Emergency Telecommunications Failure

Unique identifier / Notation TL0211 **Synonyms**

Emergency communication systems, Communications capability, Emergency telecommunications, Network-enabled capability, Emergency services, Emergency network failure

Emergency telecommunications failure is an umbrella term for telecommunications of an 'extraordinary nature' under abnormal and potentially adverse network conditions (ITU, 2007).

Primary reference(s)

ITU, 2007. Y.2172: Service restoration priority levels in Next Generation Networks. International Telecommunication Union (ITU) (http://www.itu.int/rec/T-REC-Y.2172-200706-I/en). Accessed 26 January 2025.

Annotations

Additional scientific description

Emergency telecommunications are critical when a disaster occurs, to enable emergency and disaster response teams, government ministries, departments and agencies, as well as humanitarian agencies to coordinate and deliver disaster response and recovery efforts. Emergency telecommunications failure is closely linked to service restoration. Service restoration is described as a set of automated or manual methods, invoked after a network failure, to enhance the ability of successful communications reroute and completion around the failed network element(s) (ITU, 2014).

All forms of communications traffic are expected to be carried by next- generation networks - control plane traffic (e.g., routing and signalling messages), emergency telecommunications, real-time voice and video services, data services, virtual private network (VPN) services, as well as traditional 'Best effort' traffic. In such an environment, it is important to assign priority classifications and establish rules for service restoration such that critical services (e.g., control plane traffic and emergency telecommunications) are recognised and restored over other services in case of network overloads or failures. As service flows can be expected to traverse multiple network domains, priority classification is an important step in the development of the necessary signalling protocol extensions as well as of the mechanisms for enabling preferential restoration of critical services (ITU, 2014).

The requirements for disaster communication in terms of reliability, ruggedness and resilience also differ in different phases of a disaster. The broad scope of disaster management from a communication perspective needs to be handled as regards the type of communication technologies and their utilization in the various phases of the disaster (ITU, 2014).

Metrics and numeric limits

The ITU is currently developing global guidelines for countries to develop National Emergency Telecommunications Plans (NETS) to be used for early warning and in times of emergency. The framework seeks to address a country's exposure to natural hazards and disasters prior to developing emergency data and communication systems (ITU, 2019).

Key relevant UN convention / multilateral treaty

The Tampere Convention on the Provision of Telecommunication Resources for Disaster Mitigation and Relief Operations was established in 2005. This international treaty allows countries to remove regulatory issues to immediately provide emergency telecommunications where a disaster has occurred (United Nations Treaty Collection, 1998).

Drivers

Natural hazards can destroy telecommunications infrastructure and cause severe network disruptions. Electrical power is essential for these emergency communication systems to operate and power outages are directly linked to the drivers of this hazard (Townsend and Moss, 2005; Chang et al., 2007). In addition, human-caused hazards, such as sabotage, vandalism and war, impact on emergency telecommunications. Natural hazards impact emergency telecommunication. During and after an earthquake, emergency communications are crucial. Reliable communication is vital for disseminating information, coordinating rescue efforts, and allowing people to stay informed and connect with loved ones. In the immediate aftermath, traditional phone calls may be unreliable, so text messages, social media, and battery-operated radios become important communication tools (US Department of Homeland Security, 2024; PAHO, 2009). Solar geomagnetic storms generate X-rays and solar radio bursts, accelerate solar particles to relativistic velocities, causing major perturbations to the solar wind, and can cause detrimental effects to the electricity grid, satellites, avionics, air passengers, signals from satellite navigation systems, mobile telephones and more. (National Research Council, 2008; Royal Academy of Engineering, 2013)

Impacts

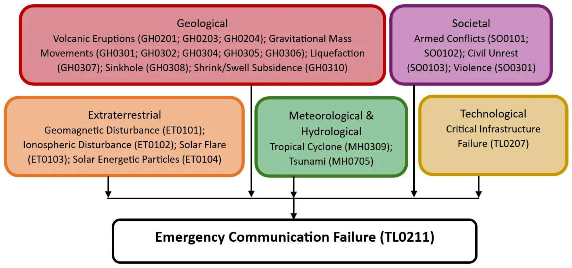
Emergency telecommunications failure can lead to the malfunction of early warning systems, increasing the potential for secondary damages. It also diminishes disaster response capabilities by causing delays or reducing the efficiency of emergency response operations. Furthermore, due to its interdependency with power and ICT systems, telecommunications infrastructure can become a target for cyber-attacks, creating additional vulnerabilities in the system (CISA, 2023).

Failure in emergency communications will have more impact in the context of other hazards, for example, wildfires are the most frequent type of emergency, particularly affecting transmission network circuits (Salema & Caldeirinha, 2024). Issues around emergency telecommunications failure increase the risk of physical damage and financial losses, where quick service restoration, to enhancing disaster response capabilities for improving emergency connectivity are vital.

Multi-hazard context

The figure below summarises common interactions between emergency communication failure and other hazards. This information should be used with caution and not be solely relied upon in Disaster Risk Management, particularly as some interactions may not have been included. Note that hazardous events occurring together or locally in space or time may not necessarily cause, amplify, or be otherwise related to each other. Specific examples of multi-hazard context can be found in the 'Hazard drivers' and 'Impacts' sections above.

Multi-hazard diagram



Risk Management

The ITU's NETS framework can be used across all stages of the disaster management cycle and provides guidelines for a country to establish robust Information and Communication Technologies (ICT) systems before, during and after a disaster (ITU, 2019).

In large-scale disaster situations, emergency telecommunication failures are likely due to network overload or interdependencies with power systems. To address these risks, it is crucial to enhance the resilience of communication systems by implementing measures such as network traffic and system performance monitoring. Additionally, risks can be mitigated through the establishment of backup communication systems, securing alternative communication pathways, and pre-planning the personnel and resources needed to ensure uninterrupted operations.

Mobile technology serves as a critical tool in mitigating emergency telecommunications failure, enabling effective communication across all phases of disaster management, including preparedness, resilience-building, response, and recovery. It ensures access to vital information and plays a particularly significant role in the dissemination and communication of early warnings (GSMA, 2023).

Monitoring

Emergency telecommunications failures exacerbate disaster risks by hindering communication and coordination among responders, potentially leading to delayed or ineffective emergency response, and increased physical and financial damage. Quick service restoration is crucial for enhancing disaster response capabilities, as it enables timely communication, information sharing, and coordinated actions to mitigate damage and aid affected populations (OECD, 2025).

References

Chang S.E., McDaniels T.L., Mikawoz J., Peterson K. Infrastructure failure interdependencies in extreme events: power outage consequences in the 1998 Ice Storm. Natural Hazards, 41 (2) (2007), pp. 337-358. (https://link.springer.com/article/10.1007/s11069-006-9039-4?utm_source=getftr&utm_medium=getftr&utm_campaign=getftr_pilot&getft_integrator=sciencedirect_contenthosting) Accessed 19 May 2025

Cybersecurity and Infrastructure Security Agency (CISA), 2023. Emergency Services sector cyber risk assessment. Cybersecurity and Infrastructure Security Agency (CISA). (https://www.cisa.gov/sites/default/files/2023-12/ess-cyber-risk-assessment_112023_508.pdf?utm_source=chatgpt.com) Accessed 26 January 2025

Groupe Spéciale Mobile Association (GSMA), 2021. National Emergency Telecommunications Plans: Enablers and Safeguards. A brief evaluation guide for policy practitioners. (https://www.gsma.com/solutions-and-impact/connectivity-for-good/mobile-for-development/wp-content/uploads/2021/12/NETP_Report_R_Digital.pdf) Accessed 19 May 2025

Groupe Spéciale Mobile Association (GSMA), 2023. Cell Broadcast for Early Warning Systems: A review of the Technology and how to implement it. (https://www.gsma.com/solutions-and-impact/connectivity-for-good/mobile-for-development/wp-content/uploads/2023/11/Cell-Broadcast_R.pdf) Accessed 26 January 2025.

International Telecommunication Union (ITU), 2014. Gap Analysis of Disaster Relief Systems, Network Resilience and Recovery. ITU-T Focus Group on Disaster Relief Systems, Resilience and Recovery Network. International Telecommunication Union (ITU). (https://www.gsma.com/solutions-and-impact/connectivity-for-good/mobile-for-development/wp-content/uploads/2023/11/Cell-Broadcast_R.pdf) Accessed 26 January 2025.

International Telecommunication Union (ITU), 2019. Global guidelines to develop national emergency telecommunication plans: Draft for comments. International Telecommunication Union (ITU). ITU Guidelines for national emergency telecommunication plans. (https://www.itu.int/en/ITU-D/Emergency-Telecommunications/Documents/2019/NETP_Global_guideline.pdf) Accessed 26 January 2025.

National Research Council. 2008. Severe Space Weather Events: Understanding Societal and Economic Impacts: A Workshop Report. Washington, DC: The National Academies Press. DOI: 10.17226/12507. (https://doi.org/10.17226/12507) Accessed 19 May 2025.

Organisation for Economic Co-operation and Development (OECD), 2025. Enhancing the resilience of communication networks. OECD digital economy papers May 2025 No. 374. Organisation for Economic Co-operation and Development (OECD). (https://www.oecd.org/content/dam/oecd/en/publications/reports/2025/05/enhancing-the-resilience-of-communication-networks_a47d78a1/d6920477-en.pdf) Accessed 19 May 2025

Pan American Health Organization (PAHO), 2009. Information management and communication in emergencies and disasters: manual for disaster response teams. Pan American Health Organization (PAHO). (https://iris.paho.org/bitstream/handle/10665.2/34886/9789275129937_eng.pdf?sequence=1&isAllowed=y#:~:text=Effective%20communication%20and%20information%20management%20are%20obviously,and%20re%2D%20ducing%20the%20risks%20of%20disaster.&text

=%E2%96%BA%20The%20challenges%20are%20to%20show%20how,quality%20of%20life%20of%20af%2D%20fected%20populations) Accessed 19 May 2020

Royal Academy of Engineering, 2013. Extreme space weather: impacts on engineered systems and infrastructure. (https://raeng.org.uk/media/lz2fs5ql/space_weather_full_report_final.pdf) Accessed 19 May 2020

Salema, C, and Caldeirinha R. 2024. 'Perspective Chapter: Mobile Radio Emergency Communications for Large-Scale Wildfire Fighting – Portugal as a Case Study'. Fire Safety Engineering - Measures, Policies, and Applications [Working Title]. IntechOpen. doi:10.5772/intechopen.1007773. (https://www.intechopen.com/online-first/1196009) Accessed 19 May 2025

Townsend, A.M. and M.L. Moss, 2005. Telecommunications infrastructure in disasters: Preparing cities for crisis communications. Telecommunications Infrastructures in Disasters: Preparing Cities for Crisis Communications - World | ReliefWeb. (https://reliefweb.int/report/world/telecommunications-infrastructures-disasters-preparing-cities-crisis-communications) Accessed 26 January 2025.

United Nations Treaty Collection, 1998. Chapter XXV: Telecommunications: 4. Tampere Convention on the provision of telecommunication resources for disaster mitigation and relief operations. (https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXV-4&chapter=25) Accessed 10 May 2025.

US Department of Homeland Security, 2025. Earthquake. (https://www.ready.gov/earthquakes#:~:text=Once%20you%20are%20safe%2C%20pay,part%20in%20disaster%20cleanup%20work) Accessed 19 May 2020

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Type

Technological

Cluster

Construction/Structural Failure (/hips-cluster/construction/structural-failure)

Coordinating agency or organisation

International Telecommunication Union (ITU) in partnership with World Food Programme (WFP)
United Nations Office for the Coordination of Humanitarian Affairs (UN OCHA)
United Nations High Commissioner for Refugees (UNHCR)

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