

Chile's Emergency Alert System - Sistema de Alerta de Emergencias: The Role of Mobile Network Operators in Early Warning Systems

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Executive summary

This report examines Chile's mobile-based emergency alert system, Sistema de Alerta de Emergencias (SAE), as a case study of effective mobile network operator (MNO) engagement in early warning systems (EWS).

Over the past decade, Chile's SAE has developed into a mature, coordinated EWS in which MNOs play a crucial role. Supported by strong regulation and high levels of mobile penetration, the SAE is a multi-hazard alerting mechanism that reaches populations quickly, reliably and at scale. MNOs not only disseminate alerts, but also maintain infrastructure, ensure handset compatibility, participate in daily testing and contribute to system design and upgrades.

Drawing on lessons from Chile's SAE, this report highlights 10 key considerations for effective MNO engagement in mobile-based EWS:

- 1. Robust policy and regulatory frameworks** define clear roles for MNO and EWS stakeholders, including infrastructure requirements, emergency roaming agreements and alert dissemination expectations.
- 2. Adoption of the Common Alerting Protocol (CAP)** standardises alert content and enables interoperability across government and MNO infrastructure for multi-channel alerts.
- 3. Strong stakeholder coordination** embeds MNOs in the national alert system and provides clarity for all stakeholders.
- 4. Shared public interest and ethical commitment** support the long-term participation of MNOs.
- 5. Regular testing, simulations and iterative improvements** strengthen operational reliability and system performance.
- 6. Handset homologation** ensures universal device compatibility, reducing exclusion and supporting consistent message delivery as part of MNO operations.
- 7. Infrastructure resilience** is supported through coordination on regulatory agreements such as roaming and mandated power back-ups.
- 8. Public communication and education** build public trust and help mitigate reputational risks for all stakeholders in the event of false alarms or system errors.
- 9. Inclusive design** can ensure alerts reach, and can be acted upon by, all segments of society while demonstrating the public value and social responsibility of MNOs.
- 10. Sustainable financing**, including MNO investment and potential public or blended models, can support the long-term viability of alert systems.

While Chile's SAE offers valuable insights, it is important to note that its status as a high-income country (HIC), well-developed mobile infrastructure and strong institutional governance have played a major role in creating an enabling environment. By showcasing the Chilean model, this report aims to support governments, policymakers, disaster management stakeholders, MNOs, humanitarian actors and donors seeking to enhance national early warning capabilities through effective public-private collaboration.

01 Introduction



Around the world, climate change is causing more frequent and intense natural disasters, with severe impacts on people and the ecosystems on which they depend.

Early warning systems (EWS) are cost-efficient and effective tools for providing the critical lead time necessary to protect lives and livelihoods. Countries with stronger EWS, especially ones that respond to multiple hazards (Multi-Hazard Early Warning Systems or MHEWS) experience fewer disaster-related deaths than countries with weaker systems.¹

Yet, one-third of people worldwide are not covered by an EWS, most of whom live in low-income countries (LICs) or Small Island Developing States (SIDS).² To address this, the United Nations Early Warnings for All (EW4All) initiative seeks to accelerate investment and action to ensure every person on Earth is covered by an EWS.³

Mobile network operators (MNOs) are uniquely positioned to support emergency preparedness and response. For decades, they have partnered with disaster management agencies, humanitarian organisations and other stakeholders to help safeguard lives and livelihoods. With 96% of the

global population covered by a mobile network,⁴ mobile technology presents a significant opportunity to scale the reach of EWS.

This report looks at Chile's national EWS, Sistema de Alerta de Emergencias (SAE), as a model of an effective EWS. It examines the role of MNOs in the SAE, highlighting key considerations that can maximise MNO participation in EWS globally and guide governments and other stakeholders, such as policymakers, disaster management stakeholders, MNOs, humanitarian actors and donors, in creating enabling environments for engagement.

The report begins by examining Chile's disaster risk profile and mobile connectivity landscape. It then provides an overview of the SAE and the role of MNOs within it. The report explores the SAE with respect to policy and regulation, stakeholders and coordination mechanisms, technology and infrastructure and financial models. Based on these insights, it outlines 10 key considerations for effective MNO engagement.



1 World Meteorological Organization (WMO). 2022. Early Warnings for All: The UN Global Early Warning Initiative for the Implementation of Climate Adaptation. Executive Action Plan 2023–2027. p. 56.

2 Ibid.

3 Ibid.

4 GSMA. (2024). The State of Mobile Connectivity Report 2024.

02 Methodology

This research explores how MNOs have engaged in the design and delivery of Chile's EWS, and the conditions that have enabled their participation. Research for this case study was conducted in four phases:

Phase 1: Desk-based research

The research began with a desk review of Chile's disaster risk landscape, EWS architecture, institutional governance and the role of MNOs. This provided a foundation for understanding the enabling environment and existing coordination mechanisms.

Phase 2: Stakeholder interviews

Semi-structured interviews were conducted with representatives of national and subnational government agencies, the telecommunications industry, civil society organisations (CSOs), academia and independent experts. Interviewees included the National Disaster and Prevention and Response Service (SENAPRED), the Undersecretariat of Telecommunications (SUBTEL), the National Seismology Centre, the National Forestry Corporation (CONAF) and the Chilean Meteorological Directorate, as well as MNOs (Telefónica and WOM), third-party service providers, the Chilean Red Cross and research institutions such as the Research Centre for Disaster Risk Management (CIGIDEN). Interviews were held both in person in Santiago, Chile, and online.

Phase 3: Validation workshop

An in-person workshop was held in Santiago to present and discuss preliminary findings. Participants from government, MNOs and academia validated, refined and expanded on the initial conclusions based on their expertise.

Phase 4: Analysis and government review

Interview and workshop data were analysed using a coding framework across four thematic areas: policy and regulation, stakeholders and coordination, technology and infrastructure and financial models.

 **Policy and regulation** | pg17 

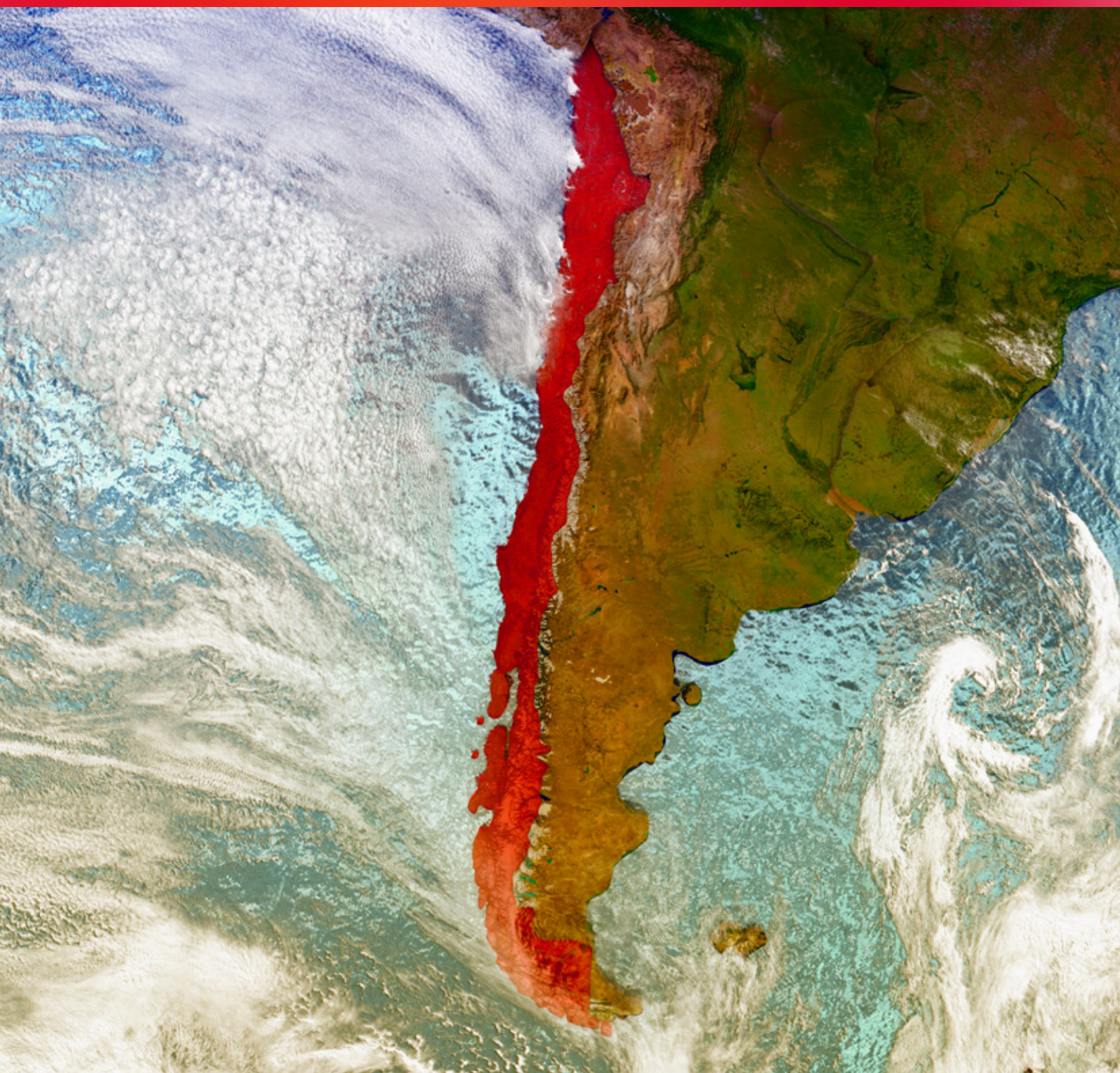
 **Stakeholders and coordination** | pg20 

 **Technology and infrastructure** | pg24 

 **Financial models** | pg31 

03

Chile's disaster risk profile



Chile ranks 39th out of 193 countries in the 2024 World Risk Index, which considers exposure to natural hazards and the vulnerability of people and systems that support resilience.⁵ Home to nearly 20 million people, Chile's level of risk represents a considerable threat.



5 Bündnis Entwicklung Hilft, Ruhr University Bochum – Institute for International Law of Peace and Conflict. (2024). [World Risk Report 2024](#).

Natural hazards

Chile's long and narrow territory covers a range of geographies and associated natural hazards, exposing its population to both extensive risk (low-severity, high-frequency events such as localised flooding or landslides) and intensive risk (high-severity, low-frequency events such as major earthquakes or volcanic eruptions).

Geological hazards

These include earthquakes, tsunamis and volcanic eruptions. Earthquakes are common due to the interaction between the Nazca and South American tectonic plates, located off the Pacific coast. Centred about 350 miles south of the capital Santiago, the 9.5 magnitude Valdivia Earthquake of 1960 was the largest ever recorded in the country, killing approximately 1,655 people and leaving 2 million homeless.⁶ The 8.5 magnitude earthquake and tsunami on 27 February 2010 (sometimes referred to as 27F) resulted in 562 deaths and an estimated USD 30 billion in damage, equivalent to 12.5% of Chile's GDP.⁷ The event triggered a greater focus on warning, evacuation and reconstruction in the country.

Volcanic activity

Volcanic activity is a major threat. Chile is the second most volcanically active country in the world, with 90 active volcanoes.⁸



Hydrological and meteorological hazards

These include drought, flooding, landslides and wildfires. Droughts have occurred multiple times over the past century (defined by a precipitation shortfall of 50%). A multi-year "mega drought" between 2010 and 2015 affected the central regions, with a 30% precipitation shortfall and the highest temperatures recorded in more than a century.⁹ Flooding affects both rivers and coastal zones and is now occurring outside the typical rainy season (April to September) due to changes in temperature, snowmelt and sea level rise.

Landslides and mudslides

Landslides and mudslides pose a high risk across the country, driven by a combination of heavy rainfall, flooding, earthquakes, volcanic eruptions, terrain, soil type and land cover. These events frequently affect rural areas, disrupting transport and isolating communities.¹⁰

Wildfires

Wildfires are becoming more frequent and severe, exacerbated by temperature increases and changing water management practices. In 2017, extensive wildfires affected nearly 1 million hectares of vegetation, compared to approximately 177,000 hectares in an average year.¹¹

Vulnerable populations

Chile's status as a high-income country (HIC) supports strong overall coping capacity, but deep socio-economic inequalities have created significant vulnerable groups.¹² These include Indigenous peoples (2.18 million identified in the 2017 census but not constitutionally recognised), low-income populations (Chile ranks among the most unequal OECD countries),¹³ immigrants (mainly from Latin America), persons with disabilities, children, older persons and women.¹⁴ Notably, central Chile, which is home to approximately 80% of the population, faces the highest volcanic risk.¹⁵

6 United States Geological Survey (USGS). (2025). [M 9.5 - 1960 Great Chilean Earthquake \(Valdivia Earthquake\)](#).

7 Center for Excellence in Disaster Management and Humanitarian Assistance (CFE-DMHA). (2021). [Chile: Disaster Risk Management Reference Handbook](#).

8 Ibid.

9 Ibid.

10 Ibid.

11 Ibid.

12 European Commission, Disaster Risk Management Knowledge Centre (DRMKC). (2025). [Country Risk Profile: Chile](#).

13 The Organisation for Economic Co-operation and Development (OECD) is an international body of 38 member countries, primarily high-income economies, that works to promote policies improving economic and social well-being. Chile has been a member since 2010.

14 Center for Excellence in Disaster Management and Humanitarian Assistance (CFE-DMHA). (2021). [Chile: Disaster Risk Management Reference Handbook](#).

15 Sandoval, V., Wisner, B. and Voss, M. (2021). "[Natural Hazards Governance in Chile](#)". Oxford Research Encyclopedias, Natural Hazard Science.

04

Chile's mobile landscape and implications for early warning systems



High mobile network coverage across Chile and relatively high access to mobile phones and services mean that most people at risk of natural hazards can be reached via a mobile connection.

Chile has the highest mobile network coverage in South America and is a leader in mobile connectivity, ranking 52nd globally in 2025 for mobile connections.¹⁶ Within a population of more than 19.6 million people, there are more than 15 million unique mobile subscribers and 13.8 million unique mobile internet subscribers – a market penetration of 78% and 70%, respectively.¹⁷ Most of the population, more than 80%, have 4G or 5G access, with another 17% having access to 3G.¹⁸

The main MNOs in Chile are Entel, Movistar (Telefónica), Claro (América Móvil) and WOM (Novador Partners).

While mobile internet connectivity is high, the usage gap¹⁹ is 25%, ranking it a close third in South America, behind Brazil (24%) and Argentina (20%) (GSMA 2024).²⁰

Although services are widely available, a key challenge for mobile-enabled EWS in Chile is geography. Mountainous terrain blocks or weakens signals, and vast desert areas pose logistical challenges for deploying infrastructure. This can especially affect isolated Indigenous populations who already face economic vulnerability and social discrimination.

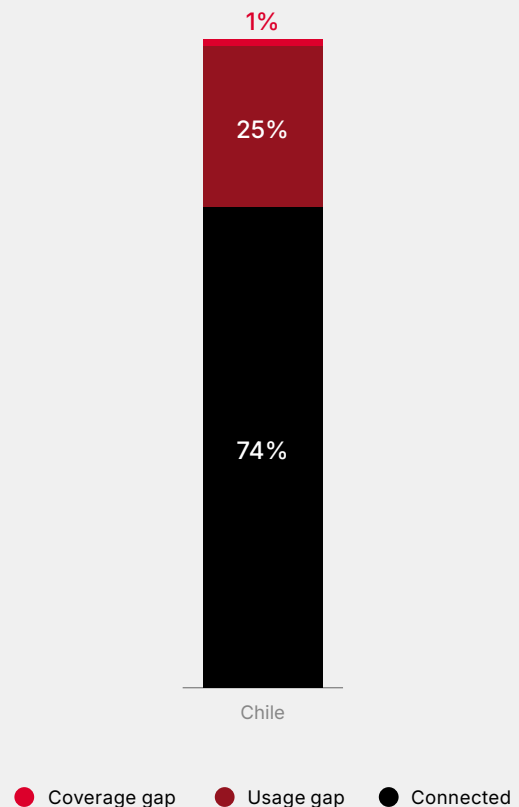
Partnerships between MNOs and satellite operators have helped address geographical challenges in Chile and facilitate critical connectivity in remote and hard-to-reach areas. For example, in 2017, SES and Entel partnered to connect the remote island of Rapa Nui, located 3,500 kilometres off the coast of Chile, where fibre optic cabling would be unfeasible.²¹

Plans are also underway for Entel and SpaceX's Starlink to establish direct-to-cell or direct-to-device services through low-altitude satellite networks, allowing enabled devices to connect directly to satellites when not connected to terrestrial networks. This collaboration, in connection with SUBTEL, will make Chile the first country in Latin America to use satellite technology for mobile phones.²² How this service will be integrated with SAE is yet to be determined.

Figure 1:

Chile: mobile internet connectivity, 2023

Percentage of population



Source: GSMA Intelligence

¹⁶ GSMA Intelligence, 2025.

¹⁷ Ibid.

¹⁸ Ibid.

¹⁹ The usage gap refers to the percentage of the population that are living within mobile broadband coverage but are not using it.

²⁰ GSMA. (2024). *The Mobile Economy Latin America 2024*.

²¹ SES. (21 September 2017). *SES Case Study*.

²² Government of Chile. (30 April 2025). ["With Starlink technology: Chile to be the first country in Latin America to enable satellite connection with cell phones"](#).

05

Chile's approach to disaster risk management and governance



Change triggered by the 2010 earthquake and tsunami

The 2010 earthquake and tsunami that caused 562 deaths and an estimated \$30 billion in damage marked a critical shift in Chile's disaster risk governance. Within a year of the event, the Chilean government conducted risk-based land use plans to inform recovery and rebuilding, adopted a finance plan, expedited insurance payments and, importantly, initiated changes to the national emergency management agency.²³

From reactive to proactive

At the time of the event, the agency responsible for crises was the National Emergency Office (ONEMI) and focused primarily on emergency response. This reactive approach, common in many countries, has since shifted in Chile towards a stronger emphasis on prevention and preparedness. This led to the creation of the National Disaster Prevention and Response Service (SENAPRED) in August 2021, which formally replaced ONEMI on 1 January 2023.²⁴ SENAPRED now leads disaster risk management and early warning efforts and sits under the Ministry of Interior and Public Security. Its mandate includes advising, coordinating and overseeing all aspects of disaster risk management.²⁵

The National Strategy for Disaster Risk Reduction 2020–2030²⁶ highlights the importance of involving communities, along with provincial, regional and national-level actors, in disaster preparedness and response. This is a departure from earlier approaches under ONEMI, which was critiqued for inadequate community participation – a gap that was seen to reinforce vulnerabilities and weaken resilience.²⁷

Priorities and strategic objectives of SENAPRED

The priorities and strategic objectives of SENAPRED reflect good practice in disaster risk governance, with an emphasis on people-centred innovation and communication. SENAPRED's stated objectives²⁸ are to:

- **Develop collaborative and inclusive technological tools** that integrate information from and to the community and SENAPRED, facilitating access to analysed information through all phases of the risk cycle.
- **Modernise monitoring, alarms, communication and information capabilities** to anticipate and alert at-risk communities in a timely manner.
- **Develop interagency actions** to increase SENAPRED's capacities in the mitigation, preparation, response and rehabilitation phases of the disaster risk cycle, with a focus on gender and rights.
- **Plan, coordinate and supervise disaster risk management tools**, with a focus on inclusion, gender and rights at national, provincial and communal levels.
- **Increase the skills of SENAPRED officials** to support organisational development and build a culture of innovation to improve disaster risk management, with a focus on gender and rights.²⁹

Contributing government agencies

SENAPRED relies on several government agencies to contribute their knowledge, expertise and monitoring capacity to disaster risk management plans for natural hazards and vulnerabilities. Many of these agencies were established or formally recognised following the earthquake and tsunami of 2010. A detailed list of contributing agencies is in Table 1.

Disaster risk management committee: COGRID

During times of crisis, representatives of government ministries and agencies assemble as a committee to coordinate disaster-related efforts under the Disaster Risk Management Committee, or COGRID (Comité Gestión de Riesgo de Desastres).

23 Siembieda, W., Johnson, L.M. and Guillermo, F.M. (2012). "Rebuild Fast but Rebuild Better: Chile's Initial Recovery following the 27 February 2010 Earthquake and Tsunami". *Earthquake Spectra*, 28 (1): 621–641.

24 Government of Chile. (2022). "Authorities present Senapred, the new service that will replace Onemi".

25 Ibid.

26 Government of Chile. (2020). *Política Nacional para la Reducción del Riesgo de Desastres: Plan Estratégico Nacional 2020–2030*.

27 Sandoval, V., Wisner, B. and Voss, M. (2021). "Natural Hazards Governance in Chile". *Oxford Research Encyclopedias, Natural Hazard Science*.

28 Government of Chile. (2022). "Authorities present Senapred, the new service that will replace Onemi".

29 Government of Chile. (2025). National Disaster Prevention and Response Service (SENAPRED): <https://web.senapred.cl/>

Table 1:

Government agencies contributing to early warnings and disaster management in Chile

	Cross-cutting	Earthquakes	Tsunamis	Abnormal surges	Volcanic activity	Forest fires	Hydromet events	Droughts
Undersecretariat of Telecommunications SUBTEL): National regulatory agency for telecommunications under the Ministry of Transportation and Telecommunications. It also addresses issues related to the regulatory framework for emergency communications. <i>Subsecretaría de Telecomunicaciones – (SUBTEL)</i>	✓							
National Seismological Centre of the University of Chile (CSN): Collects information about seismic activity and shares it with SENAPRED and the Hydrographic and Oceanographic Service of the Chilean Navy (SHOA). <i>Centro Sismológico Nacional (CSN)</i>		✓						
Hydrographic and Oceanographic Service of the Chilean Navy (SHOA): Provides real-time monitoring and information on oceanographic conditions, crucial for tsunami alerts and response. <i>Servicio Hidrográfico y Oceanográfico de la Armada de Chile (SHOA)</i>			✓					
General Directorate of the Maritime Territory and Merchant Marine (DIRECTEMAR): Responsible for protecting human life at sea and in river and lake areas, protecting the aquatic environment and ensuring compliance with laws and agreements. <i>Dirección General del Territorio Marítimo y de Marina Mercante (DIRECTEMAR)</i>				✓				
National Geology and Mining Service (SERNAGEOMIN): Responsible for generating, maintaining and disseminating information on basic geology and geological resources and hazards, including volcanic activity. It also regulates and supervises compliance on national mining practices. <i>Servicio Nacional de Geología y Minería (SERNAGEOMIN)</i>					✓		✓	
National Forestry Corporation (CONAF): Manages forest fires and undertakes reforestation efforts. It also works on fire prevention and management in rural and forested areas. <i>Corporación Nacional Forestal (CONAF)</i>						✓		
Chilean Meteorological Office (DMC): Forecasts weather and collaborates across agencies for issuing hazard alerts. <i>Dirección Meteorológica de Chile (DMC)</i>							✓	✓
General Water Directorate (DGA): Responsible for safeguarding the availability and quality of water. <i>Dirección General de Aguas (DGA)</i>							✓	✓
Ministry of Housing and Urbanism (MINVU) focuses on building regulations, urban planning and housing solutions, ensuring that new constructions meet safety standards and are resilient to natural hazards. <i>Ministerio de Vivienda y Urbanismo (MINVU)</i>	✓							
Ministry of Public Works (MOP): Responsible for infrastructure resilience, including flood defences and transport systems, and works to restore and rebuild infrastructure following disasters. <i>Ministerio de Obras Públicas (MOP)</i>	✓							
Ministry of Social Development and Family: Provides social support to vulnerable populations affected by disasters, including emergency assistance and welfare services. <i>Ministerio de Desarrollo Social y Familia</i>	✓							

NB: Chilean Red Cross: Has an auxiliary role to the government and works closely with government agencies, including on disaster preparedness, relief and recovery, providing essential services and coordinating local and international resources.³⁰ *Cruz Roja Chilena*

30 IFRC. (2024). Chile: 2024–2026 IFRC network country plan.

06

Chile's mobile-based early warning system: SAE



Sistema de Alerta de Emergencias (SAE) is Chile's mobile-based 'emergency alert system'.

It uses cell broadcast (CB) technology to send alerts to all compatible handsets connected to cell towers in a specific geographic area. When an authorised hazard monitoring agency detects a threat, it notifies SENAPRED. SENAPRED verifies the information and issues a geotargeted alert through a secure platform, which connects to all MNOs.

Each MNO then transmits the alert through its own network to all mobile phone users in the affected area, including tourists and visitors, with no need for prior registration. SENAPRED is also working to update the SAE in order to include other platforms, such as television, radio, road signage and social media.

Figure 2:

Flow of alerts through the SAE



Source: Adapted from image supplied by SENAPRED

Evolution of the SAE

The 2010 earthquake and resulting tsunami in Chile propelled efforts to establish a robust EWS in the country. At the time, Chile had some of the strongest prospects for mobile network growth and usage in Latin America,³¹ and it was determined that mobile technology would be the basis of the EWS to disseminate alerts to the public.

In 2012, a law Decree 60³² mandated MNOs to disseminate public alert messages free of charge to customers and to protect critical infrastructure from significant telecommunications outages.³³

By 2014, preliminary mobile-based early warnings were issued, and from 2017 regulation required all mobile devices sold in Chile to be compatible with SAE.³⁴

The system was originally designed with earthquake and tsunami risks in mind, monitoring the magnitude, location and depth of Chile's daily seismic events. However, over time it has expanded to cover emergency alerts for multiple hazards, including life-threatening wildfires, volcanic eruptions, landslides and other emergencies.

31 GSMA. (2011). "Latin American Mobile Observatory 2011: Driving Economic and Social Development through Mobile Broadband".

32 Government of Chile. (2012). "Decree 60: Regulations for the interoperation and dissemination of alert messaging, declaration and safeguarding of critical telecommunications infrastructure and information on significant failures in telecommunications systems".

33 Ibid.

34 Interview with Telefónica.

Box 1:

Alerts sent via the SAE

From 2014 through June 2025, the SAE has been used 1,652 times for multiple hazards:



Tsunamis:

183
messages



Flooding:

385
messages



Wildfires:

719
messages



Landslides:

39
messages



Volcanic eruptions:

25
messages



Other emergencies:

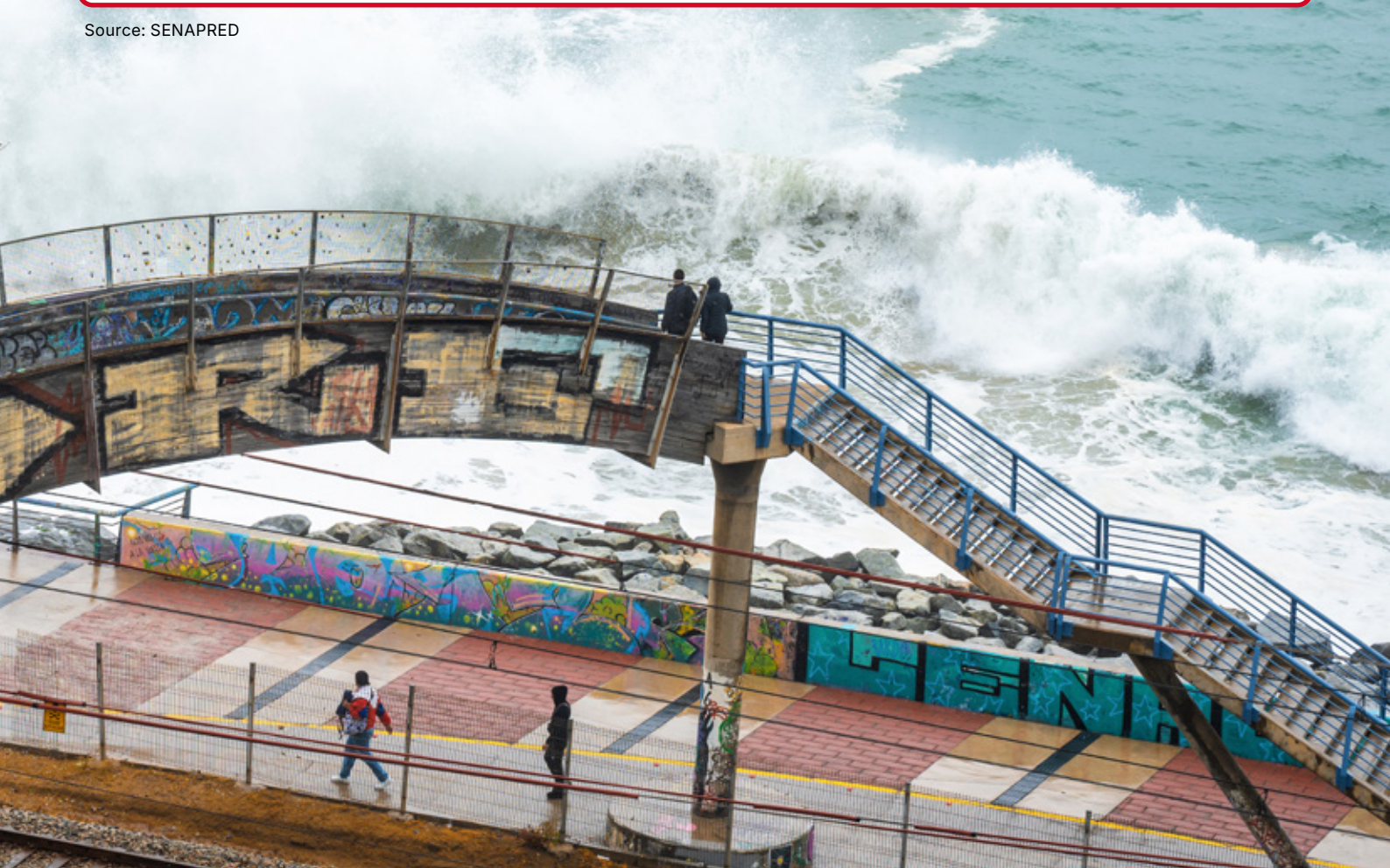
5
messages



Tests and simulation exercises
(not including homologation testing):

296 messages

Source: SENAPRED





The Undersecretariat of Telecommunications (SUBTEL) is Chile's national regulator responsible for overseeing the telecommunications sector and supporting social and economic development. In emergencies, SUBTEL collaborates with fixed and mobile network operators to establish protocols that safeguard network continuity and regulate the implementation of the SAE, including defining MNO roles and responsibilities.

Extensive legislation governs emergency alert dissemination, protection of critical infrastructure and reporting of significant telecommunications failures (Government of Chile 2012).³⁵ Decree 60 mandates that MNOs build and maintain their cell broadcast centres (CBCs), maintain critical infrastructure, deliver government alert messages free of charge and participate in coordinated efforts to ensure handset compatibility and system functionality during crises. Non-compliance can result in fines and criminal penalties for responsible individuals, reflecting the severe consequences of failures.

Some of the main regulatory issues covered in Decree 60 are summarised below.

Critical infrastructure and procedures

The Ministry of Transport and Telecommunications coordinates the design, implementation and maintenance of policies protecting Chile's telecommunications sector, ensuring communication continuity during natural hazards, power failures or other disasters (Article 25). This is done in coordination with government agencies, institutions and private organisations.

As part of this, the Ministry of Transport and Telecommunications manages the Critical Infrastructure Database (BDIC), using data provided by MNOs. The database contains all information on infrastructure declared critical (Article 21). MNOs must update this database every four years (Article 22).

MNOs are responsible for ensuring their infrastructure remains functional during extreme events, including maintaining networks without electricity from the national grid for at least four hours.

MNOs must comply with safeguarding measures for critical infrastructure, regardless of whether they operate it directly or through the lease of switching, transmission and access network facilities to third parties. This includes ensuring 24/7 supervision and maintenance of equipment and facilities for disseminating warning messages (Article 19).

Critical infrastructure is classified into two levels:

- **Level 1:** Network systems carrying significant traffic are required to be self-sustaining for at least 48 hours.
- **Level 2:** Equipment that would have a serious impact on the population's safety if it failed, such as base stations, is required to sustain operations for at least four hours.

MNOs must participate regularly in simulation exercises (SIMEX) to test system functionality (Article 16). These drills occur daily, with SUBTEL directing any necessary corrective measures. This level of routine testing is exceptional compared to many other systems globally and reflects Chile's dedication to maintaining reliability and operational performance.

³⁵ Government of Chile. (2012). "[Decree 60: Regulations for the interoperation and dissemination of alert messaging, declaration and safeguarding of critical telecommunications infrastructure and information on significant failures in telecommunications systems](#)".

Figure 3:

Screenshots of testing log showing cell broadcast message delivery status and history on March 20, 2025.

Detailed broadcast information: 28 (RNC)			
Broadcast status	CBR details	Delivery history	
Cell keys	Delivery type	Status	Delivery time
730-2-37200-6567, 730-2-37200-6566, 730-2-37200-6568	Broadcast	Successful	Thu Mar 20 11:00:09 CLST 2025
All cells	Status query	Successful	Thu Mar 20 11:03:09 CLST 2025

Detailed broadcast information: PDV15 (BSC)			
Broadcast status	CBR details	Delivery history	
Cell keys	Delivery type	Status	Delivery time
730-2-37300-6570	Broadcast	Successful	Thu Mar 20 11:00:09 CLST 2025
730-2-37300-6569	Broadcast	Failed	Thu Mar 20 11:00:09 CLST 2025
All cells	Status query	Successful	Thu Mar 20 11:03:09 CLST 2025

Source: Telefónica

Beyond Decree 60 stipulating the terms of emergency alert dissemination, national automatic roaming was established in 2020 under Law N° 21.245, which mandates the creation of roaming agreements between MNOs. If disagreements arise between MNOs during the negotiation process, the legislation defines a dispute resolution process through an independent arbitrator. Through Decree N° 138, SUBTEL also provides key definitions for emergency roaming situations and outlines the technical, economic, operational and commercial conditions to be included in MNO roaming agreements, to support implementation of the National Automatic Roaming law.

During network outages, SUBTEL coordinates with other MNOs to enable emergency roaming, allowing affected users access through alternate networks. This process is defined in the National Automatic Roaming law, which states that emergency roaming should be activated with no cost to – or additional action required by – users. While technically supported, this process is not always seamless. In the nationwide blackout in February 2025, approximately 80% of the mobile network went down.³⁶ Some users were unsure whether they needed to manually

activate roaming to receive alerts, highlighting the need for better communication around how emergency roaming works.

Interoperability and homologation³⁷

All mobile devices sold in Chile must be capable of receiving SAE alerts without additional user action. This requirement is enshrined in Article 11 of Decree 60, which mandates strict interoperability and homologation standards. Under this regulation, SUBTEL requires every new model of mobile device, including phones, smartwatches and other connected equipment, to undergo homologation testing prior to market entry.

Only accredited companies with sufficient technical expertise are authorised to conduct this testing and register compliant devices in Chile’s Centralised Equipment Database. Such companies must be accredited every 4 years. Each approved device must display visible compliance markings for consumers, ensuring transparency and trust. This policy ensures that all devices circulating in the Chilean market are technically aligned with national emergency alerting infrastructure, contributing to system-wide reliability and equitable access.

³⁶ CNN. (25 February 2025). “State of emergency declared after blackout plunges most of Chile into darkness”. CNN World.

³⁷ Homologation is the process of officially recognising or approving something, often a product, as meeting specific standards and regulations. It is a form of certification that ensures a product is safe, legal and fit for its intended purpose. In this context, homologation refers to the certification process by which mobile devices are tested and approved to ensure they are compatible with emergency alert systems.

Message transmission and liability

MNOs must ensure they are able to receive the alert messages from SENAPRED and deploy the messages to users with mechanisms that are secure, reliable and timely, ensuring priority treatment (Articles 5, 10, 11).

Upon receiving a request to disseminate an alert message, MNOs must immediately send SENAPRED an acknowledgement of receipt (Article 12).

The content of messages generated by SENAPRED must be transmitted in their entirety and in accordance with the standardised format. MNOs are not liable for the content of the message they are required to retransmit (Article 5).

Separate from regulations with MNOs, there are clear policies and protocol that guide the content and timing of messages. For example, SENAPRED issues messages when lives or significant assets are at risk, including national parks.

Coordination

In the event of significant failures of telecom systems, a Telecommunications Emergency Committee comprised of representatives from public and intermediate telecom services coordinates actions.

Outside of emergencies, SUBTEL, at the request of SENAPRED, coordinates with MNOs to create improvements in the SAE, particularly related to planning, defining georeferenced areas and the effectiveness and timeliness of message dissemination (Article 7 and 14).

Emergency network protocols

During emergencies, SUBTEL monitors network services and manages failures to ensure telecommunications remain functional in affected areas.

Box 2:

Key principles shaping the governance of Chile's mobile EWS

Chile's policy and regulatory framework for mobile emergency alerts is considered particularly comprehensive, with active government engagement to ensure compliance. In interviews, stakeholders consistently described the system as "comprehensive and clear", "justified and rational" and "fair". These insights are captured below.

Comprehensive and clear

Roles and responsibilities across institutions are well defined. SENAPRED leads all decisions related to messaging and public awareness of the SAE. SUBTEL ensures network operability for message transmission while MNOs are responsible for delivering alerts and covering the costs.

Policies and protocols are also clear. In some cases, joint policies are articulated. For example, the tripartite policy between SENAPRED, CSN and SHOA outlines how earthquake and tsunami alerts are managed. Government employees know the policies well and understand who is responsible for each aspect. For example, earthquake monitoring teams in the control room have clear, detailed, scenario-specific protocols.

Justified and rational

Regulations are broadly seen as appropriate and proportionate. The technology to provide emergency alerts already existed, and the potential to save lives was considered sufficient justification for the SAE. While some expressed frustration that MNOs absorb the significant costs, most saw this as acceptable because it was in the public interest.

Fair

All handsets sold in Chile must be SAE-compatible. Originally, regulations did not require mobile phones to be compatible with the SAE. Distributors seized this as a marketing opportunity, branding phones that would work in an emergency as SAE-compatible. This created a dangerous divide between those who would receive alerts and those who would not.

In turn, SUBTEL targeted phone manufacturers, not distributors, to require all handsets sold in Chile to be SAE-compatible. Manufacturers initially resisted, claiming high compliance costs. However, it became apparent that only an inexpensive software update was required. SUBTEL maintained its position and enforced the mandate, which has since been recognised by stakeholders as a fair requirement to ensure equal protection across the population.³⁸

³⁸ KII with former SUBTEL manager.

Stakeholders and coordination



Table 2 lists the key stakeholders involved in Chile's mobile emergency alert ecosystem, including their roles and how they coordinate and communicate.

Table 2:

Key stakeholders in Chile's mobile emergency alert ecosystem

Category	Stakeholder	Role	Coordination/communication
National disaster risk management agency	SENAPRED	Leads emergency messaging; issues alerts; communicates with public	Coordinates with hazard monitoring agencies, SUBTEL and MNOs; communicates directly with the public
Telecom regulator	SUBTEL	Regulates MNOs and manufacturers; ensures network functionality; enforces compliance	Coordinates with MNOs; enforces technical standards and compliance
Mobile network operators	MNOs including Telefónica, WOM, Entel	Disseminate SAE alerts; maintain infrastructure; liaise with SENAPRED and SUBTEL	Receive instructions from SENAPRED; coordinate with SUBTEL and Chile Telcos; deliver alerts to the public
Telecom industry body	Chile Telcos (Industry Association)	Facilitates MNO coordination and sector engagement	Coordinates MNO engagement and supports sector-wide collaboration
Hazard monitoring agency	DMC (Meteorological Directorate)	Provides weather forecasts and critical meteorological information	Shares forecasts with SENAPRED and agencies; communicates directly with public/media in tiered sequence
Hazard monitoring agency	CSN (Seismology Centre)	Monitors seismic activity and supports earthquake alerts	Coordinates with SENAPRED to provide seismic data for alerts
Hazard monitoring agency	SHOA (Hydrographic and Oceanographic Service of the Chilean Navy)	Monitors oceanographic conditions and supports tsunami alerts	Coordinates with SENAPRED to provide tsunami-related data
Hazard monitoring agency	CONAF (National Forestry Corporation)	Monitors forest fires and related hazards	Coordinates with SENAPRED on wildfire data and hazard updates
Hazard monitoring agency	SERNAGEOMIN (Geology and Mining Service)	Monitors volcanic activity and geological hazards	Coordinates with SENAPRED to share volcanic risk information
Public	General public	Receives alerts from MNOs/SENAPRED and weather information from DMC	Receives alerts from MNOs/SENAPRED and forecasts from DMC

Institutional coordination

The SAE benefits from a strong coordination framework grounded in clear institutional roles, legal mandates and technical protocols. There is a shared operational language around disaster risk, supported by regular training and knowledge exchange across agencies.

“All stakeholders have to share a common vision and agree on the steps that need taken. That’s a key to success.” – SENAPRED

Within the telecommunications sector, coordination is facilitated by the industry association Chile Telcos. Legislation requires all MNOs to designate an Emergency Telecommunications Coordinator responsible for establishing internal procedures and overseeing service restoration during disruptions. MNOs coordinate directly with SUBTEL on regulatory compliance and technical standards. No direct coordination between MNOs and hazard monitoring agencies is required, as MNOs operate strictly under SENAPRED’s instructions for public alerts.

Coordination among government agencies, particularly those responsible for monitoring hazards, varies depending on the type of hazard, the institutional maturity of the lead agency and the strength of their historical working relationships. Earthquake and tsunami alerts are supported by long-established cooperation between the National Seismology Centre (CSN) and the Hydrographic and Oceanographic Service of the Chilean Navy (SHOA). Since the SAE was initially developed to respond to these risks, protocols are well developed.

Hazards like wildfires, floods and landslides have only recently been integrated into the SAE. These events often span multiple mandates, evolve quickly and affect both urban and rural populations. Determining when and what to communicate to the public can be complex, and is a common challenge in multi-hazard contexts globally.

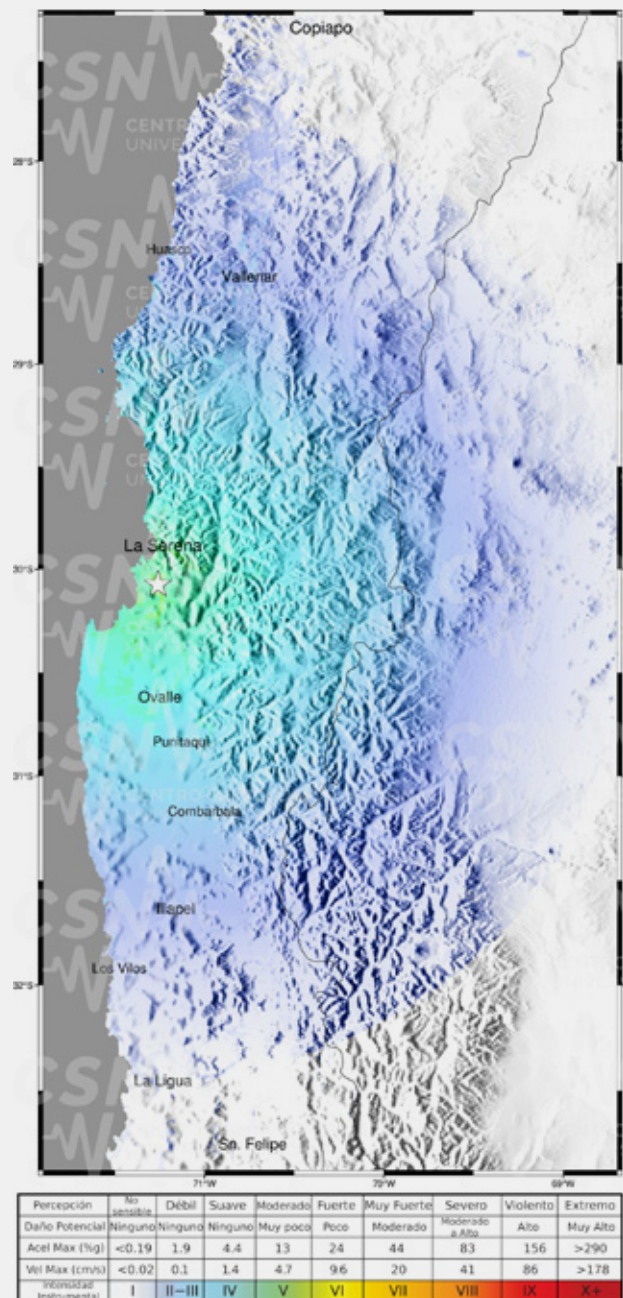
Weather-related coordination is notably strong. The Meteorological Directorate (DMC) provides timely forecasts formatted for operational use by SENAPRED and other agencies. Outside the SAE, DMC follows a two-stage public communication protocol: it first alerts SENAPRED and relevant government actors then, minutes later, issues public

alerts via media channels. This approach ensures government responders are aligned before facing public or media queries, reducing confusion and preserving institutional credibility. While coordination is generally effective, some observers noted that interagency communication during fast-moving emergencies could still be improved, especially given the high level of trust and familiarity between staff across agencies.

Figure 4:

‘Shakemap’ provided to authorities, showing expected ground motion from the earthquake

It indicates the severity of shaking and highlights areas likely to be most affected.



Source: Seismology Centre (CSN)

Public interface and engagement

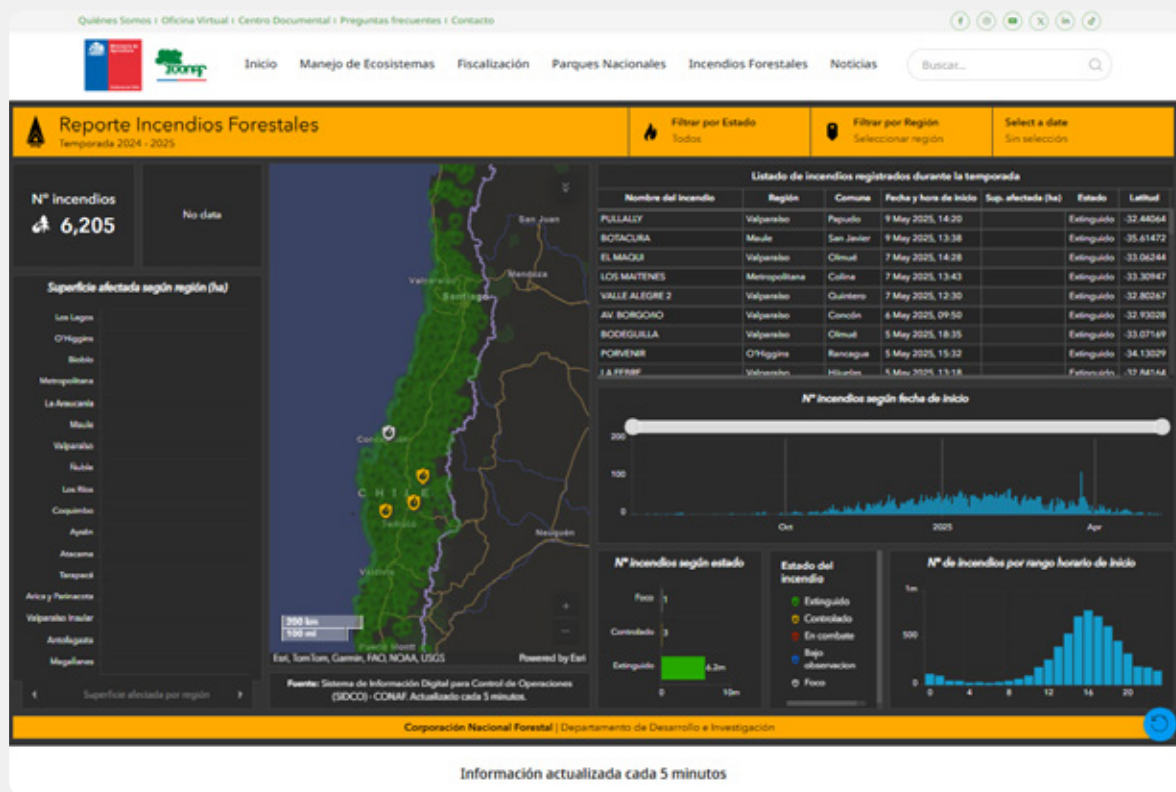
SENAPRED is the main public-facing authority for the SAE. It is responsible for public education on how the system works and for issuing alerts during emergencies. Therefore, the public strongly associates the SAE with the government (rather than with MNOs) as they are responsible for the system. The alert tone used by the SAE is widely understood and taken seriously. This trust plays a key role in reinforcing a culture of responsiveness. SENAPRED views the SAE not just as a technical system but as a long-term relationship with the public – one that requires continuous attention. Particular attention is given to the frequency of alerts, with an emphasis on using the system selectively to maintain public trust and avoid desensitisation due to false alarms or overuse.

In addition to the SAE, hazard monitoring information is available to the public on SENAPRED's website,

providing regular updates to support preparedness and response. The landing page provides two routes to the website: the first directs users to multi-hazard alerts and the second directs users to the institutional website. SENAPRED also hosts an online academy for the public to enrol in e-Learning courses about disaster risk management.³⁹

The various government agencies that monitor hazards also provide regular, detailed and accessible information on their websites and social media platforms. These include the Chilean Meteorological Directorate, National Forestry Corporation (CONAF) and the National Geology and Mining Service (SERNAGEOMIN), which monitors volcanic activity. These agencies maintain constant communication with SENAPRED. When conditions escalate to life-threatening levels, they request that SENAPRED issue a public alert through the SAE.

Figure 5:
Hazard monitoring information on the CONAF website



Source: CONAF

39 SENAPRED. (n.d.). [SENAPRED Academy](#).

All MNOs are legally required to maintain dedicated SAE web pages that explain how the system works, confirm that alerts are free of charge, list compatible handsets and provide guidance on troubleshooting.

Figure 6:

Screenshot of Telefónica's public webpage for the SAE



Recent events, including the Viña del Mar wildfires in 2024 and the national blackout in 2025, have exposed gaps in digital literacy among users. Many people did not know how to enable basic phone functions like roaming. Similar issues were reported during the April

2025 blackout in Spain. These cases underscored a critical point: mobile emergency alert systems depend not only on infrastructure, but also on public awareness and the operational readiness of users.

Box 3:

Ethical commitment to the SAE

Chile's EWS is underpinned by political, social and ethical will, with successive governments prioritising early warning. MNOs have played a central role in the development and functioning of the SAE. While compliance is mandated by law, implementation has been shaped by a broader sense of responsibility.

"The MNOs have stepped up to their role and responsibility."

- SENAPRED

Each MNO is required to deliver alerts at their own cost, maintain compatible infrastructure and appoint internal coordinators for emergency response. These requirements are accepted despite offering limited commercial return. As one stakeholder from KII Telefónica noted, "It's the right thing to do."

Several stakeholders described MNO participation as grounded in a shared understanding that protecting lives outweighs operational inconvenience. Although there were some concerns about cost and responsibility, MNOs have consistently engaged with the system in a constructive and reliable manner.

"The SAE is not an inconvenience. It saves lives. People will make a lot of sacrifices to keep people safe." - Telefónica

This willingness to invest, cooperate and accept some inconvenience has been a critical factor in the effective operation of Chile's mobile emergency alert system, supported not only by regulation and technical capacity, but by a shared ethical commitment across institutions.



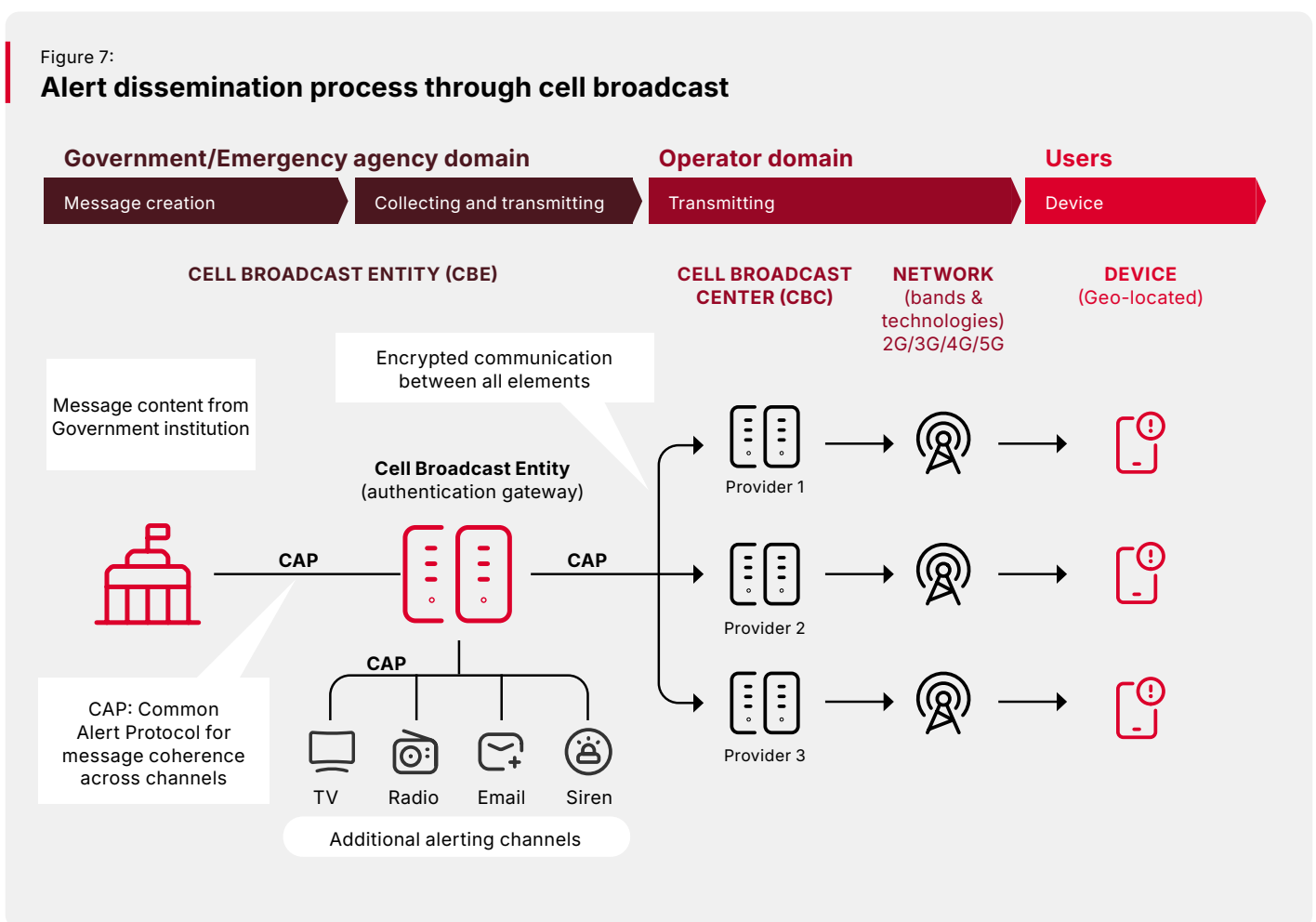
Cell broadcast (CB)

Chile's EWS uses cell broadcast (CB) technology to send alerts directly to mobile handsets within a defined geographic area. Unlike SMS-based systems, which require a list of subscriber numbers and rely on user registration, CB reaches all compatible devices connected to nearby cell towers within a target area, without the need for user data. This prevents the exclusion of individuals such as tourists or those

with outdated or incorrect registration information, ensuring broader and more equitable alert coverage. While SMS can be delayed by network congestion, CB delivers messages almost instantaneously to millions, making it ideal for time-critical alerts. The entire CB system is tested regularly nationwide to ensure functionality and readiness.⁴⁰

Figure 7:

Alert dissemination process through cell broadcast



Source: Telefónica

40 GSMA. (2023). [Cell Broadcast for Early Warning Systems: A review of the technology and how to implement it.](#)

Cell broadcast entity (CBE)

SENAPRED creates and manages alert messages via the cell broadcast entity (CBE), a platform where messages are composed and their target geographic areas defined by drawing polygons on a map. The CBE was initially developed by eVigilio (NGSoft) in 2011 and is now operated by a contracted third party, Global Systems, which maintains the hardware and software.

The CBE runs on two local servers distributed across Santiago to ensure continuity. If one location is rendered inoperable, service from the other location should function.

Common Alerting Protocol (CAP)

Chile uses the Common Alerting Protocol (CAP) as the standard format for emergency alerts. The CAP provides a predefined, structured template that ensures alerts generated by different forecasting agencies are consistent and coherent. This template captures critical information, such as the type of hazard, geographic area, severity, urgency, certainty, effective date and time, among other factors, in a standardised format.

Box 4:

The Common Alerting Protocol

The Common Alerting Protocol (CAP) is an international standard (ITU-T X.1303) developed by OASIS and adopted by the International Telecommunication Union (ITU). It provides a structured, XML-based format for creating and exchanging emergency alert messages across multiple systems. CAP enables a single message to be disseminated simultaneously through multiple channels such as SMS, CB, radio, television, apps and sirens, ensuring consistency and broad reach. Its standardised format also reduces operational complexity and cost by removing the need for multiple custom interfaces across the many warning sources and dissemination systems used for all-hazard alerts.^{41,42}



41 GSMA. (2023). [Cell Broadcast for Early Warning Systems: A review of the technology and how to implement it.](#)

42 ITU. (n.d.). [Common Alerting Protocol and Call to Action.](#)

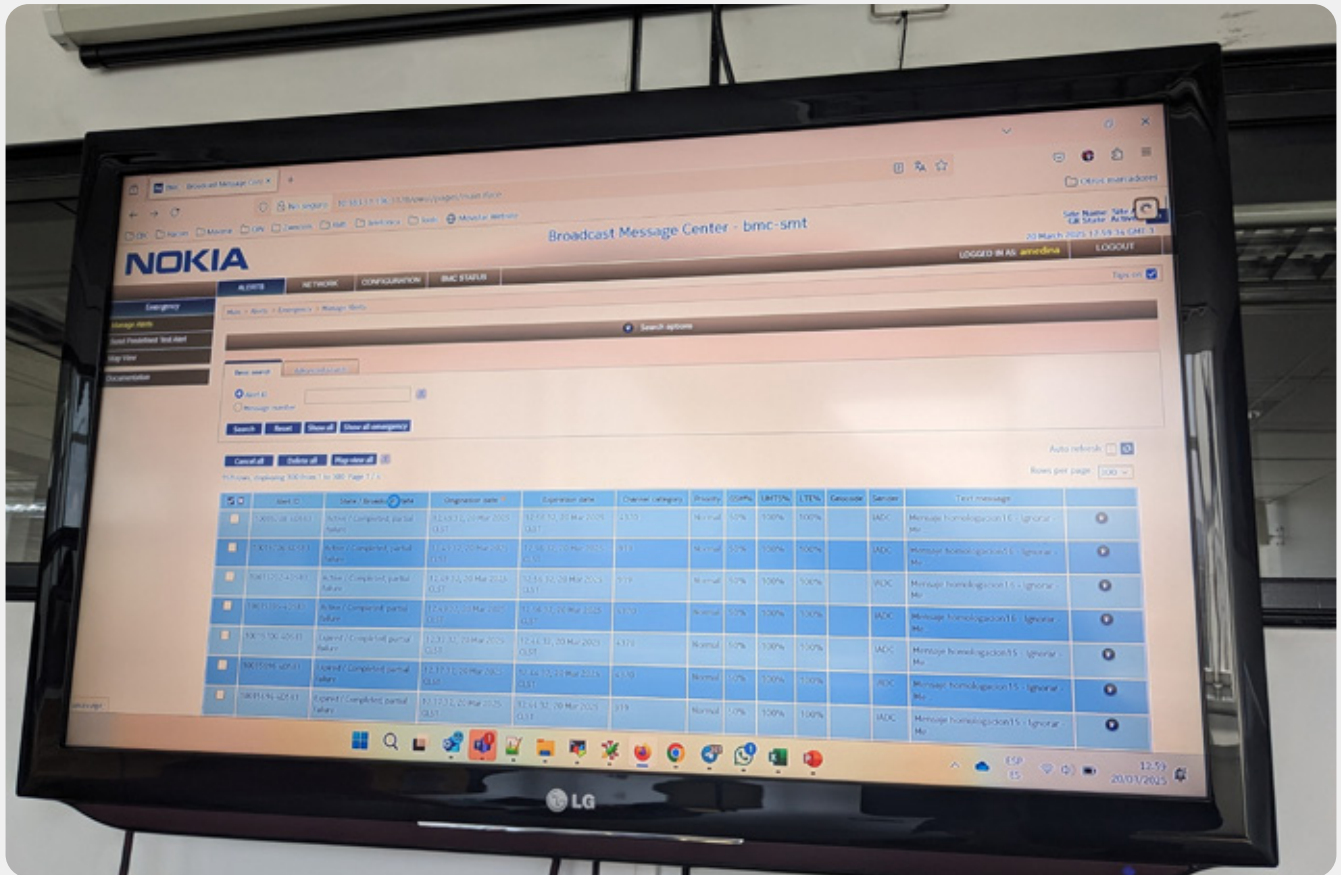
Cell broadcast centres (CBC)

In an emergency, SENAPRED's CB message is distributed from the CBE through data networks to cell broadcast centres (CBCs) operated by each MNO. These data networks run on fibre optic cables throughout Santiago. The cables have built-in redundancy in case of damage, which can occur frequently due to vandalism, theft of copper in the wires or in the event of disaster.

The CBCs are built and maintained by each MNO. In the case of Telefónica, for example, Nokia-Lucent was contracted to build the CBC that would receive messages from SENAPRED via the CBE and distribute the messages throughout its network.

Figure 8:

Live display of test alerts issued through the CBC interface



Source: Telefónica

MNOs build and operate their CBCs independently as part of a decentralised model. Globally, MNOs have indicated a preference for decentralised systems due to data privacy, network security and operational autonomy (GSMA, 2025).⁴³ However, different models are used in Latin America. Interviewees indicated that Peru has opted for a centralised model and that stakeholders in Brazil are consulting with Chile and Peru about the relative advantages and disadvantages to inform their own system.

The CBCs built by MNOs comply with SENAPRED's operational guidelines (an internal document). For example, the message must remain available in the network for a certain amount of time so that people entering the designated geographical area later than the original transmission still receive the message. The message must also have an expiry time, after which it will be removed from the system.

⁴³ GSMA. (2023). [Cell Broadcast for Early Warning Systems: A review of the technology and how to implement it.](#)

The CBC infrastructure also supports georedundancy, allowing message dissemination to continue across MNO networks if one operator experiences outages. Legal requirements mandate colocation or special configuration of towers in single-operator areas to enable emergency roaming automatically. Together, these measures demonstrate a high level of technical integration and regulatory foresight that enhances both the reliability and

timeliness of alert delivery. SUBTEL can verify that messages were successfully sent by the CBCs by calling affected regions directly – a basic yet effective mechanism that reinforces accountability. These practices reflect Chile’s commitment to maintaining a resilient, high-performance alerting system, ensuring alerts are delivered consistently even during infrastructure failures or population movement.

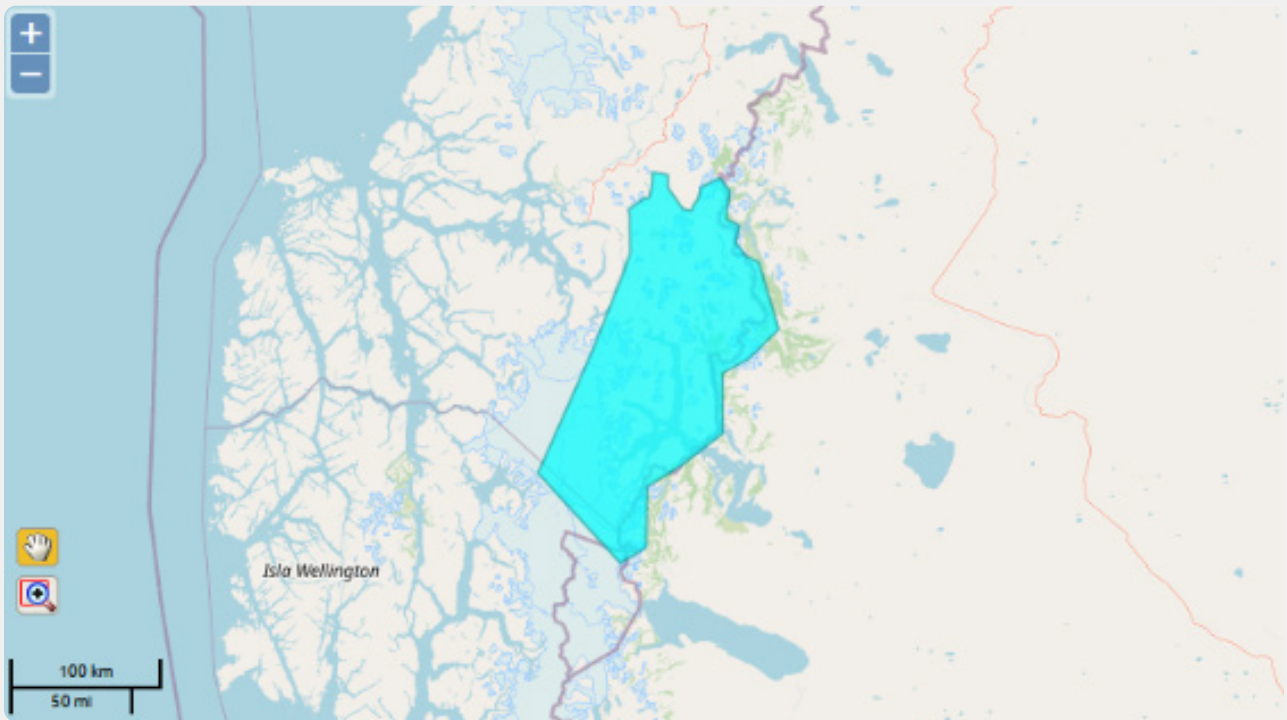
Figure 9:
Screenshot of polygon coordinates, issued by SENAPRED

Text: SENAPRED: PRUEBA del Sistema de Alerta de Emergencia, comuna de Ohiggins, Region de Aysen
 message:
 Coordinate system: Not set (Default coordinate system is WGS-84)
 Event code: CAE

Area (Geocode):	Area description	Polygon	Circle	Geocode	UTM Zone
IADC		-49.332077078854425,-73.13877457002457 -48.968795828854425,-73.84658707002457 -48.476608328854425,-73.31455582002457 -48.144577078854425,-73.11533707002457 -48.066452078854425,-73.07627457002457 -47.886764578854425,-73.08018082002457 -47.843795828854425,-72.99424332002457 -47.843795828854425,-72.96299332002457 -47.820358328854425,-72.95127457002457 -47.769577078854425,-72.93955582002457 -47.734420828854425,-72.93955582002457 -47.746139578854425,-72.84580582002457 -47.796920828854425,-72.84580582002457 -47.886764578854425,-72.75205582002457 -47.894577078854425,-72.69736832002457 -47.875045828854425,-72.68955582002457 -47.847702078854425,-72.65830582002457 -47.796920828854425,-72.63877457002457 -47.757858328854425,-72.52158707002457 -47.812545828854425,-72.45908707002457 -47.898483328854425,-72.47861832002457 -47.929733328854425,-72.47861832002457 -47.957077078854425,-72.40439957002457 -48.027389578854425,-72.42393082002457 -48.082077078854425,-72.36143082002457 -48.105514578854425,-72.28330582002457 -48.382858328854425,-72.15830582002457 -48.503952078854425,-72.34580582002457 -48.562545828854425,-72.50596207002457 -48.808639578854425,-72.50596207002457 -48.941452078854425,-72.76768082002457 -49.023483328854425,-72.97080582002457 -49.269577078854425,-72.97861832002457 -49.332077078854425,-73.13877457002457			

Source: Telefónica

Figure 10:
Screenshot of map of target area, issued by SENAPRED



Source: Telefónica

Networks

Messages are broadcast over dedicated CB channels to all compatible devices within the target area. Devices must be idle (not on calls or data) to receive alerts. During outages, the National Automatic Roaming protocol can be activated by MNOs, SENAPRED or SUBTEL to allow users access to alternative networks, mitigating congestion or failures. All MNOs are legally required to support automatic roaming and virtual mobile networks during emergencies.

Mobile handsets

All mobile devices sold in Chile must be pre-enabled to receive SAE alerts automatically without user registration. This policy is one of many features that makes Chile's EWS effective. Tourists with a phone purchased outside Chile also receive alerts while roaming. Phones purchased outside Chile and connected through a local operator (rather than via roaming) receive a message indicating the phone must be registered with an email address within one month or risk service disconnection. This approach ensures wide and inclusive coverage while minimising the risk of individuals being left out of the alerting system.

Figure 11:

Emergency alert delivered via the SAE on 19 January 2025, instructing evacuation due to a forest fire in the El Canelo sector, San José de Maipo.

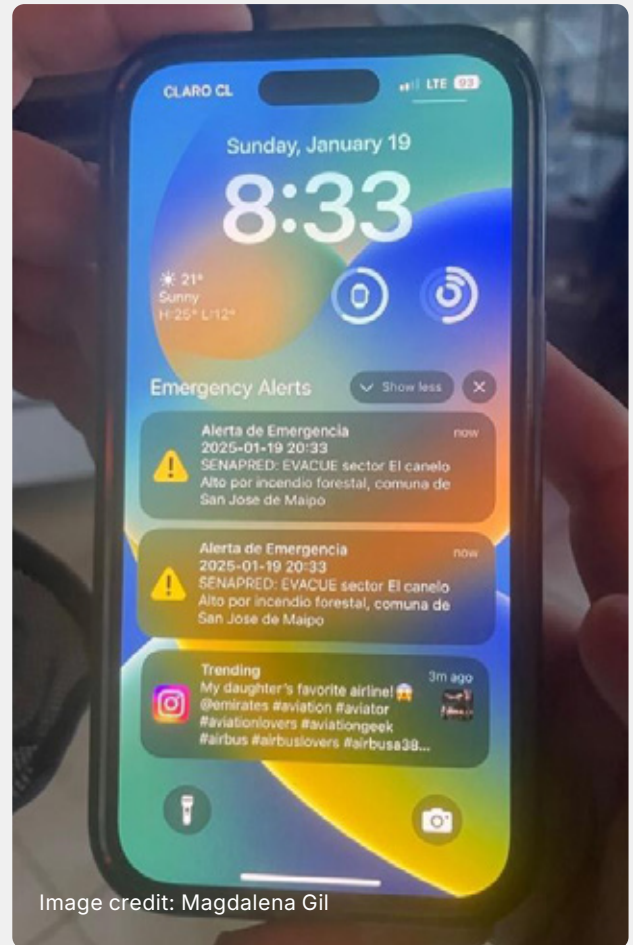


Image credit: Magdalena Gil



Homologation of handsets

All handset models sold in Chile are tested to ensure they function with the SAE before going to market. This requires visiting a specially constructed “SAE Room” where test messages are sent and certifiers confirm that handsets successfully receive them.

The SAE Room sits five stories underground in an industrial park on the outskirts of Santiago and is lined with aluminium to prevent test messages from reaching the public and causing alarm. Within the room, a mini-base station is set up for each of the five mobile networks, with all bands represented (2G, 3G, etc.)

SENAPRED issues test messages throughout the day to an area drawn on a map that corresponds to an unpopulated region in the south of Chile. The MNO base stations in the SAE Room are registered in this area and transmit emergency alerts to handsets that are physically in the room. If phones successfully receive the alerts, they can be certified. A set of pre-approved mobile handsets (one for each channel, for each network) remain in the room to ensure the test messages are being issued and received successfully.

The room is managed by Telconsur, a third-party company contracted by SENAPRED, but funded jointly by the MNOs, according to their market share.

Chile’s purpose-built SAE Room is a rare and exemplary measure of quality assurance. It provides a controlled, multi-network test environment for handset certification, ensuring that all devices on the market are compatible with emergency alerts. This level of rigour helps guarantee consistent performance across all networks and devices, reduces the risk of exclusion and bolsters public trust in the system.

Resilient infrastructure for effective EWS

Network resilience is crucial to effective EWS. While the SAE functions well under normal conditions, power outages and infrastructure failures during emergencies can critically disrupt alert delivery. Users will also lack the connectivity required to validate the messages (a natural response), coordinate with others, make informed decisions and plan what actions to take.

MNOs are required by law to maintain back-up power supplies capable of sustaining network operations for at least four hours. However, recent nationwide outages lasting much longer revealed that this minimum is insufficient. High-energy demand technologies like 5G and network congestion during emergencies can exhaust reserves faster than anticipated. While government-led emergency services rely on their own back-up communications, such as VHF radios or satellite connections, local first responders and many other civil society actors are hindered when mobile infrastructure fails.

The February 2025 blackout, which caused widespread mobile network outages, prompted discussion about whether the current four-hour back-up power requirement is sufficient. Extending back-up power requirements and planning for longer outages is therefore being considered as essential to maintain continuous alerting capabilities. Automatic network roaming and infrastructure sharing help mitigate localised outages by enabling users to connect through alternative networks.

Upgrading the SAE

Since its creation nearly 15 years ago as an earthquake and tsunami-focused system, the SAE has expanded to cover multiple hazards, including floods, wildfires, landslides and volcanic eruptions. This broader scope has significantly increased the number of alerts, from just 10 messages between 2011 and 2014 to around 200 during a single wildfire outbreak.

Following the 2024 Viña del Mar fires, damage to nearly 100 mobile antennas⁴⁴ hindered the dissemination of alerts via CBCs. This highlighted

the need to update the platform to include multiple communication channels to support greater redundancy in the delivery of alerts. This update, known as 'SAE 2,' is currently undergoing a procurement process for a third-party provider, led jointly by SENAPRED and SUBTEL. A timeline for implementation has not been confirmed.

Table 3 outlines the planned improvements for SAE 2, highlighting current challenges and the solutions designed to enhance Chile's EWS.

Table 3:

Key upgrades to SAE 2

Upgrade	Current challenge	Solution
More precise geographic targeting	Polygon mapping is not refined, causing some populations to receive unnecessary alerts (false positives). Also, users may be unfamiliar with local sector boundaries, making alerts ambiguous.	Improving polygon mapping accuracy to better target alerts and reduce false positives; address challenges related to user knowledge of sector boundaries.
Longer message content	Messages are limited to 90 characters, sufficient for simple tsunami alerts but inadequate for detailed instructions in complex emergencies like wildfires.	Expanding message length to provide clearer, hazard-specific instructions, while recognising that fast-changing situations may still limit their effectiveness.
Multi-channel dissemination	Alerts are only sent automatically to mobile phones, with no automatic transmission via radio or television.	Adding automatic alert dissemination via radio and television to ensure wide reach when mobile networks are down.
Support for Spanish special characters	Messages cannot include accented letters and other characters important for clear communication in Spanish.	Enabling use of special characters and accent marks to improve clarity and accuracy in emergency messages.

⁴⁴ BNamericas. (5 February 2024). "[Chilean telecoms infra affected by major wildfires](#)".



The models for financing CB operations can vary widely from country to country, with government investment ranging from higher to lower in different parts of the system. In Chile, financial responsibilities for the SAE are shared between government institutions and MNOs, with MNOs covering a significant portion of infrastructure and operational expenses.

Government investments in the SAE focus primarily on centralised system infrastructure and are coordinated by SENAPRED. This includes the construction and operation of the CBE – the central platform that creates messages and supports geotargeting. The CBE was originally built and funded by SENAPRED through a third-party contract awarded in 2011. SENAPRED continues to fund maintenance, including system updates, troubleshooting and staffing trained personnel who monitor the system 24/7 and activate it during emergencies. The government is also leading the tendering process for the upcoming SAE 2 upgrade.

Each MNO finances the construction of its own CBC, which connects to the CBE and transmits alerts through its mobile network. Each MNO works with third-party vendors to construct these CBCs, which vary in design and configuration but must comply with SUBTEL's technical standards. MNOs also bear the ongoing expenses for maintaining, operating and updating their CBCs, which includes skilled personnel who are responsible for reliable performance during emergencies. High operational costs can occur during incidents that require network switching, supplemental power and other contingency measures.

MNOs are also responsible for ensuring network infrastructure meets mandated resilience standards. This includes maintaining back-up power for a minimum of four hours during outages and participating in infrastructure-sharing agreements, such as antenna colocation, to reduce costs and ensure service continuity in emergencies.

Homologation of devices is a coordinated effort. MNOs contract a third party to operate the SAE Room where devices are tested and certified before entering the market. MNOs contribute the corresponding percentage of their market share towards the cost of operating the service. A new certification market has also emerged whereby device manufacturers pay authorised third-party companies to test and certify devices as SAE-compliant before they are sold.

While Chile's regulatory model mandates MNO participation as a public good, this approach may not be easily replicable in markets with fewer resources or lower commercial margins. In Chile, the financial burden has been absorbed as a condition of doing business in a well-regulated and well-resourced environment. In the case of Telefónica Chile, for example, the original investment funds to build the CBC and set up operations were allocated from Telefónica Spain. However, in other contexts, such cost structures may hinder meaningful MNO engagement and limit the reach and reliability of emergency alerts.

In other countries, more inclusive cost structures to support MNOs have proven effective. These include government reimbursements, universal service funds (USFs), tax relief and international development funding for expanding reach in underserved areas. For example, in Germany, the government reimbursed O2 for all expenses related to the implementation of the CB service in their networks, including the staff resources required. Ongoing maintenance costs are not reimbursed and must be covered by the MNO.⁴⁵ These models reduce operator risk and may be more sustainable for securing long-term MNO engagement in EWS, especially in lower resource settings.

⁴⁵ GSMA. (2023). [Cell Broadcast for Early Warning Systems: A review of the technology and how to implement it.](#)

Another potential cost-saving approach under exploration is the development of regional, cloud-based CB systems. For example, the Climate Risk and Early Warning Systems (CREWS) initiative, in collaboration with the ITU and World Bank, is supporting a regional CB platform for member states of the Eastern Caribbean Telecommunications Authority (ECTEL).

This shared system aims to reduce infrastructure and maintenance costs while preserving national control over the governance of alerts.⁴⁶

The following tables break down the capital and operational expenditures for Chile's SAE, specifying who is responsible for each.

Table 4:

Capital expenditures (CAPEX)

Component	Financial responsibility
CBE construction	Government
CBC construction	MNOs
Mobile network infrastructure upgrades	MNOs
Device certification	Manufacturers

Table 5:

Operational expenditures (OPEX)

Component	Financial responsibility
CBE maintenance and updates	Government (SENAPRED)
CBE operation staffing	Government (SENAPRED)
CBC maintenance and operation	MNOs
Mobile network ongoing operations	MNOs
Infrastructure sharing/colocation	MNOs
Telecom infrastructure monitoring	Government (SUBTEL)
Device homologation ("SAE Room" operation)	MNOs (market share based)

⁴⁶ ITU/G20 Disaster Risk Reduction Working Group. (2025). Scaling Up Cell Broadcast for Last-mile Early Warnings Delivery: Progress, Barriers, and Enabling Mechanisms.

07

Considerations for effective MNO engagement in early warning systems



The success of Chile's SAE offers valuable insights into the role of MNOs in mobile-based EWS globally. However, many of the enabling factors observed in Chile, such as high mobile penetration, widespread network coverage, pre-existing infrastructure and strong regulatory enforcement, may not be present in lower-income or less-connected markets.

While the underlying principles remain valuable, these considerations should be interpreted flexibly and will depend on the country context.

1. Clear and robust policy frameworks

A robust regulatory environment with clear roles and responsibilities underpins the effective participation of MNOs in Chile. Legal mandates clearly define MNO involvement and responsibilities, including infrastructure requirements, alert dissemination and handset compatibility. SUBTEL's regulatory oversight ensures compliance while providing technical guidance. All EWS stakeholders, including MNOs, benefit from knowing what is expected of them and each other.

2. The CAP standard and interoperability

Chile's use of the CAP aligns MNO systems with international messaging standards. CAP-enabled alerts support multi-channel dissemination, provide structure for geotargeting and ensure consistency across different networks and hazards. CAP adoption also facilitates integration between government systems and MNO-run infrastructure, reducing room for error or delay.

3. Stakeholder integration and coordination

Institutional coordination mechanisms, including technical protocols and designated emergency telecom coordinators within each MNO, embed MNOs in the structure of the national warning system. MNOs coordinate closely with SENAPRED and SUBTEL, while industry associations such as Chile Telcos support peer alignment. This model limits duplication, clarifies chains of command and positions MNOs as core actors within a wider ecosystem.



4. Goodwill and shared public interest

Although MNO participation in Chile is mandated by law, a culture of ethical commitment underpins the system. MNOs routinely cited the moral imperative to protect lives, even in the absence of direct commercial gain. Shared social values and a collaborative spirit, including joint cost-sharing arrangements, help sustain long-term engagement.

5. Testing and iteration

MNOs in Chile regularly participate in national simulations, daily system tests and iterative improvements led by SENAPRED. A culture of "learning while doing" has enabled the system to evolve over time, expanding to new hazards and updating protocols based on stakeholder feedback. MNOs benefit from this clarity and routine, which help maintain readiness and trust in the system's performance.

6. Handset compatibility

Handset homologation ensures all devices sold in Chile are compatible with SAE alerts, regardless of brand or network. This reduces digital exclusion and ensures uniform access to alerts. MNOs play a central role in this process, jointly funding the homologation system and testing devices before market entry. This shared approach ensures manufacturers comply with national alerting standards and distributes responsibility fairly. It also reduces the burden on MNOs by limiting the risk of device incompatibility undermining the reach or reliability of alerts.

7. Resilient infrastructure through collaborative approaches

Resilient infrastructure is essential for ensuring early warning messages reach the public during disasters. In Chile, MNOs finance and operate their own CBC and maintain direct control over system maintenance and upgrades. Continuity is reinforced through shared infrastructure, automatic roaming and mandated back-up power requirements. Recent large-scale emergencies have underscored the importance of designing mobile networks and power systems to withstand prolonged outages and risks. Coordination between the regulator and MNOs to define clear policy and infrastructure requirements, promote infrastructure sharing where appropriate and align expectations for service continuity during emergencies, have helped develop more resilient networks.



8. Public trust and sensitisation

Chile's SAE benefits from strong public trust, built over time through transparency, government-led education and intentional efforts to correct early missteps. MNOs contribute by hosting public-facing web pages about the system and by supporting initiatives that improve users' understanding of handset settings critical for emergency alerts. A better-informed public reduces confusion during crises, strengthens the legitimacy of the system and reinforces the reputations of MNOs, helping to mitigate concerns about being publicly associated with system failures or false alerts.

9. Inclusivity and effectiveness

For EWS to be truly effective, alerts must reach, be understood and acted upon by everyone. This includes marginalised groups such as those in remote areas, with limited digital literacy or facing language or accessibility barriers. While Chile's SAE is built on strong network reach and handset compatibility, broader inclusion considerations are important areas for future development. For MNOs, inclusion is not just a public good – it also supports more reliable performance and greater reach across their customer base. Collaborative efforts to identify and reduce access gaps can enhance the effectiveness of the system, build public trust and contribute to reputational value by demonstrating MNOs' commitment to safeguarding all users.

10. Sustainable financing

MNOs in Chile shoulder many costs associated with the SAE, particularly for infrastructure and ongoing operations. While this model has been sustained due to Chile's strong governance, institutional and financial capacity and shared public commitment, it may not be viable in many other contexts. In markets with higher cost constraints, limited operator capacity or differing public service obligations, MNOs will likely require financial support to enable and sustain meaningful engagement.

In other countries, more inclusive financing schemes, such as government reimbursements, USFs, tax incentives or offset expenditures, have proven effective at securing long-term MNO engagement in EWS. Such models are more likely to foster strong and sustained MNO participation, particularly in low- and middle-income markets.

08

Conclusion



The SAE in Chile is a particularly strong example of effective MNO engagement in an EWS using CB technology. MNOs comply with extensive regulation to deliver services at considerable cost. They do so not only as a requirement of doing business in Chile, but also because supporting the SAE is seen as “the right thing to do”.⁴⁷

For more than a decade, Chile has been developing a system grounded in strong government leadership, a clear regulatory framework and active private sector participation. MNOs play an integral role, not only in disseminating alerts via CB, but also in shaping and maintaining the technological and operational backbone of the system. Respondents from all stakeholder groups, including the public, often stated, “it works.”

Chile’s strong mobile connectivity landscape and penetration have ensured broad coverage for emergency alerts. While this may not be easily replicated in all contexts, the Chilean model offers practical insights into how MNOs can be effectively engaged in national EWS, and how governments can create an enabling environment that supports sustained involvement in safeguarding lives.



⁴⁷ Interviewee, KII Telefónica.

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