable level of risk for children, young adults and their families.

Critical infrastructure and economic activities

Key takeaways:

Use recovery as an opportunity to revitalize the economy and strengthen resilience of critical services and infrastructure

Rebuild resilient critical infrastructure and utilities

- Apply build back better principles and performance standards
- Strengthen redundancy in essential services (dual power lines, backup water, parallel communications)
- Consider establishing temporary service hubs in safer northern areas

Stabilize the existing economic base

- Support essential industries, especially fisheries
- Maintain critical utilities: power, heating, water, communications, and road access

Enable safe workforce re-entry and job recovery

- Support viable businesses through financial tools
- Implement phased, risk-based workforce re-entry
- Establish retraining programs, innovation hubs, etc.

Revitalize the economy and diversify for long-term resilience

- Develop geo-heritage and volcanic tourism
- Link Grindavík to regional tourism
- Promote SMEs, geothermal innovation, remote work/creative enterprises
- Strengthen resilience through SME diversification and value-chain development

Promote resilience of people and services

- Continue investing in preparedness, drills, continuity planning (languages) across businesses; share good practice
- Integrate risk-based tourism management with clear visitor communication
- Use routing, signage, and crowd management aligned with alert levels

The recovery process provides a unique opportunity to strengthen resilience of critical services and infrastructure in a systematic manner, and to lay the foundations for more sustainable and diversified

economic activity in Grindavík and the broader Reykjanes region. Realizing these opportunities, however, depends on resolving key constraints and establishing clear, credible long-term policy signals that support investment under conditions of ongoing uncertainty. Recovery pathways must address not only physical reconstruction and safety, but also the conditions required for the sustainable return or adaptation of economically strategic activities under evolving risk conditions.

Resilient infrastructure and services

Although housing and critical infrastructure in Iceland are generally resilient and designed with hazard exposure in mind, the current crisis has revealed areas where additional strengthening may be required to support economic recovery under sustained risk. Such strengthening is relevant for immediate actions and investments as well as medium- to long-term efforts.

- **Invest in immediate safety and stabilization.** The 3.9 km crack-filling project and fencing of high-risk zones should be completed. Continued maintenance of these investments will need to be assured, including responsibilities and funding allocation.
- **Apply build back better principles and performance standards.** While access to power, heating, water, communications, and roads was quickly restored, the resilience and redundancy of essential services and utilities must be strengthened going forward. The functioning of economically critical systems and general economic activity depends on infrastructure's physical robustness and its ability to operate reliably during periods of heightened hazard activity. Any remaining gaps in resilience can have economic effects by disrupting business operations and also undermining existing recovery efforts. Select opportunities may include investments in power lines, geothermal energy distribution, heating, backup freshwater water (in Vatnsheiði), and parallel communications). It may be possible to connect Grindavík to the electric power grid; this would need to be coordinated across different actors including HS Orka, Landsnet and HS Veitur. Another option is to add permanent backup power generators for the port area and the Vatnsheiði water source project (estimated at ISK 350 million or about €2.4 million) to ensure cold water security, may also be an option. Other efforts may include establishing temporary service hubs in safer northern areas with dual purpose such as providing dual infrastructure sites housing redundant systems such as power, water, and communications to guarantee the continuity of essential services, while functioning as service centers that support long-term community stabilization by providing office space for municipal operations. Box 24 provides highlights from international experience.

Box 24. Resilient Infrastructure: Lessons from Chile, Japan, and New Zealand

Post-eruption recovery in volcanic regions such as **Villarrica (Chile)**, as well as in **Japan and New Zealand**, emphasizes hardened and redundant infrastructure systems designed to withstand repeated hazards. This approach includes reinforcing transport networks, rerouting utilities away from high-risk corridors, and building multiple supply pathways to maintain connectivity and emergency access during disruptions. For Grindavík, this highlights an opportunity to strengthen infrastructure resilience through redundancy and flexibility, such as duplicating utility corridors, decentralizing energy and heating systems, and enabling rapid repair of critical roads. However, the uncertainty and variability of fissure-based hazards mean that even reinforced systems may remain exposed. This situation requires careful prioritization of investments and acceptance of residual risk.

Economic activities

- **Understand needs.** Just as for the social dimension, collecting relevant information about business needs and preferences is important. Regular business surveys and consultations should be conducted with a range of different economic actors, from small and medium-size to larger companies. This information can feed into overall recovery planning as well as sector-specific policy priorities, design of support programs, and revitalization planning.
- **Engage with economic actors.** In line with the key recovery principles, the effectiveness of the economic recovery process depends on the effective engagement of the private sector in recovery coordination and planning arrangements. Many critical services are privately provided, and their continuity relies on timely access to risk information, clear communication of operating conditions, and alignment with public recovery frameworks. Ensuring that private sector actors are included and represented in recovery planning processes and have access to up-to-date hazard information will be important for restoring economic activity and supporting longer-term adaptation, as well as helping to reduce uncertainty, improve preparedness, and support more-informed business decisions.
- **Stabilize the existing economic base.** Both central government and the Town Council should coordinate efforts to ensure an active job and business market is sustained in Grindavík in the years ahead. Viable essential industries for Grindavík and the surrounding areas, such as fisheries, could be supported through dedicated programs. These programs should reflect the needs and profiles of businesses, as well as the specific risk profile in Grindavík and the surrounding area. Such programs might offer incentives or compensation for firms that remained operational during the crisis; or provide tax relief or moratoria reflecting reduced asset values and elevated risk; or potentially designate the affected area as a special economic zone with tailored fiscal, financial, and potentially specific insurance products. Businesses that continued operating through the crisis effectively provided a public good by safeguarding employment, services, and social stability. Policy frameworks should recognize and reward this contribution rather than inadvertently penalizing firms for staying open.
- **Enable safe workforce reentry.** Workforce reentry or scaling up should follow broad recovery framework principles, including acceptable levels of risk—e.g., permit only adults to stay overnight, under specific conditions (certain alert level, zones, etc.). Phased workforce reentry could be gradual, transparent, and risk-based, prioritizing essential infrastructure personnel and critical services. Clear communication of entry conditions, employer duty-of-care requirements, and insurance coverage expectations will reduce liability uncertainty and enable informed decisions by firms and workers. Phased reentry should be aligned with acceptable risk levels and broader recovery rules.
- **Revitalize the economy by diversifying and building long-term resilience.** Resolving insurance and financing constraints—particularly the lack of financing for new investments and resilience upgrades—is necessary to restore business confidence and enable medium-term planning and investment. Looking ahead, longer-term economic resilience in Grindavík will depend on the capacity to adapt and, where feasible, diversify economic activity under evolving risk conditions. While fisheries remain central to the local and national economy, resilience may be strengthened through deeper integration along the fisheries value chain, environmentally safeguarded aquaculture expansion, adaptive tourism models, and broader SME diversification. Retraining programs,

innovation hubs, geothermal innovation, SMEs, and remote work/creative enterprises could be part of the mix of measures adopted. Tourism represents a significant opportunity, particularly through geothermal and volcanic geoheritage tourism, and linking Grindavík more closely to regional tourism could open new economic opportunities. In the long term, strengthening diversification and value-chain development of SMEs could support the resilience of the area (see Box 25). Over time, workforce training and skills development in these sectors could help reinforce economic viability and reduce vulnerability to future shocks.

Box 25. Economic diversification and relocation: Lessons from Montserrat and Japan

Experiences from Montserrat and Sakurajima (Japan) show how volcanic regions can adapt to prolonged disruption through re-siting of services and infrastructure and economic diversification, particularly through geotourism and strategic relocation of services to safer areas. In Montserrat, government services and infrastructure were permanently relocated to safer zones, while a new port and town were developed to anchor economic activity. In Sakurajima, authorities integrated volcano tourism into the regional economy through managed access systems, including designated viewing areas, transport routes, and real-time risk controls that allow safe, continuous operation despite ongoing activity. These approaches combine hazard management with economic adaptation, creating new opportunities while reducing exposure. For Grindavík, such approaches offer an opportunity to support phased recovery and diversification, including temporary relocation of services, development of geoheritage tourism, and integration with regional attractions, with clearly defined access points and safety protocols. However, such transitions require sustained investment, strong coordination, and careful management of safety and visitor access.

- **Promote resilient tourism with value for the local population.** Tourism requires specific attention as part of Grindavík's recovery, and there is an opportunity to integrate risk-based tourism management with clear visitor communication, using routing, signage, and crowd management aligned with alert levels. Protecting visitor safety while preserving Iceland's international reputation requires careful integration of hazard communication into tourism operations. Furthermore, managing the scale of tourism is critical to protect local resources, culture, and quality of life and to ensure a sustainable balance between economic development and local well-being in the long term (Box 26).
- **Adopt a regional approach.** More broadly, there may be an opportunity to adopt a regional, integrated approach grounded in a hub-and-spoke model, which would concentrate major investments in strategic hubs while generating spillover benefits through complementary interventions in surrounding municipalities. This model would involve an integrated approach to tourism development focusing on infrastructure, urban regeneration, geoheritage, skills development, and the enabling environment for private sector investment, with Grindavík functioning as a central hub connected to secondary spoke destinations. Infrastructure upgrades across sectors, including roads, water supply, geoheritage sites, and tourism facilities, could support local economic activity by attracting domestic and international visitors and enabling controlled, safe access that spurs economic activity in Grindavík and the wider Reykjanes Peninsula.
- **Promote resilience of people and services.** Like the broader society, the business community needs to continue investing in preparedness, drills, continuity planning (languages) across businesses, and share good practice. Linking preparedness measures, such as business continuity plans, to alert levels and evacuation protocols can help reduce disruption and support more predictable operating

conditions for firms. It is noted that utilities and service providers have established continuity plans, and these need to be in place across businesses of all sizes. Maintaining economic functionality under evolving risk conditions may require sustained investment in redundancy, business continuity planning, and the systematic monitoring of infrastructure resilience and performance over time.

Box 26. Experience from Mount Unzen – Relocation, Hazard Mitigation, and Recovery

The 1990–1996 eruptions of **Mount Unzen in Nagasaki Prefecture, Kyushu**, produced devastating pyroclastic flows and debris flows that killed 44 people, including volcanologists and journalists, destroyed hundreds of homes, and forced the long-term evacuation of communities in the Shimabara area. Recovery combined several approaches: the relocation of affected residents to planned housing developments in safer areas, the various works to manage the future volcanic risks, including check dams and improvement of transport infrastructure including the Shimabara Road to support both emergency access and economic recovery. As part of the longer-term recovery strategy, the region developed the Mount Unzen Disaster Memorial Hall, a museum and disaster education facility built at the edge of the lava dome, which preserved the lessons of the eruption and established disaster education and geotourism as pillars of the local economy. The memorial hall has attracted significant number of visitors and become an important part of Shimabara's recovery identity. The Unzen case illustrates the potential of combining physical relocation, engineered hazard mitigation, and disaster heritage and geotourism in a volcanic recovery strategy. The investment in disaster education infrastructure has provided a sustained economic return while creating a community asset around the memory of the eruption.

ANNEXES

Annex 1. Review of international experience

*This annex provides a summary of the key cases reviewed as part of the analysis. It identifies the type of event, the principal lessons from each case, and the most relevant application for Grindavík's recovery, alongside limitations to bear in mind when drawing on each example. **An extended version of this Annex is provided separately.***

Table 4. Summary table of international experience

Case/ framework	Type of event	Key lessons	Relevance for Grindavík	Key limitations
UN Priority Areas (2025)	Global framework	Ten governance priorities for recovery readiness: institutional capacity, financing, community leadership, M&E	Example of a governance checklist for structuring Iceland's recovery architecture; community engagement can be particularly relevant	Conceptual framework that needs adapting to country/local context
GFDRR Disaster Recovery Framework (World Bank, 2020)	Global framework	Comprehensive structure: recovery policy, institutional roles, sector roadmaps, financing, M&E, communication	Example of a structure for multi-sector recovery spanning housing, infrastructure, livelihoods; “build back better” approach	Designed for large-scale national disasters; may require adaptation for localized context
US–Hurricane Katrina	Flood / hurricane	Road Home Program: pre-disaster value compensation; voluntary buyouts in high-risk areas converted to open space	Example of housing support. Relevant to Iceland's Þórkatla property acquisition approach; lessons on transparent valuation and administrative efficiency	Flood disaster with restored settlement; differs from ongoing volcanic/geophysical uncertainty in Grindavík
US–Hurricane Sandy	Flood / hurricane	'Rebuild by Design': competitive multi-disciplinary process integrating science, engineering and community input	Example of structured expert-community collaboration in recovery planning; relevant for innovative infrastructure solutions	Large metropolitan context with federal resources and coastal flood focus; different scale and hazard type
US–Hawai'i (Kīlauea)	Volcanic (lava flows)	Lava Hazard Zone system integrated into county planning; Volcanic High Hazard Area overlays guide rebuilding decisions	Example how hazard mapping can directly inform land-use and recovery planning; model for adaptive updates	Centralized volcanic system easier to map; Reykjanes fissure system creates greater hazard complexity
Spain–La Palma, Canary Islands (2021)	Volcanic eruption	Regulatory compensation framework ('Volcano Law'); modular temporary housing; CO ₂ monitoring network; phased recovery zones	Example of compensation governance, temporary housing models, monitoring systems, phased return zones	Single eruptive system vs. distributed Reykjanes fissures; delays in agricultural/secondary home compensation reveal risks
Caribbean–Montserrat	Volcanic (long-duration)	Long-duration crisis management; permanent exclusion zone; large-scale emigration; ongoing	Example for caution on prolonged displacement: loss of critical population mass; risk of permanent depopulation if recovery is slow	More extreme scale of destruction and permanent hazard; different community

Case/ framework	Type of event	Key lessons	Relevance for Grindavík	Key limitations
		scientific monitoring (MVO)		size and governance context
New Zealand–Christchurch (2011)	Earthquake	Red zone land acquisition at pre-disaster values; private insurance-led model; community-centered recovery strategy	Example of housing reconstruction; lessons on valuation freezing, community participation in strategy development, and community identity in return decisions	Earthquake, not volcanic; national insurance burden limits replicability; red zone eliminated downtown, affecting nearby values
Japan–Miyakejima (2000)	Volcanic (gas hazard)	Full 5-year evacuation; conditional return with 24/7 gas monitoring, defined thresholds, alert systems, restricted zones	Example of conditional reoccupation under ongoing volcanic risk with transparent monitoring protocols	Island setting enables full control; distributed fissure eruptions in Reykjanes create different access management challenges
Japan–Mount Unzen (1990–1996)	Volcanic (pyroclastic)	Relocation to safer areas; engineered hazard mitigation (check dams); disaster education and memorial tourism	Example with combination of relocation, engineering mitigation and disaster heritage tourism; relevant to Grindavík's economic repurposing	Single-system volcano; significant Japanese institutional capacity; less directly replicable to Icelandic context
Japan–Great East Japan Earthquake	Earthquake / tsunami	Community-based collective relocation (37,000 homes); original sites converted; fisheries recovery; entrepreneurship support	Example of community-based relocation model; fisheries recovery instruments relevant to Grindavík's fishing industry	Earthquake/tsunami context; large national program with different governance; prolonged relocation risks demographic loss
Türkiye–Post-2023 earthquakes	Earthquake	Risk zoning laws (risky buildings, risky areas, reserve areas); microzonation across 200,000 ha; ministry-led transformation	Example of legal zoning and risk categorization framework for reconstruction governance; may inform Iceland's spatial planning approach	Earthquake context with different hazard dynamics; large-scale national system requiring significant legal infrastructure
Cabo Verde–Fogo (2014–2015)	Volcanic eruption	“Light footprint” approach: restricted permanent housing in caldera; relocation to safer sites; disaster/volcano tourism	Example of risk-tiered land use model; volcano tourism as economic recovery tool; relevant to Grindavík's tourism future	Small island developing state with limited resources; different governance and economic context
Indonesia–Mount Merapi/Sulawesi	Volcanic / earthquake	Community-based rehabilitation (Rekompak model); zone-based relocation; retraining for displaced populations	Example of community-driven reconstruction approach; zone-based relocation planning relevant to Grindavík spatial strategy	Very different scale, governance and fiscal context; limited direct transferability of mechanisms
Italy–Campi Flegrei/Phlegraean Fields	Volcanic (bradyseism)	EIB €1.4 billion loan for building reinforcement; INGV monitoring; community exercises (Exe Flegrei 2025)	Example of managing long-duration volcanic crisis in a European urban context; monitoring and community preparedness model	Densely populated urban context; ongoing ground uplift rather than eruptive fissure scenario
Greece–Santorini	Seismic/volcanic unrest	Tourism communications during seismic unrest;	Example of model for managing tourism and public perception	No major eruptions occurred; limited

Case/ framework	Type of event	Key lessons	Relevance for Grindavík	Key limitations
(2024– 2025)		rapid return to normality after subsidence; risk perception management	during volcanic unrest; importance of proactive, calibrated communication	direct reconstruction lessons; tourism-focused island differs from fishing community
Italy– L'Aquila (2009)	Earthquake	Gap between expert probabilistic assessment and simplified public messaging produced false reassurance; eroded institutional trust; highlighted need for clear protocols separating scientific advisers from political communicators	Example of critical lesson for science-public communication under uncertainty; framework for maintaining honest messaging throughout the Reykjanes volcanic crisis	Earthquake not volcanic; Iceland has stronger science-public trust traditions; core communication lesson applies regardless of hazard type
Iceland – Catastrophic events (1973-2020) Vestmann Islands (1973), Súðavík (1995), Eyjafjallajökull (2010)	Volcanic eruptions, earthquakes, avalanches, landslide	Sector-specific preparedness gaps for financial and social/psychological support; strong social capital a key coping resource; development in legislation and avalanche hazard assessment framework and zoning as well as catastrophe funding and hazard awareness	Example of sector-specific livelihood support for fishing; reimbursement of property; flexible access; prolonged residential displacement in the Vestmann Islands; joint restoration programs—i.e., Austurbrú; volcanic events boosted tourism	All events shorter and less destructive than Reykjanes crisis; little or no prolonged residential displacement
Cross-cutting: Social and Psychosocial Dimensions	Cross-cutting theme	Prolonged displacement causes mental health impacts; identity and place attachment shape return decisions more than finances; social capital is key recovery resource; inclusive outreach essential	Example for integration of psychosocial and mental health support from early recovery; community participation in planning; support networks in displacement; equity monitoring across all programs	Derived from multiple cases; program design requires tailoring to Grindavík community characteristics

Note: EIB = European Investment Bank; GFDRR = Global Facility for Disaster Reduction and Recovery; INGV = National Institute of Geophysics and Volcanology; M&E = monitoring and evaluation; MHPSS = mental health and psychosocial support; MVO = Montserrat Volcano Observatory.

Annex 2. Volcanic and seismic hazard in Iceland

This annex provides additional information on volcanic and seismic hazard in Iceland. It complements the section entitled “Iceland country risk profile.”.

Volcanic hazard

Post-glacial volcanic activity is confined to neo-volcanic zones 15–50 km wide, belts of active faulting and volcanism containing at least 30 volcanic systems and covering approximately one-third of Iceland (Figure 6a). One volcanic system may consist of one or more so-called central volcanoes, which may be linked through the subsurface structure. Some volcanic systems consist of a single central volcano (e.g., Öraefajökull), while others have a fissure swarm and no central volcano (e.g., Reykjanes). However, many volcanic systems have both (e.g., Hekla, Katla, Grímsvötn). Eruptions may take place in the central volcano and/or on the fissure. For example, the effusive Laki eruption in 1783–1784 and the highly ash-rich 2011 Grímsvötn eruption were sourced from the same volcanic system but different parts of it. Approximately 80 percent of all Holocene eruptions and 60 percent of the erupted magma have been produced in the East Volcanic Zone; the Reykjanes Volcanic Belt, where Grindavík is located, was traditionally thought to have the lowest productivity of the main volcanic zones (Figure 5a) (Thordarson and Höskuldsson 2008). The most frequently active volcanoes in recent decades have been Grímsvötn and Hekla.

Volcanism in Iceland displays a wide spectrum of behavior, encompassing nearly all recognized eruption magnitudes, styles, durations, magma compositions, and eruptive products. Eruptions range from Volcanic Explosivity Index (VEI) 0 to 6, with about 10 percent of all eruptions VEI ≥ 4 . Activity is relatively frequent, averaging every three to five years. It has been suggested that frequency of activity goes through cycles, and that a more active interval may be starting. Eruptions can be purely explosive or effusive or a mixture of both. The most commonly occurring eruptions are small in volume (less than 0.1 km³ Dense Rock Equivalent, DRE). In contrast, major flood-basalt events exceeding 10 km³ DRE are rare, with repose intervals on the order of 500–1,000 years. The most powerful explosive eruptions have reached VEI 6; these have occurred approximately once or twice per millennium, with the latest such event recorded in 1362 CE. Comprehensive monitoring is undertaken at historically active volcanoes in Iceland.

The principal volcanic hazards in Iceland include *jökulhlaup* (glacial outburst floods triggered by subglacial eruptions); tephra fall, with associated contamination of air and grazing land and the potential for infrastructural and structural damage; and volcanic gases and aerosols. Tephra and gas can travel outside Iceland and affect countries across Europe. During the 2010 explosive eruption of Eyjafjallajökull, airborne tephra caused the greatest aviation disruption since World War II. The 1783–1784 Laki fissure eruption released large volumes of volcanic gases that caused severe weather, widespread livestock loss and crop failure, and ultimately the deaths of 20–25 percent of Iceland’s population, contributing to a “volcanic winter”. Lava flow and volcano seismic damage are generally limited unless eruptions occur near populated areas, as in Grindavík. Pyroclastic density currents and volcanic tsunamis have been documented, though their impacts are typically restricted to infrequent, large-scale eruptions.

Two eruption scenarios have been suggested to pose the greatest risk (Brown et al. 2015). The first was prolonged, high-volume effusive eruptions similar to the 1783–1784 Laki event, which persists for weeks

or months and generates extensive gas and aerosol pollution affecting both Iceland and the wider Northern Hemisphere. The second is a large explosive eruption of VEI 6 magnitude occurring close to inhabited areas, such as the 1362 eruption of Öräfajökull, capable of producing pyroclastic density currents and heavy tephra deposition.

Seismic hazard

Iceland is characterized by a high earthquake hazard level, fundamentally driven by its location on the Mid-Atlantic Ridge. This seismic hazard is predominantly concentrated in the South Iceland Seismic Zone (SISZ) in the south and the Tjörnes Fracture Zone in the north (Figure 6a, b), both of which have produced the country's largest earthquakes.

Possibly the strongest earthquake in historic times is the 1784 earthquake in the SISZ, which caused severe damage to farmhouses in the area and killed three people. Based on the damage zone and comparison with instrumental magnitudes of more recent events, this earthquake has been assessed at 7.2 (Ambraseys and Sigbjörnsson, 2000). More recent significant events include the pair of June 2000 magnitude 6.6 South Iceland earthquakes, the 2008 magnitude 6.3 Ölfus earthquake, the magnitude 7.5 South Iceland earthquake in 1912, and the 1896 Southland magnitude 6.5–6.9 earthquake sequence. All of these caused substantial structural damage in the southern lowlands, displacing people but resulting in no fatalities. The replacement cost of earthquakes in South Iceland rising to about $\frac{3}{4}$ (73 percent) of the total replacement cost for earthquakes for the years 1987-2025 based on NTÍ data, which is about 59 percent of the average annual loss for all natural hazards in the above period. The loss in 2000 and 2008 amounting to 59 percent of the total cost of earthquakes in South Iceland in 1987-2025.

A third critical hazard area is the Reykjanes Peninsula, where the Mid-Atlantic Ridge comes ashore near Reykjavík and Grindavík. This region hosts frequent earthquakes of mixed tectonic and volcanic origin, a characteristic that has been prominently displayed during the ongoing Reykjanes unrest that began in 2019. While large rifting events such as the one on November 10, 2023, release significant crustal tension, persistent seismic unrest remains a primary hazard driver as magma intrusions continue to displace ground and affect infrastructure stability. The replacement cost of earthquakes in Reykjanes 2019-2025 being a little more than $\frac{1}{4}$ (little less than 27 percent) of the total replacement cost for earthquakes for the years 1987-2025 based on NTÍ data, which is about 22 percent of the average annual loss for all natural hazards in the above period. The loss of the last 7 years shows that about 99.9 percent of the losses was due to earthquakes in Reykjanes in the period between 1987 and 2025.

Annex 3. Analytical summary: Social dimensions of the Grindavík displacement

*This annex provides additional information on analytics conducted as part of the report preparation and aims to support consultations on social dimensions. It provides an example of how analytics—in this case, understanding the different groups within the displaced population, their motivations to return or not return to Grindavík, and the evolving demographic composition of the town itself—can support decision-making on policies, targeting, and effectiveness of recovery programs. **An extended version of this Annex is provided separately.***

Context. The analysis examines household survey data collected from former Grindavík residents (commissioned by GEC and conducted by the private company Maskina); the most recent data wave was in December 2025 (N = 1,470). The survey data are supplemented by national population register data covering all 3,863 individuals registered in Grindavík across three annual snapshots (November 2023, 2024, and 2025). A technical session was held to present and discuss the findings with several stakeholders. The following summarizes the analytical approach presented.

Data source. The analysis draws on two complementary data sources. The first is a household survey of former Grindavík residents capturing intentions to return or not return to the town, alongside detailed information on housing status, employment, social ties, mobility, health, and support received. The analysis uses raw survey data, with limited visibility into any prior third-party processing beyond what is available in the data set. The second is the Icelandic national population register, which provides an administrative record of all individuals registered in Grindavík before and after the evacuation, including newcomers who arrived after the disaster and who are not captured by the survey.

Analytical objectives. The session presented analysis organized around three core objectives: first, to develop a descriptive understanding of residents' intentions to return or not return and the main stated reasons behind those choices; second, to identify distinct population groups with systematically different characteristics and return intentions, with a view to informing more targeted policy and recovery interventions; and third, to characterize the demographic composition of Grindavík's current registered population, including newcomers with no pre-evacuation ties to the community, in order to understand what kind of community potential returnees would actually be returning to.

Methodology and Key Findings

Step 1. Descriptive analysis of return intentions. The analysis began with an examination of self-reported return intentions and the key factors motivating or discouraging return. The proportion of respondents intending to return was 14 percent, not to return was 60 percent, and undecided was 17 percent, with an additional 9 percent who had already moved back. Among intenders, three-quarters cited an emotional reason, "simply wanting to live in Grindavík," as the primary driver, reflecting strong place attachment. Among non-intenders, 63 percent cited "uncertainty about when eruptions will end" as the dominant barrier, reflecting cognitive threat appraisal. This stage established that the forces for and against return are qualitatively asymmetric: return is driven by affective attachment to place, while non-return is driven by risk perception. Secondary barriers included children having settled at the new location (35 percent), uncertainty about basic services (36 percent), concerns about what the community will be like (35 percent), and not expecting relatives or friends to return (31 percent).

Step 2. Push-pull-mooring regression analysis. To test which factors statistically predict return intention, the analysis applied a push-pull-mooring (PPM) theoretical framework using multinomial logistic regression (N = 1,153). Push factors refer to negative conditions in current displacement locations, such as poor community adaptation and weak social ties. Pull factors refer to attractions toward Grindavík, primarily place attachment operationalized as pre-evacuation social network strength. Mooring factors refer to structural constraints affecting mobility, such as housing tenure, employment status, presence of children, and number of relocations. Four predictors emerged as consistently significant: poor community adaptation in the current location was the single strongest predictor of return intention (odds ratio [OR] = 1.83); stronger pre-evacuation social networks significantly increased the odds of intending return (OR = 1.70); renters were approximately 60 percent less likely than homeowners to intend return (OR = 0.38); and those who were never employed were roughly 56 percent less likely to intend return (OR = 0.44).

Step 3. Latent class analysis (LCA). To move beyond population averages, the analysis applied latent class analysis (LCA), a statistical clustering method that identifies unobserved groups within a population based on response patterns across multiple variables. Variables were drawn from four domains: housing and support (ownership versus renting, types of public support received, number of relocations since evacuation); social ties and community adaptation (changes in social networks, community belonging, and social activity participation); employment and family situation (job loss or change, employment stability, presence of children); and health (self-reported changes in physical and mental well-being). Crucially, return intention was not included as an input to the clustering—it was held out as an external validation variable. The LCA identified five distinct population groups, each with different socioeconomic profiles and markedly different propensities to return:

- **Adapted elsewhere** (12 percent): best health and community adaptation; lowest return intention.
- **Struggling, want to return** (29 percent): worst health, weakest social ties, and poorest adaptation; highest return intention.
- **Homeowners with families** (29 percent): structurally anchored through property and children; moderate return intention.
- **Career changers, no children** (19 percent): changed employment, no children; moderate return intention.
- **Renters, highly supported** (10 percent): dependent on institutional housing support; moderate return intention.

Step 4. Population register analysis of newcomers. A supplementary analysis used the national population register to examine who has actually moved into Grindavík since the evacuation. By November 2025, 124 newcomers, individuals with no pre-evacuation registration in Grindavík, were registered in the town, constituting 13.6 percent of the remaining population (910 total, down from approximately 3,668 pre-evacuation). Their demographic profile diverges from the pre-evacuation community: 74 percent are foreign nationals (predominantly Polish, Lithuanian, and Spanish), 67 percent are male, 86 percent are working age (18–59), and virtually all arrived as single individuals (family unit size of 1). This finding is directly relevant to the 35 percent of non-intenders who cited "do not know what community will be like": the Grindavík that potential returnees would move back to is not demographically equivalent to the community they left.

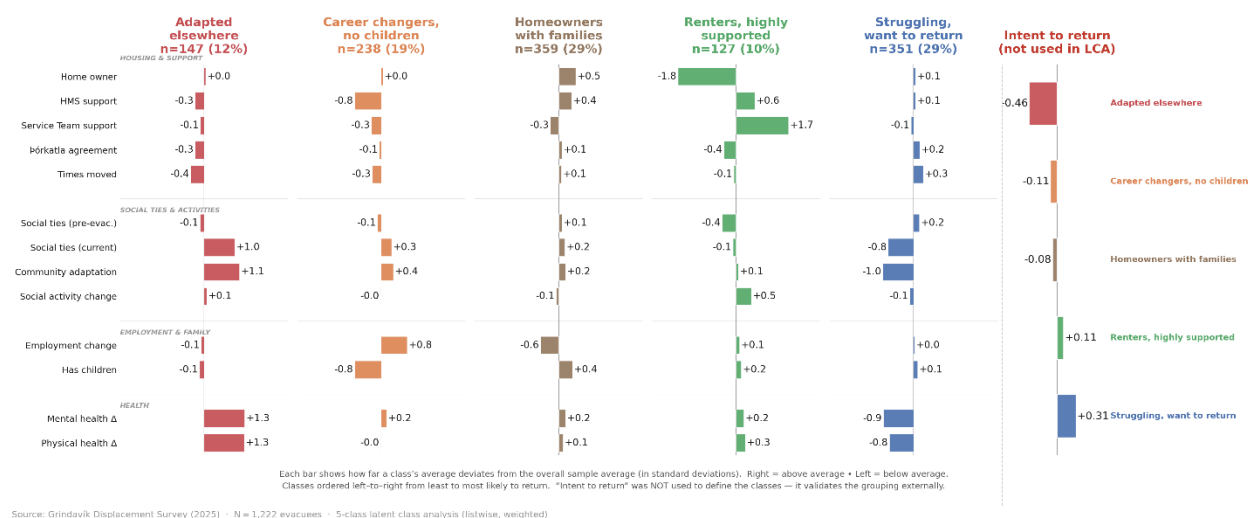
Select observations:

- Most surveyed residents do not plan to return.
- The forces for and against return are qualitatively different.
- The displaced population is not homogeneous
- The analysis reveals a displacement paradox: those who have adapted best to life elsewhere are least inclined to return, while those who suffer most from displacement are the most motivated to return.
- The community being "returned to" might no longer be the community that was evacuated.
- Volcanic risk communication is the most actionable lever — it addresses the single most cited barrier. Place attachment, the primary driver, cannot be manufactured at a displacement location. Communities that do return will likely be self-selected: disproportionately homeowners with strong pre-evacuation ties and poor adaptation elsewhere, a population that may carry elevated support needs.

Figure 14. Analysis of preferences of different groups among evacuees from Grindavík

Who are the five groups? LCA class profiles of Grindavík evacuees

Diverging bars show each class's deviation from the sample average across 13 indicators used in the model



Source: World Bank team.

Limitations. Several limitations should be noted. The survey is cross-sectional, capturing intentions at a single point in time; actual return behavior may differ from stated intentions. The modest explanatory power of the regression model (pseudo $R^2 = 0.08$) reflects both the skewed outcome distribution and the structural inability to include volcanic risk uncertainty, the dominant barrier, as a regression predictor, since the relevant survey question was asked only to non-intenders. The LCA class labels are researcher-imposed interpretive summaries, not inherent properties of the data. Group sizes and aggregations should be interpreted as indicative of patterns rather than exact population totals. The population register analysis uses a separate data source and identifies newcomers by the absence of a 2023 registration record; it cannot determine whether these individuals are temporary workers, permanent settlers, or something in between, and legal residence may not perfectly reflect actual habitation. The findings are intended to support policy discussion and recovery planning, not to prescribe decisions.

Annex 4. Risk assessment, risk thresholds, and their use in risk-based decision making

This annex provides additional information on how risk assessments and the development of long- and short-term risk thresholds can be used in risk-based decision-making. It provides a summary of key steps / areas to be considered in adopting such an approach. This annex can act as a guide for integrating risk-based decision-making into Grindavík's recovery and long-term planning, and for using risk-based decision-making to support a transition from Iceland's strong emergency response culture to a more structured framework for preparedness, mitigation, and restoration.

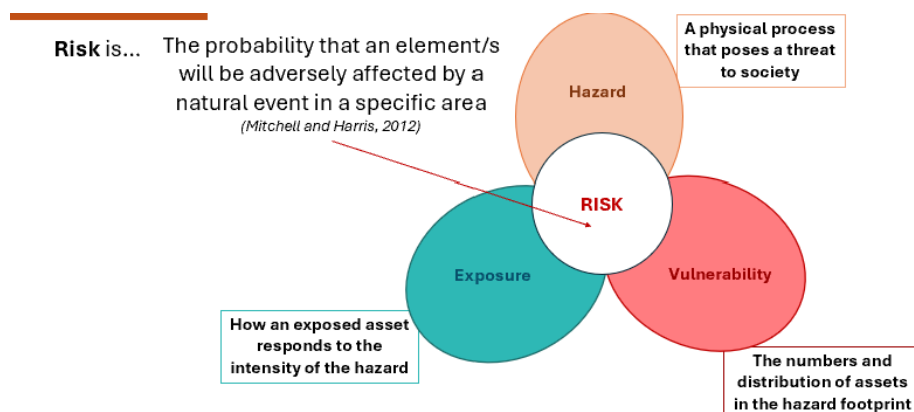
Risk assessment provides a clear understanding of hazards, exposures, vulnerabilities, and potential impacts. This understanding strengthens decision-making by making it easier to set priorities, use resources wisely, and plan ahead rather than react to each crisis. It also guides safer, more sustainable redevelopment by highlighting where rebuilding can reduce future risk, and it provides a shared base of information to support long-term, coordinated resilience efforts.

Shifting from response to planning: While Iceland possesses world-class first responders and scientific hazard assessment capabilities, a comprehensive risk assessment framework that is active during “peacetime” as well as during crises would better support planning and decision-making. Historically, it seems that formal risk assessment has been concentrated in the banking, electrical grid operability and occupational safety sectors in Iceland more than in municipal planning and crisis management.

Defining risk: Risk is a quantifiable measure of potential harm or loss and typically comprises three main elements: hazard, exposure, and vulnerability (see also the “Key terms and definitions” section).

- **Hazard** refers to the natural event itself (such as a volcanic eruption or avalanche).
- **Exposure** refers to the presence of people, property, infrastructure, and other assets in hazard-prone areas that are susceptible to potential losses.
- **Vulnerability** describes the susceptibility of exposed assets to damage or loss when subjected to a specific hazard.
- **Risk** is the quantifiable likelihood that a specific hazard will adversely affect exposed people, property, or systems. It focuses on the potential impact of such events, which includes direct physical damage and financial loss, as well as broader consequences like business disruption and the degradation of social systems and livelihoods.

Figure 15. What is risk? The main elements



Risk can be considered through several lenses:

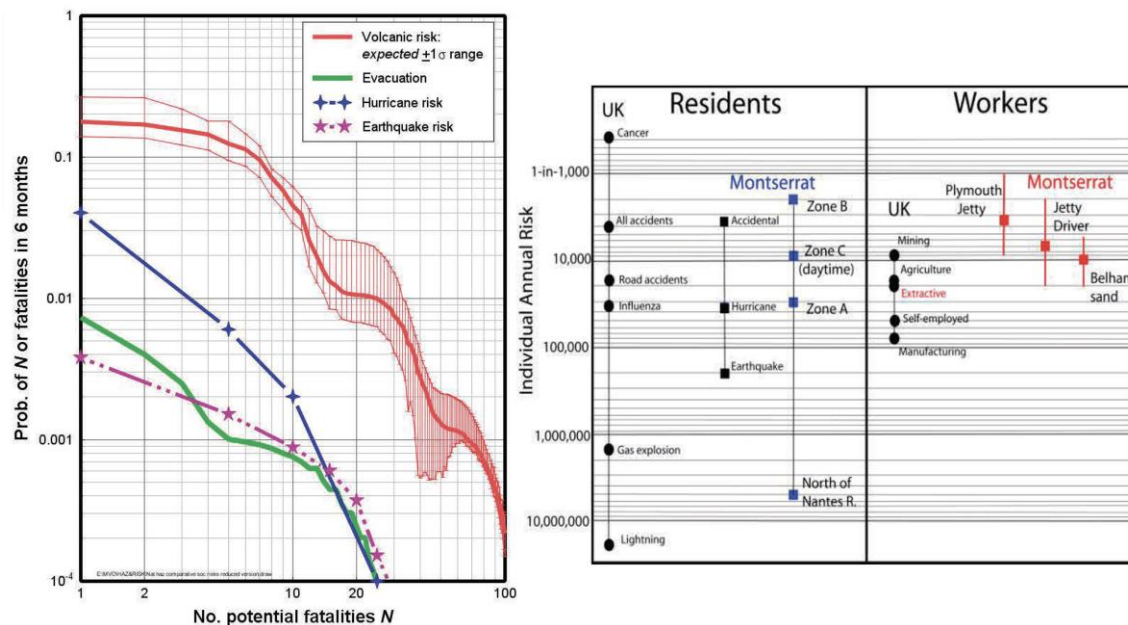
1. Individual vs. Societal risk

For people, risk can be split into two categories:

Individual risk is the probability that a specific person suffers harm. Quantitative metrics such as the annualized fatality risk have been used to guide land use and accessibility decisions for individuals conducting different activities in the UK, New Zealand (Deligne et al., 2018), Montserrat (Aspinall et al., 2015: Figure 16), and elsewhere.

Societal risk is the risk to a community as a whole, accounting for the potential for large-scale events to impact many people simultaneously. Societal risk is often visualized using frequency-number curves (F-N curves) to show the relationship between the frequency of an event and the number of fatalities it may cause (Figure 16). They help decision-makers visualize if a specific activity (e.g., tourism in a volcanic zone) falls within the acceptable level of risk. This approach has been used for the Montserrat volcanic crisis since 1995 and has been employed internationally by bodies such as the Health and Safety Executive (HSE) in Great Britain to regulate industrial and societal risks.

Figure 16. Montserrat quantitative risk assessments



Source: Aspinall et al. 2015.

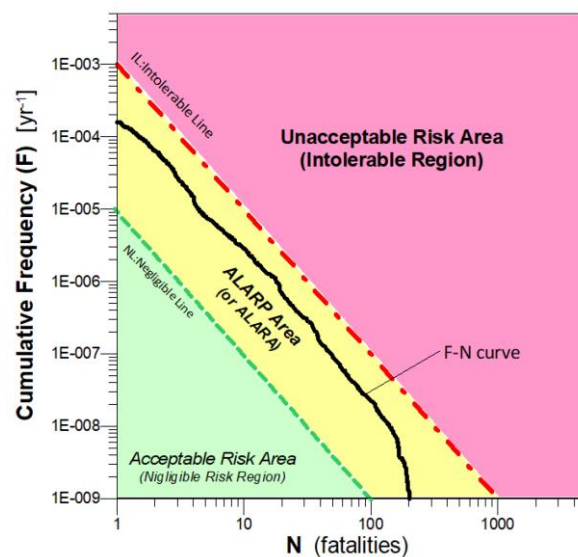
Note: At left, the figure shows societal risk F-N curve for population exposure (red, with uncertainty estimates), and the risk reduction possible if the evacuation area is extended (green), plus background hurricane (blue) and earthquake risks (mauve). At right, it shows summary plot of annualized individual risk exposures for residents and workers (latter plotted in red, with indicative uncertainties on risk estimates).

2. Acceptable levels of risk

While risk can be calculated using a purely technical approach, the level of risk that a community is willing to accept across different sectors and demographics dictates the short- and long-term management of that risk. This “acceptable level of risk” can be determined through three interconnected components:

- i. **General societal risk (long-term policy).** A national threshold for societal risk is commonly framed using the “as low as reasonably practicable” (ALARP) principle, which is particularly relevant in high-risk settings such as Iceland. Originating from UK health and safety law, the ALARP principle requires that risk reduction measures be implemented unless their cost or effort is grossly disproportionate to the safety benefit achieved. Rather than requiring the complete elimination of risk, ALARP emphasizes a balanced and proportionate approach to long-term risk management. Using this approach, risk regions are often categorized into three levels:
 - a. Unacceptable: the risk is too high and must be reduced
 - b. ALARP: Risk is acceptable only if further reduction is grossly expensive or unfeasible
 - c. Broadly acceptable: Risk is low enough to be acceptable (Figure 17).

Figure 17. Risk regions on an F-N curve



Source: Marhavilas and Koulouriotis 2021.

Notes: Schematic of the three risk regions: acceptable, ALARP (as low as reasonably practicable), and unacceptable, on a societal risk F-N (frequency-number) plot.

Applying the ALARP principle to define national thresholds for societal risk requires high-level consultation to establish the baseline level of risk that government and society are willing to tolerate. Benchmarking volcanic or seismic risk against more familiar everyday risks, such as road traffic accidents or industrial activities, can help place these hazards in context. Such comparisons support transparent decision-making and enable clearer communication of risk to the public.

- ii. **National hazard-specific standards (long-term planning).** These involve the establishment of probabilistic risk criteria tailored to individual hazards. In Iceland, this approach is exemplified by regulations defining the maximum acceptable annual individual fatality risk from avalanches that society is willing to tolerate in exposed areas. For avalanches and landslides, these limits are written into law and used to guide land-use decisions, including where permanent settlement is permitted, where protective measures must be implemented, and where relocation is required. For other hazards, comparable legally binding thresholds have yet to be established. Such non-negotiable, science-based standards provide a foundation for risk-informed spatial planning,

helping to steer long-term infrastructure development and settlement away from areas of unacceptably high hazard.

- iii. **Local operational thresholds (short-term recovery).** Local operational thresholds are intended to support short-term recovery and decision-making under conditions of elevated uncertainty and limited warning time, such as those experienced in Grindavík. These thresholds must be defined through a participatory process involving residents, businesses, emergency responders, and other relevant stakeholders. Unlike national hazard standards, operational thresholds are negotiable and activity specific. Acceptable risk thresholds should be defined separately for different sectors, i.e. the level is expected to differ between schools and commercial buildings, and for different demographics, i.e. tolerance for risk will generally be lower for children and residents than for people entering the area for economic reasons. In practice, acceptable risk is typically considered across at least four dimensions: life safety, emergency manageability, social legitimacy, and economic continuity. **Annex 5** provides insights into dialogue-based approaches that can support the definition of short-term operational risk thresholds for Grindavík.

3. *Technical and financial metrics*

In technical risk assessments, particularly in the finance and banking sectors, risk is quantified using specific metrics, and these same metrics can be applied to natural hazards to provide comparative risk assessments:

- **Average Annual Loss (AAL):** The expected loss per year averaged over a long period
- **Probable Maximum Loss (PML):** The maximum loss that is likely to happen within a specific return period
- **Cost–Benefit Ratio (CBR):** Compares the cost of a mitigation measure (e.g., protective walls, relocation, monitoring systems) to the long-term financial savings from reduced risk

Carrying out a risk assessment

The following steps are suggested steps for conducting a risk assessment for a natural hazard in Iceland, particularly within the context of the ongoing volcanic activity on the Reykjanes Peninsula:

1. *Definition of end-user needs and requirements*

A risk assessment must be driven by the specific questions decision-makers need to answer, such as whether it is safe to reopen a school or site new industrial operations. The geographic extent and scope must be specified, along with the specific hazards and metrics to be modeled, the required resolution, and the time frame for consideration. Ideally, for planning purposes, the outputs should include probabilistic (e.g., annualized fatality risk) and scenario-based "what-if" analyses.

2. *Establishment of "acceptable level of risk" thresholds*

Risk is not binary, meaning that acceptable, tolerable, and unacceptable thresholds must be defined through participatory processes that involve residents, businesses, and public institutions. Different sectors will have different risk appetites. A "protective posture" (safety first) is typically used for schools and residential areas, while an "operational posture" (continuity first) may be adopted for tourism and commercial sectors.

3. *Data collection and modeling*

Accurate assessment requires high-resolution, risk-specific data collected where hazards occur to provide a basis for accurate risk modeling. To be effective, these data should be interoperable and follow established data schemes to ensure that information can be shared and reused across different risk assessment projects. Core examples of risk-specific data include the following:

- **Geospatial layers:** For example, high-resolution digital terrain models for lava flow modelling and soil and geological data for assessing earthquake hazards.
- **Hazard intensity metrics:** Specific ground-level measurements or modelled forecasts, such as ground shaking, lava flow thickness, or gas concentrations at each building location.
- **Exposure data:** Information on the presence of people, property, and infrastructure. For urban risk, this requires data at the level of individual buildings rather than reliance on national or subnational aggregates.
- **Vulnerability and infrastructure data:** This includes databases detailing specific building characteristics (to create vulnerability curves), the layout of critical infrastructure and optional mitigation actions such as defense barriers.
- **Post-disaster impact data:** Information on location-specific damage and loss following comparable events and exposure and vulnerability contexts both in Iceland and abroad. By correlating these data with the hazard intensity metrics at the same location, more accurate vulnerability assessments can be developed.

A major challenge in modern risk assessment is that such high-resolution, ground-observed data are often insufficient or incomplete and so sustained collection efforts are required, as well as an appreciation of how the uncertainty associated with any risk assessment is affected by the data quality and quantity. Risk assessors must be transparent about their methodology, data, and any expert judgements used (e.g., input from local structural engineers on vulnerability).

4. *Calibration, validation, and uncertainty*

Before any model is used to support policy or planning decisions, it must be tested to ensure it represents real-world conditions. This typically involves at least three components:

- **Independent validation:** Test the model against datasets that were not used during development to check whether it performs reliably. Qualitative review by local experts and stakeholders not involved in building the model helps determine whether the results are realistic and suitable for decision-making.
- **Uncertainty assessment:** Identify and separate epistemic uncertainty (gaps in data or understanding) from aleatory uncertainty (natural variability in the system) and quantify each wherever possible. This helps clarify what is well-supported versus what remains uncertain.
- **Sensitivity analysis:** Examine which inputs and assumptions, such as hazard frequency, model parameters, or asset vulnerability, have the strongest influence on the final results. This highlights which factors must be treated with the most care and where improved data would most strengthen the assessment.

5. *Communication and dissemination*

Risk information is effective only if it is known, clearly understood, and straightforward to act on. Sharing data in machine-readable, interoperable formats allows agencies to reuse information across projects, reducing duplication and improving consistency. Presenting results through accessible tools, such as public dashboards, visual summaries, and regular briefings, helps translate complex scientific findings into information that people can easily interpret and use. Transparently communicating risk, risk thresholds, and uncertainties has been shown to help maintain institutional trust and psychological well-being. Dedicated and repeated dissemination and communication efforts are needed, both between agencies, and between agencies and the public.

Annex 5. Acceptable level of risk and participatory approach

*This annex provides a short overview of participatory workshop conducted as part of the report preparation intended to support a structured dialogue on defining local operational thresholds for acceptable risk to support short-term recovery. It provides an example of how participatory approaches, in this case, understanding risk tolerance / thresholds among different groups/for different activities. It is noted that the summary/workshop findings do not set policy thresholds and should not be interpreted as a final quantification of risk acceptance for Grindavík. **An extended version of this Annex is provided separately.***

Context: Icelandic practice on risk tolerability has been most clearly formalized through avalanche zoning (Regulation No. 505/2000), where annual individual fatality risk is used as an important reference point for acceptable risk. Grindavík presents a broader challenge. Under prolonged volcanic unrest, decisions are not only about the probability of death, but also about whether warning systems are reliable, whether roads remain passable, whether emergency services can respond, whether households and businesses remain viable, and whether public trust and community cohesion can be sustained. The same level of acceptable risk cannot simply be assumed for all activities: overnight residential return, school reopening, commercial and industrial operations, and tourism each involve different exposure patterns, different vulnerabilities, and different consequences when protective systems fail.

Workshop: To explore this wider decision space, a rapid participatory workshop was convened with 30 participants from 15 organizations, spanning local leadership, scientific and technical and scientific agencies, emergency and police actors, national ministries, and civil-society organizations. Participants worked in four mixed groups focused on residential return, commercial and industrial activity, tourism, and schools. The workshop was explicitly designed as a preview of a fuller acceptable-risk process, not as an exercise to set policy or define regulatory thresholds for Grindavík. A full process normally takes around two days. This shorter session was intended to familiarize stakeholders with a structured way of negotiating acceptable risk beyond a single fatality metric, using one shared scenario of continued volcanic unrest around Svartsengi introduced by IMO and assessing four dimensions of risk: people, infrastructure and services, economy, and social and governance effects.

Methodology: The exercise used a five-step acceptability scale, A1 to A5, with factor-specific descriptions for each of the 16 questions formulated across the four dimensions of risk. At one end, A1 represents the most protective position, where safety margins are high and tolerance for disruption or harm is minimal. At the other end, A5 represents the highest tolerance for risk, including conditions that would normally be considered unacceptable for most activities because they could imply severe disruption, system failure, or even mass-casualty consequences. The purpose of the exercise was not to decide where final thresholds should be set, but to make it visible where stakeholders converge, where they diverge, and which conditions they treat as least negotiable.

Findings: The following five findings stand out:

- **First,** no stakeholder group accepted high-risk outcomes. Across all 16 factors, every response remained within A1-A3; no group selected A4 or A5 for any factor. This matters because even the more continuity-oriented groups did not endorse highly permissive risk positions. The workshop

identified a bounded space for negotiations as well as no support for unrestricted operation under severe risk.

- **Second**, *warning and communications* reliability emerged as the least negotiable condition in the entire exercise. Its mean tolerability score was 1.00 corresponding to A1 on the five-level scale (1 = A1, lowest tolerance; 5 = highest tolerance) indicating unanimous placement in the most protective category. *Fatality risk* was the next key anchor, with a mean score of 1.86 and 57 percent of votes at A1, still reflecting very low tolerance. *Trust in authorities* (mean 1.60) and *emergency response capacity* (1.67) also ranked among the most influential constraints, with scores concentrated near the lowest end of the scale. Taken together, the results show that acceptable risk in Grindavík is judged not only in terms of fatalities, but also in terms of whether institutions can warn, coordinate, and respond credibly to protect the population.
- **Third**, participants distinguished clearly between protection that should be kept very strict and burden that might be managed operationally. Road access and evacuation or displacement were treated more tolerantly than warning-system failure or loss of institutional trust, suggesting that temporary disruption may be accepted if people can still be warned, moved, and supported safely. At the same time, some low-tolerance issues remained contested. Fatalities and financial risk occupied a strict but disputed space: participants agreed these factors should stay low but differed more on exactly how low acceptable thresholds should be. The greatest disagreement concerned interruption of core economic activity, psychological and social well-being, and long-term economic viability, showing where competing recovery objectives are most likely to surface.
- **Fourth**, the workshop revealed a strong sectoral divide. Schools and residential return formed a clearly protective posture: safety first, with very limited tolerance for fatalities, warning failures, weak governance, or psychosocial strain. Tourism and commercial activity formed a more operational posture: continuity first, *with* comparatively higher tolerance for disruption in order to sustain livelihoods and economic activity. Even here, however, tolerance did not extend to high-risk scenarios. The implication is that a single blanket definition of acceptable risk is unlikely to be workable. Different activities require differentiated thresholds or decision rules, because they expose different groups, depend on different services, and imply different levels of protection for vulnerable people.
- **Fifth**, the workshop findings align with the household survey of approximately 3,700 Grindavík residents evacuated in November 2023, conducted two and a half years later to assess who intends to return. The survey shows that uncertainty about when eruptions will end is the single most frequently cited barrier to return among non-intenders. The workshop helps explain why that uncertainty matters so much. Across all groups, warning and communication reliability, trust in authorities, and emergency response capacity were treated as foundational conditions. In practice, uncertainty is not only about the volcano itself; it is also about whether warning, communication, and response systems can reduce that uncertainty to a level at which households judge return to be livable. The workshop therefore reinforces the analysis of the household survey that volcanic risk communication is one of the most actionable levers available to decision-makers.

Taken together, the exercise suggests three broader implications for Grindavík.

1. **Acceptable risk needs to be approached through a multi-hazard, multi-dimensional lens** rather than through a single mortality benchmark alone; the workshop also underscored the need for a quantitative multi-hazard risk assessment that could serve as a stronger analytical foundation for such discussions in Iceland.
2. **Improved warning architecture, clearer crisis communication, and stronger inter-agency coordination** are foundational rather than secondary, because participants showed very little tolerance for failure in these systems.
3. **Future discussion of return should openly recognize that acceptable risk is likely to differ across groups and activities.** For Grindavík, the core challenge is therefore not simply whether risk is “acceptable” in the abstract, but acceptable for whom, for what activity, and under what institutional conditions.

Annex 6. List of entities consulted

1.	Prime Minister's Office (PMO)
2.	Grindavík Executive Committee (GEC)
3.	Iceland Meteorological Office (IMO)
4.	Natural Catastrophe Insurance of Iceland (NTÍ)
5.	National Police Commissioner—Civil Protection & Emergency Management
6.	National Civil Protection Agency
7.	Þórkatla (real estate company)
8.	Ministry of Finance and Economic Affairs
9.	Ministry of Foreign Affairs
10.	Ministry of Infrastructure
11.	Ministry of Education and Children
12.	Ministry of Social Housing
13.	Grindavík Municipality Administration
14.	Community Groups (inhabitants, business network, search & rescue, youth/sports)
15.	Social Support Team (GEC)
16.	Red Cross
17.	Academia (University of Iceland)
18.	Energy/electricity sector companies
19.	Blue Lagoon
20.	Fish production/farming companies
21.	Grindavík Seafood
22.	Housing contractors
23.	ÖRUGG Consulting Engineers

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