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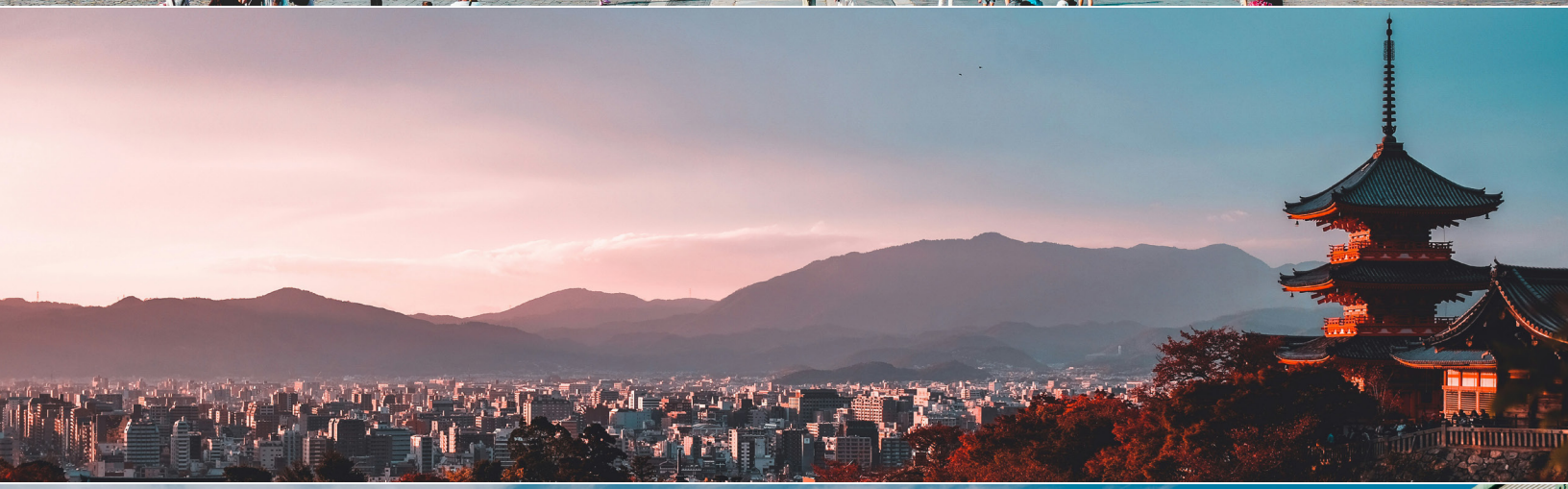
NORTHEAST ASIA

CHINA (PRC) | JAPAN | SOUTH KOREA (ROK)

Disaster Management Reference Handbook

April 2026







CENTER FOR EXCELLENCE IN DISASTER MANAGEMENT & HUMANITARIAN ASSISTANCE

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Letter from the Director

The People's Republic of China (PRC), Japan, and South Korea have all experienced frequent and major natural disasters. As a result of these experiences, each has established comprehensive policies, legislation, and coordination mechanisms to reduce domestic disaster risk and to respond and share expertise in the Indo-Pacific region and other regions around the world.

According to one count, in the past 25 years, PRC has experienced 688 disasters, Japan has experienced 181 disasters, and South Korea has experienced 70 disasters. Despite the number of disasters, these countries rarely seek international assistance due to their strong domestic coping capacity. They mobilize aspects of their coping capacity to participate in disaster management (DM) internationally. However, each of the three has their own way of interacting with disaster-affected foreign states due to differing DM structures, response frameworks, and capabilities.

Major multinational disaster responses in recent years have integrated responders from all three of these countries. PRC has deployed its Search and Rescue teams and sent funding and supplies more than a dozen times since 2001; the Japan International Cooperation Agency (JICA) has sent experts, relief supplies, equipment, and funding to a disaster-affected country almost annually since the late 1980s; and South Korea has deployed Korea International Cooperation Agency (KOICA) teams on 10 missions since 2008 in response to cyclones, disease outbreaks, earthquakes, and wildfires.

Recognizing the experience, lessons learned, and capacities that all three countries contribute to DM and response, the Center for Excellence in Disaster Management and Humanitarian Assistance (CFE-DM) continues to promote the use of international best practices for foreign disaster relief.

The goal of this updated Northeast Asia Disaster Management Reference Handbook is to provide background information for personnel participating in a disaster response operation during which they may interact with responders from PRC, Japan, or South Korea. This publication also offers civilian and military stakeholders who are decisionmakers, planners, researchers, and practitioners insight into these countries' DM policies and frameworks to strengthen international civil-military coordination.

Sincerely,

Joseph D. Martin, SES
Director

About the Center for Excellence in Disaster Management & Humanitarian Assistance

Overview

The Center for Excellence in Disaster Management & Humanitarian Assistance (CFE-DM) is a United States (U.S.) Department of Defense (DoD) organization comprised of nearly 30 subject matter experts that provide academic research, civil-military coordination training, and operational insights to support decision making before, during, and after crises. The Center is designed to bridge understanding between humanitarians, civilian, and military responders. CFE-DM partners with a diverse group of governmental and non-governmental actors, as well as academic institutions to increase collaborations and capabilities in humanitarian assistance and disaster response. While maintaining a global mandate, the Indo-Pacific region is our priority of effort and collaboration is the cornerstone of our operational practice. The Center is a direct reporting unit to U.S. Indo-Pacific Command (USINDOPACOM) and is located on Ford Island, Joint Base Pearl Harbor-Hickam, Hawaii.

Vision

Resilient Joint Forces, Allies, and Partners that are fully prepared to respond across the spectrum of humanitarian crises.

Mission

CFE-DM builds crisis response capacity in US, Allies and Partner militaries across the Indo-Pacific to save lives before, during, and after emergencies.

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EXECUTIVE SUMMARY

A large-scale, multinational disaster response in the Indo-Pacific will involve responders from the region's major political and economic players. This handbook provides disaster management (DM) profiles for the People's Republic of China (PRC), Japan, and the Republic of Korea (South Korea or ROK). By examining the hazards to which they are exposed, the vulnerabilities within their societies, and the domestic capacity they have developed, this publication shares insight into the types and scopes of response capabilities they can deliver as part of a response to a disaster elsewhere in the world. All three countries have developed mechanisms and capabilities that they deploy to support a disaster-affected state that has appealed for aid. However, their processes for determining where, when, and how they will respond differ and affect how they interact with other responders.

Domestic Demands

Although the people of some developing countries frequently suffer significant social, economic, and political disruption from hazard events, even the most advanced economies are exposed to hazards, and their people suffer adverse effects if an event overwhelms the climatic zone of their society to respond effectively. The PRC, Japan, and South Korea are economic powerhouses of Northeast Asia. The 2nd, 4th, and 12th (respectively, by the World Bank's measurement[1]) largest economies in the world are home to more than 1.59 billion people, 1.1 billion of whom live in urban areas. The intersection of built environment and ability to construct financial and social coping strategies has driven these countries to consider how to develop and implement programs to reduce vulnerability to hazards affecting urban areas. Each has learned ways to deliver hazard information, increase mobility options, and ease the delivery of assistance.

Recognizing that affected communities are most commonly the first responders after a disaster, all three ensure that resources and support flow to local authorities. Policy is managed at the highest national level – i.e., PRC's Ministry of Emergency Management, Japan's Minister of State for Disaster Management, and South Korea's Ministry of the Interior and Safety. These ministries organize and validate national DM plans and then integrate lessons and best practices from communities and local leaders.

Regional and International Work

The participation of PRC, Japan, and South Korea in international DM is institutionally separate from domestic DM although it is informed by it.

The equivalents of the foreign ministries from each of these countries have responsibility for deciding on what appeals for international assistance their countries meet. They deliver funding, relief, and technical expertise, as requested by the affected state and as meets their own domestic needs. For Japan and South Korea, relief supplies and responders mostly belong to overseas aid and development agencies – Japan International Cooperation Agency (JICA) and Korea International Cooperation Agency (KOICA). For PRC, search and rescue (SAR) teams and movement of relief and equipment are commonly directed by central authorities but may be deployed by provincial authorities. There are also private, non-profit, and non-governmental organizations from each of these countries who help with response efforts.

Japan is fully integrated into multinational humanitarian action. South Korea is well connected and increasing its human and financial contributions. PRC continues to expand its connections to the global humanitarian community. In coordination with United Nations (UN) entities, International Red Cross and Red Crescent Movement members, the Association of Southeast Asian Nations (ASEAN), and bilateral partners, the DM expertise and resources of PRC, Japan, and South Korea will remain in demand.

CHINA (PEOPLE'S REPUBLIC OF CHINA)

Country Overview

Many geophysical and climate regimes are present across PRC. The country's regions are exposed to a variety of hazards, and each region – or province – also has a mix of social and economic strengths and weaknesses. Some two-thirds of the country's 1.4 billion people live in urban areas, and rural residents continue to move to urban areas in search of opportunity. Meanwhile, some 22% of the population is over the age of 60 years, and many older people live alone. While the massive and diversified economy has the potential to support community resilience, it is not without challenges related to the concentration of industries in eastern urban areas, a swiftly aging population, and skills mismatches within the labor force. The highly centralized government is led at all levels by the Chinese Communist Party (CCP). Subnational administrators are tasked with implementing programs to reach national policy goals, including DM.

Geography and Environment

PRC's physical environment encompasses a wide variety of landforms and climatic zones. Much of the landscape is characterized by high relief, created by tectonic plate collisions that still drive seismic activity. Very high mountain ranges, the movement of continental and oceanic air masses, and the presence of major river systems all combine to create highly variable weather, and the country experiences frequent droughts and flooding. Finally, the country's coastal zones experience typhoon activity for six months of the year; wind, rain, and storm surge can be extreme.

With its southernmost point at around 19°N, PRC stretches 5,500 kilometers (km; 3,400 miles [mi]) northward to almost 50°N, and it extends 5,250 km (3,250 mi) from its western border with Kyrgyzstan and Tajikistan at about 74°E to its farthest eastern border with the Russian Federation at about 135°E.[2] PRC's land borders run for about 20,000 km (12,400 mi), and the coastline extends for some 14,000 km (8,700 mi).[3] The total area of the country is 9,596,960 km^2 (3.7 million mi^2).[4] Figure 1 shows a map of the country.[5]

The country shares land borders with 14 countries; counterclockwise from the northeast, they are the Democratic Peoples' Republic of Korea (North Korea), the Russian Federation (Russia), Mongolia, Kazakhstan, Kyrgyzstan, Tajikistan, Afghanistan, Pakistan, India, Nepal, Bhutan, Myanmar, the Peoples' Democratic Republic (PDR) of Laos, and Vietnam. The coastlines are on the Yellow Sea, East China Sea, and South China Sea.

The land generally slopes downward from west to east. The Tibetan Plateau in the west sits at an elevation higher than 4,000 meters (m; 13,000 feet [ft]). The Mongolian Plateau, Tarim Basin, Loess Plateau, Sichuan Basin, and



Figure 1: Map of the People's Republic of China

Yunnan-Guizhou (Yungui) Plateau in the central area sit at 900-1,800 m (3,000-6,000 ft) above sea level. In the east, hills and plains lie below 450 m (1,500 ft) of elevation. Beyond these generalities, relief can be stark; the country not only shares Mount Everest (the world's highest peak) with Nepal, but it is also home to Lake Ayding, which sits at 155 m (508 ft) below sea level. This relief is evidence of the seismic character of the country, impacted by the inexorable northward movement of the Indian tectonic plate, which thrusts the mountains of western and southwestern PRC upward.

There are three principal rivers that mark the country's landscape, drainage, and water management needs. They generally flow from west to east. The Huang He, the northernmost of the three rivers, rises in the Kunlun Mountains and drains into the Bo Hai gulf. The Yangtze rises in the Tibetan Highlands and flows across central PRC to drain into the East China Sea. The Xi, the southernmost of the three rivers, rises in the Yunnan-Guizhou Plateau and empties into the South China Sea via the Pearl River Delta. Despite the major influence of rivers, there are areas with virtually no surface water. The Tarim Basin in northwestern Xinjiang is one of these areas.

Adding climate to geography, the country's east is lower and flatter, cut through by rivers and exposed to monsoons. The northwest includes higher elevation basins and plateaus and is arid and eroded by wind and weather. The southwest is cold and high in elevation. Polar Siberian cold air masses prevail over most of the country in winter (November-March), and tropical Pacific air masses prevail in summer. Northern PRC is almost always under the Siberian air mass' influence and is dry, clear, and cold. Tropical summer air brings most of the country's rainfall.

Southeastern coastal areas can receive more than 2,000 millimeters (mm; 80 inches [in]) of rain annually. The Yangtze Valley receives 1,000-1,150 mm (40-45 in) of precipitation. Farther north, annual rainfall decreases to 880 mm (35 in). In the lower reaches of the Huang He, 500-650 mm (20-25 in) of rain falls annually. In northern parts of the Loess Plateau, annual precipitation is 300-500 mm (12-20 in). Throughout the far northwest, annual precipitation is less than 250 mm (10 in), and there are areas of true desert, where sometimes not a single drop of precipitation falls for several years.

Across the country, interannual precipitation varies massively. In south PRC, totals vary by more than 40% year-on-year; along the Yangtze, they vary by 45%, and in northern PRC, more than 50%. East of Beijing and in the central parts of the Yunnan-Guizhou Plateau, the rainfall variability in spring exceeds 80%. Cyclonic storms are active in northern PRC in July, and the typhoon season along the southeastern coast runs May-November. The areas that experience typhoons shift gradually northward from May to September and then gradually shift southward again.[6]

Society and Demographics

Approximately one of every five people on earth lives in PRC. The country's 1.4 billion people represent myriad ethno-linguistic groups, with many different lifestyles related to their distinct cultures and the livelihoods of their geographic and climatic zones. The country is experiencing both a shrinking population and an aging one. Meanwhile, more than two-thirds of residents live in urban areas, and there are heavy population concentrations in river valleys and coastal, delta zones exposed to major natural hazards. Communication of hazard and risk information can be complex due to differing needs, varying access to information infrastructure, and language barriers.

The total national population sat at 1,416,043,270 in 2024.[7] The national statistics bureau reported that the total fell by 1.39 million between 2023 and 2024, the third consecutive year-on-year decline. The number of total annual births in the country has been steadily falling since the 1960s,[8] and PRC has been aging swiftly in recent decades. In 2024, 22% of the population, 310 million people, were 60 years of age or older. However, there are wide variations in the speed of "greying"

among provinces. Tibet has the largest share of residents ages 0-14 years at 24 million and the lowest share of people over 60 years of age at 6 million. Meanwhile, Heilongjiang is home to only 9 million people in the 0-14-year cohort alongside 19 million people in the over-60 cohort. There are 14 provinces with more than 20 million people over the age of 60 years, and 1 province is home to more than 30 million people in this age cohort.

Alongside aging, the country continues to urbanize, and urban residents made up more than two-thirds of the population in 2024 when the total number of people living in cities hit 943.3 million. This shift saw eight provinces grow and 20 shrink in 2024. Already populous provinces – urban ones – continued to grow due to both internal, rural-urban migration and higher birth rates, while less-populous provinces continued to see outmigration and, in some cases, falling birth rates.[9]

Like population numbers and birth rates, population density varies widely across the country. The overall average is approximately 50.4 people per km^2 (389.5 people per mi^2).[10] However, according to estimates based on the PRC's National Bureau of Statistics, provincial population density can range from Shanghai's 3,911.4 people per km^2 (10,130.5 people per mi^2) to Tibet's 3 people per km^2 (7.8 people per mi^2).[11] Indeed, seven megacities are home to more than 10 million people each, and Shanghai and Beijing are each home to more than 20 million people.[12] This level of concentration can mean that many millions of people can access services to bolster their resilience to hazard events, but it also means that a major hazard event in a megacity can impact millions of people in one blow.

A key challenge for the country is that people over 60 years of age are either in highly urbanized areas where they have access to services and may be well-integrated into social structures that provide resilience in the face of disasters or other crises, or they are left behind in rural areas after children and grandchildren have migrated to cities. Those older people left in the countryside may have less access to services and be less well integrated into resilience activities, such as early warning systems or disaster risk reduction planning and implementation.

An additional aspect of culture may raise vulnerability to disproportionate effects from natural hazard events. The country's dominant ethno-linguistic group is the Han, who account for more than 91% of the population. There are 55 other recognized ethnic groups.[13] While there are Han in every province of PRC, people from minority ethnic groups tend to be concentrated in smaller areas. National law allows for those larger recognized minority groups to have administrative autonomy with some level of power over language and cultural issues within their autonomous region - e.g., Guangxi Zhuang, Inner Mongolia, Ningxia Hui, Tibet (Xizang), and Xinjiang Uyghur.[14] However, while some ethnic groups still use their own language as well as one of the various Chinese dialects, many are native speakers of a standard Chinese dialect because of the influence of Sinicization policies implemented by successive central governments. Since 2021, the national Ministry of Education has adhered to a policy of using Mandarin as the medium of instruction in all pre-schools.[15]

The ability of non-native speakers of standard Chinese to access hazard and risk information or to act on early warnings is a potential obstacle to those people participating in DM or accessing assistance during or after a disaster. Since older people within minority groups may be even less fluent speakers or readers of standard Chinese, minority elders may be especially vulnerable. Moreover, minority people living in remote areas with somewhat less access to information or transportation infrastructure may receive fewer updates on hazards or be unable to act when a warning is received. A district or province can plan to deliver key information in various languages and formats to ensure access by non-native speakers, older people, or people in remote communities.

Government

PRC's political system is characterized

by high levels of centralization, although implementation of policies is the purview of subnational administrations. All levels of administration are led by the CCP. Provincial and municipal leaders have some leeway in implementation of policies based on the context of their jurisdictions. With the national-level administration and CCP at the center of DM policymaking, subnational administrations implement programs and projects to meet policy goals. These goals cover all phases of the DM cycle – mitigation, prevention, preparedness, response, and recovery.

The CCP is the founding institution of PRC, which is a unitary party-state. The CCP itself is a massive bureaucracy with various agencies and offices, among which the national government is tasked with administering the country. The CCP's General Secretary and its Politburo lead the Party's Central Committee, its top institution. Politburo Standing Committee members concurrently hold key posts across the national government to ensure CCP control of government.[16] The party's General Secretary is concurrently the President of the PRC and Chair of the Central Military Commission (CMC), which forms the top leadership of the People's Liberation Army (PLA), which is the CCP's military, not the state's military.[17]

The State Council, subordinate to the CCP, is headed by the Premier. It is the national government or cabinet of the central government and comprises 21 government ministries, including the Ministry of Emergency Management, 3 ministerial-level commissions, the central bank, and the National Audit Office.[18] One of the agencies directly under the State Council is the China International Development Cooperation Agency (CIDCA).[19]

The National People's Congress (NPC) is PRC's unicameral legislature. It seats nearly 3,000 delegates, who are selected by and represent 33 provincial-level people's congresses and the PLA. One-third of delegates are sitting CCP and government officials. The NPC is tasked by the constitution with enacting and amending laws and approving the state budget and national plans for economic and social development, among other tasks.[20] The NPC meets annually for about one week. Therefore, in practice, the NPC's Standing Committee, a body comprising about 150 people, exercises legislative power. Constitutionally, the Standing Committee retains most of the power of the full NPC, including legislating and overseeing state agencies, and it may decide whether to declare a state of emergency nationwide or in parts of the country if a disaster strikes.

Subnational – provincial and municipal – governments are important for managing day-to-day aspects of administration across the country. Subnational administrative units are:

- Provincial level: 34 units, comprising 4 municipalities directly under central government jurisdiction (Beijing, Chongqing, Shanghai, and Tianjin), 23 provinces, 5 autonomous regions (Guangxi Zhuang, Inner Mongolia, Ningxia Hui, Tibet, and Xinjiang Uyghur), and 2 special autonomous regions (Hong Kong and Macau)
- Quasi-provincial level: 15 cities, of which 10 are provincial capitals
- Prefectural level: 318 units, comprising 278 cities, 7 prefectures, 30 autonomous prefectures, and 3 "leagues" (in Inner Mongolia)
- County level: 2,844 units, comprising 973 city districts, 388 county-level cities, 1,312 counties, 117 autonomous counties, and more than 50 "banners" (in Inner Mongolia)
- Township level: 39,000 units, comprising 8,000 neighborhoods, 21,000 towns, 8,000 townships, and 1,000 ethnic minority townships[21]

As with all aspects of PRC governance, the CCP maintains Party Secretaries at subnational levels, even though there are also provincial governors and city mayors. At all times, the official holding the CCP position takes precedence.[22] Sub-provincial officials and leaders – party and state – are appointed by the central government and retain significant control over local governance matters.[23] This

responsibility extends to local government control over emergency plans, training, exercises, and relief coordination.

Economic Profile

The economy of PRC is the second largest in the world by most measures. The basic system is highly diversified across agricultural, industrial, and services sectors. Productivity is driven by the concentration of enterprises, workers, financial institutions, and infrastructure in urban areas. While growth is steady, it is commonly understood as being export-led and heavily influenced by state-directed spending and investment. The size and diversity of the economy provide significant overall resilience to global price or supply shocks as well as to domestic disruptions, including large-scale natural hazard events.

The economy has enjoyed decades of rapid overall growth. Estimated at US$19.6 trillion in 2025,[24] the PRC's Gross Domestic Product (GDP) ranks second in the world, only behind the U.S. Nonetheless, the GDP growth rate has fluctuated over the past decade as structural shifts and financial conditions have challenged the CCP's economic managers to adapt to a changing global environment.

By some estimates, the GDP growth rate has averaged just above 6% since 2014. However, this average masks slower years (2.2% growth in 2020 and 3% growth in 2022) and a longer-term decrease in the rate of expansion, from a high of 7.4% growth in 2014 to a more moderate 4.5% estimated growth for 2025. Observers consider weak consumer spending, structural imbalances, and overreliance on export- and investment-led growth to be long-term challenges to a return to higher growth rates.[25]

An additional challenge stems from unequal distribution geographically of the benefits of the country's expanding economy. PRC's east coast provinces are considerably wealthier than inland and western regions. For example, Beijing recorded a per capita GDP of US$31,760 in 2024 while Gansu, in the northwest, reported a per capita GDP of US$7,358 the same year. With more than half of GDP delivered by the services sector and another approximately 20% delivered by manufacturing,[26] those eastern regions home to these sectors will continue to outpace less connected and less industrialized regions in a trend that could exacerbate differences in regional and household ability to build resilience.

Over the short to medium term, in addition to changing global conditions, the country will confront challenges related to its aging population and shifting labor force.

A shrinking labor force and demand for different skills than have heretofore been required are putting pressure on both employers and workers. As of 2022, the National Bureau of Statistics estimated the total potential workforce at 733.5 million people (over the age of 16 years). The same year, the All-China Federation of Trade Unions counted 402 million people in work. Of the total workforce, 293 million people (more than 70% of the population) had migrated from rural areas to urban areas for work, and the average number of years of education stood at 13.8 years. Meanwhile, the average age of a Chinese worker rose to 38.3 years. Over 85% of employed workers have a high school education,[27] but there are an estimated 500 million people between the ages of 18 and 65 years who have not completed high school. A broad swath of less-educated and lower-skilled people work in the expanding informal sector. As of 2017, the informal sector was thought to account for 56% of all jobs in the country.[28]

While more-educated and higher-skilled workers are seeing opportunities expand and wages rise, hundreds of millions of Chinese workers are unable to build household or individual resilience to hazard events or other individual or societal crises.

Disaster Profile

PRC is exposed to a wide range of natural hazards, and hazard events occur frequently. They commonly have severe impacts on infrastructure and society. Disease outbreaks, droughts, earthquakes, floods, forest fires, hailstorms, land- and mudslides, snowstorms, and typhoons occur almost annually and affect different regions of the country to varying degrees. Densely populated areas in the southeast are particularly prone to impacts from hydrometeorological and geophysical disasters. The average annual direct economic loss from disasters is approximately US$43.4 billion, and more than 100 million people are affected each year.[29]

Hazards

PRC's expansive territory encompasses diverse terrain, and regions experience highly diverse climatic conditions. The country is, therefore, exposed to the effects of a wide range of natural hazards, many of them seasonal, particularly in the Yangtze River basin, where monsoon climates and complex geological features amplify risk.

Drought

Droughts are becoming more frequent and severe, and PRC has been experiencing significant agricultural and economic losses due to drought. The highest rates of agricultural loss have occurred in northern and northeastern PRC, where crop yield reductions in some provinces reach 14-18%.[30]

The country experiences two primary types of drought: meteorological drought, which is typically associated with a lack of precipitation, and hydrological drought, which results from deficits in surface and subsurface water flow, often linked to conditions in larger river basins. Major climate-related drought events include winter–spring droughts in the southwest, spring droughts in the south, summer droughts in the northeast, and localized droughts in the south toward the end of the year. In some regions, drought and flood disasters occur in quick succession or even simultaneously.[31] In the summer, four provinces – Chongqing, Jilin, Liaoning, and Sichuan – tend to experience severe droughts. The likelihood of extreme drought is increasing most significantly in northern and western regions.[32]

Earthquake

Geophysical hazards are among the most significant threats in PRC. The country lies at the intersection of two major global seismic belts – the Circum-Pacific and the Eurasian – and this location makes it highly prone to earthquakes. Seismic activity is concentrated primarily in the southwestern and northwestern regions.[33]

Strong earthquakes, defined as those of Moment Magnitude (Mw) 6.0 or higher in eastern PRC and Mw 7.0 or higher in western PRC, can cause severe structural damage and heavy casualties. The occurrence of large earthquakes fluctuates over time, with periods of higher and lower seismic activity. Recent years have seen relatively high seismicity, and this trend is unlikely to change in the short term. Earthquakes are common in Qinghai, Sichuan, Tibet, and Yunnan, particularly along the edges of the Qinghai-Tibetan Plateau near plate boundaries. The 2008 Mw-8.0 Sichuan earthquake was one of PRC's deadliest disasters, resulting in 69,227 deaths.[34]

Extreme Temperature

Both the frequency and intensity of heatwaves have increased in recent decades. Projections of future climate conditions suggest a particularly severe heatwave risk in the North China Plain, where extreme temperatures combined with local irrigation practices may create conditions that pose dangers to outdoor laborers.

While heatwaves refer to short-term episodes of exceptionally high temperatures, chronic heat stress is also expected to rise significantly. Cities projected to experience substantial exposure to chronic heat stress include Beijing, Guangzhou, and Shanghai. At the national level, this risk is reflected in the growing number of days with a Heat Index exceeding 35°C (95°F),

which combines temperature and humidity to indicate conditions hazardous to human health. PRC is projected to experience increases in average, maximum, and minimum temperatures, although certain regions remain vulnerable to extreme cold events. Extreme temperature events are expected to continue to become more frequent and intense and require additional interior climate controls that may strain energy infrastructure.[35]

Flooding

Floods are among the most frequent natural hazard events in PRC. Most floods occur during June and July. The regions most affected by heavy rainstorms and flooding include southeastern coastal areas and the Yangtze, Huang He, and Huaihe basins. Rather than being limited to short-duration, torrential rainfall, flood-inducing rainy periods can last for days, weeks, or even a whole season. In 2020, PRC experienced 10 consecutive heavy rainfall events, and the rainy season lasted for 62 days, with overlapping affected areas recording the highest precipitation since 1961.[36]

To mitigate flood risk, approximately 331,000 km (205,673 mi) of river embankments have been constructed nationwide. They protect a population of 650 million and 42,000 hectares (103,784 acres) of arable land. However, more than 90% of these embankments are earth and stone dams built in the 1970s and 1980s. During flood season, they are highly susceptible to impacts of elevated water levels and prone to leakage, pipe clogging, and other structural failures. At the peak of the flood season, over 700,000 personnel are mobilized to patrol embankments and conduct 24-hour risk inspections across five provinces along the middle and lower reaches of the Yangtze. Nevertheless, manual dike patrols are difficult to sustain because they are time-consuming, labor-intensive, inefficient, and costly.[37]

Landslides

Around 69% of PRC's territory is made up of mountains and plateaus, where landslides, debris flows, and rock falls are common due to the terrain's geologic structure.[38] PRC is often impacted by landslides triggered by typhoons and heavy rains, but these events may also be triggered by earthquakes, winter conditions, or anthropogenic sources. Most landslides occur in southern and southwestern regions and usually during the rainy season. Deforestation is often cited as one of the leading causes of landslides in the country.[39] In recent years, PRC has devoted resources to researching landslides and boosted risk reduction efforts against this hazard.

A paper released in 2023 reviewed landslides across the country from 1940 to 2020. It found a total of 1,470 non-seismic triggered landslides that resulted in 14,394 deaths. The report found that landslides that cause human fatalities cluster in 13 provinces in southwestern PRC, and they occurred mostly during the April-September rainy season.[40] A separate study found that landslide events peak in July across most of the country.[41] Multiple studies have found that the average number of fatalities per decade has gradually decreased along with apparent human vulnerability,[42] and some studies point to advances in landslide research and disaster risk reduction efforts as driving these decreases.

While most landslides are triggered by heavy rainfall, many landslides are caused by seismic activity. PRC's deadliest landslide event occurred in Haiyuan County, Ningxia Hui Autonomous Region in PRC's northwest on 16 December 1920 when an Mw 8.3 earthquake triggered an estimated 3,700 landslides. The earthquake and landslides caused over 200,000 deaths, with around half of the deaths attributed to the landslides.[43]

Sand and Dust Storms

Sand and dust storms (SDS) are a large-scale hazard that typically originates in arid and semi-arid regions with limited vegetation. Desertification and overgrazing are often cited as contributing to the hazard. SDS can impact public health and the environment as well as transport and other infrastructure.

Strong winds lift large amounts of sand, dust,

and other surface particles from dry soil and transport them long distances. Larger particles can remain airborne for several hours, while smaller particles can remain airborne for more than 10 days. These types of storms affect the northern and northwestern regions of PRC each year. SDS mainly occur in the spring, particularly in April. In the winter, SDS are relatively rare but do occur. One study estimates that more than 500 million people are exposed to impacts of SDS annually in PRC.[44]

Originating mainly in arid areas of Inner Mongolia and the Taklamakan Desert in southern Xinjiang, as well as in neighboring Mongolia's Gobi Desert, windborne dust particles are carried eastward. The storms are driven by low-pressure systems combining with strong winds and cold air fronts to push dust into the atmosphere and carry it across PRC.[45] Northern PRC and Beijing are regularly affected by SDS originating from parts of Mongolia.[46] These storms can also affect regions as far away as Japan, South Korea, and Taiwan.

PRC has been working over the past few decades to mitigate the problem. One measure to prevent desertification is known as the "great green wall," which started in 1978. It aims to constrain the deserts in the north by stabilizing the sand with extensive tree planting. The "green wall" has been somewhat effective at slowing desertification and reducing erosion; however, it is less effective at reducing higher-altitude dust blown from far away.[47] Another such project is the restoration of vegetation in Inner Mongolia to reduce air pollution and desertification. A 2021 analysis of 15 years of data found a significant reduction of dust in northern PRC, and study authors attributed this reduction to increases in vegetation and more precipitation.[48] However, PRC officials have said that sandstorms in the region have been increasing in frequency since the 1960s due to rising temperatures and lower rainfall in the Gobi.[49] Future anticipated environmental changes such as drought, desertification, higher temperatures, and low precipitation rates are likely to increase the frequency and intensity of this hazard.

Typhoons and Storms

Typhoons bring heavy rainfall, strong winds, and storm surges. PRC's coastline, which stretches over 18,000 km (11,185 mi), is the primary area exposed to typhoons and windstorms. On average, seven typhoons make landfall along the southeastern coast each year, and they cause an estimated US$9.1 billion in direct economic losses. Among typhoon-related hazards, storm surges pose the greatest threat, and the most severe events have caused more than 100,000 fatalities.[50]

Typhoons that strike PRC originate in the Northwest Pacific Ocean and the South China Sea. They are characterized by widespread heavy precipitation and strong winds, often resulting in extensive damage to fisheries, agriculture, water infrastructure, and urban systems. Typhoons typically occur between June and October, peaking from July to September, coinciding with the East Asian monsoon season when elevated sea surface temperatures in the Western Pacific drive storm formation. In recent decades, rapid urban expansion and population growth in coastal cities has compounded the risk posed by typhoon-related hazards.[51]

Recent Major Disasters

PRC experiences a vast array of natural and technological hazard events. While dozens – and sometimes hundreds – of people can be impacted by transportation or industrial incidents and fires, those events that have widespread impacts tend to be geophysical or hydrometeorological. Annual storms – summer and winter – can cause flooding and landslides in river basins, low-lying areas, and steep slopes. Meanwhile, earthquakes can cause landslides and avalanches or, in urban areas, wreak destruction on the built environment.

Over the past 10 years, storms have been the most common and deadly hazard event, but there have also been several notable earthquakes. The vignettes below describe the largest events of the past decade.

Typhoon – September 2025

Typhoon Ragasa struck Hong Kong on 24 September 2025; it also threatened the mainland. The Hong Kong weather observatory said the storm had maximum sustained winds near the center of about 195 km per hour (kph; 120 mi per hour [mph]) as it skirted around 100 km (62 mi) to the south of Hong Kong, where strong winds damaged bridges and knocked down trees. The storm surge drove a ship onto the shore and damaged parts of the city's waterfront. Areas around some rivers and promenades flooded, and several promenade restaurants experienced wind and water damage. Over 60 people were injured. Nearly 1.9 million people were pre-emptively evacuated across Guangdong Province. A weather station in that province recorded wind gusts of up to 241 kph (150 mph), and a massive storm surge battered the coastline. Schools, factories, and transportation services were suspended in a dozen cities.[52]

Flooding – July 2025

From 23 July 2025, heavy rains fell over Beijing and surrounding provinces. They peaked on 28 July, a day when the Miyun district of Beijing recorded 573.5 mm (22.6 in) of rainfall in 24 hours, just below the annual 600-mm (24-in) average for a full year. At one point, Beijing's Huairou area saw an extreme record of 95.3 mm (3.75 in) of precipitation in an hour. Flooding and landslides caused by the rains left 30 people dead in the capital region, forced the relocation of 80,000 people, damaged roads, and cut off communication and power to 130 villages. In Miyun, where most of the deaths occurred, bridges collapsed and created obstacles for responders trying to reach the area. The rains also stretched into Hebei Province, where a landslide killed eight people, and Tianjin, where flood waters reached the roofs of many houses.[53]

Earthquake – January 2025

At least 126 people were killed and 46,000 people were affected[54] after a powerful earthquake struck a remote region of Tibet on 7 January 2025. In addition to PRC, the Mw 7.1 tremor and multiple aftershocks were felt in Bhutan, India, and Nepal, including by hikers at a Mount Everest base camp. The China Earthquake Networks Center reported some 500 aftershocks, 27 of which were Mw 3.0 or stronger. Officials reported that more than 3,600 houses were damaged, and many residents were trapped. Over 30,000 residents were relocated from isolated, hard-to-reach villages. With winter temperatures expected to drop below freezing for several days immediately after the quake, shelter and warm clothing were the greatest needs.[55]

Typhoon – July 2024

Tropical Cyclone Gaemi impacted PRC in late July 2024. Landslides and a dike breaching incident killed at least 15 people. Evacuations were widespread.[56] The storm made landfall in Fujian on 25 July before moving inland over Jiangxi Province. As the storm approached, more than 240,000 people were temporarily evacuated in Fujian, and more than 5,000 rescuers were deployed to several points in the province.[57] Once the storm made landfall and began dissipating, Henan, Hunan, Jilin, Liaoning, and Yunnan Provinces also felt the effects. In Henan Province, the typhoon affected some 87,000 people and left 4 dead. In Liaoning, more than 14,500 residents were relocated ahead of expected flooding, and a national-level emergency response was declared for the Beijing-Tianjin-Hebei region on 29 July.[58]

Earthquake – December 2023

On 19 December 2023, an Mw 5.9 earthquake struck Gansu and Qinghai Provinces in western PRC. Some 150 people were killed and 600,000 were affected.[59] Nearly 15,000 houses collapsed, and tens of thousands of people had to be evacuated. The China Earthquake Networks Center reported nine aftershocks at Mw 3.0 and above.[60] Water, power, transport, and communication links were disrupted. The high altitude and winter weather meant that responders were ordered to

rush warm clothing and shelter to the affected area. Rescue teams had to navigate difficult conditions on frozen roads in the mountainous area.[61]

Storm – July 2023

After it made landfall twice in Philippines, Tropical Cyclone Doksuri continued westward toward PRC. Ahead of the arrival of the remnants of the storm, PRC's national weather authorities issued their most severe warning and predicted gale-force winds.[62] The system reached Beijing after hitting the coast at Fujian on 28 July. Pre-emptive evacuations had seen more than 354,000 people relocated to shelters, and 880,000 people were eventually affected. In Beijing itself, more than 30,000 people were displaced by heavy rains and strong winds, and 20,000 people in Hebei Province were displaced.[63] Additional evacuations saw 125,000 people move to shelters in Shanxi Province. By 2 August, officials reported that 20 people had died. More than 150,000 people were reported to be without running water, and nearly 60,000 were affected by power outages.[64]

Earthquake – September 2022

On 5 September 2022, an Mw 6.6 earthquake rattled Sichuan Province. The death toll topped 118 people, and more than 130,000 people were affected.[65] The temblor severed telecommunications lines and triggered landslides and rock falls that disrupted transport and communications in neighboring Chongqing. Some power plants were taken off-line temporarily.[66]

Flooding – July 2021

Heavy rain fell over Henan Province between 17 and 23 July 2021. Flood waters inundated cities and villages, filled subway tunnels, caused the collapse of river embankments, and disrupted electric power supplies. Areas of the province saw as much rainfall in three days as they normally see in an average year. On 20 July, the provincial capital, Zhengzhou, received more precipitation in a single hour (202 mm; 8 in) than had ever been recorded in PRC,[67] and it received 617.1 mm (24.3 in) of rain over the course of 3 days.[68] In Xinxiang, north of Zhengzhou, seven reservoirs overflowed, sending waters downstream into 58 counties. During the peak of the flooding, citizens used social media channels to call for help, including from a subway train that was stuck in flooded tunnels in Zhengzhou.[69] After the week of flooding, the death toll stood at 398, and overall, the events affected more than 14 million people and 16 million hectares (39.5 million acres) of crops.[70]

Sandstorm – March 2021

From 14 March 2021, a massive dust storm blew out of the Gobi Desert and impacted communities across Mongolia, 12 provinces in northern PRC, and the Korean Peninsula. In PRC's Inner Mongolia, many cities closed schools and halted public transport, while flights at the provincial capital airport were grounded. Air particulate pollution in some areas was 160 times the recommended limit for human health. The dust storm reached Beijing on 15 March, and visibility in the city fell to less than 300 m (984 ft). Flights, schools, and outdoor events were cancelled, and public health advisories recommended that children, older people, and people with respiratory illnesses remain indoors.[71]

Flooding – June-August 2020

Exceptionally heavy summer rains affected much of East Asia in 2020. In June and July, PRC's Yangtze Valley received significantly more rain than the long-term average, and authorities reported five severe floods.[72] By 12 July, the floods had caused 141 deaths, flattened 28,000 homes, and damaged 3.53 million hectares (8.7 million acres) of crops.[73] As of 20 July, cumulative precipitation for the season exceeded 500 mm (19.6 in) over most of the river basin, and it topped 1,200 mm (47.25 in) in some areas of the lower reaches of the river.[74] On average, rainfall totals were more than 300 mm (11.8 in) above normal.[75] By 1 August, 4.2 million people across Anhui, Chongqing, Fujian, Guangdong, Guangxi Zhuang, Guizhou,

Hubei, Hunan, Jiangxi, Yunnan, and Zhejiang Provinces had felt the effects of the flooding.[76] The final floods, 14-22 August, saw long days of overlapping heavy rain bands drop 400 mm (15.75 in) of rain on the Yangtze's upper reaches.[77] The flooding left nearly 300 people dead by the end of the rainy season.[78]

Flooding – June 2019

Torrential rains wrought havoc across central and southern PRC from 10 June through early July 2019. The death toll topped 300, and more than 4.5 million people were affected across Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Yunnan, and Zhejiang Provinces.[79] In Guizhou Province, an entire town was submerged under 2 m (6.5 ft) of water.[80] Rainfall in Jiangxi reached as much as 688 mm (27 in), according to the national meteorological administration. The province saw floods wipe out 10,800 hectares (26,700 acres) of crops and destroy hundreds of houses. In Guangxi, 20,000 households lost power, while roads and bridges were damaged.[81]

Flooding – July-September 2018

From the first week of July into early September 2018, flooding and mudslides caused by seasonal storms and three typhoons left at least 65 people dead. Houses and farmland suffered heavy damage.

In the first week of July, heavy rain caused flooding in Gansu and Sichuan Provinces. Four consecutive days of rain, compounded by Typhoons Prapiroon and Maria affected 1.4 million people; 3 people died, more than 900 houses collapsed, and some 29,000 houses were damaged. A total of 36,900 hectares (91,000 acres) of crops were affected in Sichuan alone. Another heavy rainstorm in Gansu affected 1.5 million people; 12 people died, 2,300 houses collapsed, and 19,000 other houses were damaged.[82]

Later, heavy rain battered the northwestern Ningxia Hui Autonomous Region from 22 July, and more than 5,200 residents were evacuated. One spot in the region, Helan Mountain, received 277.6 mm (8.9 in) of rain, and floods roared down the eastern side of the mountain. In Inner Mongolia, the rain also triggered floods that left 12 people dead.[83] Flooding on 31 July killed 20 people as torrential rain battered Xinjiang Uygur, and 5,500 residents were evacuated to temporary relocation sites.[84]

August brought no respite. On 18 August, nearly 260,000 residents in Henan Province were affected by Typhoon Rumbia. Provincial officials reported that nearly 20,000 hectares (50,000 acres) of crops were affected and 138 houses were damaged.[85] The typhoon brought rainstorms and flooding to Anhui and Shandong Provinces, where emergency responders delivered relief materials to 6.4 million people; 18 people were killed in these two provinces.[86] Finally, in the first week of September, a flood and mudflow that hit Yunnan Province killed eight people. The events affected 52,000 residents and damaged over 4,200 houses and 1,800 hectares (4,450 acres) of farmland.[87]

Flooding and Landslide – June-October 2017

Severe weather in mid-2017 caused flooding and landslides that killed at least 60 people.

From mid-June, heavy rain caused flooding and landslides in Sichuan Province, where more than 7.3 million people were affected and 10 people died.[88] By the first week of July, an emergency had been declared, and 16 more people died in Guangxi Zhuang.[89] The same week, flooding along the Yangtze in Hunan Province saw the river reach a record 39.51 m (130 ft) above normal, and flooding inundated houses, uprooted trees, and damaged roads.[90] Another storm in late July saw flash flooding in Shaanxi Province. Ten people were killed, and some 76,800 people evacuated.[91]

A brief respite was broken by several tropical storm systems that caused flooding and drove evacuations, but the worst weather resumed in early October. From 1 to 9 October, heavy rains in Anhui, Henan, Hubei, Shaanxi, and Sichuan Provinces killed 23 people and forced tens of thousands to evacuate.[92] Five more people died in Hubei Province as heavy rain continued.[93] Then, on 16 October, Typhoon Khanun made landfall in Guangdong Province. More than 368,000 people were evacuated ahead of the storm's arrival.[94]

Drought – August 2016

During the summer of 2016, prolonged drought affected 10 million people. Affected provinces included Gansu, Heilongjiang, Inner Mongolia, Jilin, Ningxia, and Shanxi. More than 690,000 people lacked clean drinking water after the lowest amounts of precipitation in 10 years were recorded.[95]

Flooding and Landslides – June-October 2016

Severe weather impacted large areas of PRC throughout summer and into autumn 2016. Throughout June and July, flooding killed 417 people. During this period, central authorities declared 16 national responses and deployed 17 teams to affected areas.[96] There was no let-up during August and September, and more than 50 people died during these two months. During the whole five months, Typhoons Nepartak, Meranti, Megi, Sarika, and Haima brought high winds and heavy rains that caused destruction.

By the end of the first week of June, heavy rain and hail over Gansu, Guangdong, Guangxi, Hainan, Henan, Hubei, Shaanxi, Shanxi, and Sichuan Provinces had left five people dead. More than 23,600 houses were damaged or destroyed.[97] By the final week of that month, 10 southern provinces had reported 9 million people affected, more than 388,000 evacuated, and at least 98 people dead.[98] Rains continued, with concentrations over the lower Yangtze, and 14 more people were killed and 120,000 displaced by flooding the first week of July.[99] On 9 July, a landslide caused by torrential rains in Xinjiang killed another 36 people, while Typhoon Nepartak struck Fujian the same day and killed 3 people.[100]

Mid-August brought further heavy precipitation. Beijing, Hebei, Heilongjiang, Liaoning, and Shandong Provinces saw flooding that affected 78,000 people and caused 1 death.[101] These rains were followed in the first half of September by Typhoon Meranti, which impacted 2.7 million people across 15 cities in Fujian, Jiangsu, Jiangxi, Shanghai, and Zhejiang Provinces. In these areas, 29 deaths were reported.[102] Heavy rains continued over Sichuan and Yunnan Provinces during the following week, and 14 more people were confirmed dead, while 81,000 had been affected.[103] September rains were boosted on 28 September by Typhoon Megi's landfall in Fujian Province. As rains moved inland, they caused a landslide in Zhejiang Province, where eight people were killed.[104]

On 18 October, the next storm system arrived. Typhoon Sarika made landfall on Hainan. The Category 2 typhoon packed winds of up to 162 kph (100 mph), and nearly 500,000 people were evacuated from coastal and low-lying areas. Days later, on 21 October, Typhoon Haima made landfall in Guangdong Province. Some 668,000 were evacuated ahead of the storm's arrival, and nearly 1.7 million people were affected.[105]

Tornado – June 2016

On 23 June 2016, severe weather hit Yancheng, Jiangsu Province. A tornado and hail characterized the storm that killed 98 people and injured 800 more. Wind speeds reached 125 kph (78 mph). Homes and factories were destroyed. Emergency crews reported conducting 100 rescues and supporting the evacuation of 2,000 others. Central authorities dispatched relief goods while provincial authorities deployed a 1,000-person rescue team and sent additional supplies.[106]

Disaster Management Policy, Planning, and Response

The central government sets DM policies and directs national, multilateral, and bilateral execution of preparedness, response, and recovery activities. However, implementation of all aspects of domestic DM devolves to lower levels of administration – provinces and counties – with many local administrations maintaining their own SAR capabilities that are used not only at home but may also be available for overseas work. The Ministry of Emergency Management (MEM) is the central ministry responsible for domestic DM strategy and planning. The Ministry of Commerce is the most significant player for foreign disaster response, with cooperation from Ministry of Foreign Affairs and PLA, as required. PRC has delivered large-scale assistance to disaster affected countries near and far in the past two decades.

National Disaster Management System

The emergency management system at the central government level consists of four elements:

1. National contingency plans
2. Emergency management offices
3. Emergency response mechanisms
4. Emergency response law

National Plans

The State Council is responsible for the overall national contingency plan and the master plan for aspects of the process – i.e., early warning, response, recovery, and reconstruction.[107] National DM and risk reduction plans are published with time periods concurrent with the overall national 5-year planning cycle, and the current plan is the National Comprehensive Disaster Risk Reduction Plan for the 15th Five-Year Plan, unavailable in English as of the completion of this handbook.

The National Emergency Management System Plan during the 14th Five-Year Plan Period (2021-2025) set the goal of reducing the average annual direct economic losses from natural disasters to within 1% of gross national product over the course of the work period. This plan followed the key period of 2015-2020, during which the MEM was established. The State Council's 13th Five-Year Plan for the Construction of National Emergency Response System led the country to develop a cohesive, authoritative, and effective national emergency response system under the new MEM.[108]

Emergency Management Office

There are nominally six levels of DM organization – i.e., central government, province, city, county, township, and village. The MEM, within the State Council, serves as the coordinator of the whole national process of risk and disaster management – assessment, mitigation, preparedness, response, recovery, and reconstruction.[109] Within the MEM sits the National Committee for Disaster Reduction (NCDR), an interministerial coordination mechanism that is responsible for drafting national disaster reduction policies and plans.[110]

Emergency Response Mechanisms

Under the 14th 5-year plan, the government targeted construction of a National Emergency Command Headquarters with facilities, equipment, and systems to dispatch, command, and deliver operational support. Moreover, regional emergency rescue centers and command sites were targeted for development. In addition to delivering centralized command, they would be able to conduct education and training and to run drills.[111]

Once an event has occurred, it is categorized by a "level," which designates the scope of response necessitated by the event's severity. These response levels are:

- Level I – Central government direction; may create new command body
- Level II – Major events under provincial government command
- Level III – Large events under the command of municipal governments
- Level IV – General incident under county government oversight[112]

Emergency Response Law

Under the 2007 Emergency Response Law, responsibility for handling disasters was vested primarily with county administrations because of the location of these authorities with respect to affected people. The law defines an emergency as "a natural disaster, accidental disaster, public health incident, or social safety incident, which takes place by accident, has caused or might cause serious social damage, and needs the adoption of emergency response measures."[113] It required the state to establish an emergency response management system with uniform leadership, comprehensive coordination, categorized management, graded responsibility, and territorial management.[114]

After the passage of the National Security Law in 2019, CCP leadership was reasserted, and the National Security Committee was considered the decision-making, deliberative, and coordinating body; the committee has the power to mobilize all national resources – party, government, military, and society – to respond to an emergency. This passage was followed by revision of the Emergency Response Law in November 2024 after "gaps" noted in the government's response to the Coronavirus Disease 2019 (COVID-19) pandemic.

The revised Emergency Response Law requires the government to offer "special and priority protections" to certain vulnerable groups, including minors, elders, people living with disabilities, pregnant and nursing women, and those who need prompt medical care. It also tasks the government with clarifying "false or incomplete" information related to a hazard or disaster and requires local governments to use web-based or automated reporting systems to inform higher levels of government of an emergency situation.[115]

Ministry of Emergency Management (MEM)

Since 2018, the MEM has been responsible for:

- Organizing preparation of the national emergency master plan
- Promoting development of and exercising the emergency plan system
- Establishing a disaster reporting system
- Dispatching a uniformly constructed emergency response team and material reserves
- Organizing construction of disaster relief systems and assuming command of the state in response to major disasters
- Guiding prevention and control of fire, flood, and geological disasters[116]

The MEM plans for and directs emergency rescues and develops the mechanisms for inter-departmental cooperation on disaster prevention and relief[117] based on the responsibilities it inherited from former authorities; these responsibilities (and their former authorities) are:

- All responsibilities of the former State Administration of Work Safety
- The emergency management responsibilities of the general office of the State Council
- Fire management responsibilities (Ministry of Public Security)
- Disaster relief responsibilities (Ministry of Civil Affairs)
- Geological disaster prevention and control (Ministry of Land and Resources)
- Flood and drought disaster prevention and control (Ministry of Water Resources)
- Grassland fire prevention (Ministry of Agriculture)
- Forest fire prevention related responsibilities (State Forestry Administration)
- Earthquake disaster emergency rescue responsibilities (China Earthquake Administration)[118]

Since the MEM's founding, the DM community has been oriented toward an all-hazards approach. As such, the Chinese People's Armed Police Force's Fire Fighting and Forest Forces were transformed into the National Comprehensive Firefighting and Rescue Force (China Fire and Rescue, CFR). Based on the CFR, the country was set to organize several national special disaster rescue teams, regional mobile rescue teams, and professional rescue teams with SAR dogs. The MEM's disaster

engineering rescue agencies were set to be a template for regional engineering rescue teams for areas with frequent flooding or geological hazard events.

The MEM has oversight over an emergency stockpile system that maintains relief supplies and materials. There are 20 central relief supply reserve bases and 35 comprehensive warehouses. The 14th 5-year plan period targeted construction of 7 more comprehensive reserve bases in key transport hub cities, in densely populated areas, and near disaster-prone areas. In addition, some 40 central and provincial fire and rescue emergency supply stockpiles were set for construction, alongside more than 200 prefecture-level warehouses.[119]

Non-Government Response

With a highly centralized DM system, the space for non-governmental organizations or civil society groups to participate in a disaster response or in other aspects of DM is small. Of course, residents and neighbors of affected communities respond immediately and spontaneously. However, organized work separate from authorities is discouraged, and previously active non-governmental groups are commonly integrated into government work or turned into paid service providers.

Civilian Rescue Teams (CRT)

A key aspect of local response is the civilian rescue team (CRT). Across the country, CRTs respond to emergencies in cooperation with government agencies and non-profits or foundations. There are an estimated 3,500 CRTs active throughout PRC. When a major emergency is declared, authorities can call for mobilization of CRTs, which then travel to the affected area. While some CRTs are independent, others have links to major organizations – e.g., One Foundation, Red Cross Society of China, or Blue Sky. Most are funded by their members, but others receive donations from foundations for large purchases like equipment, insurance, or transportation. Broadly, when a CRT responds, it can deliver the following emergency support functions:

- Lead/support SAR missions
- Transfer and distribute relief supplies
- Provide medical treatment and epidemic prevention
- Provide temporary resettlement and psychological assistance
- Inspect and maintain infrastructure
- Provide disaster assessments and reports
- Provide command and coordination

CRT volunteers generally have been able to stay for about one week at the affected site before returning to their homes. Therefore, they most often perform the first two duties.[120]

Blue Sky Rescue (BSR)

Formed in 2007, BSR is a non-government entity that is an auxiliary of the Beijing Red Cross branch. As of 2023, it was the largest non-government humanitarian entity in the country and had 50,000 registered volunteers. Of its volunteers, 10,000 or more have received professional training. BSR has gained membership in the UN's International Search and Rescue Advisory Group (INSARAG). In addition to domestic disaster responses, BSR teams have deployed overseas for rescue missions – i.e., for the earthquake in Nepal in 2015 and for the Türkiye-Syria earthquake in 2023.[121]

Red Cross Society of China (RCSC)

RCSC is PRC's official National Red Cross Society and serves as the country's unified Red Cross organization. It is a humanitarian social relief organization engaged in humanitarian work and a recognized member of the International Red Cross and Red Crescent Movement. The RCSC's mission is to protect human life and health, uphold human dignity, promote humanitarianism, and advance the cause of peace and progress.

Founded on 10 March 1904, the RCSC has been involved in assisting wounded soldiers, providing aid to refugees during conflict, and assisting disaster victims. It also supports relief activities in other countries whenever possible. After PRC's 1949 founding and with the support

of the Central Government, the RCSC was reorganized in August 1950, and in 1952, the RCSC reclaimed its seat in the International Red Cross and Red Crescent Movement. In 1993, the NPC Standing Committee officially promulgated the Red Cross Law, which provides legal protection to the RCSC and its work.[122] In 2017, the Red Cross Law was newly revised to further define the RCSC's statutory duties. In the 2024 revision of the Emergency Response Law, RCSC's responsibilities in disaster response and relief were more clearly defined.[123]

The RCSC maintains a stockpile of relief items, with some 2 million items pre-positioned across the country.[124] Nationwide, there are nearly 3,200 branches and over 20,000 staff. Volunteer numbers top 2.9 million.[125] The Red Cross organizations in Hong Kong and Macau became highly autonomous branches of the RCSC in 1997 and 1999, respectively. At present, RCSC has branches in the Special Administrative Regions of Hong Kong and Macau, and 70,000 grassroots units in communities across the country.[126]

According to the 2017 revised Red Cross Law, the RCSC performs the following statutory duties:

1. Carry out rescue and disaster relief work and establish a Red Cross emergency rescue system. In the event of war, armed conflict, natural disaster, accident, public health emergency, or other unforeseen events, provide emergency rescue and humanitarian assistance to the wounded, sick, and other victims.
2. Conduct emergency rescue training, popularize emergency rescue, disaster prevention and mitigation, and health knowledge, and organize volunteers to participate in on-site rescue.
3. Participate in and promote voluntary blood donation and body and organ donation. Participate in related work on hematopoietic stem cell donation.
4. Organize and carry out Red Cross volunteer services and Red Cross youth work.
5. Participate in international humanitarian relief work.
6. Promote the fundamental principles of the International Red Cross and Red Crescent Movement and the Geneva Conventions and their Additional Protocols.
7. Fulfill the tasks entrusted by the PRC government in accordance with the basic principles of the International Red Cross and Red Crescent Movement.
8. Carry out work in accordance with the relevant provisions of the Geneva Convention and its Additional Protocols.
9. Assist the PRC government in carrying out other humanitarian service activities related to its duties.[127]

In addition to its work with the International Federation of Red Cross and Red Crescent Societies (IFRC), the RCSC cooperates with the International Committee of the Red Cross (ICRC) and other National Societies.[128]

<u>One Foundation</u>

The One Foundation, formerly the Shenzhen One Foundation Charity Fund, is a grant-making organization focused on disaster relief, children's welfare, training of public welfare professionals, and funding grassroots charities. It was registered in 2011 as the first private charitable fundraising organization in PRC. Its headquarters are in Shenzhen, with offices in Beijing, Shanghai, Ya'an, and Chengdu.[129] During disaster responses, it commonly works with local authorities to source and deliver supplies. Perhaps more importantly, it has developed a network of non-government groups that are, individually, too small and too poorly funded to conduct appropriate training or response activities. By bringing its resources to bear, the One Foundation has been able to create 20 provincial networks comprising 1,000 local non-government organizations and to help them build training and resource bases.[130]

<u>China Association for Disaster Prevention</u>

The China Association for Disaster Prevention (CADP) is a nationwide social organization, supervised by the CCP and administered by the MEM.[131] It is a legally

registered national non-profit with members from institutions and teams whose personnel are engaged in disaster forecasting, prevention, relief, management, publicity, and education.[132] CADP's 24 branches and 1,000 members bring together academics, rescue professionals, and leaders of local civil society groups involved in DM.[133]

National Military Role in Disaster Response

Military personnel and paramilitary police officers are common first responders to major disasters within PRC. Because of their presence throughout the country, personnel from the nearest military installation often immediately arrive in affected areas when a local administration requires additional manpower, equipment, or other resources. At a policy level, it is expected that military resources will be available to support civilian authorities as needed. In past domestic disasters, the various PLA staff and branches have swiftly delivered. As PRC's military continues its 21st century modernization, the ability of the armed forces to support PRC's international disaster relief efforts may also expand, although the policy backbone for this work has been slow to develop.

The PLA is the armed wing of the CCP and, as a "party army," it serves the CCP rather than the state. The PLA encompasses four services – Army, Navy, Air Force, and Rocket Force – as well as four service arms – Aerospace Force, Cyberspace Force, Information Support Force, and Joint Logistics Support Force.

The CCP oversees PLA forces through the CMC, which serves policy functions and oversees strategies on manpower, training, and equipment. The CMC also oversees a paramilitary force, the People's Armed Police (PAP), which includes the China Coast Guard.[134] The Ministry of National Defense (MND), under the State Council, does not govern the PLA but manages PLA's interactions with foreign militaries and defense agencies.[135]

The CMC has directed the PLA to be ready and able to perform specific missions and tasks to support the CCP's strategy and defend PRC's sovereignty, security, and development interests. The PLA's missions and tasks include safeguarding PRC's territorial sovereignty and maritime rights and interests, maintaining combat readiness, conducting military training under real combat conditions, safeguarding PRC's nuclear weapons and its interests in the space and cyberspace domains, countering terrorism and maintaining stability, protecting PRC's overseas interests, and participating in emergency response and disaster relief.[136]

As PRC's economic and diplomatic interests and influence have expanded, Beijing has tasked the PLA with global missions such as distant sea lane protection, UN peacekeeping operations, and protecting PRC citizens abroad. The PLA established a naval base in Djibouti in 2017, and, according to U.S. government assessments, it appears to have had rotational access to a Cambodian naval base since December 2023.[137] Forward bases or agreements with other countries for use, overflight, or services, will be critical components of PLA's ability to participate in large-scale disaster relief beyond Central, South, and Southeast Asia.

PLA forces may mobilize for disaster response within PRC. The PLA Air Force and Navy and the PAP assist by procuring and transporting relief materials, equipment, and personnel. In multiple instances, PLA troops, PAP, and other militia have deployed in the thousands, along with vehicles and boats, to disaster-affected areas to help local governments with SAR, to clear debris and aid with clean up, to monitor riverbanks and dykes, and to help relocate at-risk residents. Engineering and anti-chemical brigades have also been mobilized for specific mitigation tasks.[138]

The PAP also routinely undertake civil support missions, especially law enforcement support and public safety, especially during disasters,[139] alongside another paramilitary force, the People's Armed Forces Departments (PAFD). PAFDs boost the PLA and PAP by recruiting and training at the local level. PAFDs are primarily responsible for ensuring domestic public security and social stability. Their units

are staffed by military and civilian employees from local governments. They are responsible for recruiting personnel for all armed security forces, and they conduct oversight of recruitment, organizing, and management of militia forces. PAFD units and the militia they oversee serve in an auxiliary capacity to help local officials cope with disasters and other crises.[140] The extremely local character of the PAFD cadres – they retain their normal jobs and lives – is considered by national leaders to be their biggest asset. They know the communities in which they operate and are trusted to participate in large- and small-scale emergencies.[141]

International Disaster Response

There are dozens of stakeholders involved in PRC's overseas development, humanitarian relief, and disaster response activities. Despite the 2018 founding of CIDCA, that agency is primarily a policymaker and strategic manager of development activities. On the ground in affected countries, official PRC aid is overseen by the embassy responsible for the country and is paid for, delivered, and monitored by Chinese companies or organizations contracted by national authorities or the provincial administration sponsoring the activity.

Embassies and consulates under the Ministry of Foreign Affairs are responsible for collecting and reporting back to Beijing information on a disaster; they coordinate the relationship between Beijing and the recipient government(s) and organize the receipt and distribution of relief supplies at the front line.[142]

When emergency assistance or development aid is delivered bilaterally, officials from Overseas Economic and Commercial Counsellor's Offices of the Ministry of Commerce oversee the aid. Ministry of Commerce country offices in partner countries where Beijing has frequent development programming usually have one or two staff members. Their work dovetails with the strategic demands and objectives of PRC's embassy or consulate. After an aid program has been delivered, CIDCA is tasked with evaluating its execution and feeding its findings back into planning and strategy.[143]

A January 2021white paper on foreign aid, "China's International Development Cooperation in the New Era," detailed that PRC's emergency assistance consists of providing supplies and equipment, dispatching international rescue teams and medical expert groups, and repairing damaged facilities.[144] Beijing decides how and where it will deliver emergency humanitarian assistance based on requests from and in consultation with affected countries that have appealed for assistance. The Global Development and South-South Cooperation Funds support cash and relief supply delivery, and the country can dispatch international SAR teams and medical expert groups to affected countries.[145]

The most common types of assistance delivered by PRC are relief supplies and cash donations. However, the China International Search and Rescue (CISAR) Team and China Search and Rescue (CSAR) participate in responses that require technical rescue capacity.[146] The CSAR, the CISAR Team, and SAR teams from provinces commonly mobilize for international missions. In May 2025, both the CSAR and CISAR Team won renewed "heavy" urban SAR classification from INSARAG; this recertification was the 2nd for CSAR, founded in 2018, and the 4th for the CISAR Team, founded in 2001.[147] Having teams classified according to a standard enables disaster-affected countries to prioritize acceptance of international support from urban SAR teams with the capacity needed for the situation. The "heavy" class is assigned to self-sufficient teams capable of working at two disaster sites simultaneously for 10 days (24 hours a day) without assistance from the affected country.[148] More recently, in December 2025, 160 personnel from the Beijing Fire and Rescue Corps, the National Emergency Medical Rescue Team, the CISAR Team, and other agencies won INSARAG certification to assess domestic rescue teams and award INSARAG badges to those who meet international standards.[149]

PRC's large-scale response to the April 2015 Mw 8.1 earthquake in Nepal can help understand the scale and variety of assistance PRC can deliver. The CISAR Team departed for Nepal the night after the earthquake. Beijing extended three rounds of emergency humanitarian assistance funding worth US$20.2 million to assist in procuring and distributing shelter, sanitation, and safety resources. Local governments of the Tibet Autonomous Region, the provinces of Fujian, Guangdong, Sichuan, and Yunnan, social organizations such as the RCSC, as well as Chinese enterprises and individuals, traveled to Nepal to provide emergency relief, while others donated cash or offered supplies. Chinese enterprises doing business in Nepal both conducted self-help and assisted the Nepalese government.

PRC has delivered various types of assistance to countries within its neighborhood and much further afield. The 2021 document, "Measures for the Administration of Foreign Aid," prioritizes aid to countries that maintain strong diplomatic ties with PRC, but it does not rule out delivering humanitarian aid to other countries. In the past five years alone, PRC has sent rescuers, technical advisors, funding, and relief supplies to Nepal, Myanmar, and Afghanistan – countries on its borders – as well as to Mozambique, Türkiye, and Syria – countries requiring significant logistics and overflight planning – and, finally, to Philippines and Tonga – island states with either geopolitical or geographic factors that challenge PRC's ability to deliver aid. Scholars have noted that direct bilateral aid from PRC to a disaster-affected country often depends on the relationship between the two and to domestic political elements within the affected state.[150]

Two overseas responses in the past five years illustrate the resources that PRC can deliver in the wake of a disaster in a country with which Beijing has built strong diplomatic and economic relations.

The response to the 28 March 2025 Mw 7.7 earthquake in Myanmar illustrates how PRC delivers disaster relief in a neighboring country that holds importance for Beijing's economic and security strategies. In a response organized directly between Myanmar's authorities and Beijing, Chinese teams were among the first to provide emergency response personnel and supplies.[151] The quake claimed at least 3,600 lives and caused severe damage near Mandalay; millions of people needed food, water, shelter, and medication even as transport and communications were disrupted. Myanmar's ruling junta rapidly appealed for international assistance. PRC dispatched US$13.9 million in emergency aid.[152] The CSAR, the CISAR Team, and the SAR team from the Hong Kong Special Administrative Region all worked as part of rescue, recovery, and medical teams through 9 April. Relief was delivered by PRC-chartered flights. Additional direct, bilateral financial assistance topped US$136.6 million by mid-April.[153]

After the Hunga Tonga – Hunga Ha'apai volcanic eruption and tsunami in Tonga in January 2022, PRC delivered disaster assistance. Because of the Tongan authorities' requirements that aid delivery be "contactless" within the context of the COVID-19 pandemic, PRC aid – like most other international deliveries – involved fewer human resources or technical experts and more military support. While other responding militaries – Australia, Fiji, France, Japan, New Zealand, the United Kingdom, and the U.S. – coordinated their work through Australia's Joint Operations Command Headquarters Humanitarian Assistance and Disaster Response International Coordination Cell, no PLA representatives were present in the Cell. The PLA delivered aid to Tonga in a completely bilateral fashion. The first batch of supplies was carried by two PLA Air Force Y-20 heavy transport aircraft, which departed from Guangzhou and had to stop at least three times (Indonesia, Papua New Guinea, and Fiji) to refuel for the 10,000-km (6,215-mi) journey. The aircraft carried some 33 tons of other relief supplies. PRC's second batch of aid was carried by two naval ships that set off from Guangzhou 10 days after the tsunami. Between them, the PLA Navy's landing platform dock Wuzhishan and replenishment ship Chaganhu carried more than 1,400 tons of aid.[154]

Critical Infrastructure for Disaster Management

PRC is a hub for Indo-Pacific logistics, and its transportation and communications systems have the capacity to meet domestic disaster response requirements and support international or regional response operations. Government, corporate, or non-profit missions to deliver relief to Central, South, or Southeast Asia can be launched from mainland PRC, while missions further afield require PRC to work with third countries for overflight and refueling. For most responses, major PRC airports or Chinese-managed or PRC-friendly air- and seaports in the affected region are potential logistics hubs. Moreover, PRC-based communications companies already provide connectivity in many countries. Their ability to reinforce or repair communication lines is significant. Disaster-affected countries' ability to access PRC satellite or other closed system information may prove critical in the future.

Transportation

There are major transport links between PRC and all countries in the Indo-Pacific region due to the strong trade links that PRC has built. Air and sea cargo departing PRC and destined for a disaster-affected country could pass through a number of major PRC air- or seaports and move on PRC-owned craft. Similarly, PRC personnel can reach most parts of the region swiftly to support PRC government disaster operations. However, PRC has not invested significantly in pre-positioned supplies. Rather, with few exceptions, PRC responders will expect to ship relief items from home, purchase them locally, or deliver cash to the affected state or implementing partners to purchase them. Key air- and seaports of embarkation for PRC's responders or relief cargo are profiled here. For responses in Bhutan, Central Asia, or Mongolia, overland transport may be utilized for cargo, although responding personnel – especially SAR teams – likely will fly to arrive expeditiously.

Airports

The major airports of PRC are pivotal players in global trade and they provide opportunities for handling humanitarian cargo. Given the role of the country's airports in time-sensitive commercial cargo movement, the availability of massive airports, sophisticated cold chains, and digital handling have the potential to ensure that any responders or humanitarian cargo moving from PRC to a disaster-affected country can depart from any number of hubs. The following list describes some characteristics of PRC's main cargo airports.

Beijing Capital International Airport (PEK)

Beijing Capital is the capital city's cargo hub, with annual cargo handling of more than 2 million tons. Recent investments have expanded the cargo facilities and integrated automation and security features.[155] One runway (1/19) is concrete surfaced, and the other (18L/36R) is surfaced in asphalt.

- 1/19: 3,800 × 60 m (12,467 × 197 ft)
- 18L/36R: 3,800 × 60 m (12,467 × 197 ft)[156]

Guangzhou Baiyun International Airport (CAN)

Guangzhou Baiyun, in the country's southern Pearl River Delta region, handles 1.8 million tons of cargo annually. It has specialized handling capacity for perishable goods, with an extensive network of cold-chain warehouses.[157] There are two double runways and one single runway.

- 1L/19R: 3,600 × 45 m (11,811 × 148 ft)
- 2R/20L: 3,800 × 60 m (12,467 × 197 ft)[158]
- 3/21: 3,600 × 45 m (11,811 × 148 ft)[159]

Hong Kong International Airport (HKG)

Hong Kong International handles more air freight than any other airport in the world. It manages over 5 million tons annually. The advanced cargo facilities include express cargo terminals, temperature-controlled storage, and on-site customs clearance.[160] There are three runways operational at the airport; they are all surfaced with asphalt.

- All runways: 3,800 × 60 m (12,467 × 197 ft)[161]

Shanghai Pudong International Airport (PVG)

Mainland PRC's busiest cargo airport, Shanghai Pudong is located on the PRC's eastern seaboard. The airport handles over 3.6 million tons of cargo each year and is equipped with dedicated cargo terminals and cold-chain facilities. It is home to a network of freight-forwarding companies.[162] The two double runways are surfaced in concrete.

- 17L/35R: 4,000 × 60 m (13,123 × 197 ft)
- 16R/34L: 3,800 × 60 m (12,467 × 197 ft)[163]

Shenzhen Bao'an International Airport (SZX)

Shenzhen Bao'an handles annual cargo volumes of nearly 1.3 million tons.[164] There are two runways.

- 15/33: 3,400 × 45 m (11,155 × 148 ft)
- 16L/34R: 3,800 × 60 m (12,467 × 197 ft)[165]

Seaports

The eastern coast of PRC is home to some of the world's largest, busiest, and most modern commercial ports. For delivery of immediate relief supplies, they are less likely to play a role given the time required to cover distances from PRC to most affected states. However, for nearer neighbors in need – the Koreas, Japan, Philippines, or Vietnam – they could provide additional capacity for relief cargo transit. The following list describes 10 key ports and their capacity. Figure 2 shows a map of these ports.[166]

Port of Dalian

PRC's northernmost port with year-round ice-free access, Dalian's port has 80 berths, and 50 of them can handle vessels more than 10,000 deadweight tonnage (DWT) and with a draft of up to 16 m (52 ft). Annual total cargo throughput stands at 455 million tons, and nearly 10 million twenty-foot equivalent units (TEU) of containers pass through annually.[167]

Port of Guangzhou

The state-owned Port of Guangzhou is the largest multi-purpose port in southern PRC, serving as the main gateway for the Pearl River

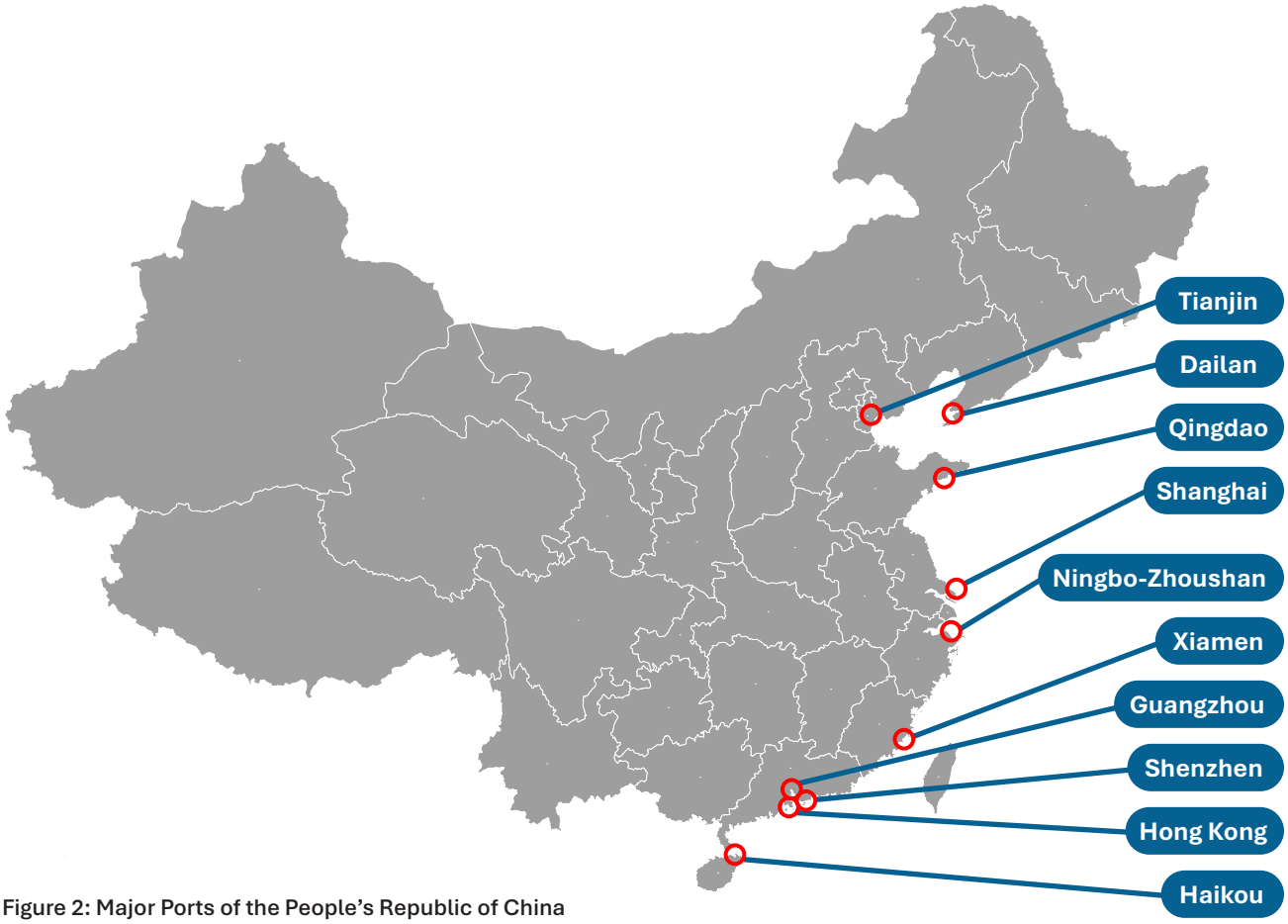


Figure 2: Major Ports of the People's Republic of China

Delta and Guangdong Province. The port has a total container throughput of 24.2 million TEU annually and a total cargo throughput of 600 million tons annually.[168] There are more than 4,500 berths across the port's terminals and areas, and storage space is significant across warehouses and logistics parks. In the near future, there is the expectation that the port will have the capacity to handle vessels of up to 100,000 DWT.[169]

Port of Haikou

On Hainan Island's northern coast, Haikou is the island's main logistics center and one of PRC's busiest ports for containers, general cargo, and passengers. It handles more than 14.5 million TEU of containers and 150 million tons of total cargo via 6 terminals.[170]

Port of Hong Kong

With its position on the South China Sea, the port of Hong Kong mostly handles containerized cargo. It handles nearly 20 million TEU of containers and 260 million tons of total cargo annually.[171] Handling is currently spread across nine terminals and 18 berths, with work underway to expand.[172]

Port of Ningbo-Zhoushan

Ningbo-Zhoushan lies along the central part of the mainland coast. The port is operated mostly by a state-owned company under the Zhejiang provincial government. There are more than 200 deepwater berths for vessels over 10,000 DWT and 115 large and super-large deepwater berths for vessels over 50,000 DWT. This port dominates PRC's super-large deepwater capacity. Annual container throughput tops 27.5 million TEU, and total cargo throughput tops 1.12 billion tons.[173]

Port of Qingdao

On the northern coast on the Yellow Sea, Qingdao's port is part of a Northeast Asia logistics cluster along with Yantai, Rizhao, and Weihai ports in PRC and South Korea's Busan Port.[174] Within the Qingdao port, there are four autonomous port zones; the Dagang and Qianwan independent ports manage freight and containers, Huangdong mostly handles oil and petroleum tankers, and Dongjiakou handles containers, general cargo, and iron ore.[175] Total container throughput tops 18.25 million TEU annually, and total cargo throughput tops 600 million tons annually.[176]

Port of Shanghai

Operated by Shanghai International Port (Group), Shanghai's main port is centrally located along the coast, north of Ningbo-Zhoushan. Its total annual containerized cargo throughput is 43.5 million TEU, and its total annual cargo handled is 514 million tons.[177] The port's operations are fully automated. Moreover, many smaller ports feed the Port of Shanghai. There are three working areas – Huangpu, Yangtze, and Yangshan Deep Water Zone.[178]

Port of Shenzhen

Covering 260 km (162 mi) on the southern coast, Shenzhen's port comprises several smaller ports on the eastern and western sides of the Kowloon Peninsula (Hong Kong). To the east are the Yantian and Dapeng port areas, and to the west are Nanshan, Dachan Bay, Dachan Island, Xiaochan Island, and Bao'an. Yantian, Nanshan, and Dachan Bay are the three main ports, with a focus on containerized shipping. Total annual tonnage tops 195 tons of cargo, and total container throughput tops 27.7 million TEU annually.[179] With more than 140 berths in total, the port has 51 berths dedicated to vessels over 10,000 DWT and 18 container berths.[180]

Port of Tianjin (Tanggu)

The largest port in northern PRC, Tianjin is Beijing's primary port of entry. It handles 500 million tons of cargo annually and continues to expand.[181] With a total land area of 120 km^2 (46.3 mi^2), the port has 200 berths across 9 zones, classified for the ultimate destination of their cargo.[182]

Port of Xiamen

The deep-sea port at Xiamen Island can handle sixth-generation mega-vessels. It is

the largest port in southeastern PRC, with 30 km (18.6 mi) of harbor and 74 berths across 12 operating zones, 9 of which are dedicated to containerized cargo. Annual container and cargo throughput are 10.7 million TEU and 218 million tons, respectively.[183]

Road and Rail

PRC shares land borders with several hazard-prone states, including landlocked ones. It could use overland – rail or road – links to deliver relief after a disaster. While this mode of transport may not suffice for rapid SAR team transport, it could be an option for supply transport if affected regions are served by major overland arteries.

For longer-term recovery supplies and equipment, rail could prove an effective mode for PRC to deliver to neighboring countries. Existing railroads link eastern PRC's major industrial areas with Russia's Far East and Mongolia; rail also links the western PRC cities of Urumqi and Kashgar with central Russia and Kazakhstan, with access from there into the rest of Central Asia. Planned rail lines from southern PRC will eventually connect to the rail networks of Southeast Asia – Lao PDR, Thailand, Malaysia, and Singapore.[184] The rail line linking PRC to Mongolia's capital requires a change of wheels at the border due to use of different rail gauges on the two countries' networks.

PRC's road links with surrounding countries are more robust than rail links and could serve swift, overland delivery of relief goods in border zones that are heavily populated and where commercial freight commonly moves. Multiple roads cross into Mongolia. Various routes link western PRC and eastern Kazakhstan. Only one road – Asian Highway (AH) 42 – links PRC and Nepal, a disaster-prone country where air transport has proven the most effective means of delivering past disaster relief. Two major highways and two other key roads link PRC to Bhutan. Various major and minor roads serve northern Vietnam from southern PRC, while one major road and some minor ones lead into northern Lao PDR. Road access between PRC and Myanmar is subject to heavy government restriction due to the conflict in Myanmar.

Communications

PRC has a robust, modern telecommunications system. The country's emergency managers continue to orient toward an early warning system (EWS) that reaches the entire population, with local and provincial emergency managers able to alert people. Moreover, Beijing is increasingly offering bilateral partners access to hazard monitoring tools and building out parts of a global monitoring system. The China Meteorological Administration (CMA) is among the key PRC representatives within the global EWS community; it promotes development of cloud-based EWS within its sister meteorological organizations, especially in developing countries.

The basis of PRC's domestic EWS is the domestic telecommunications sector. As of 2026, there are upwards of 1.8 billion mobile telephone subscriptions in PRC,[185] and all mobile phone connections in the country are broadband. More than 95% of the population uses a smart phone. Additionally, more than 1.3 billion residents are internet users, and 1.2 billion people have social media accounts. About half of the population owns a desk- or laptop computer, and 60% of internet users access the web via a computer, but more than 96% of Chinese internet users access the web via their smart phone.[186] PRC's hazard alerts are pushed by government offices to mobile phones via SMS, and government agencies maintain active accounts across the most popular social media platforms.

Early Warning Systems and Regional Information Sharing

Based on an 18 September 2020 policy regarding emergency science communications, the central emergency managers within the MEM are tasked with disseminating scientifically accurate and useful information about hazards.[187] Meanwhile, alongside the MEM, government departments at all levels have specified tasks to undertake when a disaster strikes; these tasks include communicating or sharing information.

The Ministry of Industry and Information Technology oversees the national command and dispatch system for emergency telecommunications, which links incident command vehicles at disaster sites or in transit.[188]

The national emergency warning information release system, like the four-level system for command of a disaster, has national, provincial, municipal, and county levels; it connects 22 government ministries, and uses a Common Alert Protocol to cover warning types across four categories (natural disaster, accident, public security, and public health) and 16 sectors that range from seismic and meteorological to transport, agriculture, forestry, and tourism. Alerts can be transmitted via TV, radio, mobile telephone, and internet.[189]

The alert system delivers warnings using four color-coded levels that apply across all four categories of emergency. The alert levels are:

- Level I (Red): The most severe alert, indicating an imminent and highly dangerous threat
- Level II (Orange): A serious threat is likely
- Level III (Yellow): A significant threat is possible
- Level IV (Blue): A general threat is possible[190]

China Meteorological Administration (CMA)

The CMA is the policy and regulatory agency for meteorological services across PRC. It sets technical and professional standards for provincial-level meteorological services. It is a key player in central government's DM planning and execution, as well as for EWS policies and programs.[191] The CMA is the central authority charged with assessing the risk of meteorological disasters in advance and updating forecasting and warning services. It relies on the national emergency warning information release system to continue to build out and improve the early warning hierarchy.

When severe weather is forecasted or has occurred, the CMA provides reminders to government leaders and heads of disaster-related departments. Under the emergency coordination mechanism triggered by meteorological early warning, a detailed classification of response grades has been developed, and the country has established a mechanism for suspending school, industry, and business in high-risk areas and areas under extreme weather conditions.[192]

The CMA Department of Disaster Mitigation and Services is tasked with organizing and conducting disaster prevention, mitigation, and relief operations and services for emergencies; formulating and implementing prevention plans and developing national-level contingency plans for meteorological disasters; conducting meteorological disaster risk assessments; organizing and guiding meteorological disaster prevention and mitigation efforts against cold waves, gales, lightning, heavy fog, etc.; and delivering meteorological services for decision-making, industry-specific needs, and major national events and key infrastructure projects.[193]

China Earthquake Administration (CEA)

The CEA, under the MEM, is tasked with building out the national seismic network and conducting earthquake research to minimize earthquake disasters. Since 2004, it has operated the China Earthquake Networks Center (CENC) to operate the seismic monitoring network. The CENC delivers rapid earthquake notifications, and it archives, catalogues, and reports data and information from the network. The CENC and 31 provincial earthquake centers coordinate and monitor over 1,000 seismographic stations and 3,000 strong-motion and intensity instruments.

From 2018, the country began to develop the National Earthquake Intensity Rapid Notification and Early Warning Project under the CENC.[194] Completed in mid-2024, the national earthquake EWS brings together observation, data processing, and emergency information. It uses 20,000 monitoring stations, with a concentration in the areas most exposed to seismic hazards. These stations feed early warning centers that then deliver automated messages to mobile telephones in addition to TV and radio.[195] All rapid reports from the seismic network are published by the CENC within 15

minutes – and often with 2-3 minutes – across SMS, Sina Weibo, dedicated apps, and a data-sharing website. Final reports regarding seismic activity are catalogued by the CENC on its website.[196]

Disaster Information Management

The National Natural Disaster Information Management System (NNDIMS) has been operational since 2009. It covers all villages and towns in the country. It supports integrated disaster reporting through desktop and mobile terminals, relies on both the broadband network and Beidou satellites, and forms a real-time backup operational environment. Based on the NNDIMS, the National Disaster Information Officer Database was completed in 2016. It manages details on 800,000 disaster information officers and provides real-time statistics for the officers and their contact information, thereby allowing direct channels between the national-level ministry and disaster information officers at the village level and supporting disaster trends analysis.[197]

Key Information Nodes

China Meteorological Administration

Web: *http://www.cma.gov.cn*

China Earthquake Administration

Web: *http://www.cea.gov.cn/*

Deployable Telecommunications Infrastructure

Separately from emergency response, PRC participates in global preparedness and mitigation through early warning or risk assessment capacity sharing, most often with countries involved in PRC's economic, trade, and infrastructure development programs. The Working Mechanism for the Belt and Road Earthquake Risk Reduction Cooperation brought together 22 countries and international organizations to support construction of earthquake monitoring stations and networks in Nepal, Lao PDR, and Kenya. It also contributed to establishment of the China-ASEAN Earthquake and Tsunami Monitoring and Early Warning System. In cooperation with the UN Development Programme, PRC helped Maldives use drones to monitor rising sea levels and floods to enable better disaster preparation and response.[198]

The CMA and CEA share data regionally and globally. The CENC shares real-time seismic data with 99 stations of the Global Seismic Network, and it shares information directly with the Korea Meteorological Administration.[199]

Fengyun Satellites

The CMA maintains a constellation of geostationary and polar-orbiting satellites – Fengyun (FY) – that monitor earth systems to support meteorological science and prediction. Their coverage spans from West Africa to the Central Pacific and from pole to pole. They deliver data on cloud radiation, sea and land surfaces, atmospheric parameters and composition, as well as space weather to the CMA's National Satellite Meteorological Center, and they feed the CMA's weather, climate, ecology, and DM forecasting and support.[200] Since 2018, as a provider of data and information to the World Meteorological Organization (WMO), the FY constellations can be tasked for disaster monitoring, damage assessments, and recovery assessments. More than 30 countries are registered to receive FY Emergency Support Mechanism observations during disasters.[201]

Multi-hazard, Alert, Zero-gap and Universal (MAZU)

PRC released the MAZU International Cooperation Initiative at the 2025 World Artificial Intelligence Conference. It is a technology-driven methodology to support "Early Warning for All" initiatives globally.[202]

The CMA is currently marketing its MAZU-Urban EWS to global partners. MAZU-Urban integrates advanced algorithms, multi-source data processing, cloud-based EWS products, and open-source meteorological models to support DM practitioners in risk assessment, monitoring, early warning dissemination, and response.[203]

JAPAN

Country Overview

The islands of Japan are exposed to a wide range of natural hazards ranging from seasonal typhoons to powerful earthquakes and devastating tsunamis. Japan's climate, geography, and dense urban centers mean that many people and the national economy are also heavily exposed. Due to its strong economy and stable government, the country has not only succeeded in reducing the vulnerabilities of groups who might otherwise be unable to cope with a disaster, but it has also developed a robust infrastructure backbone and the ability to fund research and mitigation efforts such as seismic-resistant buildings and world-renowned warning systems. While Japan's experience with disasters has resulted in a culture of preparedness, the country's economic losses from disasters are among the highest in the world and have the potential to undermine individual and some community resilience.

Geography and Environment

Japan is an archipelago in the western Pacific Ocean. It is also surrounded by the Sea of Japan, Sea of Okhotsk, and East China Sea. Figure 3 shows a map of the country.[204]

The archipelago consists of the four main islands – Hokkaido, Honshu, Shikoku, and Kyushu – as well as numerous smaller islands. The country has a total land area of about 378,000 km^2 (145,947 mi^2). The largest and most populous island, Honshu, is nearly 228,000 km^2 (88,031 mi^2) in area and is the 7th largest island in the world. It is home to the capital, Tokyo, and other major cities. The archipelago stretches for approximately 2,400 km (1,500 mi) from north to south. In addition to the four main islands, major groups of smaller islands include the Ryukyu (Nansei) Islands (including the island of Okinawa) to the south of Kyushu and the Izu, Bonin (Ogasawara), and Volcano (Kazan) islands to the south and east of central Honshu.[205]

Across all of the islands, the terrain is rugged, with mountains making up more than 80% of the land surface, and there are many active and dormant volcanoes, including Mount Fuji, the country's highest mountain, peaking at an elevation of 3,776 m (12,388 ft). Due to the mountainous terrain, most of Japan's population is concentrated in the country's limited flatlands.[206]

Japan experiences all four seasons, and most areas have a temperate climate, although the northernmost island, Hokkaido, is subarctic and Okinawa, far to the south, is subtropical.



Figure 3: Map of Japan

In general, Japan's climate is characterized as monsoonal, with a winter monsoon that blows cold air across the Sea of Japan and a summer wind pattern that brings warm, moist air from the Pacific.

From late September to late March, winds blow from Siberia across the Sea of Japan, where they pick up moisture, and they deposit this moisture as rain or snow on the side of the Japanese islands facing the Sea of Japan. During this period, the Pacific Ocean side experiences dry, windy weather. Most of the country has a warm, damp rainy season (the summer monsoon) from May to July.[207] The "tsuyu" rains begin in May,[208] and precipitation is heaviest during the "baiu" ("plum rain") in June and July, when most of the country receives the majority of its more than 1,020 mm (40 in) of annual precipitation. Eastern Hokkaido, where only 920 mm (36 in) of rain or snow fall annually, is the driest part of the country, while the Kii peninsula, on the central part of Honshu's southern coast, receives the most rainfall, with 4,060 mm (160 in) annually.[209]

Summer is very hot and humid, and the months of August and September bring the most active time of the typhoon season. Weather cools in autumn and winter.[210] Temperatures are usually warmer in the south than in the north. In Tokyo, the average temperature for January is 6°C (42°F), while the average for August is 27°C (81°F). The annual national average is 16°C (61°F). The warmest temperatures in the country occur in Kyushu and the southern islands.[211]

Society and Demographics

In 2025, the total population of Japan was estimated at 122,664,433.[212] Tokyo, located in east-central Honshu, is one of the world's most populous cities, with an estimated population of 33 million.[213] Indeed, the vast majority of Japan's population, some 92.19%, resides in urban areas.[214] The country has one of the highest life expectancy rates in the world at 84.04 years, and it has a shrinking population.[215] The aging society confronts long-term challenges related to abandonment of rural areas, a shrinking workforce, and strong cultural homogeneity.

The people of Japan are mostly ethnically Japanese. Only around 3% of the population are foreign nationals. This low number can be attributed to Japan's restrictive immigration policy that tends to favor the acceptance of foreign workers who are in the "professional and technical fields."[216] Foreign national residents from PRC make up the largest contingent of foreign national residents (26.0%), followed by Vietnam (15.7%), South Korea (14.8%), and Philippines (10%). With Japan not likely to ease immigration restrictions in the near future and with the current low number of foreign nationals residing permanently in Japan, the country's negative population growth rate is unlikely to change.[217]

Japanese is the national language. It is divided linguistically into two major dialects: Hondo and Nanto. Hondo is used throughout the country and can be divided into three subdialects: Eastern, Western, and Kyushu. Nanto is used by Okinawans from the Amami Islands in Kagoshima Prefecture to Yonaguni Island at the western end of the country.[218]

There is no dominant religion. Shinto, various sects of Buddhism, Christianity, and some "new religions" – e.g., Soka Gakkai, Shinko shukyo – coexist. Many Japanese people practice both Shintoism and Buddhism, which have roughly the same number of adherents, although there are slightly more people practicing Shintoism.[219]

Vulnerable Groups

The impact of hazard events on individuals and the coping strategies they employ depend heavily on socio-economic status, culture, and access to resources, among other factors. Specific risk reduction measures – especially including vulnerable people in hazard awareness and in planning for disasters – can help reduce vulnerability and build societal resilience.

Elders

Worldwide, Japan has the highest percentage of elderly residents. The estimated number of people aged 65 years or older is 36.19 million, some 29.4% of the population. According to estimates, this ratio is projected to reach 34.8% in 2040.[220] The aging population has socioeconomic consequences such as stress on the medical system and workforce shortages, and older people may be more vulnerable to the impacts of disasters. During a hazard event, older people may require more help and support, particularly during evacuations. Conditions in evacuation centers may be especially challenging for elderly evacuees who may be more susceptible to contagious diseases.[221]

Elders who reside in care facilities face additional issues including shortages of care workers who may themselves be affected or displaced by a disaster. Additionally, facilities or medical equipment may be damaged, and there may be a lack of running water and electricity to adequately run care centers.[222] Finally, older people are commonly less tech-savvy and may miss early warnings carried over personal electronic devices, such as smart phones.[223]

People Living with Disabilities

The number of people living with disabilities in Japan is roughly 11.6 million, or some 9.2% of the population.[224] Worldwide, people living with disabilities face a higher risk of negative impacts during disasters. Mobility, hearing, or vision impairments commonly translate into a need for assistance to access hazard information and for special care during evacuations. People living with disabilities may require specialized facilities or assistance, neither of which may be available at all emergency shelters.

Studies following the Great East Japan Earthquake and Tsunami in 2011 found that people living with physical, mental, or intellectual disabilities had a mortality rate 25-50% higher than the general population.[225] There are likely many reasons for the higher death rate, but key among them is the fact that people living with physical disabilities were unable to escape, while those living with hearing impairments may not have heard warnings. Reportedly, only one TV broadcaster – NHK – provided live closed captioning, and many people were unable to see the broadcast due to outages.[226] People living with disabilities who were able to reach emergency shelters faced inaccessible facilities and a lack of both information and medications. Some were forced to leave the shelters to seek assistance elsewhere. Japan has made progress since then, as people living with disabilities are actively involved in improving DM policies.[227]

Children

The estimated number of children under 15 years of age is 13.66 million, just 11.1% of the total population.[228] While Japan prioritizes disaster education in schools, children need assistance for disaster preparedness through teachers and family members, and they need assistance during a disaster. Children are commonly unable to independently access information or early warnings. Moreover, like elders, children may need help and support during evacuations. During and after a disaster, they may experience trauma and its psychological effects due to loss of family members or homes, and many experience education disruptions. Children also face challenges at emergency shelters, where they may need extra assistance and supervision, and they are more susceptible than most adults to illness during potential disease outbreaks.

People Living in Poverty

Despite a robust economy, Japan's poverty rate sits at 15.4%, higher than the average among members of the Organisation for Economic Co-operation and Development (OECD).[229] Thus, a significant portion of the population may not be able to financially withstand the shock of a natural disaster. This group may have significant overlaps with other vulnerable groups such as elders who, along with other low-income people, may lack adequate savings or live in older, less resilient housing. Besides loss of life and injury, the impacts of disasters on people living in poverty include loss of livelihoods, displacement, food insecurity, and poorer health outcomes.

Disasters can plunge populations not previously considered poor into poverty. Following the 2011 Great East Japan Earthquake and Tsunami, hundreds of thousands of people fell into poverty after losing homes, possessions, and jobs.[230]

Women

Japan's women make up 51.2% of the total population. Disasters exacerbate pre-existing gender inequalities, which include disparate access to resources, weaker social networks, and less decision-making power. Women may face increased vulnerability during disasters due to pre-existing discrimination related to already greater responsibility to care for elders and children. In some cases, women may face greater economic insecurity, and a key group is single mothers, who also face social discrimination. During or following a disaster, women may face challenges at evacuation centers, which, in the past, have lacked proper hygiene facilities, privacy, and security. Women with caregiving responsibilities or vulnerable social positions are more likely to be displaced, face food insecurity, and experience violence.[231]

Meanwhile, Japan's women have traditionally had less input and decision-making authority in DM. For instance, a survey by Japan's Cabinet Office revealed that almost 60% of municipalities had no female staff in their DM departments. To address these inequalities, the Japanese government adopted the Priority Policy for Women's Activities and Gender Equality 2024; it aims to promote the assignment of female staff in national and local governments. Local governments are also being encouraged to appoint women to key DM roles.[232]

Government

The Japanese government is a parliamentary constitutional monarchy. The chief of state is Emperor Naruhito (since 1 May 2019). The government is headed by a Prime Minister.[233] While the Emperor is the "symbol of the State and unity of the people," he does not have any political power. The Emperor appoints the Prime Minister, who is nominated by the legislature. The Prime Minister designates and heads up the Cabinet, usually filled by members of the legislature. The Cabinet comprises the Cabinet Office, Cabinet Agencies, and 11 Ministries.

The legislative branch, called the National Diet, consists of the House of Representatives (the lower house) and the House of Councilors (the upper house). Members of both houses are elected by the public. The Diet nominates the Prime Minister through a Diet resolution.

The judicial branch is comprised of the Supreme Court and four types of lower courts. The Supreme Court's chief justice is appointed by Cabinet nomination and official appointment by the Emperor. The other 14 justices are appointed by the Cabinet. Under the Supreme Court are high courts, district courts, family courts, and summary courts.[234]

Subnational governments are divided into prefectural and municipal levels:

- Prefectural level: 47 administrative prefectures, 43 of which are "ken" (prefectures proper), while Tokyo is a "to" (metropolitan prefecture), Hokkaido is a "dō" (district), and Kyoto and Osaka are "fu" (urban prefectures); the governor of each prefecture is elected by residents.[235]
- Municipal level: 1,718 cities, towns, and villages; mayors are elected by residents.[236]

The 47 prefectures fall into eight regions as follows:

- Hokkaido: Hokkaido
- Tohoku: Aomori, Iwate, Miyagi, Akita, Yamagata, Fukushima
- Kanto: Ibaraki, Tochigi, Gunma, Saitama, Chiba, Tokyo, Kanagawa
- Chubu: Niigata, Toyama, Ishikawa, Fukui, Yamanashi, Nagano, Gifu, Shizuoka, Aichi
- Kansai (Kinki): Mie, Shiga, Kyoto, Osaka, Hyogo, Nara, Wakayama
- Chugoku: Tottori, Shimane, Okayama, Hiroshima, Yamaguchi
- Shikoku: Tokushima, Kagawa, Ehime, Kochi
- Kyushu and Okinawa: Fukuoka, Saga, Nagasaki, Kumamoto, Oita, Miyazaki, Kagoshima, Okinawa[237]

Economic Profile

Japan is among the world's economic powers, but it is not without challenges. It is the second-largest East Asian economy[238] and has maintained steady – if slow at 0-2% – annual GDP growth since the 2008 global financial crisis, with the exception of the first year of the COVID-19 pandemic, which saw Japan's growth rate slip to -4.2%.[239] The country lacks natural resources like fossil fuels and most minerals, both of which are critical to support its industrial activity. Moreover, it has limited agricultural land and imports much of its food. Meanwhile, a stagnating work force and high cost of repairs to advanced infrastructure after disasters demand systematic and institutional attention.

The market-based economy is diversified with strong manufacturing and services sectors. It is one of the largest producers of motor vehicles, ships, steel, and consumer electronics, but the service sector has grown to dominate in terms of proportion of GDP and employment. Agricultural land is limited, but the relatively wet climate provides ample water that makes paddy cultivation possible. The principal crop is rice, with other crops including wheat, barley, potatoes, fruits, vegetables, and tea. Agricultural production has remained relatively stable since the 1990s,[240] but it only makes up a fraction (less than 1%) of GDP.[241] The agricultural sector employs about 3% of the working population,[242] but many workers have left for other sectors, and the median age of agricultural workers has risen. The fisheries subsector – traditionally a mainstay of the culture and economy – also faces problems such as overfishing and pollution. In addition, the number of workers has declined. Domestic fisheries production has been declining, and imports have exceeded exports in recent years.

Japan is one of the world's leading automakers and shipbuilders, and it is also a major producer of crude steel, synthetic rubber, aluminum, plastics, cement, pulp, paper, chemicals, and textiles. The country has some of the world's most advanced industrial plants and is well known for automobiles, consumer electronics, and consumer goods.[243]

The major economic and industrial zone is in Keihin, a region that extends inland from the northwestern shore of Tokyo Bay. It encompasses Tokyo and part of Kanagawa Prefecture. The center of the zone lies in the Kawasaki and Yokohama harbor area. Heavy industry, including steel mills and shipbuilding, has helped drive the national economy. Inland, factories for the automobile industry, consumer electronics, textiles, and processed foods support the manufacturing subsector. Industrial expansion has occurred from land reclamation projects; however, overcrowding has led to some factories being relocated to coastal areas of Chiba and Ibaraki Prefectures and other regions, where they may also be exposed to hazards. The financial capital is also located in Tokyo, where most major banks and financial institutions are based. This concentration of heavy and financial industry leaves a crucial section of the economy exposed to hazards, in particular the predicted "big one," or large earthquake that may strike the Tokyo area. Along with a projected major loss of life, such an event is likely to be devastating to Japan's economy, as it would not only kill or injure millions but would also disrupt livelihoods and damage massive amounts of capital. However, in most cases, Japan's advanced manufacturing industry, supply chains, and logistical capability allows the country to respond and recover from most disasters.[244]

As a modern economy, Japan confronts high costs related to hazard events. From 2013 to 2023, Japan experienced US$90.8 billion in total economic losses from climactic hazards, behind only the United States, PRC, and India, countries with exponentially more land area. Japan ranked 6th on the Disaster Risk Index compiled by global telecommunications company Intersec and based on a per capita comparison of deaths, injuries, and economic damage caused by disasters across 160 countries from 2000 to 2024. This ranking was driven by US$2.35 trillion in economic losses and 543 deaths and injuries when adjusted for the country's estimated population.[245]

Disaster Profile

Japan's climate, topography, and geographic location translate into high exposure to hazards. Many of the country's people live in high-risk, multi-hazard regions. Early warning systems and earthquake-resistant building practices help to mitigate some risk. While Japan's modern and resilient infrastructure has helped reduce casualties and damages, economic losses from disasters have been very high, accounting for 17.5% of global economic losses from natural disasters.[246] A key aspect of this huge toll is that disasters often follow each other in succession – e.g., earthquakes followed by tsunamis or typhoons followed by floods. As a highly developed nation and with an organized and capable DM system, Japan can cope with a range of disasters without the need for international assistance. Still, some of the most severe disasters can force the country to call for international assistance.

Hazards

Japan is exposed to a range of natural hazards. Its location along the Pacific Ring of Fire exposes the country to earthquakes, tsunamis, and volcanic eruptions, and it is also exposed to hydrometeorological hazards such as frequent typhoons and storms.

Drought

In general, Japan has abundant rainfall. However, most rivers are steep, and rainwater falling in the mountain ranges flows quickly to the ocean. Although the country has repeatedly faced serious water shortages owing to severe droughts, studies suggest that, historically, the normal rainfall pattern reasserts swiftly. However, since around 1965, there has been a nationwide trend of less rainfall, and droughts have occurred in many areas.[247]

Most recently, Japan experienced drought and record heat in the summer of 2025, and the effects included a surge in heatstroke patients presenting in hospitals, low water levels, and agriculture losses. New average temperature records were set in June and July along with the record low rainfall. Many regions received less than half of their average rainfall in July, with the Sea of Japan side of the Tohoku region receiving only 13% and the Hokuriku region receiving only 8% of average rainfall. Water levels in dams fell and prompted central and local governments to call for water conservation.[248] The low rainfall levels affected rice-growing regions such as Niigata Prefecture, which saw rainfall in July drop to just 3.5 mm (0.14 in) compared to 376.5 mm (14.8 in) during the same month a year prior.[249]

Earthquake

Japan is among the most seismically active countries in the world. It sits astride four major tectonic plates: the Pacific plate, the Philippine Sea plate, the Eurasian plate, and the North American plate.[250] The country and its surrounding area account for some 18% of the world's earthquakes. Because of historical activity, Japan is the birthplace of seismology as well as the study of tsunamis. Seismic activity is recorded about once every 5 minutes. Most major earthquakes and tsunamis affect the Pacific Ocean side of the country. However, there are occasionally large-scale quakes that happen under the Sea of Japan.[251]

The size of an earthquake is measured using two scales. One is the Moment Magnitude (Mw), and the other is the Seismic Intensity (Shindo) scale, the latter of which is only used in Japan. While Mw represents the amount of energy released by an earthquake, Shindo represents the level of shaking in a particular area. Levels on the Shindo scale go from 0 to 7, with 7 being the strongest. Levels 5 and 6 have both "lower" and "upper" ratings that make for a total of 10 levels.[252]

Although Japan's history with earthquakes dates back centuries, the two largest quakes to affect Japan in recent decades were the 11 March 2011 Mw 9.0 Great East Japan (Tohoku) Earthquake and Tsunami and the 1995 Great Hanshin-Awaji (Kobe) earthquake. The 2011 earthquake triggered a large tsunami that caused widespread destruction and left around 16,000 people dead. It destroyed around 17,000 homes and buildings and damaged another 138,000.

The earthquake and tsunami also damaged three reactors in the Fukushima Daiichi Nuclear Plant and triggered a nuclear crisis. Damages to the nuclear plant and the subsequent leaking of radioactive material forced the evacuation of more than 700,000 people living within the 20-km (12.4-mi) exclusion zone declared by the government.[253]

The Hanshin earthquake hit on 17 January 1995 and left an estimated 6,400 people dead. It was the worst earthquake to hit Japan since 1923. The Hanshin area is Japan's second largest urban area. As a result of the disaster, infrastructure was reinforced against another earthquake, and the government revised its disaster response policies. An emergency transport network was also created, and evacuation centers and shelters were set up in Kobe by the local government.[254]

Economic damage due to earthquakes has been very high. Earthquakes that occur in developed areas are the Asia-Pacific region's costliest events in terms of average annual loss, which incorporates direct and indirect losses to the economy. Japan accounts for 64% of total earthquake losses in the region; PRC accounts for 14%.[255]

Like other seismically active countries in the region, there is a fear of a potential "big one" occurring in Japan. According to some studies, there is a 70% probability of a major earthquake occurring directly underneath the Tokyo metropolitan area within the next three decades. Damage forecast from a Mw 7.3 quake would result in approximately 11,000 casualties and 175,000 damaged houses.[256]

Another scenario includes a mega earthquake (Mw 8.5 or higher) in the Nankai Trough, located just off Japan's Pacific coast. An earthquake there would be a megathrust earthquake that can generate tsunamis. The Trough is a 900-km (560-mi) long trench under the Pacific Ocean where the Philippine Sea plate is sliding under the Eurasian plate. According to some experts, there is an 80% chance of an earthquake there within the next 30 years. Estimates find that such a quake could trigger a tsunami as high as 34 m (112 ft) and cause an estimated US$1.81 trillion in losses. The Nankai Trough is known for producing a mega quake once every 100-150 years.[257]

Because of past earthquake disasters, Japan has invested heavily in engineering and technology to help mitigate the effects of earthquakes. During the Hanshin earthquake in January 1995, elevated rails of the Shinkansen (bullet train) collapsed and caused massive damage. Following the disaster, railway companies retrofitted elevated rail bridges by reinforcing bridge piers with steel plates. Since then, there have been no reports of bridge piers being seriously damaged in major earthquakes.[258] Buildings such as the Tokyo Skytree integrate advanced engineering, such as structural cores that absorb vibrations and seismic dampers that reduce impact.[259] The private sector has also added to the knowledge base of DM capabilities, for example, by developing the swing mass damper (SMD) device. Shimizu Corporation, a construction firm, designed the SMD to be installed on the roofs of ultra high-rise buildings to control multi-directional shaking caused by a major earthquake. Older buildings can be retrofitted with the SMD.[260]

Epidemic Disease

Japan has experienced several disease outbreaks in recent years; they include seasonal influenza, pertussis (whooping cough), COVID-19, Severe Fever with Thrombocytopenia Syndrome (SFTS), and streptococcal toxic shock syndrome (STSS). SFTS is a tick-borne disease caused by the bite of a tick infected with a virus. Shifting climate zones are amplifying the opportunity for disease vectors to spread into new geographic areas where people and animals have not developed defenses to the microorganisms they carry. Moreover, the aging and highly-concentrated population of Japan can swiftly share pathogens. A combination of public health measures, culture, and innovative treatment has heretofore helped the country stave off many outbreaks, but illness and death still impact many communities annually.

Flooding

Japan is exposed to several different kinds of flooding – flash floods, river floods, coastal flooding/storm surge, and tsunami wave floods.

Two key rainfall phenomena cause many of Japan's floods. The "Shūchū Gōu" refers to localized heavy rainfall that persists for several hours over one area. It is typically caused by a stationary seasonal rain front or the approach of a typhoon. Total rainfall can top several hundred millimeters (4+ in). Meanwhile, the "Kyokuchi-teki Ōame" refers to torrential downpours that occur when atmospheric conditions become unstable. Sometimes referred to as "guerrilla rainstorms," they often occur in summer and are localized. The total rainfall typically reaches several tens of millimeters within a short period.[261]

Economic damage from floods has historically been quite high. Since statistics for flood damage began in 1961, the most damage recorded was in 2019, when floods caused US$14.35 billion in damage. In 2021, total flood damage, including from debris flows, was approximately US$2.35 billion. That year, around 15,000 buildings were damaged, and the total devastated area covered roughly 18,000 hectares (44,479 acres).[262]

Japan has managed flood risk by large-scale flood control projects with a focus on urban areas. For example, the Tokyo area has large underground facilities built to help mitigate the effects of floods in the city. The Metropolitan Area Outer Underground Discharge Channel is 6.3 km (3.9 mi) long and located 50 m (164 ft) below the trunk road of the metropolitan area. The facility helps prevent floods by temporarily storing water and then discharging it to remote rivers. According to the Government of Japan (GoJ), this facility has mitigated flood risk in the 987 km^2 (381 mi^2) river basin that surrounds Tokyo.[263]

Heatwave

In recent years, Japan has experienced record high temperatures. The summer of 2025 marked the third consecutive year of record highs. Japan's hottest day in recorded history was 5 August 2025 when a temperature of 41.8°C (107.24°F) was recorded in Isesaki City, north of Tokyo; that day, heatstroke warnings affected 44 of 47 prefectures. The Isesaki reading passed the previous record of 41.2°C (106.16°F), set on 30 July 2025 in Tamba City, Hyogo Prefecture.[264] June-August 2025 was the hottest summer since records began in 1898; temperatures were 2.36°C (4.25°F) above normal.[265] In July 2025, the number of locations that recorded a maximum temperature of 35°C (95°F) or higher totaled 4,565, the most since data became available in 2010. Cases of heatstroke amounted to a record 17,229 patients who were transported by ambulance in June, the most in a month since 2010.[266]

Historically less exposed to extreme heat, much of Northeast Asia faces emerging heat risk. Parts of southern Japan, South Korea, and PRC can experience an increase of up to 100 days annually with a Heat Index above 35°C (95°F) and more than 50 days above 41°C (105.8°F). The UN Economic and Social Commission for Asia and the Pacific (UNESCAP) reports that these areas "are on a clear trajectory toward higher human health risks and a strain on urban systems."[267]

Landslide

Landslides are another common hazard due to mountainous terrain and unstable ground. Landslides are most often triggered by heavy rainfall, but they may also be triggered by melting snow or earthquakes. An estimated 680,000 landslide hazard areas are found throughout Japan.[268] A GoJ report in 2020 found that Japan experienced an average of 1,500 landslides every year over the previous decade; this number was almost a 50% increase compared to the previous decade.[269]

Landslides of three types – steep slope failure, deep-seated landslide, and debris flow – affect the country. A steep slope failure is the result of shallow soil movement on a slope steeper than 30°. A deep-seated landslide is a slow soil-block movement on a sliding surface deeper than 2 m (6.56 ft) below the surface, while a debris flow is a flow of mixed water,

sand, and stones. The frequency of steep slope failures and debris flows has increased by 136.1 and 42.9 times, respectively, per decade in the last 40 years, according to a 2025 study.[270]

Since 2006, the Ministry of Land, Infrastructure, Transport, and Tourism (MLITT) has requested that local officials hold landslide and disaster prevention drills. June has been designated as landslide prevention month to prepare for heavy rain and typhoons. The drills have reportedly resulted in a reduction in the amount of damage caused by landslides.[271] Sabo dams have also been built in high-risk areas to help mitigate damages from landslides.[272] Sabo dams are usually built in the upstream areas of streams where they are meant to suppress the flow of sediment, while those built at the exits of valleys produce a barrier to debris flow.[273]

Tsunami

Japan faces the world's highest tsunami hazard risk due to the country's location along the Pacific Ring of Fire, a high population density in coastal areas, and high infrastructure exposure along coastlines. More than 50% of the population of Asia that is exposed to tsunami hazard lives in Japan.[274]

The ever-present tsunami risk has instilled a culture of preparedness in the country. Old "tsunami stones" are found on coastlines, where they warn populations to "not build any homes below this point" or to seek high ground after earthquakes.[275] The Japanese observe "World Tsunami Awareness Day" on 5 November each year and mark the day with tsunami preparedness activities. Additionally, a unique Japanese concept is the "Tsunami Tendenko," an "each-one-individually" ethos that prioritizes the importance of personal safety during a tsunami. This principle, taught especially in Tohoku, is credited with saving hundreds of lives in the 2011 earthquake and tsunami, as it encourages citizens to act quickly, without waiting for others, and to prioritize individual safety.[276]

The region of seafloor around the Kuril Trench and the Japan Trench, which lie offshore of Hokkaido south to Iwate Prefecture, is a particularly exposed area. In 2022, the GoJ designated 272 municipalities in 8 prefectures as areas for promoting measures to prevent and mitigate damage from possible major earthquakes; it also targeted 108 cities, towns, and villages in 7 prefectures at risk of severe damage from tsunamis.[277]

Following the 2011 Great East Japan Earthquake and Tsunami, Japan invested in protective seawalls along the northeast coast since existing breakwaters along the coast were overwhelmed by the 2011 disaster. One example is the city of Rikuzentakata, which was among the cities fortified after the disaster after it was nearly destroyed by the tsunami. A 12.5-m (41-ft) high sea wall to separate the city from Hirota Bay was completed in 2019.[278] In addition, since the tsunami, some areas have forbidden construction in flat areas near the coast and have relocated residents to higher land. Other areas, including Rikuzentakata, have raised the level of land before constructing new buildings. By 2018, some 395 km (245 mi) of seawalls were built at a cost of US$12.74 billion.[279]

Tsunami Evacuation Shelters and Evacuation Sites – often school gymnasiums – are designated in certain areas. Evacuation Sites are temporary areas, and evacuees may be forced to move. More permanent shelters include Tsunami Evacuation Buildings to which local residents can evacuate. These buildings are normally located in coastal areas where there are no hills and, therefore, they provide a safe and resilient building for residents in otherwise unprotected areas.[280]

The Japan Tsunami Hazard Information Station (J-THIS) was developed to contribute to use of tsunami hazard information. J-THIS publishes probabilistic tsunami hazard assessment results on a distribution map called the "Map of 30-years exceedance probabilities of tsunami," which can show which coastal areas are relatively more or less likely to be hit by a tsunami compared to other areas.[281]

Typhoons and Storms

Typhoons can strike any region of the country. The typhoon season runs from May

through October, with most activity occurring from July to September. These types of storms bring strong winds, heavy rain, flooding, high waves, and storm surges. Aside from heavy rainfall and strong winds, typhoons are often accompanied by storm surges that threaten coastal communities. Landslides may also be triggered by typhoons.[282]

The number of typhoons to impact Japan per year varies, and the annual average for 1951–2023 was around 26; of these storms, 3 made landfall each year, according to data tracked by the Japan Meteorological Agency (JMA). During the survey period, August and September were the most active months. There are frequent stationary rain fronts near Japan in September, and if moisture-laden air flows into these fronts from a typhoon, activity can increase and worsen damage. Many typhoons in August and September follow tracks that generally sweep across the country.[283]

Volcanic Eruption

Japan is home to 111 active volcanoes. Volcanoes frequently erupt, but not all of them threaten population centers.

The country has a history of large-scale volcanic eruptions, including the 1707 Hoei Eruption of Mount Fuji and the 1914 Taisho eruption of Sakurajima. More recently, in 1991, Nagasaki Prefecture witnessed Mount Unzen's Fugen Peak erupt; a massive pyroclastic flow killed more than 40 people. Mount Fuji, Japan's highest peak and geographical symbol of the nation as well as a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage site, is an active volcano that some volcanologists say could erupt at any time.[284]

There is generally less threat from lava flows than from a sudden unexpected eruption where there is little to no time for safe evacuations. The 27 September 2014 Mount Ontake eruption was such a sudden event, where a difficult-to-predict phreatic eruption (an eruption driven by rapid vaporization and expansion of water caused by heating or depressurization of underground water) occurred suddenly. This eruption left at least 63 mountain climbers dead or missing near the mountain's summit. More than 15,000 rescuers conducted operations for 20 days. After the event, safety measures for climbers were updated; they included establishing evacuation facilities, reinforcing mountain cabins, stationing patrol personnel during certain periods of the climbing season, and a prefectural DM radio communications system.

The GoJ has designated 26 August as "Volcanic Disaster Preparedness Awareness Day" to increase public interest and understanding of preparedness measures for active volcanoes. The date was derived from 26 August 1911, when Japan's first volcanic observatory was established on Mount Asama. The GoJ stipulates that on the day the central and local governments must conduct events such as DM drills.[285]

Wildfire

The peak fire season usually begins in early February and lasts around 13 weeks. Wildfires generally occur between January and May. In recent years, the greatest number of fires recorded in a year was 208 (2015). From 2001 to 2024, around 13,000 hectares (32,124 acres) of tree cover were damaged by fires. The year with the most tree cover loss due to fires was 2012, when 1,200 hectares (2,965 acres) were lost. During 2001-2024, Hokkaido had the highest rate of tree cover loss from fires with an average 87 hectares (215 acres) lost per year. The next most affected region was Iwate with an average of 31 hectares (76.6 acres) lost per year.[286]

Recent Major Disasters

The following is a list of significant disasters in Japan within the past 10 years.

Heavy Snow – January-February 2026

Low temperatures and very heavy snowfall affected areas across Japan from 20 January into February 2026. They resulted in at least 35 deaths and 393 injuries. Around 15 prefectures in northern, central, and western Japan, as

well as coastal areas on the Sea of Japan were affected, with the worst effects felt in Akita, Niigata, and Yamagata.[287]

Severe Weather – August-September 2025

Heavy rainfall and storms in August and September 2025 affected several areas of Japan. Flooding and landslides resulted in casualties and damage.

On 8 August, five people were injured in Kagoshima and Toyama Prefectures. Over 124,000 people were displaced in Kagoshima. An evacuation order was issued for 358,248 people for Akita, Kagoshima, and Miyazaki Prefectures, and 179 houses were damaged due to flooding across several prefectures.[288]

Between 10 and 11 August, severe rainfall affected Kyushu, where it caused flooding and landslides and led to at least three deaths and widespread damage. The fatalities were due to landslides and flooding in Kagoshima, Kumamoto, and Fukuoka Prefectures. At least two people were reported missing in Kumamoto. Over 700 houses were flooded.[289]

On 10 September 2025, strong winds, tornadoes, and heavy rainfall affected central Japan, mainly Shizuoka Prefecture, where they caused several incidents. Media reported that a tornado had killed one person in Yoshida town, Shizuoka. In addition, 89 people were injured, and 1,836 houses were damaged across the prefecture.[290] A day later, heavy rainfall and strong winds hit Tokyo. They left at least one person dead and others injured. The Yazawa River in Setagaya Ward and the Tachiai River in Shinagawa Ward overflowed and prompted local authorities to issue evacuation alerts. According to media reports, the casualties occurred when containers collapsed at a port in Ota Ward. A third individual was injured after lightning caused a fire in an apartment building.[291]

Multiple Disease Outbreaks – Summer 2025

In Summer 2025, officials reported a surge in whooping cough and SFTS. As of 10 August 2025, authorities reported 64,467 cases of whooping cough, more than 15 times the reported 4,096 cases in all of 2024. As of 10 August 2025, the number of SFTS cases was 135, a record high. Although only a total of 1,071 cases had been recorded in Japan between March 2013, when records began, and April 2025, officials expressed concern about the spread. SFTS used to only be reported in warmer western regions, but it is now detected in eastern Japan. Environmental changes have contributed to the growing habitat for ticks and fuel concerns about further spread of other tick-borne diseases. Older populations are particularly susceptible, and the disease has a 27% fatality rate.[292]

Wildfires – February-March 2025

Several wildfires occurred across Japan in February and March 2025. They caused at least one death, several injuries, evacuations, and damage.

In late February, a wildfire in the Akasakicho area in Ofunato city in northern Japan left at least one person dead. It burned at least 2,900 hectares (7,170 acres), nearly 10% of the land in the city. Around 3,306 people were under evacuation orders, and the blazes damaged at least 200 houses and buildings.[293] Conditions were unusually dry, and Ofunato had received only 2.5 mm (0.1 in) of rain in February, the lowest monthly total for the month of February since 1964. Strong winds exacerbated the situation, and steep terrain challenged responders.[294]

Then, in late March, fires in the western towns of Okayama, Imabari, and Aso burnt hundreds of acres and injured at least two people. In Okayama, a fire started on Mount Kaigara and burned 250 hectares (600 acres) of forest land; nearly 900 people were evacuated and 6 buildings were damaged. In Imabari City, Ehime Prefecture, Shikoku Island, wildfires burnt an area of 137 hectares (338 acres). They injured one person and displaced at least 1,887 people. In Kumamoto Prefecture, Kyushu Island, 20 hectares (49.4 acres) were burnt, and one person was injured. Experts blamed dry weather and dry leaf litter as the likely cause.[295]

Tropical Storm Pulasan – September 2024

Tropical Storm Pulasan brought heavy rains to central-western Japan on 21-22 September 2024. At least 11 people were killed after the storm triggered floods, swollen rivers, and landslides, mostly across Ishikawa Prefecture.[296]

Typhoon Shanshan – August 2024

Tropical Cyclone Shanshan passed over Kyushu, Shikoku, and Honshu 29 August – 1 September 2024. It brought heavy rainfall that drove floods and landslides. At least eight deaths were reported - three in Aichi Prefecture, two in Fukuoka Prefecture, and one each in Kagoshima, Tokushima, and Saga Prefectures. In addition, 127 people were injured, and around 2,200 buildings were damaged. The most affected prefectures were Gifu, Miyazaki, Oita, and Shizuoka.[297] Parts of Miyazaki and Kagoshima Prefectures reported rainfall topping 400 mm (15.75 in) in a 24-hour period.[298]

Severe Weather – July 2024

Heavy rainfall affected northern Japan on 26 July 2024. Akita, Shiga, and Yamagata Prefectures were impacted by floods and landslides that caused casualties and damage. At least one person died in Omonogawa in Akita; three people were missing in Shinjo city, Yamagata Prefecture, and one person was missing in Yuzawa City, Akita Prefecture. Two people were injured in Okura Village in Yamagata. An evacuation order was issued for over 198,000 people across the three prefectures.[299]

STSS Outbreak – June 2024

In June 2024, Japan reported record levels of STSS, a rare and highly fatal bacterial infection. As of 2 June 2024, officials reported 977 cases, which surpassed the 2023 record of 941 cases, which had been the highest since statistics began in 1999. The infection has a mortality rate of up to 30%. Between January and March 2025, 877 deaths were reported; 97 deaths had been reported the previous year. Most STSS cases are caused by the group A streptococcus bacteria. In rare circumstances, strep A can become invasive when a bacterium produces a toxin that enables it to gain access to the bloodstream and cause serious illness such as toxic shock.[300]

Noto Peninsula Earthquake and Tsunami – January 2024

On 1 January 2024, a Mw 7.6 earthquake struck the west coast of Honshu, near the northern coast of the Noto Peninsula region of Ishikawa Prefecture. At least 240 people died in the earthquake, with 15 others unaccounted for. The earthquake also triggered a tsunami that was recorded to be at least 0.9 m (3 ft) and that damaged houses and property, while the area near Akasaki port experienced a wave of 4.2 m (14 ft). At least 120 hectares (296 acres) of land was flooded by the tsunami, according to the MLITT, while multiple landslides were also triggered by the earthquake.[301]

About 55,000 homes were totally destroyed or badly damaged. Thousands of people - peaking at more than 30,000 – were displaced. The earthquake also damaged infrastructure, and many residents were left without power and running water at the height of winter. Japanese news media reported widespread soil liquefaction, which contributed to the extensive damage. Wajima city in Ishikawa was one of the areas most affected by the earthquake and accounted for most of the casualties. The earthquake sparked a massive fire in the city, where around 200 buildings were burned down and many others were damaged.[302]

Tropical Cyclone Yun-Yeung – September 2023

Tropical Cyclone Yun-Yeung passed over central Honshu on 8-9 September 2023. It brought heavy rainfall and strong winds that caused floods and landslides that resulted in casualties and damage. Three deaths were reported across Ibaraki and Chiba. Around 1,200 buildings were flooded across Chiba, Fukushima, and Ibaraki Prefectures.[303]

Tropical Cyclone Khanun – August 2023

Tropical Cyclone Khanun affected southern Japan in early August 2023. At least one death and 72 injuries were reported. Khanun mainly

impacted Okinawa and the Kagoshima Islands; over 328,000 residents in Kagoshima, Miyazaki, and Okinawa were evacuated.[304]

Severe Weather – July 2023

Heavy rains, floods, and landslides in southwestern Honshu and northern Kyushu were recorded during July 2023. These events resulted in at least five deaths, five people missing, and 18 people injured. More than 1,400 buildings were damaged, and over 56,000 people were under evacuation orders across the prefectures of Fukuoka, Oita, and Saga.[305]

Tropical Cyclone Nanmadol – September 2022

Tropical Cyclone Nanmadol made landfall over southern Kyushu and western Honshu on 19 September 2022. It left two people dead in Miyazaki Prefecture. One person was also reported missing in Hiroshima Prefecture, and 130 individuals were injured across Kyushu and Honshu. Additionally, more than 110 houses were damaged.[306]

Mw 7.3 Earthquake – March 2022

A Mw 7.3 earthquake at a depth of 63 km (39 mi) occurred on 16 March 2022 off the coast of Fukushima Prefecture. It left at least two people dead and 161 others injured. The epicenter was located about 50 km (31 mi) east of coastal Minamisoma City in Fukushima. A foreshock of Mw 6.5 and an aftershock of Mw 5.5 were also recorded in the area. A tsunami warning was issued by authorities but was later lifted. A small tsunami up to 0.3 m (1 ft) was recorded in the coastal areas in Miyagi and northern Fukushima.[307]

Landslides – July 2021

Over 72 hours of heavy rain over central Honshu triggered massive landslides and mudslides that have resulted in casualties and damage the first week of July 2021. At least three fatalities in Atami Town, Shizuoka Prefecture, were attributed to a landslide that occurred on 3 July. In addition, around 80 missing people and 130 damaged buildings were reported across the same area.[308]

Earthquakes – February-March 2021

A Mw 7.1 earthquake struck off Japan's east coast on 13 February 2021. The epicenter was northeast of Namie, a coastal town 96 km (59.6 mi) from Fukushima.[309] One death was linked to the quake, which was felt throughout Fukushima, Iwate, and Miyagi Prefectures, and there were 185 people injured across 10 prefectures across northeastern Japan. More than 3,000 houses were damaged,[310] and at least 950,000 homes temporarily lost power.[311] The earthquake was followed by another Mw 7.0 temblor on 20 March off the Miyagi Prefecture coast, just north of Fukushima Prefecture. There were reports of buildings shaking as far away as Tokyo. Authorities reported seven injuries, and train service was disrupted in parts of the East Japan Railway Company network. Both the February and March quakes were considered aftershocks of the Mw 9.0 quake in 2011.[312]

Typhoons Haishen and Maysak – September 2020

Typhoon Haishen brought heavy rains to the Ryukyu Islands and Kyushu on 6-7 September 2020. It triggered floods and landslides that killed at least two people and injured 90 others. Nearly 100 houses were damaged or destroyed across the affected area.[313] The storm caused a loss of power for hundreds of thousands of homes while 8 million people had been asked to evacuate from the path of the storm. Haishen struck just one week after Typhoon Maysak, one of the region's strongest typhoons in years. Nearly 430,000 homes in Kyushu were without power on 7 September while factories, schools, and businesses across western Japan were shuttered. Hundreds of flights and trains were cancelled. Haishen also forced Japan's Coast Guard to suspend its search for sailors missing from a cargo ship that sank during Typhoon Maysak, which had affected southern Japan and the region at the beginning of September. The Gulf Livestock 1 was carrying 43 crew members and 6,000 cows when it went missing.[314] At least one crew member was later rescued by Japan's Coast Guard.[315]

Summer Storms – June-July 2020

Wet summer weather associated with storms along a seasonal front drenched parts of southern Japan from late June into early July 2019. One of the most severe incidents occurred on 3-4 July when devastating flooding and landslides battered Kyushu. Around 381 mm (15 in) of rain fell in just 6 hours, a record for rainfall, with some areas seeing about half of their average annual rainfall in just 2 days. On 8 July, a landslide occurred in a residential area of Hita City, Oita Prefecture; it covered several houses with mud and trees. Some 3 million of Kyushu's 12 million residents were advised to evacuate. Sixty people were confirmed dead in Kumamoto Prefecture, two in Fukuoka Prefecture, and one in Oita Prefecture, all due to flooding. The Kuma River, which flows through Kumamoto Prefecture, rose well above its banks on 4 July and washed away at least one bridge, cut off citizens from rescue crews, and caused widespread power outages. The Chikugo River in Fukuoka Prefecture flooded a large residential area.[316]

Typhoon Hagibis – October 2019

At least nine people were reported dead and dozens were injured as Japan recovered from its biggest storm in decades. From 12 to 14 October 2019, Typhoon Hagibis triggered floods and landslides as it battered the country with wind speeds of 225 kph (140 mph). Rivers breached their banks in at least 14 places and inundated residential neighborhoods. The storm first made landfall on the Izu Peninsula, southwest of Tokyo, and moved up the east coast. Almost 500,000 homes were left without power. In Hakone, more than 1 m (3 ft) of rain fell in 48 hours, the highest total ever recorded in Japan. Further north in Nagano Prefecture, levees along the Chikuma River gave way and sent water rushing through residential areas. Officials said some of those killed were swept away by landslides while others were trapped in their cars as floodwaters rose. More than 7 million people were urged to leave their homes as the storm approached.[317]

Tropical Storm Krosa – August 2019

At least three people died and 49 people were injured after Tropical Storm Krosa struck Japan. Krosa was the third tropical storm or typhoon to strike the country in as many weeks.[318] Krosa made landfall near Hiroshima on 15 August 2019 and began moving north. More than 400,000 people were advised to evacuate. Around 800 flights and train services were cancelled, and ferries to Shikoku were cancelled as high waves lashed the coast.[319] Krosa brought more than 800 mm (30 in) of rain and wind gusts of nearly 144 kph (90 mph). Yanase, a mountainous area of Kochi Prefecture on Shikoku, topped the storm's rainfall total list with 869.5 mm (34.23 in) of rain, 124.5 mm (nearly 5 in) of which was recorded in just 3 hours. A peak wind gust of 151 kph (94 mph) whipped Muroto, in coastal eastern Kochi. Torrential rain triggered a large rockslide, which closed a main road in a mountain valley.[320]

Typhoon Francisco – August 2019

At least one person died and several were injured on Kyushu as a strong typhoon hit the country on 6 August 2019. Typhoon Francisco, the season's eighth typhoon, made landfall in Miyazaki, where it delivered strong winds and torrential rain before it traveled northward. Nearly 130 flights were canceled, and train services were disrupted. At least 24,710 households lost power in 11 Kyushu cities and towns. The strongest wind gust was recorded in Miyazaki at 140 kph (87 mph), while Nobeoka city received 95.5 mm (3.75 in) of rain in one hour.[321]

Typhoon Trami – September 2018

Typhoon Trami hammered the Ryukyu Islands, including Okinawa, before making landfall in the southern main islands in September 2018. Trami underwent rapid intensification in the 24 hours leading into 23 September, and it reached Category 4 strength in southern waters but was a Category 1 when it made landfall in Wakayama Prefecture on 30 September. Trami injured dozens of people and forced tens of thousands to evacuate, and

it brought high waves, flooding, and storm conditions to much of central and southern Japan. Nanjo City on the southern part of Okinawa measured a wind gust of 201 kph (125 mph) on 29 September. The U.S. Air Force base at Kadena, Okinawa, reported a wind gust of 168 kph (105 mph) the same day. On mainland Japan, wind gusts late on 30 September were clocked at over 128 kph (80 mph) in Nagoya and over 96 kph (60 mph) in Tokyo. More than 431 mm (17 in) of rain fell in southern Japan, including in Miyazaki and Kochi. Flooding of homes and farms was reported.[322]

Hokkaido Earthquake – September 2018

A Mw 6.7 earthquake struck Hokkaido on 6 September 2018. The tremor struck 62 km (39 mi) southeast of Sapporo and was one of the strongest earthquakes Hokkaido has experienced. It triggered 3,800 landslides as well as cases of soil liquefaction, and it ripped roads apart. At least 41 people were killed, and some 700 people were injured.[323] More than 3,600 people were evacuated to shelters. Water supply and local public transportation were disrupted in some areas, and electric power was cut to nearly 3 million households after damage to a major thermal plant.[324] Power shortages caused shutdowns at factories and shops, and significant amounts of industrial equipment were destroyed. The quake also caused extensive damage to agriculture, forestry, fisheries, and public works.[325]

Typhoon Jebi – September 2018

The strongest typhoon to hit Japan's mainland in 25 years smashed a tanker into a bridge and forced one of the country's largest airports to close and hundreds of flights to be canceled. At least 10 people died after Typhoon Jebi slammed into western Japan on 4 September 2018. It made landfall in Tokushima Prefecture. Winds lashed buildings and whipped up the sea, yanking a tanker from its anchorage and ramming it into the bridge connecting Osaka's Kansai Airport with the mainland. Storm surges also swamped runways at Kansai Airport. Authorities said more than 400 people were injured across 20 prefectures. More than 8,000 residents sought shelter in 1,667 evacuation shelters in 24 prefectures. On Honshu, nine cities and towns issued compulsory evacuation orders. A further 53 cities issued non-compulsory evacuation orders. Towns and cities in Aichi, Gifu, Hyogo, Kyoto, Nara, Osaka, and Wakayama, along with Kagawa, Kochi, and Tokushima on Shikoku were affected. Jebi dumped more than 500 mm (19.6 in) of rain in some areas.[326]

Summer Storms – July 2018

Southwestern Japan suffered its worst rainfall disaster in 25 years in 2018. The 5-15 July rains resulted in widespread floods and set off landslides that killed 225 people and forced millions to evacuate across 15 prefectures. The rainfall was supercharged by the remnants of Typhoon Prapiroon interacting with the Baiu front, and this interaction led to an incessant 10-day rainfall that, in some areas, exceeded 400 mm (15.7 in) of precipitation. Hiroshima Prefecture alone experienced 1,243 mudslides. A post-disaster accounting found that the country had sustained damage to agriculture, forestry, and fishery sectors that amounted to losses of US$9.86 billion. The sudden shutdown in many sectors also led to shortages of water, food, and shelter.[327]

Osaka Earthquake – June 2018

A powerful earthquake struck northern Osaka Prefecture on 18 June 2018. There were five fatalities in Osaka Prefecture, and a total of 417 injuries across Hyogo, Kyoto, Mie, Nara, Osaka, Shiga, and Tokushima Prefectures. Nearly 7,000 homes were damaged in Osaka and three other prefectures. The quake, which came in at a maximum of lower 6 on the Japanese 7-point seismic intensity scale (Mw 5.5-5.9), damaged gas and water utilities as well as important railway networks, but all were back online within a week. The quake struck at the peak of the morning rush hour commute and led Japan Railways and other private railway lines to halt services on almost all train lines. At one point, some 200,000 people were stuck in trains that

made emergency stops on the tracks.[328]

Mount Kusatsu-Shirane Volcanic Eruption – January 2018

Mount Kusatsu-Shirane erupted on 23 January 2018. The phreatic (steam blast) eruption killed one person and injured 11 others. The individual who died was a member of Japan's military who, along with colleagues, was taking part in training in the area. Those injured were other military members and skiers who were injured when the eruption triggered an avalanche and sent rocks raining down on the slopes.[329]

Typhoon Lan – October 2017

At least two people were killed and 17 injured as Typhoon Lan struck Japan, where it brought dangerous winds and threatened to cause major flooding and mudslides. The storm made landfall on 23 October 2017 along Japan's southern coast near Minamiizu before rapidly moving to the northeast. At arrival, Lan packed winds of 165 kph (100 mph). More than 200,000 people were ordered to evacuate, and a further 2.2 million homes were under advisory to prepare for evacuation. Several parts of Japan recorded rainfall totals greater than 500 mm (19.6 in) in 72 hours. Shingu, Wakayama Prefecture, recorded 894 mm (35.1 in) during the 3-day period.[330] Flooding and landslides were also reported along the Pacific coast, and the storm forced the cancellation of domestic flights and the suspension of some trains, while rains closed parts of several expressways amid fears of flooding.[331]

Typhoon Talim – September 2017

A powerful typhoon struck Japan on 17-18 September 2017. It left at least two people dead. Typhoon Talim made landfall in Kyushu with winds of up to 162 kph (100 mph) and moved northeast along the country to reach Hokkaido. It dumped torrential rain and paralyzed transportation. One of those killed was a woman found inside her house, which was hit by a landslide in Kagawa; another was a man found in his car, which sank under a swollen river in Kochi. National media said 38 people had been injured in storm-related accidents. At least 116 domestic flights were cancelled, and some Shinkansen train services were suspended in northern Japan. Talim had battered Okinawa where it dropped the most rain seen over a 24-hour period in 50 years in the city of Miyako.[332]

Typhoon Noru – August 2017

Typhoon Noru killed two people and brought more than 504 mm (19.8 in) of rain in 24 hours to the Ryukyu Islands on 30 July 2017. By the time the storm began to impact Kyushu, it had weakened, although it still brought significant rain – 200 mm (7.8 in) in some places. As the storm moved northward and eastward, Owase and Nikko, both on Honshu, recorded rainfall of 213 mm (8.3 in) and 263 mm (10.3 in), respectively.[333]

Flooding and Landslides – July 2017

Heavy seasonal rains impacted northern Kyushu amidst a warm, wet weather front on 9-10 July 2017. Emergency responders recovered three bodies from a landslide in Asakura, Fukuoka Prefecture, on 10 July, as authorities conducted searches for missing people and provided help to residents trying to dig out from flooding and landslides. Although recovery efforts were beginning, the region was still under a high risk of landslides from the mountains due to the softening of the ground from torrential rainfall. Travel was disrupted in Oita Prefecture, where at least one bridge was washed out and a landslide covered train tracks.[334]

Typhoon Nanmadol – July 2017

Typhoon Nanmadol swept through southern Japan the first week of July 2017, and it caused flash flooding that killed at least one person. The storm made landfall in Nagasaki Prefecture on 4 July. It dumped heavy rains that disrupted traffic and left 70,000 without power in Nagasaki and Kumamoto as it traveled eastward. The city of Aso in Kumamoto saw over 80 mm (3.1 in) of rain in one hour, and Nagasaki recorded 50 mm (1.9 in) in the same

short time.[335] The rains triggered landslides in Fukuoka and Oita Prefectures. In Fukuoka Prefecture, about 375,000 people at risk of flooding were ordered to leave their homes. Overflowing rivers damaged the town of Asakura. In Oita Prefecture, more than 21,000 people were told to evacuate.[336] Then, the typhoon brought downpours to the Hokuriku region, where Kanazawa reported 60 mm (2.4 in) of rain, and there were landslide warnings for some areas in Niigata, Toyama, and northern Nagano Prefectures after rainfall of up to 300 mm (11.8 in) fell over a period of several hours.[337]

Typhoon Malakas – September 2016

A powerful typhoon struck Kyushu on 20 September 2016; it left at least 36 people injured after torrential rains caused serious flooding that washed away a bridge and inundated homes and cars. Transportation across Kyushu and parts of western Japan came to a standstill as Typhoon Malakas brought winds of up to 180 kph (112 mph). Houses, cars, and fields were partly submerged in Miyazaki Prefecture, where a record 578 mm (22.75 in) of rain fell on one city in just 24 hours. Officials issued evacuation advisories that affected about 620,000 people. More than 114,000 households lost power. Regional train services were halted, and about 180 flights were cancelled because of strong winds.[338]

Typhoons Kompasu, Mindulle, and Lionrock – August 2016

Three typhoons hit northeastern Japan in quick succession between 21 and 31 August 2016.

First Typhoon Kompasu, then Typhoon Mindulle, and finally Typhoon Lionrock brought heavy rains and strong winds to areas stretching from Tokyo to Hokkaido. Typhoon Kompasu hit Hokkaido on 21 August and killed one person. The storm was downgraded and moved off swiftly, but it was followed by the more powerful Mindulle, which dumped heavy rain that caused flooding on Hokkaido on 23 August. It killed one person near Tokyo where it made landfall on 22 August. In all, at least one person was killed and 61 were injured as Mindulle flooded rivers, submerged roads, and damaged farms across Japan's northeast. More than 1 million people across eastern Japan were covered by evacuation advisories of varying degree. In Hokkaido, more than 2,700 people temporarily fled their homes to public shelters.[339]

Finally, on 30 August, Lionrock brought flooding and landslides to Iwate Prefecture. At least 10 people were killed, mostly in a home for the elderly, while 1,100 people were evacuated from their homes, and 400 people had to be rescued after they were stranded by flooding and landslides. As it moved northward, Lionrock was downgraded to a low-pressure system, but it still dumped heavy rain over areas of Hokkaido, where it caused evacuations and riverbank collapses. The Sorachi River broke its banks, and 4,200 residents were ordered to evacuate, while 26,000 were advised to do so.[340]

Kumamoto Earthquakes – April 2016

On 14 April 2016, a Mw 6.5 earthquake struck Kumamoto Prefecture, Kyushu. The quake and its effects left at least nine people dead and 800 injured with damage and casualties concentrated in Kumamoto and Oita Prefectures. More than 120,000 people were evacuated. Two days later, on 16 April, another quake, measuring Mw 7.3, hit in the same area, and initial assessments found that another 42 people were dead and thousands injured as a result of the second quake; dozens of people were reported trapped in the rubble of collapsed buildings.[341] Water service had been cut throughout the entirety of Kumamoto city, with a population of roughly 730,000.[342] By 30 April, 66 people were confirmed dead and 1,500 injured, and more than 23,000 people remained displaced. Aso Region in Central Kumamoto experienced the worst destruction.[343]

Disaster Management Policy, Planning, and Response

Japan's national government is responsible for DM policies, national laws, and plans. Local governments are responsible for immediate response efforts within their jurisdictions and are also responsible for setting and implementing local disaster response plans. The Central Disaster Management Council oversees and leads national-level DM, while prefectural and municipal Disaster Management Councils work at the prefecture and local level. For foreign assistance, the Ministry of Foreign Affairs (MOFA) oversees and directs Japan's international disaster response and humanitarian assistance missions, implemented by the Japan International Cooperation Agency (JICA) and by Japan Disaster Relief (JDR) teams that are deployed to disaster-affected regions around the globe. The Japan Self-Defense Forces (JSDF) may deploy to support government teams when requested.

National Disaster Management System

There are DM councils at the national, prefectural, and local levels. Their overall work is guided by a national-level DM plan. Disaster response relies on several key agencies, including firefighters and police, as well as the Coast Guard and JSDF, in some cases.

The 1961 Disaster Countermeasures Basic Act (DCBA) is the legal foundation for DM. It was enacted following a devastating typhoon in 1959. The main contents of the DCBA include:

- Definition of responsibilities for DM
- DM organizations
- DM planning system
- Disaster prevention and preparedness
- Disaster emergency response
- Disaster recovery and rehabilitation
- Financial measures
- State of disaster emergency[344]

The Central Disaster Management Council was formed under the DCBA. The Council is the main and lead DM body. It is chaired by the Prime Minister and includes the Minister of State for Disaster Management, all other cabinet ministers, heads of major public corporations, and academic experts. Within the Cabinet Office, which is the secretariat for the Council, the Minister of State for Disaster Management is assisted by the department of the Cabinet Office Director-General for Disaster Management, whose mandate is to manage planning and central coordination with regard to matters relating to policies on disaster risk reduction and matters concerning disaster response in the event of a large-scale disaster. The role of the Council is to formulate and promote implementation of the Basic Disaster Management Plan, which is the master plan and basis for disaster risk reduction activities. Figure 4 shows the organizational structure of the Central Disaster Management Council.[345]

In prefectures and local municipalities, prefectural and municipal Disaster Management Councils integrate representatives of local government organizations, including police and fire departments, as well as designated local public corporations. Implementation of disaster risk management measures is based on Local Disaster Management Plans, which are drafted by the prefectural and local municipality councils.[346]

At the local level, there are DM councils established for hazard-specific concerns, such as for active volcanoes. Each volcanic area in Japan has established a Volcanic Disaster Management Council, with local governments leading development of alert and evacuation systems. Japan has opted away from taking a uniform nationwide approach to volcanic eruptions as each volcano is different in terms of characteristics such as phenomena that occur during eruptions, location, and climber traffic. Annually, the Cabinet Office holds the "Liaison and Collaboration Conference of Volcanic Disaster Management Councils," where members of each Council gather to strengthen cooperation in promoting volcano disaster risk management measures.

The Basic Disaster Management Plan is prepared by the Central Disaster Management Council. Based on the Plan, local governments

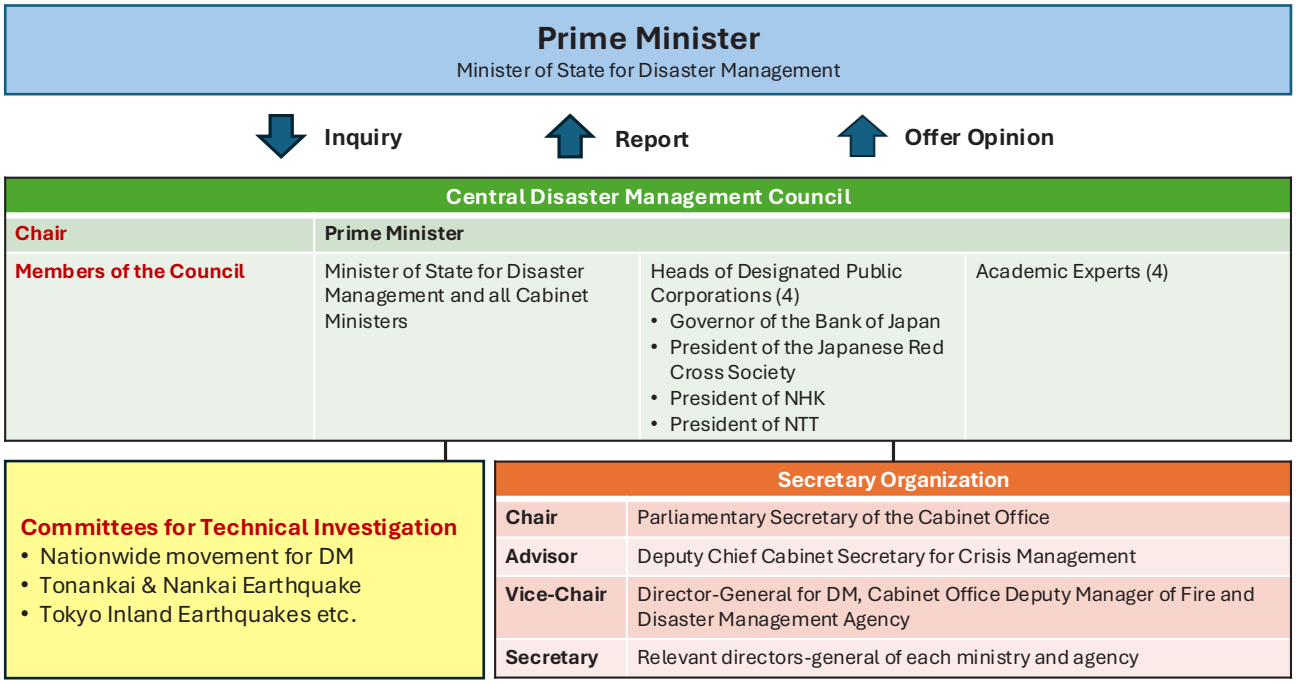


Figure 4: Organization of Japan's Central Disaster Management Council

must prepare local DM plans, and designated administrative organizations and public corporations need to prepare their own Disaster Management Operational Plans. The Basic Disaster Management Plan clarifies the duties assigned to the Government, public corporations, and local governments in implementing DM measures. For easy reference to countermeasures, the plan also describes the sequence of disaster countermeasures – i.e., preparation, emergency response, recovery, and reconstruction – according to the type of disaster.

The Plan is revised, as appropriate, based on recent disasters and policy developments. Legally, it must be reviewed each year to address scientific research findings, lessons from disasters that have occurred, and noted effects of implemented response measures.

A 2013 amendment to the DCBA established the Community Disaster Management Planning System to promote voluntary disaster risk management activities by communities in cooperation with municipalities to enhance local disaster resilience. The system allows community residents to formulate a Community Disaster Management Plan and propose to the Municipal Disaster Management Council that the plan be included in the Municipal Disaster Management Plan. As of 1 April 2023, 2,428 communities across 216 municipalities in 43 prefectures had their Community Disaster Management Plans laid out under local DM plans, and 6,510 communities across 389 municipalities in 46 prefectures were working toward the development of a plan.[347]

Fire and Disaster Management Agency (FDMA)

The Fire and Disaster Management Agency (FDMA) is a principal first responder. It is comprised of about 170,000 personnel and is augmented by around 780,000 Volunteer Fire Corps members. Through its primary activities of firefighting, rescue operations, fire prevention, and ambulance services, the agency plays a large role in fire and disaster prevention and response. When a disaster occurs, the FDMA dispatches Emergency Fire Response Teams to the affected area. In addition to protecting lives and property from fires, the FDMA works to protect the public from natural hazards and seeks to mitigate damage. The FDMA is also responsible for transporting people who have been injured during a disaster.

The FDMA assists in emergency responses

when the response overwhelms the capacity of local fire and disaster teams. According to the FDMA, it responds to three different types of disasters: large-scale disasters or accidents (earthquakes, tsunami, fire, nuclear accident, road accidents, etc.), serious incidents (terror attacks), and armed attack situations (landing invasion, missile attacks, etc.). It has six main missions:

1. Preparedness for large-scale disasters – e.g., the Nankai Trough Earthquake and the Tokyo Inland Earthquake
2. Save lives that can be saved
3. Prevent fires and industrial disasters
4. Enhance DM in communities with Volunteer Fire Corps playing the central role
5. Protect people from terrorism and armed attacks
6. Develop human resources and employ new technologies[348]

National Police Agency (NPA)

The National Police Agency (NPA) plays a critical role in disaster response. It works together with other agencies to assist in a range of roles, such as rescue operations, supporting evacuations, searching for missing people, conducting forensic examinations and identity checks, and assisting with traffic measures and crimes in the disaster area.

The 2011 Great East Japan Earthquake and Tsunami resulted in significant changes in the way the NPA supports government response. Before the disaster, the police responded to disasters by organizing and operating troops. However, the earthquake and tsunami resulted in the dispatch of large units over an extended period. In 2012, based on this experience, the NPA expanded rapid response units to be immediately dispatched from across the country in the event of a large-scale disaster. In addition, in order to support and restore the functions of police in affected areas, general units were established to meet the requirements of an extended disaster response.

Rapid response units are dispatched for a period of about two weeks from immediately after the disaster strikes, and they carry out disaster control activities for a period of 3-7 days. The units aim to be self-sustaining and conduct activities without receiving any support, including accommodation or supplies. General units are dispatched after a large-scale disaster but not as quickly as the rapid response units. They conduct activities such as searches for missing people, patrols of the area, traffic control, and other activities based on the requests of the local government of the disaster area over an extended period of time.[349]

Japan Coast Guard (JCG)

The Japan Coast Guard (JCG) also has primary responsibility to respond and prepare for disasters, particularly in the maritime realm. The JCG responds to maritime disasters such as oil and hazardous chemical spills, collisions, and maritime SAR, as well as to natural disasters such as tsunamis and typhoons. The JCG supports disaster prevention through aid to navigation through lighthouses, preparation and provision of disaster information, and collaboration with other agencies, including medical personnel.[350] Japan is divided into 11 Coast Guard regions, with a total of 66 Coast Guard Offices and 51 Coast Guard Stations.[351]

During a disaster, the JCG assists with assessments by patrol vessels or aircraft, provides rescue through the Special Rescue Team and Mobile Rescue Technicians, and provides information and alerts for ship traffic. Oil spills are attended to by the National Strike Team. The JCG assists with transport of medical personnel and relief supplies to disaster-affected areas. It also aids with provision of emergency supplies such as water, power, and hygiene support.[352]

In October 2017, the JCG formed a team called the Mobile Cooperation Team (MCT) to help develop the capacity of coast guards in other countries. MCT assists with the development of environmental disaster prevention, SAR, and maritime law enforcement.[353]

Japanese Red Cross Society (JRCS)

The Japanese Red Cross Society (JRCS) is a special corporation established under the Japanese Red Cross Law of 1952. It is a key stakeholder in domestic disaster response. It is a member of the Central Disaster Management Council and a key player in overall DM. The organization is also listed as a Designated Public Corporation under the DCBA and therefore is obligated to cooperate with the national and prefectural governments in the provision of relief assistance.[354]

Founded on 1 May 1877 as the Philanthropic Society (Hakuaisha), the JRCS is headquartered in Tokyo and supports a nationwide network of chapters throughout all 47 prefectures. Each chapter has a Board of Councilors, with branches formed in association with government administrative units at the city, ward, town, and village levels. The JRCS operates 104 medical institutions, 19 facilities for training nurses and other personnel, 234 blood program establishments, and 29 social welfare facilities. Over 65,000 staff members work at these facilities. The Red Cross Volunteer Corps has around 2,900 volunteers nationwide.[355]

When a disaster strikes, the JRCS provides medical aid, stockpiles and distributes relief supplies, provides blood products, collects donations, supports volunteers, and provides psychological care. The JRCS has 500 medical relief teams (around 6,500 people) comprised primarily of doctors and nurses from the 91 Red Cross Hospitals across Japan. During an emergency, response teams (6 members per team) and domestic Emergency Response Units (ERU) are dispatched. As part of its stockpiles, the JRCS maintains supplies of blankets, sleeping kits, and emergency relief kits. JRCS disaster volunteers are trained on a regular basis and assist with first aid, preparing meals, transporting and distributing relief supplies, and assisting at evacuation centers.[356]

Aside from domestic activities, the JRCS supports disaster management and response activities overseas, including natural disasters, disease outbreaks, and anthropogenic hazards such as conflict and displacement. The JRCS assists by providing ERUs, in-kind aid, funds, and trained delegates. An ERU is a team of trained technical specialists, ready to be deployed at short notice and designed to be self-sufficient for one month. An ERU is capable of operating for up to four months. The JRCS ERU delegates comprise medical personnel, technicians, and administrators who provide immediate medical care to disaster-affected populations. The JRCS has two Emergency Clinic ERU sets of equipment on standby, one in Japan and the other in Singapore, and it is in the process of gaining World Health Organization (WHO) certification to have one Hospital ERU designed to provide multi-disciplinary care at a referral level.

The JRCS has pre-positioned and maintains an emergency stockpile in the IFRC warehouse in Kuala Lumpur, Malaysia; the supplies are sufficient to meet the needs of 10,000 households. The JRCS also supports local Red Cross and Red Crescent National Societies in procuring relief materials and in training local relief personnel, staff, and volunteers. The JRCS works in coordination through the IFRC emergency response framework to provide immediate support to National Societies in disaster-affected countries, and it can deploy rapid response personnel and medical services upon request. It also responds to IFRC or ICRC Emergency Appeals with cash or in-kind contributions.

The JRCS also provides recovery and reconstruction support for disaster-stricken communities by assisting in the reconstruction of damaged houses and medical facilities or by helping local National Societies stockpile relief supplies, train volunteers, and promote disaster preparedness. The JRCS also assists internally displaced people and refugees from crises around the globe.[357] At the international level, the JRCS works in close partnership with the ICRC and IFRC on ongoing humanitarian crises, including the conflicts in Ukraine and Gaza. In 2022, the JRCS signed the Climate and Environment Charter for Humanitarian Organizations, a reflection of its commitment to addressing the growing humanitarian impacts of

climate-related disasters.

National Military Role in Disaster Response

The JSDF play a critical role in disaster response and preparedness in the country and have been conducting relief missions since the 1950s. Japan's long history of natural disasters and exposure to hazards prompted the GoJ to train the military in disaster response operations. The JSDF have averaged more than 200 deployments for disaster missions within the country each year. However, JSDF forces are not first responders and will dispatch support only at the request of local governments.[358]

Among other tasks, Japan Ground Self-Defense Force (JGSDF) personnel perform SAR missions; deliver aid to ships and aircraft in distress; assist with accidents; and provide flood control, medical care, epidemic prevention, water supply support, transportation of personnel and supplies, and medical evacuations. The Japan Maritime Self-Defense Force (JMSDF) conducts similar operations in Japan and abroad.

The most significant disaster relief operation in Japan's history was in 2011, when the Tohoku earthquake and tsunami triggered a nuclear accident at the Fukushima Daiichi Nuclear Power Plant. Responding to the triple disaster required the mobilization of 180,000 JSDF troops and logistics personnel, who coordinated relief efforts with other responders, including the U.S. government and U.S. military personnel.

Since 1987, Japan has also conducted foreign disaster response missions. Recent JSDF deployments include for the earthquake in Nepal in 2015, flooding in Djibouti in 2019, and fighting bush fires in Australia in 2020.[359]

International Disaster Response

Japan's international disaster response is mainly overseen by the MOFA, which dispatches JDR Teams when assistance overseas is requested or accepted by the affected country. Official Development Assistance (ODA) and other humanitarian assistance is implemented by JICA, which is also directed by the MOFA. The JSDF will provide support to the Japanese government for overseas disaster relief missions if requested. This support is usually delivered through transport and medical activities.

Ministry of Foreign Affairs (MOFA)

Among its many other functions, Japan's MOFA oversees the country's international disaster relief and assistance activities, including the dispatch of JDR Teams. Japan will dispatch JDR Teams based on orders from the Minister for Foreign Affairs, and they provide relief assistance and supplies during major international disasters in response to requests from affected countries or from other international agencies. The MOFA's work also includes overseeing JICA, Japan's overseas development agency.

The GoJ can dispatch three types of assistance to a disaster-affected country; they are: 1) a JDR Team; 2) emergency relief supplies; or 3) emergency funding. Depending on the type of relief the GoJ decides to dispatch, the MOFA oversees the mission, generally via JICA. Figure 5 shows the types of relief and how they are conducted.[360]

Japan International Cooperation Agency (JICA)

Falling under the MOFA, JICA is the primary agency for implementing Japan's ODA. Its global mandate sees it working across the Asia-Pacific region, Latin America, Africa, the Middle East, and Europe. It has some 2,011 full-time staff and is headquartered in Tokyo. There are 15 branch offices throughout Japan and around 100 overseas offices around the globe. The objective of JICA is to "contribute to the promotion of international cooperation as well as the sound development of [the] Japanese and global economy by supporting the socioeconomic development, recovery or economic stability of developing regions."

While mainly an overseas development agency focused on challenges such as health care, education, and urban and regional development, JICA responds to disasters and

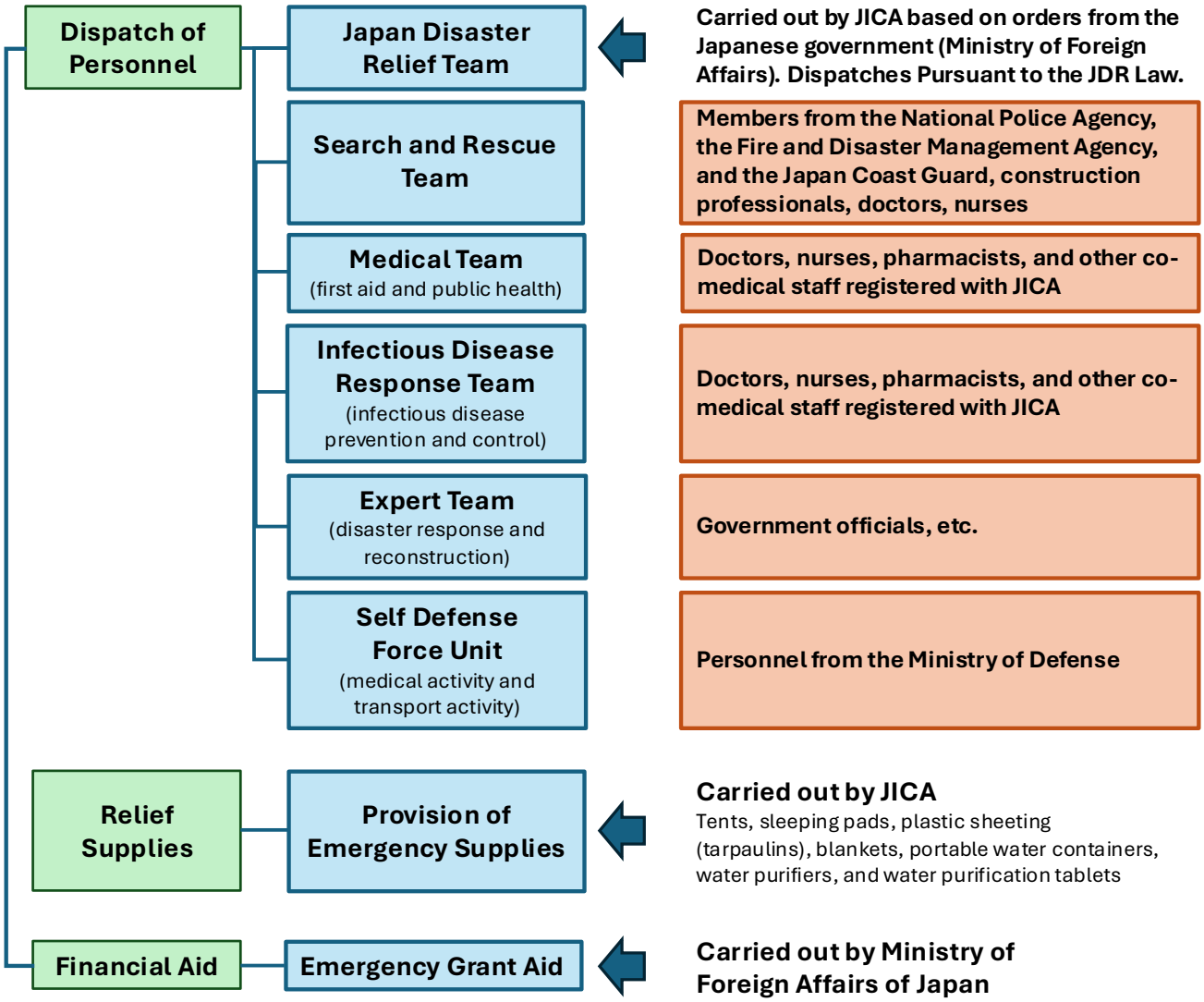


Figure 5: Japan's International Disaster Relief Components

participates in disaster risk reduction (DRR) activities on the basis of DRR being directly linked to "Human Security" and "Sustainable Development." JICA's focus on the prevention, mitigation, and preparedness phases of DM align with the Sendai Framework for Disaster Risk Reduction 2015-2030. As such, JICA cooperates in two major aspects: 1) promoting the Sendai Framework; and 2) addressing the specific needs of each country.[361] To meet these goals, JICA collaborates with international partners including UN entities, the World Bank, and the Asian Development Bank. It strengthens cooperation on DRR with domestic partners – central and local governments, academia, industry, and civil society – to share knowledge with developing countries.[362]

Following significant regional and international disasters, JICA will typically provide relief goods or funding to affected countries and populations. To expedite the shipment of emergency goods, as part of the JDR system, JICA maintains a regional warehouse in Singapore for rapid distribution across the Asia-Pacific region. The warehouse stores items such as tents, blankets, and sleeping pads. JICA maintains additional warehouses in Miami, Florida, U.S., and in Dubai, United Arab Emirates. JICA does have local stockpiles in the Pacific, namely on Majuro in the Republic of the Marshall Islands, and at Koror, Palau. These warehouses are meant for local use only and are not equipped for transporting supplies to other countries. Six priority goods are stockpiled at the locations outside Singapore; they include tents, sleeping pads, plastic sheeting

(tarpaulins), blankets, portable water containers, and water purifiers.

JICA develops partnerships with other aid agencies and international organizations involved in disaster relief, including UN organizations. JICA also cooperates with Japanese non-governmental organizations operating in affected areas.[363]

Aside from providing emergency relief supplies, JICA oversees dispatch of JDR Teams.

Japan Disaster Relief (JDR) Teams

The JDR Law (1987) established JDR Teams as the GoJ's international disaster responders. The JDR Law is limited to natural disaster response; a separate law governs GoJ humanitarian action for conflict-affected people. The JDR was dispatched for the first time in 1987 to deliver relief to flood-affected areas of Venezuela.

There are five types of JDR Team – SAR Team, Medical Team, Infectious Diseases Response Team, Expert Team, and Self-Defense Force Unit. One or more types of the teams are dispatched as appropriate to the response. JDR Teams carry all of the supplies and equipment they need for their expected operations, and they are self-sufficient in terms of water, food, tents, and other items in order to avoid putting strain on affected communities.[364] The most recent team to be developed was the Infectious Diseases Response Team. After the multinational response to the Ebola outbreak in West Africa in 2014, the JDR Infectious Disease Response Team was established in October 2015 to respond to global outbreaks. It was dispatched for the first time in July 2016 to respond to a yellow fever outbreak in the Democratic Republic of Congo.[365]

The SAR Team conducts SAR, provides first aid, and transports victims. The JDR SAR Team most recently gained INSARAG re-certification as a "heavy" urban SAR team in 2022.[366] Having teams classified according to a standard enables disaster-affected countries to prioritize acceptance of international support from urban SAR teams with the capacity needed for the situation. The "heavy" class is assigned to self-sufficient teams capable of working at two disaster sites simultaneously for 10 days (24 hours a day) without assistance from the affected country.[367] An example of the make-up of an SAR Team is the team that responded to a Mw 7.1 earthquake in Mexico City in 2017. The Team comprised 70 personnel from the MOFA, NPA, FDMA, JCG, and JICA.[368]

The Medical Team provides care to victims. It is classified by WHO as Emergency Medical Team (EMT) Type 1 and Type 2 capable of providing an emergency field hospital for disaster response and providing specialist cells for hemodialysis and surgery.

The JSDF team carries out emergency relief activities when deemed necessary. Activities include rescue, medical care (including disinfection), providing water, and air and sea transportation. Duration of operations can be approximately 2 weeks to 2 months long.

The Expert Team provides guidance on how to best manage disasters and achieve recovery.[369]

As of 2026, Japan has dispatched over 130 JDR Teams to 41 countries and regions, and JSDF has dispatched its unit for 17 disasters and conducted support activities such as transportation and medical assistance. In response to the typhoon disaster in the Philippines in November 2013, in addition to dispatching JDR Medical and Expert Teams, Japan also dispatched its largest-ever contingent of JSDF with approximately 1,200 personnel.[370]

Critical Infrastructure for Disaster Management

Renowned for its earthquake resistant buildings and for its EWS that automatically shuts down Shinkansen service right before a disaster, Japan has spent years and much funding on building and reinforcing critical and other infrastructure. Japan can play the role of a regional hub for disaster response logistics in the Indo-Pacific because its modern and efficient transport infrastructure can assist with regional relief operations. Japan's experience with disasters and technological ability has led to the development of cutting-edge and reliable telecommunications systems, showcased by its advanced EWS. The technology and knowledge behind Japan's communications capability has been shared and exported to other countries, thereby increasing response capacity in the region.

Transportation

Japan, as an island nation and one of the world's largest economies, relies heavily on its air- and seaports to facilitate trade and for passenger transport. The extensive transport network is efficient, reliable, and extremely capable of handling all types of cargo. Personnel responding to a disaster in Japan or transiting through Japan to an affected country should find transit relatively easy. While there are adequate international and domestic civilian airports for responder movement and air cargo, U.S. government or military responses may utilize U.S. military air and naval bases, which are not addressed here.

Airports

Japan's modern international airports are well connected to other major international airports and regional Asian hubs as well as domestic airports throughout Japan.

Chubu Centrair International Airport, Nagoya

Chubu Centrair International Airport, Nagoya, also referred to as Centrair or Nagoya airport, is located on a man-made island in Ise Bay, Tokoname City, Aichi Prefecture. It is located 35 km (22 mi) south of Nagoya. Aside from access to domestic locations, Centrair is well connected to other Asian and Japanese cities. It has one runway, which is partially concrete, asphalt, or bitumen bound macadam.

- 18/36: 3,500 × 60 m (11,483 × 197 ft)[371]

Fukuoka Airport (FUK)

Fukuoka airport is a major hub for the southern island of Kyushu, with many regional international flights. It is located in Fukuoka, the largest city in Kyushu. It has one paved asphalt runway.

- 16/34: 2,800 × 60 m (9,186 × 197 ft)[372]

Haneda International Airport (HND)

Haneda International Airport (also known as Tokyo International Airport) serves Tokyo with both international and domestic flights, and it is also one of Japan's busiest airports. It is the airport closest to Tokyo, located 18 km (11 mi) from Tokyo's main train and subway station.[373] The airport has three asphalt surfaced runways.

- 4/22: 2,499 × 61 m (8,199 × 200 ft)
- 16L/34R: 2,999 × 61 m (9,839 × 200 ft)
- 16R/34L: 2,999 × 61 m (9,839 × 200 ft)[374]

Kansai International (KIX)

Kansai International Airport (also known as Osaka Kansai) is located on an artificial island in Osaka Bay, 38 km (24 mi) southwest of Osaka Station, in Osaka Prefecture. It is offshore of the cities of Senna and Izumisano. The airport serves western Japan and is the main international airport for Osaka, Kyoto, and Nara and Wakayama Prefectures.[375] The airport has two asphalt-concrete paved runways.

- 6R/24L: 3,500 × 60 m (11,483 × 197 ft)
- 6L/24R: 4,000 × 60 m (13,123 × 197 ft)[376]

Naha Airport (OKA)

Situated on Okinawa's main island, Naha Airport serves as the regional hub for Okinawa. It is located 4 km (2.5 mi) west of Naha city center. It serves both civilian and military operations. Naha airport is in close proximity to the U.S. Air Force's Kadena base and the U.S. Marine Corps base at Futenma; the extended

center lines of both of these airfields intersect the approach to the runway. The airport has one asphalt paved runaway.

- 18/36: 2,999 × 46 m (9,839 × 151 ft)[377]

Narita International Airport (NRT)

Narita International Airport is one of Japan's busiest airports and serves as a regional hub. It is located 58 km (36 mi) east of Tokyo in Chiba Prefecture.[378] The airport has two runways, both asphalt surfaced.

- 16L/34R: 2,180 × 60 m (7,152 × 197 ft)
- 16R/34L: 4,000 × 60 m (13,123 × 197 ft)[379]

Sendai International Airport

The Sendai International Airport is located near the coast in the city of Natori in Miyagi Prefecture, about 20 km (12 mi) southeast of Sendai, the biggest city in the Tohoku area. It has two asphalt paved runways.

- 12/30: 1,201 × 46 m (3,940 × 151 ft)
- 9/27: 3,000 × 46 m (9,842 × 151 ft)[380]

Seaports

According to the MLITT, Japanese ports and harbors are classified into four types: Strategic International Hub Ports, International Hub Ports, Major Ports, and Regional Ports. There are five Strategic International Hub Ports, which "[serve] as the hub of an international ocean freight transportation network for long-distance international ocean freight shipping, having advanced functions to connect the international ocean freight transportation network and the domestic ocean freight transportation network." There are 18 International Hub Ports, 102 Major Ports, and 807 smaller regional ports, the last managed by prefectural or municipal governments.[381] The five Strategic International Hubs are profiled here, as they have the greatest potential to support large-scale international and regional shipments of disaster recovery items.

Port of Kobe

The Port of Kobe is in Hyogo Prefecture, on the southern side of Osaka Bay and overlooking the Seto Inland Sea. Its location allows it to connect to more than 450 port cities worldwide. Kobe has a well-sheltered, deepwater harbor. The fourth busiest port in the country, the port has an annual cargo handling capacity of 80 million tons, and annual container throughput was 2.9 million TEU in 2023. There are six container terminals that span over 786,880 m^2 (8,469,905 ft^2) and 34 berths for handling containers. Another 12 terminals deal with general bulk cargo. The port is also a fishing port, and seafood is exported overseas from the port. The port is owned and operated by the Kobe City government.[382]

Port of Nagoya

The Port of Nagoya is Japan's largest trading port, handling more than 10% of the total Japanese international trade. It is centrally located in Aichi Prefecture along Ise Bay. It has a naturally protected harbor and artificial breakwaters. It has 290 berths with a total length of more than 33 km (20.5 mi). The four container terminals span 146 hectares (361 acres) and 12 of the berths; annual container throughput was 2.7 million TEU in 2023. Other terminals and berths serve conventional bulk and breakbulk. The port has many warehouses spread over 278 hectares (687 acres), 53 hectares (131 acres) of covered storage space, and 74 hectares (183 acres) of coal storage warehousing. The port is owned and managed by the Nagoya Port Authority.[383]

Port of Osaka

The Port of Osaka is located along Osaka Bay and is surrounded by a major urban area. The port is one of Japan's leading ports and helps facilitate trade in western Japan. It is a crucial port for trade within Asia and handles a significant portion of Japan's manufactured goods and consumer products. It can handle more than 80 million tons of cargo annually. Its area comprises 4,800 hectares (11,861 acres), and it has 181 berths, including 70 berths for international shipments, 110 berths for inland trade, and 13 berths for containerized cargo. Its annual container throughput was 2.4 million TEU in 2023.[384]

Port of Tokyo

The Port of Tokyo is located on Tokyo Bay. It is one of the Pacific's largest and most technologically advanced ports. It serves as a major hub for import and export activities and helps to facilitate trade in eastern Japan. The Tokyo Port Authority manages this port, and over 40,000 people are employed there. The port spans 1,000 hectares (2,471 acres), and it comprises 204 wharves, 15 berths for handling containers, numerous storage yards, and cold storage facilities. Its annual container throughput was 4.4 million TEU in 2023.[385]

Port of Yokohama

The Port of Yokohama is situated at the center of Tokyo Bay in Kanagawa Prefecture, just south of Tokyo. The port serves as a key entry point and offers easy access to the city. Yokohama is the country's second-largest container port and has strong ties to global trade.[386] The port is owned by the Yokohama city government and operated by Yokohama-Kawasaki International Ports and Yokohama Ports Corporation. It handled some 101 million tons of cargo in 2024; container throughput in 2024 was 3 million TEU.[387] The Honmoku dock is the main port facility, comprising 14 berths for handling containers and 10 general cargo berths. More berths are being built to handle increasing volumes of traffic. The Osanbashi wharf handles passenger ships and cruises, the Detamachi wharf handles fruit and vegetable imports, and the Daikoku dock offers logistics services via seven berths and warehouses. The Kanazawa pier deals with timber, metal scrap, wood products, and construction material.[388]

Road and Rail

An island nation, Japan relies on air and sea transport to bring goods into and out of the country. Domestically, Japan's modern infrastructure allows for efficient transport along well-paved and -maintained roadways and a modern, advanced rail system, featuring the Shinkansen (bullet train) service. While the Shinkansen is primarily for passenger transport, Japan's rail system also moves freight and could be utilized to transport relief goods within the country if necessary. Likewise, its road network is sufficient to truck relief goods to most areas of the country; however, hazard events such as earthquakes, tsunamis, and landslides have disrupted road networks in the past and necessitated the use of air transport assets, including JSDF and U.S. military transport. Japan's airport network and major seaports are well-connected to Japan's road and railway network, as well as to major cities, should urban centers be affected by disasters.

Communications

Japan has an advanced and modern telecommunications network. Along with resilient infrastructure, EWS and communications practices are technologically advanced, well-developed, and cover the major natural hazards. Together, they give the public crucial time to prepare and brace for a disaster. JMA is the main authority on the dissemination of disaster information to both Japanese government agencies and the general public. It also plays a key role in disseminating information to the Asia-Pacific region because of its status as a regional center for earthquake, tsunami, and weather warnings.

The Japanese public is highly connected through mobile device subscriptions and the internet. In 2023, there were 108.31 million internet users, or nearly 87% of the population, and 48.05 million broadband users, or more than 38% of the population. Landline telephones are still fairly popular, with around 59.33 million landlines in use, or a landline teledensity of approximately 1 line per every 2 people.[389] However, mobile devices are nearly twice as common. As of 2025, there were 110.7 million unique mobile subscribers with more than 191.8 million total mobile connections, or 155% mobile penetration. There is substantial mobile broadband coverage with extensive 4G networks and more than 96 million active 5G connections. There are four nationwide mobile network operators. A 2025 report notes that with a largely urban population, there is near-universal mobile coverage; however, Japan's mountainous

terrain means that full coverage remains a challenge. Nonetheless, comprehensive digital literacy among the population coupled with sizeable mobile coverage provides a solid backbone for emergency alerts via mobile devices, while desk- or laptop internet users can access information from various government and scientific portals.[390]

Early Warning Systems and Regional Information Sharing

Japan leverages technology to protect itself through early detection of and alerting for major hazards. The various national EWS are recognized worldwide for their cutting-edge technology and efficiency. Natural hazard alerts are sent through mobile devices, local public speaker systems, TV, radio, and digital platforms. The country's modern telecommunications system allows for stable communication before, during, and after disasters. The mobile telephone network is resilient and can be expected to remain in service even after a hazard event, such as a major earthquake, with minimal interruptions. These alert mechanisms provide extra seconds for people to evacuate or activate automatic protocols, such as stopping high-speed trains and shutting down nuclear plants.

Japanese telecommunications companies have recently agreed to provide free, accessible public Wi-Fi (SSID: 00000JAPAN) during emergencies or natural disasters. This service reduces strain on mobile telephone networks and enables international visitors to remain in communication during a crisis. The service is compatible with most devices.[391]

Japan Meteorological Agency (JMA)

The primary responsibilities of JMA are to monitor the weather and seismic and volcanic activity. It is responsible for weather analysis and prediction and for issuing forecasts and critical warnings to government agencies and the public for natural hazards, including typhoons and storms, earthquakes, tsunamis, and volcanic eruptions.[392]

There are six regional JMA headquarters – Sapporo, Sendai, Tokyo, Osaka, Fukuoka and Okinawa – that observe and monitor weather and natural hazards and issue forecasts, warnings, and bulletins for their respective regions. The regional headquarters give direction to local meteorological offices for the provision of information to prefectural and sub-prefectural levels.[393]

JMA issues disaster information and alerts directly to DM authorities and local governments and to the population through TV, radio, and other media.

For earthquakes, JMA collects real-time data from 1,800 seismometers and 4,400 seismic intensity meters across Japan. The agency analyzes earthquake information and issues warnings or advisories if there is a threat of a tsunami. JMA also monitors tsunami situations using sea level data gathered from 410 coastal tide gauges and offshore tsunami meters.

JMA monitors tropical cyclone activity over the western North Pacific and issues advisories every 3 hours on the results of analysis and forecasts on location, intensity, and movement. JMA issues 5-day forecasts every 6 hours. If damage from a storm is expected, analysis is provided every hour, and 50-knot (92.6-kph; 57.5-mph) wind probability data is issued every 6 hours.

Other responsibilities include monitoring the weather and natural hazards for aviation and maritime safety. JMA provides meteorological information to agencies that monitor airports and airspace; among these agencies are airlines and the Japan Civil Aviation Bureau (JCAB) under the MLITT. JMA also operates Aviation Weather Service Centers at major airports to assist in the safe flow of air traffic. To support maritime safety, JMA issues marine forecast, warnings, and other information including currents and temperatures for ships in waters around Japan.

While JMA's primary responsibility is to monitor hazards and provide warnings, it also cooperates with agencies and organizations internationally and, more importantly, serves as a monitoring and warning center for the Asia-Pacific region. East Asia, Western Pacific,

and Oceania regions are covered by JMA's Himawari satellite, which provides data on the distribution of clouds, moisture, volcanic ash, upper-air winds, and sea surface temperatures. Data from Himawari is shared with other national meteorological and hydrological services. JMA also operates 20 Doppler weather radars for observation of precipitation and upper-air wind fields. Other weather monitoring tools include a total of 160 JMA weather stations for surface weather observation nationally. JMA carries out observation and monitoring related to environmental issues such as global warming and ozone layer depletion and also provides information on phenomena such as El Niño. JMA also works closely with JICA to provide training to personnel from partner-countries' National Meteorological and Hydrological Services (NMHS). Staff from NMHSs worldwide have participated in training courses since 1973.[394]

JMAs Regional Specialized Meteorological Center (RSMC) Tokyo – Typhoon Center provides information on tropical cyclones in the western North Pacific and the South China Sea. This information includes forecast and present positions as well as the movement and intensity of cyclones. The RSMC is operated by JMA within the framework of the WMO's World Weather Watch Program. It is one of six such centers worldwide. The RSMC provides real-time online information for tropical cyclone forecasters in the region. It also provides training and dispatches experts to other NMHSs.[395]

Another center operated by JMA to monitor and issue advisories is the Northwest Pacific Tsunami Advisory Center (NWPTAC). NWPTAC forecasts tsunami heights and arrival times when an earthquake of Mw 6.5 or greater occurs in or around the Northwest Pacific. NWPTAC Advisories are provided to support other nations' decisions on domestic tsunami warnings and potential evacuation.

JMA also provides a variety of information services for severe weather preparedness – e.g., daily forecasts, weekly forecast, seasonal forecasts, bulletins, landslide alert information, flood warnings and advisories for designated rivers, and hazardous wind watch. The agency produces real-time risk maps that show landslide, inundation, and flood risk for individual kilometer grids every 10 minutes.

Finally, JMA supports disaster response at the local level by staffing JMA Emergency Task Teams (JETT) to provide support in the event of a large-scale disaster. On the ground, JETT personnel provide weather commentary based on local needs and support local governments and organizations. Weather Disaster Mitigation Advisors (WDMA) were first dispatched in December 2020 to work within and support local governments. All local meteorological offices in Japan have support teams that work to build close relationships with governments.[396]

General Alerts

J-Alert

The GoJ has a national emergency broadcasting system. Officially known as the National Instant (Early) Warning System (Zenkoku Shunji Keiho Shisutemu), it is called "J-Alert," and it can provide early warning emergency alerts for regions projected to feel the impacts of a hazard event. The alert system communicates with the public for a range of crises including natural hazards and civil protection. It utilizes various methods such as an alarm during TV broadcasts with a scrolling message, loudspeakers in communities, radios, and mobile phones. The system was launched in February 2007 and covers all municipalities nationwide.[397] The system is generally used by JMA to transmit alerts about natural hazard events, while the Cabinet Secretariat will send information about ballistic missiles, air raids, terror attacks, or any other threat for which the general public would need warning.[398]

Other Emergency Alert Applications

Various applications ("apps") for mobile devices are available for alerts. The "NHK World TV" app (https://www3.nhk.or.jp/nhkworld/en/app/) provides alerts via a Push Notification service in English. The Japan Tourism Organization's "Safety Tips" app

(*https://www.jnto.go.jp/safety-tips/eng/app.html*), aimed at foreign tourists, pushes alerts to users about weather warnings and natural disasters in multiple languages. The app also provides an evacuation flowchart and useful links that can be utilized during a disaster.[399]

Aside from multilingual apps, in recent years Japan's public broadcaster, NHK, has sought to broaden information sharing during a disaster by using artificial intelligence to read out English subtitles for special newscasts about disasters. The system operates when the J-Alert is sounded, when an earthquake with a seismic intensity of Shindo 5 or higher is detected, when a tsunami is forecast to arrive, or if torrential rain is expected.[400]

Typhoons and Storms

Japan's government issues various alerts for typhoons and storms depending upon the conditions and expected impacts. Weather watches (chuiho) are calls for "caution" when wind and rain are projected to cause damage. Warnings (keiho) are released when forecasters predict that a storm will cause heavy, widespread damage. "Heavy rain and flooding warnings" (oame-kozui keiho) or "heavy rain information" (oame ni kansuru joho) are signs that dangerous weather conditions are occurring.[401]

The Cabinet Office has prepared guidelines for evacuations ahead of a typhoon or storm. It is a five-level color-coded system:

- Level 1 (White): Early Advisory
- Level 2 (Yellow): Heavy Rain/Flooding/ Storm Surge Advisory
- Level 3 (Orange): Evacuation of Elderly. At this level, older people and others requiring assistance for evacuations should begin to evacuate, while others should cancel activities and prepare for evacuation.
- Level 4 (Purple): Evacuation Order. Evacuation required for all.
- Level 5 (Black): Emergency Safety Measures. Issued when a disaster is imminent or taking place.[402]

Japan continues to innovate with regard to forecasting and sharing information on typhoons and other storms. Researchers are using supercomputers and high-resolution weather simulators to help predict micro-scale weather phenomena, such as tornadic winds associated with typhoons or highly localized heavy downpours that cause major damage. A team from Fujitsu and Yokohama National University has become the first to predict tornadoes spawned by typhoons by combining the supercomputer Fugaku with the innovative Cloud Resolving Storm Simulator (CreSS). Another collaboration by the National Institute of Information and Communications Technology, Osaka University, and the National Research Institute for Earth Science and Disaster Resilience aims to predict highly localized "guerrilla downpours." This team is using Fugaku and two next-generation radars to help with forecasts.[403]

Earthquake Early Warning System

JMA launched Japan's Earthquake EWS on 1 October 2007. The earthquake early warning alarm, along with its unique sound, is broadcast on TV, radio, and mobile phones.[404]

Modern earthquake EWS began over three decades ago. Following the 1995 Kobe earthquake, the National Research Institute for Earth Science and Disaster Resilience (NIED) created four nationwide observation networks to improve earthquake monitoring, assessments, and impact projections. Lessons from past earthquakes allowed for the creation of detailed maps of active faults, and this mapping has, in turn, allowed for more predictive technologies.

A network of seismometers measures ground motion caused by an earthquake or volcano, and the data are immediately analyzed to determine the threat level. That analysis provides officials support to determine what type of response is needed. The network lies on the seabed off the east coast of Japan for early warning of quakes and tsunamis originating in the Pacific. It is connected to another network off central Japan. The linked networks are known as Monitoring of Waves and Land on Seafloor (MOWLAS).[405]

Japan's high-speed rail, the Shinkansen, is

equipped with an early earthquake detection system. When the first slight tremors are detected, power is shut down, and emergency brakes are applied. It takes around 2 seconds for the system to activate after primary seismic waves are detected. The system is being constantly upgraded and has proved successful along with other infrastructure countermeasures. For example, during disasters like the 2011 Great East Japan Earthquake, all 27 trains in service at the time stopped safely.[406]

Tsunami Warning System

When a potentially tsunamigenic earthquake occurs, JMA issues "Major Tsunami Warnings," "Tsunami Warnings," or "Tsunami Advisories" for regions; each of these levels is based on estimated tsunami heights. Major Tsunami Warnings cover waves of 5 m (16 ft), 10 m (33 ft), and over 10 m (33 ft). Tsunami warnings cover waves of 3 m (10 ft), and tsunami advisories cover waves of 1 m (3 ft). With large earthquakes (Mw 8 or higher), JMA's determination of tsunami risk requires additional time; therefore, the agency will issue an initial warning based on predefined maximum magnitude to avoid underestimating any potential tsunami. In these cases, estimated tsunami heights are expressed qualitatively – i.e., "huge" or "high" – in initial warnings, and once the exact magnitude is determined, JMA updates the warning with tsunami heights in quantitative figures.[407]

If JMA expects a tsunami to cause damage, it issues a warning around 3 minutes after an earthquake.[408] Warnings are issued via TV, radio, mobile phones, sirens, and local alarms. For beachgoers, Japan utilizes a "U" flag, an International Maritime Signal Flag, which guides evacuations near water. The flag is used to advise people that a tsunami is expected and that they should evacuate immediately.[409] Warnings are also issued online. JMA has a webpage that shows active tsunami warnings, advisories, and forecasts.

At the local level, when an earthquake strikes, local governments use disaster prevention administrative radio systems to communicate information on tsunami evacuations. A survey by the Ministry of Internal Affairs and Communications following the 2011 earthquake and tsunami found that 35% of people living in areas inundated by the tsunami did not hear the audio information from public speakers, and this finding emphasizes the need for better disaster communications. Learning from this lesson, Sendai City in Miyagi Prefecture invested in an emergency announcement system that uses automated drones to urge people to evacuate when tsunami alerts are sounded. The system began full-scale operations in October 2022. The drone system uses a dedicated private wireless communication network, which is free from disruption in the event of a disaster. The other advantage of the system is that it can be dispatched faster than helicopters and can provide data from lower altitudes.[410]

Volcano Early Warning

Monitoring volcanic activity 24 hours a day, JMA provides volcanic warnings and forecasts for the 110 active volcanoes in the country. It issues these warnings based on observation, monitoring, and evaluation. When a volcano erupts, JMA issues immediate "Eruption Notices" to announce that a volcano has erupted and to encourage people to protect themselves.[411]

For monitoring active volcanoes, JMA operates the Volcanic Observation and Warning Center in Tokyo and Regional Volcanic Observation and Warning Centers (VOWC) in Sapporo, Sendai, and Fukuoka. The Centers monitor active volcanoes within their area of responsibility.

JMA conducts "intensive observation" of 50 of the country's volcanoes, known as "Continuously Monitored Volcanoes," which are chosen by the Coordinating Committee for Prediction of Volcanic Eruption for special attention for disaster mitigation. JMA utilizes surveillance cameras, seismometers, observation instruments, and other equipment, and it collects data from research institutions and local governments. JMA conducts mobile

observation, which includes land-based monitoring of volcanic activity and aerial monitoring utilizing helicopters and drones in partnership with other organizations.[412]

Other EWS

There are other EWS in place for other hazards such as heatwaves and drought. Japan's satellite-based drought monitoring and early warning system is maintained by the University of Tokyo's Institute of Industrial Science, and its forecasts are published on-line.

For heatwaves, a "Heat Stroke Alert" is issued by the Ministry of the Environment and JMA when the risk of heat illness is forecast to be extremely high based on the Wet Bulb Globe Temperature Test (WBGT)[413] heat stress index forecast. Heat Stroke Alert is issued on a regional basis. Alerts are generally issued the evening before or in the early morning of days when heat risk is high. Alerts are delivered via government websites and other platforms such as the Yahoo! weather app. Registered users can also receive alerts by email or on messaging apps. In April 2024, a special heat stroke alert was introduced for particularly dangerous conditions.[414]

Information Sharing

In 2017, realizing the importance of information sharing during a disaster, the Cabinet Office established the "National and Local Government Public-Private Disaster Information Hub Promotion Team" to discuss information sharing. As part of this initiative, the Information Support Team (ISUT), a deployable team, began operation in 2019 to support local governments by consolidating, mapping, and providing information on damages and shelters during a major disaster. The ISUT organizes this information on a dedicated website, which displays electronic maps. These displays are shared with response organizations to support decision-making.[415]

The Cabinet Satellite Intelligence Center (CSICE) of the Cabinet Intelligence and Research Office (CIRO) within the Cabinet Secretariat develops and operates Information-Gathering Satellites with the objective of collecting information for security purposes and crisis management. Satellite images are distributed to the Prime Minister's Office and relevant ministries and agencies to assess the situation and inform decision-making. Some images are made public in the event of a disaster or accident causing large-scale damage.

Disaster Information Management System (DIMS) and SOBO-WEB

The private sector contributes to disaster information systems. Fujitsu has provided national and local governments with Japan's first Disaster Information Management System (DIMS). The DIMS has provided officials with access to data crucial to an effective response to a disaster. Information includes warnings and predictions of impacts as well as the likely scale of the disaster. The technology has been shared with other regional countries, including Indonesia, where Fujitsu presented a custom DIMS to Jakarta in 2013.[416]

Based on the recommendations of the "Digital and Disaster Management Technology Working Group" in May 2021, the Cabinet Office is promoting several initiatives to drive Digital Transformation (DX) in DM, which includes the development of the next Integrated Disaster Management Information System, called SOBO-WEB. This second-generation system, which began operations in 2024, has incorporated mechanisms such as SIP4D (Shared Information Platform for Disaster Management), which NIED operates. The scope of use will be expanded to include local governments, designated public corporations, and national-level ministries and agencies.[417]

SOBO-WEB is now used by approximately 1,900 organizations, such as ministries and local governments, to aggregate information based on Basic Shared Information on Disaster Response and aims to expand the use of information among disaster response agencies. SOBO-WEB is a system that shares disaster information as geospatial information, and it aims to help disaster response agencies grasp and assess the damage situation at an early stage, capture disaster information from a bird's eye view, and understand overall damage from the disaster.[418]

Information Sharing Focal Points

Japan Meteorological Agency
3-6-9 Toranomon, Minato City
Tokyo 105-8431, Japan
X: JMA_bousai
Web: *https://www.jma.go.jp/jma/indexe.html*
Real-time risk map: *https://www.jma.go.jp/bosai/en_risk/#zoom:5/lat:34.034453lon:138.999023/colordepth:normal/elements:land*
Tsunami warnings, advisories, and forecasts: *https://www.jma.go.jp/bosai/map.html#5/37.996/135/&elem=warn&contents=tsunami&lang=en*
Volcanic warnings/eruption notices: *https://www.jma.go.jp/bosai/map.html#5/34.5/137/&contents=volcano&lang=en* or *https://www.data.jma.go.jp/multi/volcano/index.html?lang=en*

Ministry of Land, Infrastructure, Transport and Tourism
2-1-3 Kasumigaseki
Chiyoda-ku, Tokyo 100-8918
Tel: +81-3-5253-8111
Web: *https://www.mlit.go.jp/en/index.html*
Disaster Prevention Portal: *https://www.mlit.go.jp/river/bousai/bousai-portal/en/index.html*

Figure 6 shows a screenshot of JMA's real-time risk map available round-the-clock.[419]

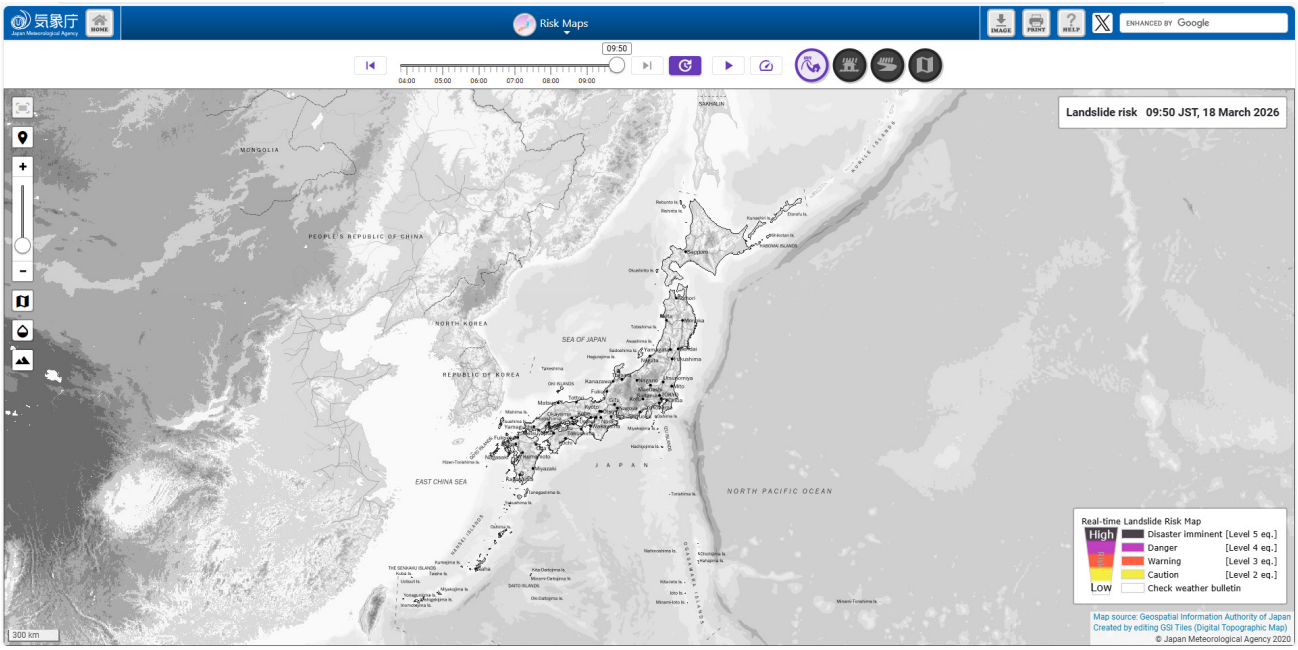


Figure 6: Japan Meteorological Agency's Real-Time Risk Map

SOUTH KOREA (REPUBLIC OF KOREA)

Country Overview

Covering the southern portion of the Korean Peninsula, South Korea is mountainous and exposed to wide-ranging and sometimes violent climate and weather patterns. The more than 51 million people of South Korea are highly educated, economically active, and well connected to information and services. An estimated 90% of them live in an urban area. A key challenge is that Korean society is among the most rapidly aging societies on the planet; more than 28% of the population is over the age of 60 years. The national economy is fully marketized, diverse, and innovative, with a strong orientation toward services and export earnings. The national government sets policy directions and supports resource mobilization toward objectives, but the lower levels of administration are the implementors, and sustained localization efforts continue.

Geography and Environment

South Korea's land and location expose it to several geophysical and hydrometeorological hazards, the latter of which tend to be seasonal. With steep relief and a long coastline, the country can experience severe storms – high winds, heavy rains, and storm surges – as well as extreme tides. There is some potential for seismic and volcanic activity, as well as drought if seasonal precipitation regimes fail.

Stretching south to north from about 33°N to 38°N and west to east from about 124°E to 130°E,[420] South Korea covers 99,720 km^2 (38,502 mi^2) of territory on the Korean Peninsula. It shares only one 237-km (147-mi) land border with the Democratic People's Republic of Korea (North Korea), but it has 2,413 km (1,499 mi) of coastline on the East Sea (Sea of Japan), Korea Strait, and Yellow Sea. Figure 7 shows a map of the country.[421]

The country is mountainous, with many valleys and a narrow coastal plain. Rivers flow eastward and westward from the Taebaek Mountains, which run north-south along the eastern side of the country. Those rivers flowing eastward are short and fast-moving. Those rivers flowing westward flow down to lower-elevation plains before entering the Yellow or East China Sea. The Han, Geum, and Nakdong are the three major rivers. The Nakdong is the country's longest river and empties into the Korea Strait.

There are several mountain ranges that branch off from the Taebaek. The mountains of the mainland reach elevations no higher than 1,915 m (6,300 ft); the highest point in the



Figure 7: Map of South Korea

country, Mount Halla at 1,950 m (6,398 ft), is on Jeju Island in the Korea Strait. Halla and another offshore volcanic island – Ulleung in the East Sea – are the country's only volcanoes.

South Korea experiences quite cold, dry winters and hot, humid summers. Only the very southern coast avoids winter freezes. Annually, temperatures range from a January average of –5°C (23°F) to an August average of 25°C (77°F). The eastern coast is the driest part of the country, and the southern coast, including Jeju Island, is the wettest part. June and July, when the summer monsoon blows through, are the wettest months, and late-summer typhoons can bring heavy rainfall, mostly to the southern coast.[422]

Society and Demographics

The people of South Korea are broadly homogeneous in terms of ethnic background and first language, Korean.[423] The population is commonly characterized as aging faster than any other country in the world, as birth rates have plummeted and life expectancy has lengthened. Aging, urban communities have the advantage of ensuring that many people, including the elderly, have access to services, but a falling labor-age cohort means that fewer people are available to assist older people, children, or people living with disabilities during a crisis. The broadly well-educated and digitally-connected Korean populace can access hazard and risk information in a way readable and understandable to nearly everyone, but some Koreans' ability to act may be less robust.

The Korean Statistical Information Service (KOSIS) reported 51.6 million people in 2026.[424] The country has one of the world's lowest fertility rates (the number of children the average women will bear). It dropped below 2.00 (roughly replacement level) for the first time in 1984[425] and reached 0.748 in 2024.[426] Because of the falling birth rate, the country's population peaked at 51.8 million in 2020.[427]

Koreans are also living longer, with a life expectancy of 83.7 years.[428] As of 2024, nearly 28% of the population was over the age of 60 years, and this percentage is 10 points higher than the percent of that age cohort in 2014.[429] The Ministry of Health and Welfare and KOSIS report that the incidence of poverty is highest (approximately 38%) among people 65 years of age and older. Older females are more likely than older males (43% versus 32%) to live under the poverty line[430] in a reflection of past generations of women with fewer educational and employment opportunities than younger generations have had. Older people living in poverty may have less access to hazard or risk information, be less able to act on early warnings, and experience either physical or social obstacles to accessing assistance after a disaster.

Historic settlement patterns saw people living in small villages along the coasts or rivers. However, since the 1970s, the country has swiftly urbanized. In 2020, the national statistics office measured the overall population density at 520 people per km^2 (1,347 people per mi^2), but this average masks stark differences. Mountainous areas throughout the eastern and northern regions are sparsely populated, and some 90% of the population now resides in urban areas. People cluster around the cities of Seoul, Daegu, and Busan. In 2020, an estimated 50% of the entire population lived in and around Seoul.[431]

In the 2024 census, KOSIS found that there were approximately 60,000 more males than females in the country. Among citizens, females outnumbered males by some 200,000 people, but among the non-citizen population, males outnumbered females by some 300,000.[432] Less than 6% of the total population over 13 years of age had schooling ending with high school or earlier. Males and females show equally strong educational attainment and goals for employment; approximately 75% of both males and females hold or are pursuing a university or graduate credential, and some 60% of each group say that their educational attainment is targeted at securing a "good job."[433] Moreover, more than 85% of residents surveyed in 2025 agreed that females can/should have a job. Although some older cohorts – especially the 80 years of age and older cohort, at more than 11%

– include more people saying females should only be dedicated to housekeeping and care of the family, only 5% of all respondents had that opinion.[434] The expectation that all adults will work, if able, shows strong capacity for building individual and household resilience.

The census questionnaire into social participation by residents found that some 80% of the population reported being socially active, with equal proportions of males and females saying they participate in some type of social meetings. Hobbies, sports, and leisure groups are hubs of community activity for more than half of the population, with males being slightly more active in these types of activities than are females. However, both civil society groups and local community organizations saw 10% or fewer of all residents participating,[435] an indicator that participation in community-based DM may see lower participation than other types of social interaction.

Government

South Korea is a presidential republic, with separate executive, legislative, and judicial branches exercising power at the national level. Although many powers are devolved to provincial governors, metropolitan mayors, and their respective councils, policies for major issues, including DM, are set at the national level. In many cases, the national authorities and agencies play the role of overseeing or mobilizing resources for programs to build local capacity as well as for locally-led actions, such as disaster responses.

The President is selected by direct popular election and serves a 5-year term, with a limit of a single term. The President is head of both state and government, as well as commander of the armed forces. As such, the President heads the State Council, which includes the heads of executive ministries and ministers without portfolio. There is a prime minister, appointed by the President and approved by the National Assembly[436] to act as the President's principal executive assistant, tasked with supervising ministries and administrative actions.[437] The unicameral legislature – National Assembly – seats 300 members chosen by a combination of direct and indirect election to 4-year terms.

Below the national level, there are nine provinces and seven metropolitan cities. Each of these levels elects its own governor (province) or mayor (city), as well as its legislative council. Provinces are divided into counties and cities, and the larger cities are divided into districts and neighborhoods.[438]

Under the State Council, the Ministry of the Interior and Safety (MOIS) is responsible for various issues of government business, including government innovation, administrative efficiency, e-government (the digitization of public services), protection of personal information, and support for elections and referenda. It is especially important in promoting local autonomy and decentralization by ensuring that local governments raise and manage revenue, mediating disputes among local governments, and establishing and supervising policies related to DM.[439]

Economic Profile

The economy of South Korea is a modernized, diversified, market system, driven by innovation and investment across sectors, especially education, infrastructure, and technology. In recent years, the country has struggled with global trade tensions and supply bottlenecks, as well as with domestic political crises that have dented domestic consumer demand and driven high exchange rates. As society ages, the country will continue to struggle to fill open jobs, and there is significant risk of worsening economic inequality that leaves many Koreans vulnerable in the face of extreme natural or anthropogenic hazard events.

The country enjoyed an average GDP growth rate of 5.6% annually for more than 40 years.[440] Growth has slowed to between 1% and 4% annually since the onset of the COVID-19 pandemic and subsequent global trade shocks and frictions that have caused a currency depreciation against dollar-denominated commodities and investments.[441] From the 1960s until the 1980s, growth was closely managed by national leadership to target specific industries

for investment and development; first were textiles and light manufactures, then iron, steel, and chemicals, and then in the last part of the 20th century came automotive, electronic, and information technology sectors. This focused industrial policy left the country with a legacy shaped by large conglomerates,[442] although an estimated 99% of all companies in the economy are small and medium-sized enterprises.[443]

Approximately one-third of GDP is delivered by the industrial sector,[444] and manufacturing accounts for 90% of exports[445] and employs about one-quarter of the workforce.[446] The region around Seoul and the country's southeastern region are manufacturing hubs.[447] Since the 1960s, the national industrial sector has been export-oriented, and the logistics sector has grown substantially to handle all types of commodities trade. Its air- and seaports are designed and operated to support not only exports but also regional transshipments of goods. National major corporations are world leaders in manufacturing and exporting information and communications devices, as well as tools, automobiles, ships, steel, and petrochemicals.[448]

Making up nearly 60% of GDP[449] and employing some two-thirds of the labor force,[450] the services sector is dominated by tourism and financial services, although information technology services, professional and technical services, the arts, sports, retail, and food and beverage are all large subsectors. Photo 1 depicts the modern and developed cityscape in Seoul.[451]

The agricultural sector accounts for less than 2% of total GDP and employs about 5% of the workforce. In terms of foodstuffs, the country is self-sufficient only in rice production. It depends on imports for some 70% of its food products[452] and is, therefore, exposed to the potential price and supply disruptions that come with global tensions or from major natural disasters in the region. There are several long-term trends that feed into this sector's relative weakness; they include reductions in farmed acreage across the country, falling numbers of agricultural laborers, an aging agricultural workforce, and changing tastes among consumers who seek non-local food products.[453]



Photo 1: Seoul at Sunset

Disaster Profile

South Korea is exposed to various types of hazards, each capable of causing significant disruption to infrastructure, agriculture, industry, trade, and human well-being. The country's geophysical and climatic characteristics further shape its risk. The northern and eastern regions are characterized by rugged mountainous terrain, where landslides or rockfalls driven by heavy rain or seismic activity are key risks. Meanwhile, there are four distinct seasons: hot, humid summers with heavy rainfall; cold, dry winters; and transitional spring and autumn periods marked by variable weather patterns. Heavy rains can drive flooding, and, on average, several typhoons impact South Korea annually.[454]

Hazards

South Korea is exposed to a wide range of natural and anthropogenic hazards – droughts, earthquakes, epidemic diseases, floods, heatwaves, landslides, sandstorms, tsunamis, volcanic activity, and wildfires. Among the key threats are recurrent and severe summer monsoon floods, intense storms characterized by strong winds and heavy rainfall during typhoon season (June-September), and public health emergencies such as the COVID-19 pandemic. The frequency, severity, and spatial distribution of hazards vary considerably, and in some cases, they interact, compounding impacts.[455] Heavy rainfall and typhoons are particularly frequent and destructive, and the country's mountainous topography exacerbates flooding and landslide events.

Drought

Drought is a slow-onset hazard that leads to water scarcity, affecting large geographic areas and multiple sectors with significant socio-economic consequences. In South Korea, droughts are recurrent and severe, and they impact water supply, agricultural productivity, and ecosystem health. In September 2025, the South Korean government declared a national drought disaster in response to critical water shortages in a major reservoir after rainfall in the affected region had fallen to 40% of normal levels, while persistent heatwaves accelerated evaporation. Authorities implemented emergency measures, but the crisis escalated to a national emergency, requiring fire fighters, military, and Coast Guard mobilization to deliver water supplies.[456]

Earthquake

Since the initiation of full-scale seismic monitoring in 1978 by the Korea Meteorological Administration (KMA), a total of 2,206 earthquakes has been recorded in and around the Korean Peninsula. There is an average of approximately 48 events per year. Of these events, earthquakes of Mw 3.0 or greater, which can be felt by humans, occur about 10 times annually. Seismic activity in South Korea has exhibited temporal variability; it was relatively high from 1978 to 1982, subdued between 1983 and 1991, and active again from 1992 to the present.[457] The strongest earthquake in the past decade occurred on 16 April 2016; it registered at Mw 5.7 and struck approximately 292 km (181 mi) southeast of Busan at a depth of 10 km (6.2 mi).[458]

Epidemic Disease

Zoonotic diseases – infectious diseases transmitted from animals to humans – constitute a major global health concern. More than 60% of all infectious diseases are zoonotic, and, in the past 25 years, over 75% of newly emerging infectious diseases have originated from wildlife. In South Korea, 13 zoonotic diseases are officially designated for monitoring and outbreak prevention. They include anthrax, avian influenza, brucellosis, enterohemorrhagic E. coli infection, Japanese encephalitis, Q fever, rabies, Severe Acute Respiratory Syndrome (SARS), Severe Fever with Thrombocytopenia Syndrome, tuberculosis (TB), Variant Creutzfeldt–Jakob Disease, and enteric infections such as salmonella and campylobacter.[459]

TB continues to pose a public health challenge, although the country has made significant progress. In 2021, the incidence

rate was 45 cases per 100,000 population, representing a 50% decline over the past decade. Current strategies focus on early detection and treatment of active TB cases, as well as preventive therapy for latent infections.[460]

Malaria is considered low-risk yet remains endemic in South Korea. It is an acute febrile illness transmitted by mosquitoes carrying the malaria parasite. In South Korea, new malaria cases typically present between May and October, with primary incidence reported in Seoul, Incheon, Gyeonggi, and Gangwon Provinces. Approximately 700 cases are recorded annually. The WHO has designated South Korea as a priority country for malaria elimination, with a target of achieving zero domestic cases by 2028.[461]

Extreme Temperatures

South Korea is experiencing an intensification of extreme temperature hazards, marked by increasingly frequent and severe summer heatwaves and a notable rise in tropical nights. The KMA defines a heatwave as a period during which the daily maximum temperature reaches or exceeds 33°C (91.4°F) for more than two consecutive days. Both the number of heatwave days and the duration of heatwave periods have risen significantly, with 2018 and the period from 2023 to 2025 ranking among the hottest on record.[462] In response to recurrent heatwaves, the South Korean government implemented a comprehensive, multi-tiered strategy that integrates national policies, institutional frameworks, and collaborative efforts with local governments and civil society organizations. A central component of this approach is the role of the KMA, which issues heatwave warnings and impact-based forecasts through an enhanced alert system. This system utilizes the Daily Maximum Perceived Temperature metric, incorporating humidity to more accurately reflect health impacts.[463]

Flooding

South Korea has experienced notable changes in precipitation patterns. In the past 20 years, the average annual rainfall has increased by 135.4 mm (5.3 in), while the number of rainy days has declined by 21.2 days. According to the KMA, future projections indicate that between 2021 and 2100, rainfall intensity in metropolitan areas will rise significantly. This shift suggests less frequent but more intense precipitation events, thereby increasing the risk of torrential rainfall. As of 2025, more than 86% of natural disaster-related damage in South Korea was attributed to extreme rainfall events, including torrential downpours and typhoons. These hazards often result in severe floods, with recurrent summer monsoon season flooding causing extensive damage to infrastructure, agriculture, and human lives.[464]

In addition to rain-driven flooding, South Korea's southern and eastern coastal regions face growing risk of sea level rise and coastal flooding. Between 2016 and 2020, Haeundae Beach – one of the country's most prominent tourist destinations – lost over 20% of its sand due to accelerated coastal erosion driven by typhoons and storm surges. Projections indicate that the combined effects of sea level rise and extreme weather events will exacerbate coastal erosion and coastal flooding in low-lying areas and will intensify risks to communities.[465]

Landslides

Landslides represent a significant natural hazard in South Korea, where mountainous terrain comprises approximately 80% of the land area. The pronounced monsoon season, characterized by short periods of extreme rainfall, often precipitates cascading effects including landslides, which can cause considerable numbers of casualties and extensive damage to infrastructure. Severe, localized rainfall – particularly during July and August – is a common trigger. In response, the Korea Institute of Geoscience and Mineral Resources (KIGAM) has developed and operates the Landslide Monitoring System (KIGAM-LAMOS), which leverages emerging technologies to assess landslide risks within national parks.[466]

Sandstorms

Sandstorms, commonly referred to as "yellow dust," constitute a significant meteorological hazard in South Korea. These events occur when strong winds transport desert dust from arid and semi-arid regions of northern PRC and Mongolia, most frequently during the spring season. The prevalence of sandstorms has increased since the 1960s, largely due to rising temperatures and reduced precipitation in the Gobi Desert.[467] Yellow dust poses serious health risks, particularly respiratory and cardiovascular issues, as the fine particles – measuring 10 micrometers or smaller – can penetrate deep into the lungs.

The South Korean government has enacted legislation granting authorities access to emergency funds for sand and dust storm mitigation measures, including mandatory installation of high-capacity air purifiers in classrooms and restrictions on vehicle use during severe events.[468] When sandstorm activity intensifies, the Ministry of Environment issues a "yellow dust risk advisory" to all cities and provinces. The advisory level is elevated when fine dust concentrations exceed 300 micrograms for more than 2 hours. Additionally, the Ministry has established an emergency response team to coordinate with local authorities and implement necessary protective actions.[469]

Typhoons and Storms

South Korea's location in the western North Pacific heightens its exposure to typhoons and storms. Storms, particularly during the typhoon season from July to October, pose significant risks, as they bring strong winds, heavy rainfall, and storm surges that damage coastal areas, buildings, and transportation networks. Southern and eastern coastal regions, including Jeju Island and Gyeongsang Province, are the most frequently affected areas of the country.

Typhoons often produce torrential rainfall and flooding, which can trigger landslides and urban inundation, while high winds cause severe damage to the built environment. Historically, typhoons have caused substantial socio-economic losses. For instance, Typhoon Hinnamnor, which made landfall in early September 2022, resulted in multiple fatalities and significant economic disruption. To mitigate these impacts, the KMA employs advanced, high-resolution tracking and forecasting systems for typhoons. Furthermore, the South Korean government routinely issues pre-emptive evacuation orders for vulnerable low-lying areas and undertakes infrastructure reinforcement prior to major storm events.[470]

Wildfire

An estimate of between 500 and 900 wildfire incidents are reported each year in South Korea, and they affect approximately 1,000-4,000 hectares (2,500-10,000 acres) of land annually. In recent years, the incidence of wildfire has increased by roughly 30%. The majority of these events occur during the spring months, from February to April, when the spread of wildfires is facilitated by hot, dry, and windy conditions.[471] Wildfires not only cause significant environmental damage – air pollution, soil erosion, and water quality degradation – but also pose direct threats to human health and safety.[472]

Recent Major Disasters

The following section offers a synopsis of some of the most significant disasters that have affected South Korea over the past 10 years. This list is not intended to be exhaustive, but rather, to provide an understanding of the scale and impact of natural hazard events over the course of a decade.

Flooding – July 2025

Heavy rainfall from 16 July 2025 onward affected Gwangju, Gyeonggi, Honseong, Naju, and Seoul. The rain triggered floods and landslides, causing casualties and property damage. The flooding resulted in four deaths and left three people missing. Nearly 5,200 individuals were displaced, and more than 4,500 others were affected by flooding.[473]

Wildfires – March 2025

Wildfires broke out in southern regions of the country on 21 March 2025, and they lasted nearly two months. On 25 March, the National Fire Agency raised its fire response level to the highest alert level.[474] By 2 April, the wildfires had spread across 11 regions and burnt 48,000 hectares (118,610 acres). They caused 31 deaths and 44 injuries, and they displaced 3,307 people and damaged at least 4,015 houses.[475] On 28 April, a wildfire broke out on Mt. Hamjisan in Daegu; it affected at least 57 hectares (140 acres).[476]

Flooding and Landslide – July 2024

During July 2024, heavy rainfall in South Chungcheong and North Jeolla Provinces caused floods and landslides that resulted in casualties and property damage.[477] On 11 July, media reports confirmed four deaths and more than 3,500 people displaced. Heavy rain impacted Seoul and the surrounding metropolitan area, where they drove flooding, which led to evacuations and infrastructure damage.[478]

Flooding – July 2023

On 15 July 2023, sudden flooding at the Gunpyeong 2 Underpass in Cheongju submerged 17 vehicles and caused 14 deaths. Heavy rain had struck central and southern South Korea and led to widespread flooding. The MOIS reported nine people missing and 34 injured. About 6,200 households were evacuated from affected areas. The flooding caused severe damage to railways, roads, power lines, and communication networks.[479]

Flooding – August 2022

Between 8 and 11 August 2022, South Korea was hit by record heavy rainfall brought by a western North Pacific subtropical high-pressure system and a continental cyclone north of the Korean Peninsula. The torrential rain triggered severe flooding that resulted in 14 deaths, left 7 people missing, and injured at least 17 people.[480] The downpour flooded 2,676 homes and buildings. The KMA reported 381.5 mm (15 in) of rain, an amount that surpassed the previous record of 354.7 mm (13.9 in) set in August 1920.[481]

Wildfire – March 2022

On 1 March 2022, a wildfire was reported in Hapcheon County, South Gyeongsang Province, and it spread north into Goryeong County. About 460 residents from Hapcheon and Goryeong Counties were evacuated, and approximately 675 hectares (1,668 acres) of land were burned.[482] Several wildfires were also reported in southeastern Gangwon Province and northeastern North Gyeongsang Province between 7 and 9 March. The wildfires affected approximately 15,091 hectares (37,290 acres) in both Uljin County, North Gyeongsang, and Samcheok, Gangwon. More than 400 facilities, including 273 houses, were damaged, while 540 residents were evacuated. The Hanul nuclear power plant in Uljin County was threatened by the wildfires; however, due to strong winds and firefighting operations, the plant was protected.[483]

Typhoons and Tropical Storms – August-September 2020

Typhoon Jangmi made landfall on the southern tip of Geoje Island near Tongyeong in the southern Gyeongsang Province on 10 August 2020. Over 14,000 facilities were damaged, and 7,000 people were displaced.[484] In early September, Typhoons Maysak and Haishen brought heavy rain, flooding, and strong winds to the country. Haishen, the first super typhoon of the season in the western Pacific, made landfall near Ulsan on 7 September; it brought wind speeds equivalent to a Category 2 hurricane. The storms brought rainfall totals of 100-150 mm (4-6 in) to eastern coastal areas, while rainfall totals were 25-75 mm (1-3 in) for inland and western areas. More than 100 homes were damaged.[485]

Flooding – August 2020

As of 9 August 2020, at least 30 people were reported dead after 46 days of heavy rains. The country's longest monsoon season

in seven years caused flooding, landslides, and evacuations. The Central Disaster and Safety Countermeasure Headquarters said at least eight additional people were injured. More than 5,900 people from 11 provinces and cities were evacuated. An estimated 9,300 hectares (22,980 acres) of farmland were swamped or buried, while 9,500 public and private facilities were reported damaged. About 100 m (328 ft) of levee collapsed at the Seomjin River in the southern edge of the peninsula and flooded the area, and about 1,900 people were evacuated. Five people were killed in Gokseong, South Jeolla following a landslide.[486]

Typhoon – August 2020

Typhoon Hagupit brought deadly downpours to South Korea, and the government moved to designate special disaster zones in the country's interior on 5 August 2020. This declaration would pave the way for state support for the central regions that experienced loss of life and property damage. Gyeonggi and North Chungcheong Provinces, as well as Seoul and other central areas suffered heavy rains. According to the Central Disaster and Safety Countermeasures Headquarters, at least 15 people were killed. The massive downpours also forced the suspension of some train services, the shutdown of roads, and the closure of low-lying bridges.[487]

Flooding – July 2020

During the second half of July 2020, widespread flooding hit central and southern parts of South Korea. The worst affected areas were South Chungcheong and North and South Jeolla Provinces as well as Daejeon City. At least two people died, and 100 buildings were damaged in Daejeon.[488] In addition, two people were killed in Hamyang County in South Gyeongsang Province.[489]

Tropical Storm – September 2019

Tropical Storm Tapah brought rain and wind to southern areas of South Korea on 21 September 2019. The conditions injured 30 people and knocked out power to about 27,790 houses. Although the storm did not make landfall on the Korean Peninsula, the storm flooded streets, damaged houses, and led to about 250 flight cancellations at 11 airports.[490]

Typhoon – September 2019

On 7 September 2019, at least three people were reportedly killed and dozens were injured as Typhoon Lingling brought heavy rains and strong winds. Hundreds of minor incidents were reported throughout the country. Several sections of road, including bridges to Incheon Airport, were closed due to strong winds that threatened to overturn small vehicles. Korea Electric Power Corporation said more than 161,000 homes had experienced power outages. Local meteorologists reported that the fastest wind speed measured was 195.8 kph (121.6 mph) in South Jeolla Province; it was the 5th strongest gust of wind on record in South Korea.[491] Strong winds also caused power outages in 17,000 homes on Jeju Island, where the storm toppled trees and streetlamps and damaged traffic signs.[492]

Tropical Storm – October 2018

Tropical Storm Kong-rey struck southern South Korea on 9 October 2018. It killed at least two people and left thousands without power. The tropical storm made landfall near Chinhae Naval Base on the southeastern coast before brushing past Busan and passing through the provinces of North and South Gyeongsang. Throughout the southeast and on Jeju Island, hundreds of homes were flooded.[493]

Super Typhoon – October 2016

At least seven people were killed as Super Typhoon Chaba struck southern regions of the country with strong winds and heavy rains on 7 October 2016. The worst hit areas were the southern cities of Busan and Ulsan, as well as Jeju Island. Nearly 229,000 households lost power for about a day. The typhoon inundated 508 houses and 1,000 vehicles and damaged 7,500 hectares (18,532 acres) of crops. About 200 people from 90 households were evacuated due to flooding.[494]

Disaster Management Policy, Planning, and Response

Authority within the national DM system flows from the central government to local governments and finally to civil society. Public and private entities take part in each level to ensure that the system is participatory, inclusive, and efficient. When a disaster occurs, responsibility for command, coordination, and mobilization is shared among national and local authorities. With the MOIS as the policy lead, the hubs of the system are the Central Disaster and Safety Countermeasures (C-DSC) Headquarters and the Local Disaster and Safety Countermeasures (L-DSC) Offices. Local governments have substantial authority over DM within their jurisdictions and have the responsibility of integrating civil society and the public into their programs.

National Disaster Management System

The Framework Act on the Management of Disasters and Safety (2004) laid the foundation for an integrated DM system. It applies to natural disasters, technological accidents, and epidemics.[495] Substantial revisions to the Framework Act in 2014 designated MOIS as the coordinator of all disaster and safety management matters. The Act also lays out the roles of central and local government agencies.[496]

Ministry of the Interior and Safety (MOIS)

MOIS establishes and oversees implementation of DM policies, especially those related to emergency countermeasures, civil defense, and disaster prevention.[497] It is the key national ministry overseeing both local autonomy and DM and, therefore, it has a dual-track internal structure. There are two vice-ministers, one that oversees government organizations and local autonomy and one for disaster and safety management.[498] Figure 8 shows the organizational structure of the divisions within MOIS that are responsible for DM.[499]

The Vice Minister for Disaster and

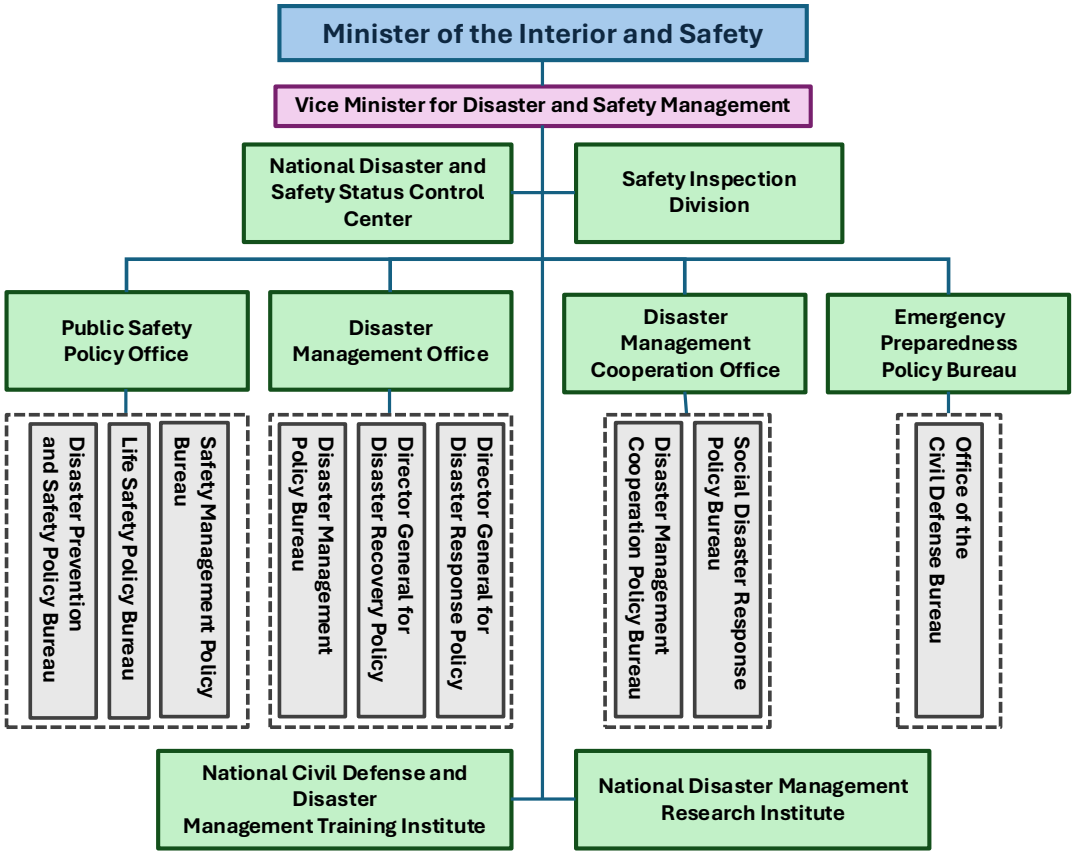


Figure 8: South Korea's Ministry of the Interior and Safety Organizational Chart

Safety Management oversees the National Disaster and Safety Status Control Center (NDSSCC), Disaster Management Office, and Disaster Management Cooperation Office.[500] The NDSSCC brings together staff from central government ministries and related organizations for 24-hour-a-day, 7-day-a-week monitoring. It oversees and manages national disaster situations through its dedicated disaster information analysis, monitoring, and forecasting systems.[501] The Disaster Management Office establishes restoration plans and operates support systems through response and damage assessments. The Disaster Management Cooperation Office organizes and operates the C-DSC Headquarters and Management Support Teams.[502]

The C-DSC Headquarters is a platform for coordinating the whole-of government response. It serves as a hub for cross-ministry and central-local communication and resourcing. [503] Although it is generally headed by the Minister of the Interior, it can be led by the Prime Minister in case of catastrophic emergencies ("level 4"). It is fully mobilized when whole-of-government capacity is required.[504]

At the local level, local governments have developed provincial or metropolitan safety management and natural hazard mitigation plans, established safety management or disaster and safety countermeasures committees or offices, and activated internal disaster and safety divisions. L-DSC Offices oversee and coordinate DM activities within their jurisdictions. They work directly with the C-DSC Headquarters. Given the authority of local governments over their jurisdictions, when a disaster requires activation of the C-DSC Headquarters, representatives of the C-DSC Headquarters must be accompanied by L-DSC officers within the disaster-affected areas.[505]

Figure 9 shows the South Korean DM organization structure at both national and local levels.[506]

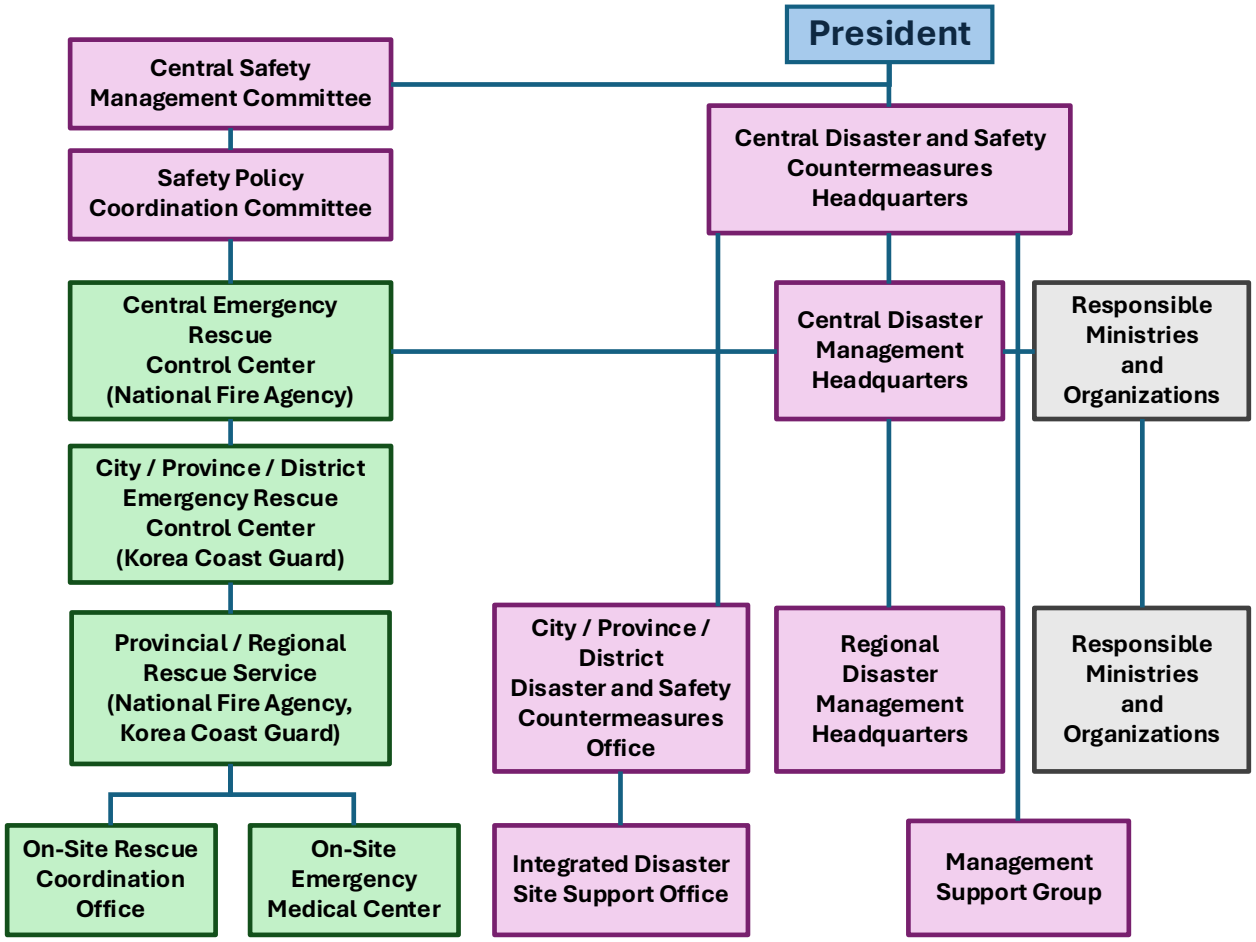


Figure 9: South Korea National and Local Coordination Structure

The National Fire Agency (NFA) maintains 18 headquarters across South Korea's provinces and cities, where it has more than 200 local fire stations, nearly 300 rescue squads, 1,350 emergency medical squads, 1,000 Safety Centers, and 8 firefighting ship squads.[507] It operates the national emergency telephone number, 119, and the emergency operations center.[508] The Fire Commissioner oversees operations across the central "119 Emergency Operations Center" and five bureaus and divisions, including the "119 Response Department," which covers the Rescue Division.

Among other tasks, the NFA Rescue Division is responsible for:

- Establishing and managing the National Emergency Rescue Control Bureau
- Supporting operation of local emergency rescue control bureaus
- Handling matters concerning education, evaluation, and support of emergency rescue organizations and emergency rescue support organizations
- Handling matters concerning control and supervision of the National 119 Rescue Headquarters
- Handling matters concerning organization and management of 119 international rescue squads, international emergency relief activities, and cooperation with international exploration/rescue-related organizations
- Handling matters concerning establishment and operation of comprehensive plans for inland water disaster or other relief, rescues, and emergency medical services at the beach and mountain rescues
- Establishing, integrating, and coordinating emergency rescue response plans
- Developing and distributing platform programs, such as risk analysis and evaluation, for emergency rescue response
- Planning and supervising policy programs in relation to onsite response for disaster emergencies
- Handling matters concerning establishment and management of a standard action protocol at a disaster scene
- Handling matters concerning development, distribution, and evaluation of emergency rescue training programs[509]

The NFA's National 119 Rescue Headquarters delivers command and support for large-scale disasters, researches and disseminates rescue technology, education, and training for rescue personnel, and undertakes rescue and support for disasters at the request of the affected city or provincial governor or as deemed necessary by the head of the Central Emergency Rescue Control Team. The Central 119 Rescue Headquarters in Seoul is the hub for all NFA rescue planning, budgeting, training, aviation, equipment, and teams throughout the country.[510]

Korea Coast Guard

The Korea Coast Guard is an independent agency under the Ministry of Maritime Affairs and Fisheries. Under its Commissioner General, there are more than 30 divisions, and it has an affiliated Special Rescue Unit. Across five regions and 21 stations, the Korea Coast Guard missions are:

- Safeguarding maritime sovereignty
- Preventing and investigating maritime crimes
- Conducting maritime SAR and ensuring maritime safety
- Establishing and maintaining vessel traffic order
- Preventing and responding to marine pollution

The Rescue and Safety Bureau oversees the SAR Division.[511] In terms of DM, the Korea Coast Guard prepares for and responds to typhoons, earthquakes, and tidal waves, and it undertakes rescue efforts and responses in coastal seas.[512]

Other Mechanisms

To address issues related to institutional, financial, or human capacity within local governments, the central government can use the Management Support Group to help local authorities at disaster sites. The Group, launched only in the event of large-scale disasters, forms

based on a central DM plan and comprises members from national-level organizations alongside disaster experts from other related organizations and groups. The support team is dispatched to the disaster-affected region and, once on site, it oversees response efforts, while local governments supply resources to the team.

In recent disasters, the Ministry of National Defense (MND), police, and NFA have filled key Management Support Group roles. Police and fire services are commonly part of the on-site management and coordination teams. Police also participate in safety inspection, and MND can be part of recovery support.

Plans and Processes

The Standard Manual for Disaster Crisis Management (SMDCM) lays out the DM system and the roles and responsibilities for related organizations. It was revised in 2019 to better reflect the reinforced DM system and updated policies, specifically:

- Clarifying the role of the Office of National Security as a control tower in serious disasters
- Requiring that DM videoconferences be held from the initial stages of a disaster with the participation of the National Crisis Management Center
- Instituting proactive management of disasters by specifying the processes of crisis symptom monitoring and evaluation
- Improving the flexibility in emergency alert issuance based on the progress of a crisis by specifying the categories of crisis symptoms
- Specifying the disaster evacuation process for safety-vulnerable groups and the procedures for notifying foreign embassies of foreign casualties.

The National Safety Management Framework Plan is a 5-year guidance document that builds on the national and local authorities' 5-year DM plans to ensure implementation of national and local disaster risk management strategies. The key aspect of this initiative is to identify hazards, assess risk, make decisions, and invest in disaster prevention.

The national DM system includes 26 disaster risk assessment programs that address both natural and anthropogenic hazards. By generating data and information on risk factors, the country can better direct investments in risk management. Produced for a 10-year period, the Comprehensive Plan for Natural Hazard Mitigation is a compendium of natural hazard mitigation plans from each local government with specific strategies and action plans. Among the products that result from this planning and investment are the Korea Age-specific Safety Education Maps (KASEM), launched in 2016. KASEM covers guidelines for safety education appropriate and necessary for each of six age groups: early childhood, early school years, adolescence, young adulthood, middle adulthood, and late adulthood. They cover categories of safety and risk, as well as skills to address them.

Community Action

Several public-private mobilization mechanisms exist to synchronize government and community response. Key players include but are not limited to the Korean Red Cross and Hope Bridge Korea Disaster Relief Association (KDRA).

<u>Local Autonomous Disaster Prevention Teams (LADPT)</u>

Introduced in 2007 at the lowest, local level, the Local Autonomous Disaster Prevention Team (LADPT) system is intended to increase private actors' participation in DM. Local government ordinances establish and support LADPTs. Their main tasks include serving as emergency liaisons with government organizations, disseminating alerts, supporting resident evacuations and vehicle access control, supporting emergency recovery and displacement shelters, and sourcing and distributing emergency relief supplies. LADPTs also participate in hazard identification and risk assessment, and they help provide resident training and campaigns on behavioral guidelines. They form a key bulwark for supporting victims between the onset of a

disaster and the arrival of government support.

Integrated Volunteer Support Groups (IVSG)

Civil society and affected communities can use an Integrated Volunteer Support Group (IVSG), a mechanism intended to systematically manage residents' participation in disaster response. When a disaster strikes, the IVSG, in collaboration with local volunteer centers and the Korean Red Cross, organizes volunteers. The IVSG's duties include recruitment, training, allocation, advising, and overall management of volunteers who support displaced residents in the initial stages of a disaster and participate in recovery work after the initial response period. Volunteers managed by the IVSG are specifically tasked with assisting people living with disabilities by providing information, supplying necessities, and securing mobility and transport.

Korean Red Cross

The Republic of Korea National Red Cross (Korean Red Cross) is a humanitarian organization providing emergency assistance, disaster relief, and education in South Korea. It is a key stakeholder in domestic DM with roles across rescue and relief, and it is the recognized South Korean affiliate of the IFRC. The Korean Red Cross is also listed as a Designated Public Corporation under the Disaster and Safety Management Basic Act and is therefore obligated to cooperate with the national and prefectural governments in providing relief assistance.[513]

The Red Cross Society in Korea was originally formed in October 1905. After the end of the colonial era, the Republic of Korea officially reformed the society as the Republic of Korea National Red Cross in 1949. The Korean Red Cross conducted its first major relief operation for war victims during the Korean War (1950-1953). It was formally recognized by the ICRC on 26 May 1955 and became a member of the IFRC on 28 September 1955. In 1981, the Korean Red Cross was entrusted by the government, through a Presidential Decree, to oversee the country's entire blood service.

The Korean Red Cross is headquartered in Seoul and operates a nationwide network of 14 chapters. It runs five hospitals and one rehabilitation center, which provide affordable medical services to vulnerable populations, including foreign-national migrants, elderly people living alone, and low-income families. It also manages 131 blood donation centers across the country.[514] Across its 14 chapters, the Korean Red Cross delivers certified public health training; water, mountain, and road safety; youth peer education; psychosocial support; and senior health care management.[515]

When disasters strike, the Korean Red Cross provides humanitarian aid by purchasing and distributing relief goods, establishing shelters for the displaced, and providing mental health support for victims.[516] Its programs span disaster preparedness and response, blood transfusion, first aid and safety, and restoring family links. All programs and services are guided by the International Red Cross and Red Crescent Movement's seven fundamental principles: humanity, impartiality, neutrality, independence, voluntary service, unity, and universality.

As one of two National Societies operating on the Korean Peninsula, the Korean Red Cross has a unique mandate for inter-Korean relations. In partnership with the Red Cross Society of the Democratic People's Republic of Korea, it organizes family reunions between individuals separated during and after the Korean War. To date, these reunions have enabled nearly 18,000 individuals across approximately 4,000 families to reunite with loved ones not seen since 1953. In addition to face-to-face reunions, the Korean Red Cross facilitates letter exchange, live video meetings, and family reunions in third countries, and it provides psychosocial and financial support to separated families. More than 75,000 individuals in South Korea are currently ageing without having reunited with family members in the North. The Korean Red Cross also sends relief items and non-food supplies to North Korea both during emergencies and on a non-emergency basis, largely funded by the South Korean government.[517]

On the international scene, the Korean Red Cross supports disaster management and response activities overseas, including after natural disasters and disease outbreaks, and during humanitarian crises. It provides emergency relief and recovery support to affected communities and sustains development programs for sister National Societies, particularly in the Asia-Pacific. It currently operates development programs in several countries, including Mongolia, Nepal, Timor-Leste, and Vietnam, where it supports local National Societies to build sustainable disaster risk reduction and response capacity.[518]

Hope Bridge Korea Disaster Relief Association

KDRA is a government-designated relief organization that shares responsibility for disaster recovery and victim rescue with the government. It is the only government-designated relief organization that oversees the disbursement of donated funds to disaster victims. In the event of a disaster, KDRA sets up a disaster and safety response unit and collaborates with MOIS and local authorities to establish logistics centers for relief goods.[519] The organization also provides specialized training to community disaster prevention teams, volunteers, and relief officers.[520]

National Military Role in Disaster Response

The armed forces of South Korea may undertake civilian support missions when civilian resources are overwhelmed. National military forces are precluded from such missions if it would negatively impact performance of military operations. Given the importance of full war-time preparedness in the face of sustained hostilities on the Korean Peninsula, civilian support missions and any foreign disaster response or peacekeeping are always measured against mission assuredness and readiness for defending the country from external (i.e., North Korean) aggression. Individual and unit-based disaster preparedness education and training occur annually across the armed forces.

With nearly 500,000 active members, the South Korean armed forces comprise four branches – army, navy, air force, and marines.

In all cases where military forces or equipment are used for civilian support, local authorities at the site of the crisis remain in command and may control those military personnel or assets. Explicit civilian support missions include medical assistance, logistical support, SAR operations, and support for law enforcement. Many units across the national armed forces practice these missions – especially medical and engineering support – with service overseas in UN peacekeeping missions.

For more than two decades, the MND has been a stakeholder in inter-agency consultation and policymaking for national-level crisis management. In 2020, revisions to the Framework Act on Disaster and Safety Management explicitly authorized the national DM agency to request support from the military. Since then, the armed forces have emphasized "comprehensive security," which is interpreted as authorizing the military's role in domestic disaster response within the bounds of the Constitution's assignment to the armed forces of a duty to protect the lives and property of the people. Figure 10 illustrates the MND's plan for executing a Presidential authorization to deploy the military domestically to provide support under disaster countermeasure operations.[521]

At the onset of a disaster, the C-DSC and L-DSC Headquarters are activated, along with their respective control centers. Within the defense and armed forces establishments, the MND and each service activate a Disaster Countermeasures Headquarters, while the Joint Chiefs of Staff form a Search and Rescue Headquarters to fulfill their role of approving any deployment of troops or military equipment to a disaster site. If the L-DSC Headquarters requests support from one or more military units or branches, that unit or branch reports up to the MND and, in turn, receives guidance on civilian support operations.

Two key aspects govern mobilization. One, the military can deploy troops only when requested by the civilian government. Two,

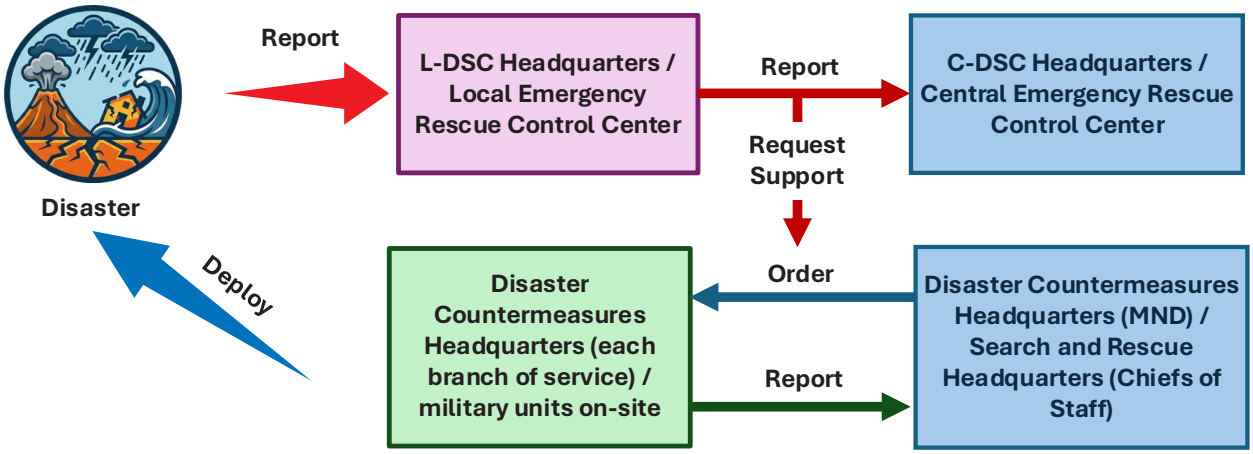


Figure 10: Call-out Process for South Korean Armed Forces

under the Framework Act, the local head of government at the disaster site controls troops and equipment.

The Army explicitly includes in its objectives serving the "people's interests," which covers civilian support missions like prevention of contagious disease, maintenance of public order, preservation of industrial order, restoration of damaged assets, and support in the case of major nationwide events. A snapshot of five years that includes the first year of the COVID-19 pandemic found that from 2016 through 2020, some 845,500 individual service members were deployed domestically for civilian support.

- The largest single deployment was during the COVID-19 pandemic, when some 271,000 troops, as well as military equipment and facilities were mobilized to support the national inter-agency public health and medical campaign. In addition, the Air Force, for the first time in its history, used a military asset – a C-130 aircraft – to import medical supplies after commercial airlines suspended cross-border operations.
- After the COVID-19 response, the next largest armed forces civilian support mobilizations comprised 114,000 troops called up for typhoon response in 2020.
- In 2019, 107,000 troops were called up for activities to address a livestock epidemic.

By far, epidemic diseases and typhoons have been the hazards that have elicited the greatest domestic military mobilization for civilian support; each of these hazards accounts for approximately one-third of all mobilization during the 5-year snapshot period.[522]

In 2021, the MND revised its Defense Disaster Management Directive to align with updates in the Framework Act. It adopted the Common Manual for Defense Disaster Response, which, in turn, established the bases for the National Defense Rapid Support Team to take part in domestic disaster missions. An additional development was the creation and activation of a combined disaster information management system that is operated by the armed forces and allows the MND and military forces to share information directly with MOIS, KMA, NFA, and the national forest service to accelerate decision-making.[523]

International Disaster Response

South Korea values international humanitarian assistance and DM as methods to reduce non-traditional security threats. During a humanitarian emergency anywhere in the world, South Korea's Ministry of Foreign Affairs (MoFA) determines whether the government will deliver assistance and the type and scale of that assistance. KOICA delivers the assistance, including through deployment of a Korea Disaster Relief Team (KDRT), which may integrate armed forces members. The military may also participate in disaster responses through transport and logistics, separate from the KDRT. In the event of a very large-scale disaster, the Public-Private Joint Council

Overseas Emergency Relief convenes to support decision-making.

The country's international humanitarian aid and integration into the global DM community has expanded since its 2010 accession to the Development Assistance Committee (DAC) of the OECD.[524] The DAC brings together the world's largest aid donors to promote development cooperation to contribute to the sustainable development of developing countries.[525] The MoFA oversees aid and development grants, mainly managed by KOICA, which has more than 900 staff, with 33% employed at headquarters and 67% deployed in partner countries; of the latter staff, 73% are locally hired.[526] As of 2024, only about 1.4% of KOICA grants were used for emergency relief,[527] and the remainder are for longer-term development activities.

The Overseas Emergency Relief Act (2007, updated 2018) governs how the country provides rapid rescue of human lives and relief to disaster-affected countries. The law requires the government to deliver assistance in close cooperation with affected countries and international organizations upon request from the affected countries and as it fits within the scope of South Korea's strategic priorities. It vests with the MoFA responsibility for organizing, recruiting, training, stockpiling, developing mobilization and resource management systems, and cooperating with private and international stakeholders in the DM space.

If it deems necessary, the MoFA can convene the Public-Private Joint Council Overseas Emergency Relief, which comprises representatives of other key ministries – e.g., MND, the Ministry of Economy and Finance – and civil society organizations. The Council deliberates on whether to provide relief, the details, scales, and methods of relief provision, cooperation with the private sector, and assessments of relief activities. If the Council resolves it, the MoFA may, among other requests to central government ministries or agencies, request the MND dispatch military transport aircraft or carriers to support rapid transport of personnel or supplies for emergency rescue or relief.[528]

After the MoFA determines that South Korea will provide assistance to a disaster-affected country, it also determines the type of relief, scale, and content, and KOICA implements the humanitarian assistance. KOICA has several ways to deliver assistance.[529] Its three main means are:

- Financial Contributions – Grants through reputable international organizations, especially UN entities of the International Red Cross and Red Crescent Movement
- In-Kind Contributions – Rapid provision of items needed by affected countries and sourced either from KOICA warehouses or procured locally
- KDRT Deployment – Supports damage reduction, recovery, lifesaving, and medical relief

The deployment of in-kind relief contributions is illustrated in Figure 11.[530]

Established in 2007 under the Overseas Emergency Relief Act, the KDRT has earned recognition from the international community through active engagement at major disaster sites worldwide, including the Ebola virus outbreak in Sierra Leone in 2014, flooding from a dam collapse in Lao PDR in 2018, and the 2023 Türkiye-Syria earthquake.[531] In July 2025, the KDRT participated in the ASEAN Disaster Emergency Response Exercise (ARDEX) for the first time. The KDRT team of 17 joined some 500 other DM professionals from around ASEAN and the world. The Cambodia-hosted ARDEX comprised various drills, and KDRT performed rescue operations, on-site emergency medical treatment, and command post operations.[532]

Multiple organizations and governmental agencies can provide personnel for KDRT deployments. The KDRT comprises three groups – rescue, secretariat, and medical.[533] Figure 12 illustrates KDRT composition, and Figure 13 illustrates the process for deploying the KDRT.[534]

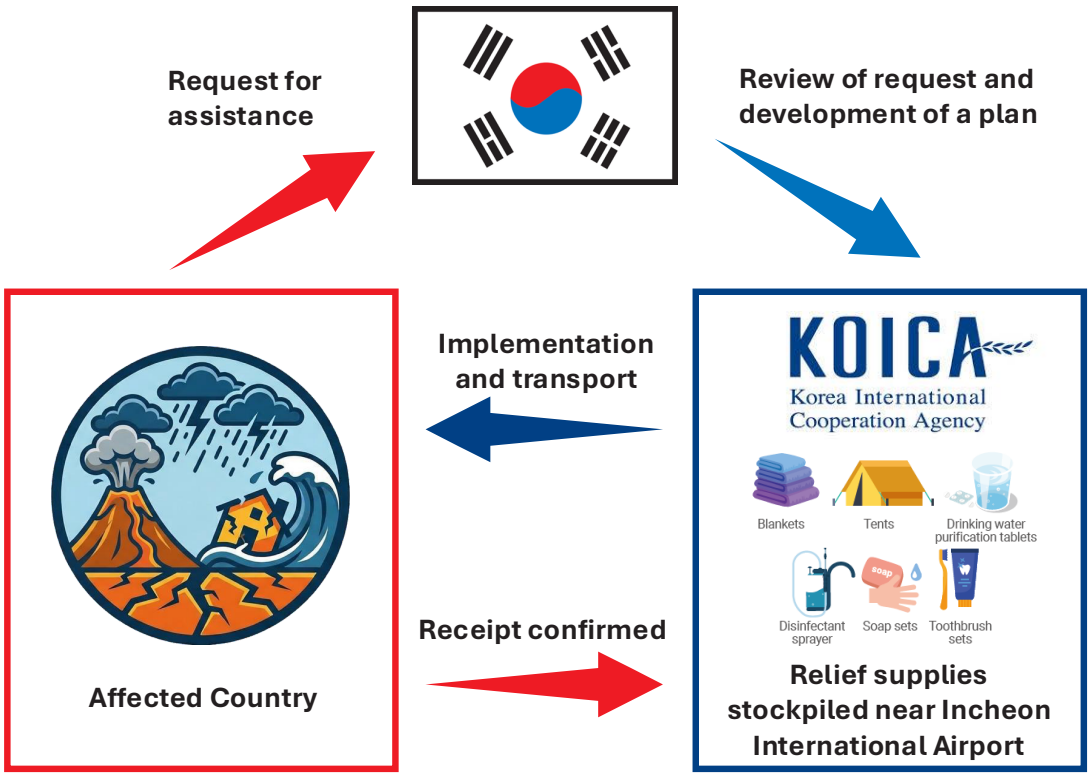


Figure 11: KOICA Relief Process and Supply Stockpiles

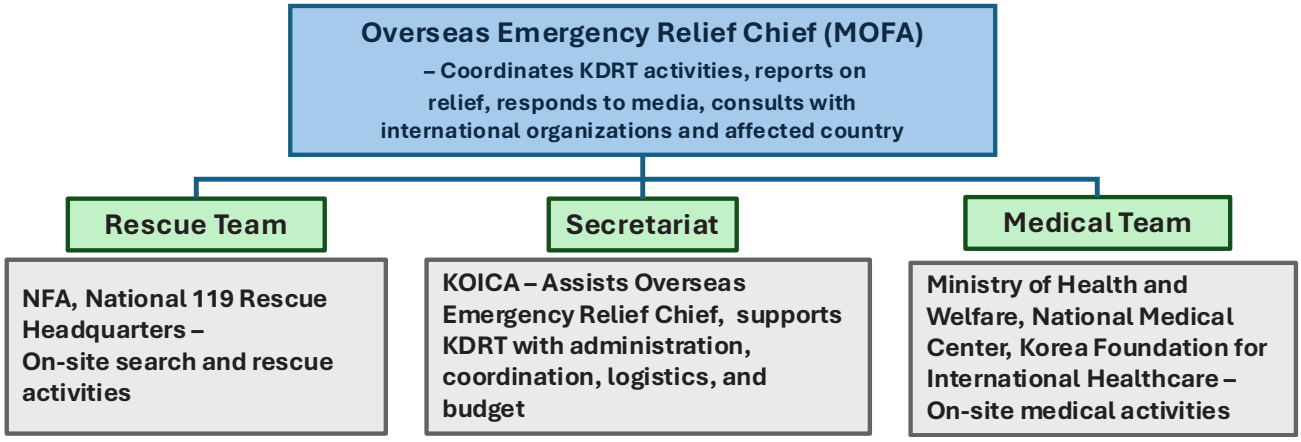


Figure 12: Composition of Korea Disaster Relief Team



Figure 13: Korea Disaster Relief Team Deployment Process

The KDRT rescue team is classified as a "heavy" urban SAR team, per the requirements of the INSARAG External Classification. Having teams classified according to a standard enables disaster-affected countries to prioritize acceptance of international support from urban SAR teams with the capacity needed for the situation. The "heavy" class is assigned to self-sufficient teams capable of working at two disaster sites simultaneously for 10 days (24 hours a day) without assistance from the affected country.

The KDRT medical team is classified as a "Type I Fixed," in line with the international standards set by the WHO EMT certification evaluation. The "Type I Fixed" level is assigned to self-sufficient teams with the capacity to treat 100 outpatients per day for at least 14 days with 29 crew members without assistance from the affected country.[535]

The government conducts annual national KDRT exercises at the National 119 Rescue Headquarters. The annual simulation exercise tests inter-agency coordination mechanisms and clarifies institutional roles across all overseas disaster response phases, from situational reporting and deployment decision-making to on-site operations and post-mission evaluations. Participants in the annual drill represent the MoFA, MND, NFA, KOICA, and others, especially the Ministry of Health and Welfare and National Medical Center.[536]

Founded in 2007, the KDRT deployed 10 times between 2008 and 2023. They have been dispatched to respond to earthquakes, epidemics, fires, floods, and storms, as shown in Table 1.

Philippines – 2013

South Korea responded to the impacts of Typhoon Haiyan (local name, Yolanda) in Philippines by deploying personnel, relief goods, equipment, and financial support. The first tranche of relief supplies was carried by an armed forces aircraft and handed over to Philippine authorities in the hard-hit city of Tacloban on 14 November. At the request of the Philippine government, these supplies included blankets, tents, sanitation kits, water purification tablets, and emergency food. The next day, the KDRT departed from Seoul aboard another military aircraft and arrived in Tacloban later that day.[537]

Four teams of KDRT rotated through deployments to Tacloban to provide medical support to communities affected by the typhoon. The teams collectively spent six weeks in the country. The first two teams (89 people) comprised mostly rescue personnel with some medical staff; they rescued 145 people and treated more than 3,000 victims. As local authorities began requesting more medical staff and fewer rescuers, KDRT composition shifted to include more medical professionals.[538]

From 15 November, KDRT staff participated in health cluster meetings, and from 16 November, medical KDRT staffers were assigned to work at St. Paul's Hospital,

Event	Mission Dates	Number of Personnel
Earthquake, PRC	16-23 May 2008	44
Cyclone, Myanmar	5-15 June 2008	30
Earthquake, Indonesia	1-7 October 2009	44
Earthquake, Haiti	15-30 January 2010	53
Typhoon, Philippines	15 November – 15 December 2013	127
Ebola Outbreak, Sierra Leone	13 December 2014 – 23 March 2015	35
Earthquake, Nepal	27 April – 14 May 2015	47
Dam collapse / flooding, Laos	26 July – 24 August 2018	63
Earthquake, Türkiye	8 February – 23 March 2023	152
Wildfires, Canada	2 July – 2 August 2023	151

Table 1: Past Korea Disaster Relief Team Deployment Details

Tacloban. They supported a Filipino medical team already on-site. The KDRT was able to provide outpatient emergency care and brought generators, blood analyzers, an X-ray machine, ultrasonography, patient monitors, and essential medicines.[539]

In addition to the KDRT, Typhoon Haiyan saw the first overseas deployment of South Korean military troops for disaster response. The 500-person "Araw Contingent" was sent to Philippines with tasking to restore public facilities and clean up disaster-affected areas, provide free medical services and undertake activities to prevent disease outbreaks, run vocational schools and Korean language programs, provide feeding programs, and screen movies. The Contingent outsourced some activities to non-governmental organizations. Two aspects of this deployment caused criticism and debate: 1) the scope of some of the Contingent's tasks, especially language programs; and 2) the MND's decision to send troops separate from the KDRT.[540] Since then, there has not been a repeat of this bifurcated military-KDRT deployment.

Türkiye – 2023

In one of its largest deployments, the KDRT responded to the February 2023 earthquake in Türkiye and Syria. The first team of 118 SAR personnel from the NFA, MND, MoFA, and KOICA, arrived in Türkiye the day after the quake and spent 10 days there. Operating from a base in Antakya, Hatay Province, one of the hardest-hit areas, they recorded eight rescues and 19 recoveries, many using KDRT rescue dogs. The rescue teams were replaced by a 21-member team comprising 10 medical professionals from the National Medical Center, the Korea Foundation for International Healthcare, and the MND, as well as 2 MoFA officials, 5 KOICA staff, and 4 members of relief organizations. Alongside the KDRT deployment, South Korea donated US$778,000 in supplies, including tents, blankets, and sleeping bags, all transported by two military aircraft and a commercial flight.[541] KOICA's role in the deployment was to ensure that coordination tasks were covered so that SAR and medical teams could focus wholly on tasks in the field to save lives. KOICA staff attended coordination meetings, exchanged information with other responding agencies, and shared updates across the KDRT.[542]

Military Foreign Disaster Response Missions

The MND supports transport of emergency relief, rescue personnel, supplies, and provisions. It has formed a military transport support system to dispatch overseas emergency relief teams using military cargo aircraft within 48 hours of an emergency to 15 Asian countries. In 2021, it published the Overseas Incident Response Manual for Korean Military Aircraft to cover rapid dissemination of information, establishment and operation of a cooperative response system, procedures for strengthening initial response and recovery systems, tasks and roles of relevant agencies, and response procedures and measures.

MND published the "Guide Book for Civil-Military Cooperation in Overseas Emergency Relief Missions" to help South Korean armed forces mission personnel understand both the disaster response system of an affected country and the global military cooperation system when supporting military cargo aircraft in the event of an overseas disaster. The guidebook consists of an overview of disaster response and the disaster response systems for five key disaster-prone countries in the Asia-Pacific region.

Recognizing the threat that non-traditional security challenges pose to national security, the MND notes that disasters, terrorism, and novel infectious diseases require as much attention and preparation as traditional security domains, cyberspace, space, and cutting-edge technologies. The national security establishment seeks pathways to cooperate with regional and international stakeholders on coordinating DM through multilateral groups, key among them the ASEAN Regional Forum, Singapore's Changi Regional Humanitarian Assistance and Disaster Response (HADR) Coordination Centre (RHCC), and the Regional Consultative Group (RCG) on Humanitarian

Civil-Military Coordination for Asia and the Pacific. As part of the national security objective of elevating the South Korea–U.S. alliance and expanding and strengthening its own global defense cooperation network, the MND and national armed forces conduct training, cooperation, and knowledge sharing in the disaster response space with the U.S.[543] Photo 2 shows U.S. Army Garrison Humphreys emergency responders during an accident exercise at Desiderio Army Airfield, Camp Humphreys, South Korea in March 2026.[544]

International Cooperation

The MoFA and KOICA maintain networks that allow work across the DM spectrum.

South Korea has a strong partnership with the International Red Cross and Red Crescent Movement. Since 2012, the MoFA, IFRC, and Korean Red Cross have shared a focus on building the skills and preparedness of other National Societies to respond to disasters. A memorandum of understanding signed in 2023 consolidated the partnership. The agreement lays out work programs to support local communities' preparedness, build EWS, and promote anticipatory action.[545]

Separately, the ICRC has had an office in South Korea since 2015. Its focus is on humanitarian diplomacy, maintaining dialogue with Seoul regarding humanitarian affairs and policies, and raising the awareness of international humanitarian law among the armed forces and other stakeholders.[546] In 2024, the ICRC and KOICA signed an agreement to collaborate on addressing the needs of people affected by armed conflict and to promote international humanitarian law. After years of KOICA support for ICRC work around the globe, this formal agreement is expected to allow both parties to benefit from their respective expertise in development and humanitarian action.[547]



Photo 2: Emergency Responders Work Together during an Accident Response Exercise

Critical Infrastructure for Disaster Management

South Korea's modern and efficient transport and telecommunications systems are sufficient to meet the needs of domestic DM. The country's major air- and seaport links also have the capacity to support regional or international disaster response operations. International airports are directly linked to major regional and international hubs, and the country's seaports are some of the world's largest, able to handle bulk cargo efficiently and expeditiously. The country's high-tech telecommunications infrastructure provides around-the-clock monitoring, hazard information, and early warning to residents nationwide. South Korea also exports knowledge, experience, and technology globally as a partner to various organizations supporting development of meteorological and alert systems for developing nations.

Transportation

South Korea has reliable and efficient transport links to most countries across the Indo-Pacific region. Assistance – people or relief supplies – from the people and government of South Korea reaches its destination quickly. The country's major air- and seaports could be major points of embarkation or transshipment for disaster relief. As with most responding countries, relief teams are initially likely to be dispatched by air to affected countries.

Airports

South Korea's modern and highly developed aviation infrastructure plays an important role in passenger and freight transport. There are several international airports linking South Korea to other major regional and international hubs, and numerous domestic airports serve the country's domestic needs. There are eight international airports.

Cheongju International Airport (CJJ)

Cheongju International Airport is located in Chungcheongbuk-do, in central South Korea. It is a civil/military airport with convenient access to the nearby cities of Cheongju, Daejeon, and Sejong, and to other areas of the Chungcheong region.[548] The airport's two runways have concrete surfaces.

- 06L/24R: 2,743 × 61 m (8,999 × 200 ft)
- 06R/24L: 2,743 × 46 m (8,999 × 151 ft)[549]

Daegu International Airport (TAE)

Daegu International Airport is a civil/military airport in downtown Daegu, the country's third largest city. The airport operates international routes and domestic flights to Jeju Island.[550] The airport's two runways have concrete surfaces.

- 13L/31R: 2,743 × 46 m (8,999 × 151 ft)
- 13R/31L: 2,755 × 46 m (9,039 × 151 ft)[551]

Gimhae International Airport (PUS)

Gimhae International Airport is the gateway airport to Busan, the country's second largest city. The airport operates international and domestic flights and is well-connected to Busan by surface transport.[552] The airport has two runways, one asphalt (18L/36R) and one concrete (18R/36L).

- 18L/36R: 2,745 × 46 m (9,006 × 151 ft)
- 18R/36L: 3,200 × 60 m (10,499 × 197 ft)[553]

Gimpo International Airport (GMP)

Gimpo is around 16 km (10 mi) from central Seoul. It has a cargo terminal.[554] The airport's two runways have asphalt surfaces.

- 14R/32: 3,200 × 60 m (10,499 × 197 ft)
- 14L/32R: 3,600 × 45 m (11,811 × 148 ft)[555]

Incheon International Airport (ICN)

Incheon International is a major hub for the region. It is the larger of Seoul's two international airports and is located about 48 km (30 mi) from the city. The modern airport is the main international gateway for the country and is considered one of the top airports in the world.[556] It has a cargo handling capacity of 6.3 million tons annually. In 2021 and 2022, the airport handled the second-largest volume of international cargo in the world. The airport has four parallel runways.

- 15L/33R: 3,750 x 60 m (12,303 x 197 ft)
- 15R/33L: 3,750 x 60 m (12,303 x 197 ft)

- 16L/34R: 4,000 × 60 m (13,123 × 197 ft)
- 16R/34L: 3,750 × 60 m (12,303 × 197 ft)[557]

Jeju International Airport (CJU)

Jeju International Airport is the gateway to Jeju Island, Korea's largest island. The Seoul-Jeju route is known as one of the busiest routes in the world. It also serves international flights.[558] The airport's two runways have asphalt surfaces.

- 13/31: 1,910 × 45 m (6,266 × 148 ft)
- 6/24: 3,000 × 45 m (9,842 × 148 ft)[559]

Muan International Airport (MWX)

Muan International Airport is located in Muan County, South Jeolla Province, and it is the only international airport in the southwestern Jeolla region. The runway has a concrete surface.

- 01/19: 2,800 × 45 m (9,186 × 148 ft)[560]

Yangyang International Airport (YNY)

Yangyang International Airport is located in northeastern Gangwon State; it serves Pyeongchang and is located close to Gangneung and Sokcho, two popular tourist destinations on the east coast.[561] It has one runway with a concrete surface.

- 15/33: 2,500 × 45 m (8,202 × 148 ft)[562]

Seaports

South Korea is home to some of the world's largest seaports that are equipped with modern technology. They support national and regional industries such as automotive, steel, petrochemicals, and bulk cargo. Ports feature modern container terminals, bulk cargo facilities, and specialized berths for automobiles, steel, and petrochemicals. As such, South Korea's seaports are likely to be able to receive or send relief supplies, including in transshipment, for a major regional natural disaster. A major hub in the region, South Korea's ports directly link to PRC, Japan, Russia, and Southeast Asia.[563]

Port of Busan

The Port of Busan is the busiest port in the country. It connects South Korea to major shipping routes and is the 6th largest container port in the world. It handles over 24.4 million TEU of containerized cargo each year. The port is located at the southeastern tip of the Korean Peninsula, at the mouth of the Naktong River and near Japan's Tsushima islands. As the country's flagship port, Busan leads in smart port technologies. The port is a key sea logistics hub for the region with its location as a gateway for trade in Northeast Asia. The port features major terminals including North Port for general cargo and passengers and Busan New Port, a state-of-the-art container terminal that has four berths capable of handling 50,000-ton ships. Other key facilities include six container terminals, multi-purpose piers, and extensive storage areas. The port is equipped to support high-volume cargo operations and can accommodate the world's largest container ships.[564] The port has been operated by the Busan Port Authority since 2004.[565]

Gwangyang (also known as Kwangyang)

Located on South Korea's southern coast in South Jeolla Province, Gwangyang is a major port for South Korea's industrial and energy sectors. It has modern facilities and equipment that can support mega-vessel operations. The port can handle over 2.5 million TEU of containerized cargo annually. Gwangyang port offers deep-water berths, liquified natural gas (LNG) terminals, and advanced information technology (IT) systems, all of which support large vessel operations and high-volume logistics for industrial, energy, and automotive sectors. The port is a multi-commodity hub with over 30 container cranes and advanced automation, including a 100% on-dock system. The port has 20 main berths for 20,000–50,000-ton vessels, and container terminals that feature 16 dedicated container berths. It is ranked among the top 60 container ports globally. The port is managed by the Yeosu Regional Maritime Affairs and Fisheries Office.[566]

Incheon

The Port of Incheon is located on the

northwest coast, at the mouth of the Han River, bordering Seoul and the Yellow Sea. It consists of an outer harbor and inner port, which was the first container handling facility in South Korea. It is a major port and logistics hub and ranks among the top 40 container ports worldwide. In South Korea, it is the 2nd-busiest container port. The port handles large vessels, and it features modern terminals with deepwater berths, facilities for LNG, automobiles, grain, and advanced IT systems. It supports high-volume logistics for the automotive, industrial, and energy sectors. It has 49 berths and handles some 3 million TEU of containerized cargo each year.[567]

Pohang

The port of Pohang, an important industrial port, is located in the city of Pohang on the country's eastern coast, bordering the East Sea in North Gyeongsang Province. Pohang is notable for its industry, primarily serving the steel industry and as home of POSCO, one of the world's largest steelmakers. As such, the port is closely integrated with POSCO and has significant bulk handling capability. Aside from serving as a key shipping hub, it is also a fishing hub. The port features three main areas: Shinhang (New Port), Guhang (Old Port), and Yeongilmanhang. Key terminals include the Yeongilmanhang Container Terminal, which has a 1,000-m (3,281-ft) container pier and a general cargo pier. The port has 24 berths, and its annual container throughput is about 500,000 TEU. It operates under the Ulsan Port Authority. [568]

Ulsan

The port of Ulsan is located in Ulsan, a major port city on the southeastern coast. The port supports the city as an industrial powerhouse by serving various industries. Ulsan specializes in energy and automotive cargo, with extensive liquid and vehicle terminals. It ranks 1st in liquid cargo volume and 3rd nationwide for total cargo throughput. Ulsan offers deepwater berths, LNG terminals, and advanced IT systems, and it supports large vessel operations and high-volume logistics for the industrial, energy, and automotive sectors.[569]

Communications

Based on its modern telecommunications system, South Korea's EWS can route alert messages through various media – broadcast, mobile phones, etc. – and target recipients geographically. Central and regional DM authorities are responsible for deciding when and to whom to send an alert. However, the public may also report emergencies to authorities via "two-way" mobile telephone apps. The MOIS and KMA are the key sources of early warning and alert information, and KMA is the key technical agency producing scientific information related to hazards. An additional telecommunications system directly links first responder agencies in a dedicated network.

The country has a greater-than-100% mobile telephone penetration rate with 51.6 million people and nearly 70 million mobile connections, 99.7% of which are broadband – i.e., 3G, 4G, or 5G. Over 50 million people (>97% of the population) use the internet, and nearly 49 million social media user identities are registered in the country. About 60% of all South Korean web traffic is via smart phone, and lap- or desktop computers make up most of the rest. By far, the top social network in the country, with nearly 83% of all national internet users, is Kakaotalk; Instagram is a distant second place with nearly 64% of internet users, and no other network sees traffic from more than 40% of internet users.[570]

Korea Safe-Net, the disaster and safety communications network, is a dedicated, national network that provides 4G wireless for voice and video sharing among emergency responders within the domestic system. Police, firefighters, local governments, the coast guard, military, emergency medical services, and utilities offices all have dedicated terminals for Korea Safe-Net on their premises and have had full use of it for command and control during a response since 2018.[571]

Early Warning Systems and Regional Information Sharing

KMA is the hub for hazard monitoring data, and it is responsible for assessing alerts from its monitoring stations and delivering actionable information to national and regional authorities. The national government and the L-DSC Headquarters, which both receive alerts from KMA, have responsibility for informing citizens and managing evacuations.[572] However, as mobile data and two-way apps continue to improve, information delivery to people within an at-risk area will likely become more direct. KMA delivers information to the public via its webpage, its portal on NAVER (South Korea's largest portal and primary search engine), a mobile phone app, and social media accounts, including Line and Facebook.[573]

Available Alert Systems

Cell Broadcasting System (CBS)

Use of the CBS for delivery of hazard alerts has been practiced for over a decade. It relies on a partnership between the government and telecom service providers. The DM authorities request access to transmit warning messages to users in specific geographic areas, and the telecoms provide access to the CBS system, which then delivers the message to mobile devices in the specified area.

Automatic Verbal (Text) Notification System

The Automatic Verbal System covers key at-risk regions. When a technical agency assesses that an emergency is imminent or occurring, it can identify emergency management officials within the regional DM office, other disaster-related agencies, or a residential area to target with a message. That message then goes out through a village broadcast amplifier, automatic-answer telephone, landline, or mobile telephone with information for people in the affected areas as to what actions to take – e.g., evacuation.

TV and Radio Disaster Warning Broadcasting Systems

Use of TV or radio via the TV and Radio Disaster Warning Broadcasting Systems is handled at the central (TV) or regional (radio) government level, with authorities requesting that stations deliver a warning and those stations controlling delivery by passing it through a relay station to regional disaster prevention and countermeasures headquarters in the affected region(s).

"Emergency Ready" app

Most recently, authorities have developed a mobile phone app that not only delivers warnings and alerts to users but also allows users to report emergencies.[574] Available in Korean, English, Chinese, and Japanese,[575] it also carries guides for actions to take upon receipt of notice of an emergency. Users can choose the settings for notification – location on, SMS on, etc. Warnings through MOIS' www.safekorea.go.kr cover all hazards.[576] The website is available in Korean and English and carries various forecasts and safety guidelines under normal circumstances, with alerts available on the homepage, as appropriate. Through the web portal, users can download the "Emergency Ready" app for mobile devices.[577]

Korea Meteorological Administration

KMA is home to all of the country's official technical and scientific agencies covering hydrometeorological and geophysical hazards. KMA comprises six regional offices, three branch offices, and seven weather stations. Among the key subordinate centers are the National Typhoon Center and the Earthquake and Volcano Center. KMA launched its first dedicated meteorological satellite in 2018.[578]

KMA's tasks are:

- Issue warnings and special weather reports for heavy rain and snow, storm surges, tsunamis, typhoons, yellow dust, and other extreme events
- Distribute short- and medium-term forecasts
- Issue quarterly bulletins and El Niño and La Niña forecasts[579]

The administration's network integrates some 500 automated weather stations (AWS)[580]

and 327 seismic stations.[581] It also maintains data links with international and regional hazard monitoring agencies in order to gather insight into remote hazard events that could have impacts on the Korean Peninsula. Key extra-territorial hazards of this type include earthquake, tsunami, and volcanic eruption.[582]

Figure 14 shows the KMA dashboard, with "severe weather alerts" selected, and "dry air" alerts posted for most of the country's east coast (12 February 2026).[583]

Severe Weather

From May 2026, KMA's new severe weather alert system will be in place. It will deliver additional warnings for heat waves and add higher levels of warnings for torrential rains (exceeding 100 mm [4 in] per hour). In part, this improvement will be achieved by integrating monitoring information from radars operated by the Ministry of Climate, Energy, and Environment, and additional analytical power – partly from artificial intelligence – will deliver improved flood forecasting.[584]

Earthquake

The earthquake EWS came online in 2016. It uses a network of seismic detectors and a triple algorithm analytical process to determine magnitude and epicenter, and this analysis feeds into the decision matrix of whether or not to issue an alert.[585] As of 2025, an alert was delivered to mobile devices 5-10 seconds after detection of a quake; in 2026, KMA expects to reduce that time to 3-5 seconds from quake to delivery to devices within a 40-km (25-mi) radius of the epicenter.

In December 2025, KMA introduced a shift in its alert messaging for earthquakes. Before that date, when an earthquake of Mw 3.5 or higher was detected, an alert text was sent to regions with moderate exposure, and this practice led to many people receiving alerts but feeling almost no shaking. Going forward,

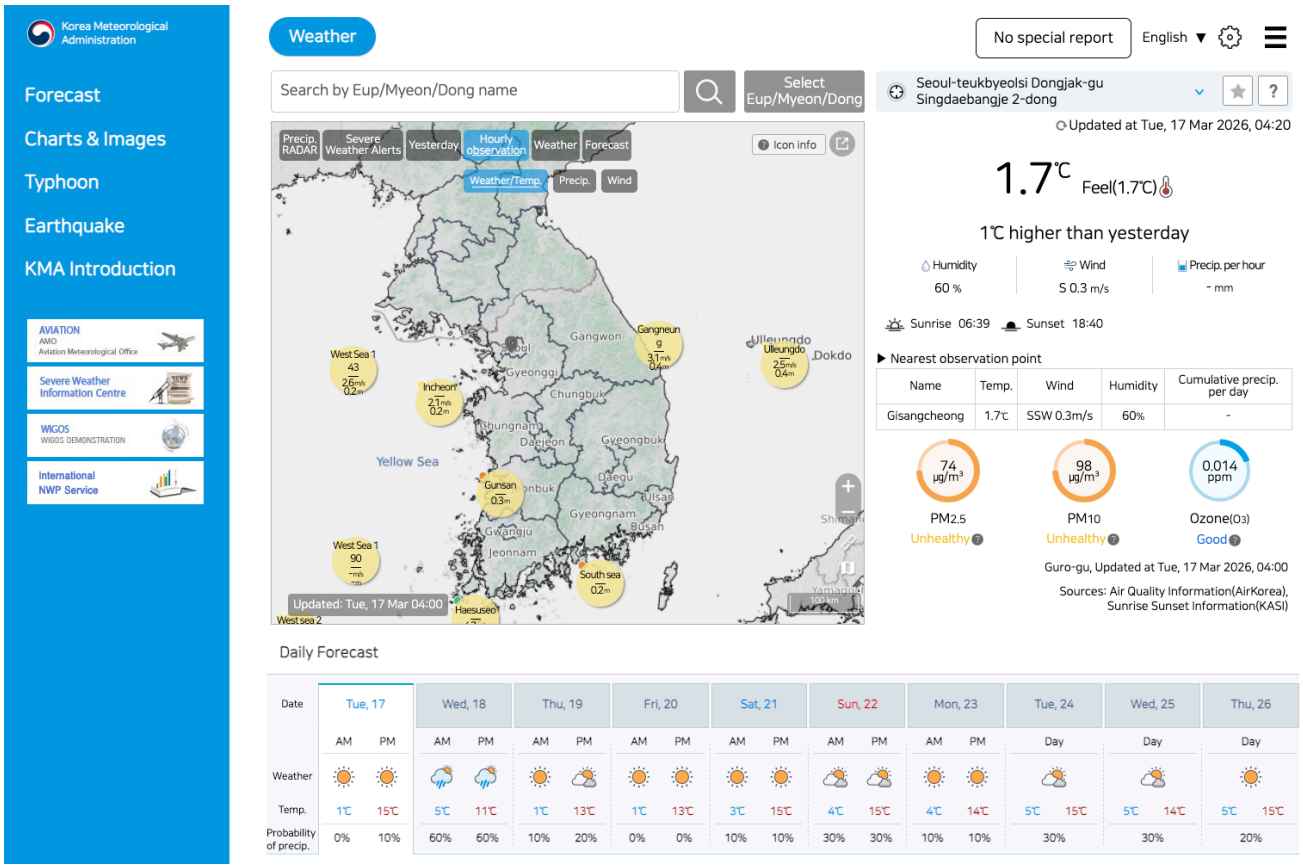


Figure 14: Korea Meteorological Administration Dashboard

text alerts will be segmented into two types: 1) emergency texts sent to mobile devices in regions with damaging shaking; and 2) safety guidance texts sent to mobile devices in areas with minimal shaking, but where confusion can be reduced.[586]

Tsunami

KMA monitors tsunamis via wave gauges, coastal observations, and sea monitoring closed-circuit television (CCTV), and it shares some tide gauges with the Korea Hydrographic and Oceanographic Agency. When a large earthquake occurs anywhere in the seas around the Korean Peninsula, KMA runs an analysis on the event to forecast potential wave heights and their arrival time. It integrates information from the U.S. Geological Survey (USGS), JMA, and Pacific Tsunami Warning Center (PTWC). If it is assessed that damage in South Korea is possible, a tsunami alert is issued.[587] KMA's tsunami forecast system is undergoing updating to allow it to deliver alert and safety messages separately at 3-hour intervals by integrating real-time observations into bulletins.[588]

Information Sharing Focal Points

Ministry of the Interior and Safety
42 Doum 6-ro
Sejong-si, 30112, Republic of Korea
Tel: +82-2-2100-3399
Web: *https://www.mois.go.kr/eng/a01/engMain.do*

Korea Meteorological Administration
Government Complex-Daejeon Bldg 1
11~14F
189 Cheongsa-Ro, Seo-Gu, Daejeon,
Republic of Korea
Tel: +82-2-2181-0900, +82-42-481-7500
Web: *https://www.kma.go.kr/neng/index.do#*

Deployable Telecommunications Infrastructure

South Korea's international responders do not specialize in emergency telecommunications. Communications equipment taken on KDRT deployments is generally for self-sustainment and internal communications. However, the country is a partner of various global agencies to support development of meteorological and EWS capacity in developing countries.

KMA is a key implementor of South Korea's overseas development assistance by supporting advancement of NMHSs and EWS in Bangladesh, Cambodia, Lao PDR, Mongolia, Myanmar, Uzbekistan, and Vietnam.[589] In Mongolia, it also installed AWS in cooperation with that country's DM agencies.[590]

Within the WMO's Regional Association II, KMA operates the website for the Regional Association to provide weather charts, including city-specific numerical weather prediction for developing countries. KMA is one of three services delivering these products. The project offers an affordable means for developing countries to access these types of products and apply them to their public weather services.[591]

KT – formerly Korea Telecom – has a corporate presence in several developing or hazard-prone countries, such as Philippines and Vietnam. In these countries, it offers network solutions and first-responder command center telecoms advice and construction.[592] The corporation's ability to establish direct partnerships with governments and companies makes it a potential partner of Seoul in overseas DM, especially for preparedness and mitigation.

CONCLUSION

PRC, Japan, and South Korea each experience large-scale hazard events every year. However, their work over the past half century to reduce vulnerability and institutionalize coping capacity means that their exposure to natural hazards does not commonly translate into disasters that threaten socio-economic or political stability. Due to their success, each of these countries is active in supporting less-developed countries to build capacity and reduce vulnerability.

Disasters have caused massive damage, human casualties, and economic disruption across PRC, Japan, and South Korea. Nonetheless, these countries are dedicated to sharing their expertise in building capacity and disaster response. All three maintain teams of experts in SAR, emergency medicine, logistics, and damage assessment that can respond at home and overseas.

PRC's domestic DM capacity is strongly centralized in terms of policy and resource management. National-level scientific agencies are tasked with ensuring that meteorological and seismic knowledge, monitoring, and preparedness are shared nationally. Provincial and county officials have responsibility for implementation and service delivery. Many provinces have dedicated SAR and emergency medical teams, and there is usually support from PLA and PAP units. When this capacity is translated to international disaster response, PRC is well-placed to share its technical hazard monitoring tools and to deploy SAR, but its ability to support emergency logistics rests primarily with PLA.

Japan's DM institutions and processes are strongly informed by the country's history of major disasters, and they are heavily oriented toward improvements in the built environment and technology. With the national government as the central policy maker, communities are empowered to assess their risk and implement plans for both mitigating risk and responding to emergencies. The government also shares its advanced DM technologies and expertise with international partners. With JICA as the key implementing agent, Japan's development and humanitarian work have been strongly anchored in its people for more than 50 years. JDR Teams can integrate JSDF personnel and may rely on military logistics or transport in some cases to deliver assistance overseas.

The DM landscape of South Korea is anchored in the central government, but local leaders have significant authority, and the private sector and communities have key roles. The NFA plays the central role as a first responder, but inter-agency mobilization and coordination are hallmarks and increasingly integrate expertise from the MND and armed forces. Civilian agencies and private entities are the main deployable capability of South Korea. KOICA may seek transport for supplies from the armed forces, but the KDRT is civilian-led and is comprised of teams of experts that have years of response experience.

In addition to the variations in their domestic and deployable capabilities, there are differences in the ways these three countries integrate with international DM institutions and practices. Japan and South Korea are major donors to both development and emergency aid funding and are proponents of multilateral coordination mechanisms. They have experience participating alongside UN and other international agencies and other responding countries. PRC is a major funder of international work, but it tends to funnel most of its development and aid financing bilaterally. It works almost exclusively in a bilateral fashion when delivering assistance to another country.

As intense hazard events become increasingly frequent, the resources and expertise of PRC, Japan, and South Korea will be called upon to assist, and their personnel and assets will come into contact with other international responders. Familiarity with the capabilities and methods used by each country's responders will help ensure efficient, effective disaster response.

APPENDICES

Risk Indices

Risk calculation takes into account exposure to hazards, vulnerability, and coping capacity. Addressing all of these elements is important in reducing and mitigating disaster risk. Various indices emphasize structural or institutional risk while others emphasize hazards or losses (human and economic). Regardless of emphasis, disaster risk calculations use some form of the equation:

Disaster Risk = (Hazard × Vulnerability) / Capacity[593]

Taken from the UN Office for Disaster Risk Reduction (UNDRR) glossary, definitions will help clarify this formula:

- Capacity - The combination of strengths, attributes, and resources available within an organization, community, or society to manage and reduce disaster risks and strengthen resilience
- Disaster risk - The potential loss of life, injury, or destroyed or damaged assets, which could occur to a system, society, or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability, and capacity
- Hazard - A process, phenomenon, or human activity that may cause loss of life, injury, or other health impacts, property damage, social and economic disruption, or environmental degradation
- Vulnerability - The conditions determined by physical, social, economic, and environmental factors or processes, which increase the susceptibility of an individual, a community, assets, or systems to the impacts of hazards[594]

In general, the goal of indexing risk is to inform decisionmakers and DRR practitioners of the level of risk to and underlying capacity of the target community. The various risk calculation models support proactive crisis management frameworks and are helpful for prioritizing allocation of resources and for coordinating actions focused on anticipating, mitigating, and preparing for humanitarian emergencies.

INFORM Risk Profile

INFORM is a collaboration of the Inter-Agency Standing Committee (IASC) Reference Group on Risk, Early Warning, and Preparedness with the European Commission. It is a multi-stakeholder forum for developing shared, quantitative analysis relevant to humanitarian crises and disasters. The Joint Research Center of the European Commission is the scientific lead. There are three operational dashboards – i.e., INFORM Risk, INFORM Severity, and INFORM Climate Change.[595]

The **INFORM Risk Index** is an open-source assessment that supports prevention, preparedness, and response decisions. It measures the risk of humanitarian crises and disasters in 191 countries. The INFORM model is based on the standard dimensions of risk: Hazards and Exposure, Vulnerability, and Lack of Coping Capacity. The 1st dimension measures the natural and human hazards that pose the risk. The 2nd and 3rd dimensions cover population factors that can mitigate against or exacerbate the risk. The Vulnerability dimension considers the strength of individuals and households relative to a crisis, while the Lack of Coping Capacity dimension considers factors of institutional strength.[596]

The INFORM model is split into different levels to provide a quick overview of the underlying factors leading to humanitarian risk. INFORM gives each country a risk score of 1-10 (1 being the lowest and 10 the highest) for each of the dimensions, categories, and components of risk, as well as an overall risk score.[597] The higher the score the more at-risk a country is. In the 2025 INFORM Risk Index:

- PRC had an overall risk score of 3.0/10, which INFORM categorizes as the "Low" risk class and lands PRC as the 117th most at-risk country in the Index[598]

- Japan and South Korea both had overall risk scores of 2.1/10, which INFORM categorizes as the "Very Low" risk class and lands Japan and South Korea as tied as the 166th most at-risk countries in the Index[599]

The Hazards and Exposure dimension score takes into account a combination of both natural and anthropogenic hazards.

PRC rated 5.8/10 or 40th of 191 countries in Hazards and Exposure. Its Vulnerability dimension score was 1.4/10 or 181st of 191, and the Lack of Coping Capacity dimension score was 3.3/10 or 133rd of 191. Physical exposure to River Floods at 9.3/10 was the greatest threat in the Hazards and Exposure dimension. Development & Deprivation measured 3.4/10, the highest facet of the Vulnerability dimension. Governance rated 4.7/10 to be the most significant gap in the Lack of Coping Capacity dimension. Figure 15 shows the INFORM Risk dashboard for PRC for 2025.[600]

Japan rated 5.8/10 or 40th of 191 countries in the Hazards and Exposure dimension score. The Vulnerability dimension score was 1.6/10 or 178th of 191, and the Lack of Coping Capacity dimension score was 1.0/10 or 189th of 191. Physical exposure to Tsunamis at 10/10 was the greatest threat in the Hazards and Exposure dimension. Inequality measured 1.5/10 to be the greatest Vulnerability. Governance rated 2.3/10 to be the most significant gap in the Lack of Coping Capacity dimension. Figure 16 shows the INFORM Risk dashboard for Japan for 2025.[601]

South Korea's Hazards and Exposure dimension score rated 4.2/10 or 55th of 191 countries. The Vulnerability dimension score was 1.5/10 or 179th of 191, and the Lack of Coping Capacity dimension score was 1.4/10 or 183rd of 191. Physical exposure to Cyclones at 8.3/10 was the greatest threat in the Hazards and Exposure dimension. Inequality measured 1.4/10, the highest Vulnerability score. Governance rated 2.9/10 to be the most significant gap in the Lack of Coping Capacity dimension. Figure 17 shows the INFORM Risk dashboard for South Korea for 2025.[602]

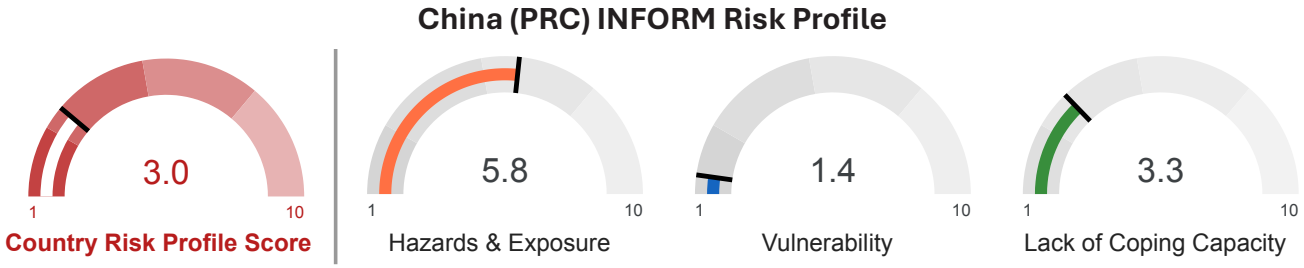


Figure 15: PRC's INFORM Dashboard (2025)

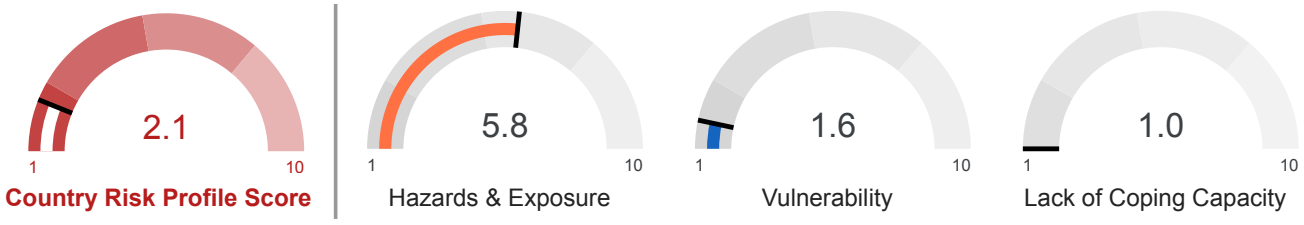


Figure 16: Japan's INFORM Dashboard (2025)

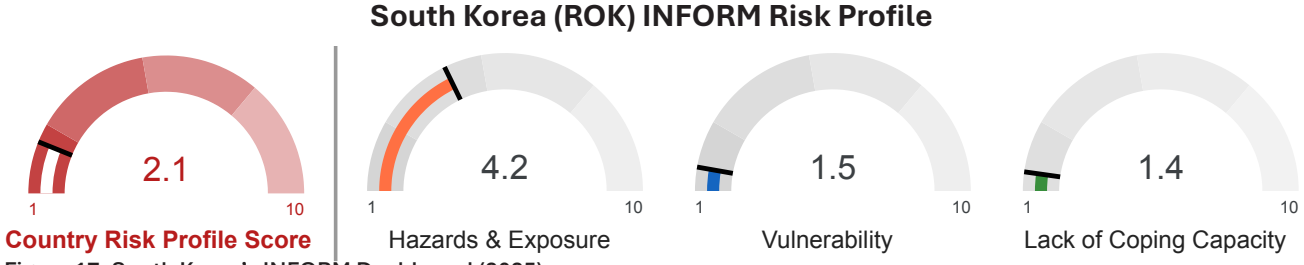


Figure 17: South Korea's INFORM Dashboard (2025)

Additional Resources

This appendix provides additional references, with links, to enable readers to find relevant and contextual information.

International Sources
Sendai Framework for Disaster Risk Reduction 2015-2030 United Nations Office for Disaster Risk Reduction (UNDRR) https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030 *The Sendai Framework is the globally agreed-upon strategy to reduce disaster impacts globally through understanding risk, strengthening risk governance, investing in disaster risk reduction, and enhancing preparedness through "build back better."*
United Nations Office for the Coordination of Humanitarian Affairs (UN OCHA) https://www.unocha.org/asia-and-pacific *The UN OCHA Regional Office for Asia and the Pacific (ROAP) is located in Bangkok, Thailand. It supports regional humanitarian coordination and response preparedness.*
International Federation of Red Cross and Red Crescent Societies (IFRC) https://www.ifrc.org/national-societies-directory/asia-pacific-regional-office or https://go.ifrc.org/regions/2 *The IFRC Asia Pacific Regional Office in Kuala Lumpur, Malaysia, works in support of 38 National Red Cross and Red Crescent Societies across the region. It provides coordination, financial and technical support for disaster operations, and long-term society development programs.*
Organisation for Economic Co-operation and Development (OECD) https://www.oecd.org/en/about/committees/development-assistance-committee.html *The OECD's Development Assistance Committee (DAC) comprises 34 members and associate members who make up the largest providers of global aid. Its remit is to promote sustainable development via overseas development assistance (ODA). Japan and South Korea are both DAC members.*

U.S. Government Sources
U.S. Embassy in Japan https://jp.usembassy.gov/ *The U.S. Embassy is located in Tokyo, and there are five consulates throughout the country to support U.S. government work with Japan's government, private sector, and people, and to provide services to U.S. citizens and entities in the country.*
U.S. Embassy in the Republic of Korea https://kr.usembassy.gov/ *The U.S. Embassy is located in Seoul, and there is a consulate in Busan. They support U.S. government work with the government of South Korea and its people and private sector, as well as delivering services to U.S. citizens and businesses in the country.*
U.S. Embassy in the People's Republic of China https://www.state.gov/countries-areas/china (U.S. State Department) *The U.S. Embassy is in Beijing, and there are five consulates throughout the country. These missions support U.S. government and private-sector interaction with public and private entities of the PRC.*
Pacific Disaster Center (PDC) https://www.pdc.org/ *The PDC is an applied science and research center of the University of Hawaii. It delivers data and analytical support to global multi-hazard early warning systems and disaster management decision-making tools. Its flagship DisasterAWARE platform delivers map-based hazard and disaster information.*
Humanitarian Assistance Response Training – Disasters (HART-D) Course CFE-DM, U.S. Indo-Pacific Command https://www.cfe-dmha.org/hart-d *Target Audience: O3-O6, E6-E9, and DoD civilians who may plan for or execute a Foreign Disaster Relief mission or participate in disaster response activities in exercises or security cooperation engagements.*
USINDOPACOM Foreign Disaster Response in the Indo-Asia-Pacific April 1991 – January 2024 CFE-DM, U.S. Indo-Pacific Command https://www.cfe-dmha.org/Publications/New-Releases *Contemporary historical synopsis of foreign disasters the U.S. DoD responded to in the Indo-Pacific.*

Regional Coordination
Asia-Pacific Regional Guidelines for the Use of Foreign Military Assets in Natural Disaster Response Operations ("APC-MADRO Guidelines") The Asia-Pacific Conferences on Military Assistance to Disaster Relief Operations (APC-MADRO) & OCHA, 2014 https://www.unocha.org/publications/report/world/asia-pacific-regional-guidelines-use-foreign-military-assets-natural-disaster-response *Reference guide for states planning and executing foreign military support for regional disaster response.*
Multinational Force Standing Operating Procedures (MNF SOP) – Annex C: Humanitarian Assistance/ Disaster Relief Multinational Planning Augmentation Team (MPAT), U.S. Indo-Pacific Command https://www.pacom.mil/Portals/55/Documents/J7/MNF%20SOP%20Ver%203.4_14%20FEB%2025_vbf.pdf?ver=4LVTNxMJB8_1xpfxYdARrg%3d%3d (D1 C1/ PDF pg. 883) *Annex on international humanitarian assistance; part of broad standing procedures for regional multinational force operations other than war.*

Acronyms and Abbreviations

ADRC	Asian Disaster Reduction Center
ARDEX	Association of Southeast Asian Nations Disaster Emergency Response Exercise
ASEAN	Association of Southeast Asian Nations
AWS	Automated Weather Stations
BSR	Blue Sky Rescue
C-DSC	Central and Disaster Safety Countermeasures
CADP	China Association for Disaster Prevention
CBS	Cell Broadcasting Service
CCP	Chinese Communist Party
CEA	China Earthquake Administration
CENC	China Earthquakes Network Center
CFE-DM	Center for Excellence in Disaster Management and Humanitarian Assistance
CFR	China Fire and Rescue
CIDCA	China International Development Cooperation Agency
CIRO	Cabinet Intelligence and Research Office (of Japan)
CISAR	China Search and Rescue (team)
cm	centimeter(s)
CMA	China Meteorological Administration
CMC	Central Military Commission (of the PRC)
COVID-19	Coronavirus Disease 2019
CRT	Civilian Rescue Team (of PRC)
CSAR	China Search and Rescue
CSICE	Cabinet Satellite Intelligence Center (of Japan)
DAC	Disaster Assistance Committee
DCBA	Disaster Countermeasures Basic Act (Act No. 223 of 1961) (of Japan)
DIMS	Disaster Information Management System (of Japan)
DM	disaster management
DRR	disaster risk reduction
DWT	deadweight tonnage
EMT	Emergency Medical Team
ERU	Emergency Response Units
EWS	early warning system
FDMA	Fire and Disaster Management Agency (of Japan)
ft/ft^2	foot (feet)/square foot (feet)
FY	Fengyun
GDP	Gross Domestic Product
GoJ	Government of Japan

ICRC	International Committee of the Red Cross
ICT	Information and Communication Technology
IFRC	International Federation of Red Cross and Red Crescent Societies
in	inch(es)
INSARAG	International Search and Rescue Advisory Group
ISUT	Information Support Team
IVSG	Integrated Volunteer Support Group
J-THIS	Japan Tsunami Hazard Information Station
JCAB	Japan Civil Aviation Bureau
JCG	Japan Coast Guard
JDR	Japan Disaster Relief (team)
JETT	JMA Emergency Task Teams
JGSDF	Japan Ground Self-Defense Force
JICA	Japan International Cooperation Agency
JMA	Japan Meteorological Agency
JMSDF	Japan Maritime Self-Defense Forces
JRCS	Japan Red Cross Society
JSDF	Japan Self-Defense Force
KASEM	Korea Age-specific Safety Education Maps
KDRA	Hope Bridge Korea Disaster Relief Association
KDRT	Korea Disaster Relief Team
km/km^2	kilometer(s)/square kilometer(s)
KOICA	Korea International Cooperation Agency
KOSIS	Korean Statistical Information Service
L-DSC	Local Disaster and Safety Countermeasures (of South Korea)
LADPT	Local Autonomous Disaster Prevention Team (of South Korea)
LNG	Liquid Natural Gas
m/m^2	meter(s)/square meter(s)
mi/mi^2	mile(s)/square mile(s)
MCT	Mobile Cooperation Team (of Japan)
MEM	Ministry of Emergency Management (of the PRC)
MHLW	Ministry of Health, Labor and Welfare (of Japan)
MND	Ministry of National Defense (of the PRC and of South Korea)
MoFA	Ministry of Foreign Affairs (of South Korea)
MOFA	Ministry of Foreign Affairs (of Japan)
MLITT	Ministry of Land, Infrastructure, Transport, and Tourism (of Japan)
mm	millimeter(s)
Mw	Moment Magnitude

NCDR	National Committee for Disaster Reduction (of PRC)
NDRCC	National Disaster Reduction Center of China
NDSSCC	National Disaster and Safety Status Control Center (of South Korea)
NFA	National Fire Agency (of South Korea)
NIED	National Research Institute for Earth Science and Disaster Resilience (of Japan)
NMHS	National Meteorological and Hydrological Services
NNDIMS	National Natural Disaster Information Management System (of PRC)
NPA	National Police Agency (of Japan)
NPC	National People's Congress (of PRC)
NWPTAC	Northwest Pacific Tsunami Advisory Center
OECD	Organisation for Economic Co-operation and Development
PAFD	People's Armed Forces Department
PAP	People's Armed Police
PDC	Pacific Disaster Center
PLA	People's Liberation Army
PDR	People's Democratic Republic (of Laos)
PRC	People's Republic of China
PTWC	Pacific Tsunami Warning Center
RCG	Regional Consultative Group
RCSC	Red Cross Society of China
ROK	Republic of Korea (South Korea)
RSMC	Regional Specialized Meteorological Center
SAR	Search and Rescue
SARS	Severe Acute Respiratory System
SDS	Sand and Dust Storms
SFTS	Severe Fever with Thrombocytopenia Syndrome
SMDCM	Standard Manual for Disaster Crisis Management
STSS	Streptococcal Toxic Shock Syndrome
TB	Tuberculosis
TEU	twenty-foot equivalent unit(s)
U.S.	United States
UN	United Nations
VOWC	Volcanic Observation and Warning Centers
WDMA	Weather Disaster Mitigation Advisors
WHO	World Health Organization
WMO	World Meteorological Organization

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