



Planning and management of resources against disasters in Spain



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1. INTRODUCTION:

Spain can be considered as a country moderately threatened by catastrophe risks. It maintains a Civil Protection System with the necessary capacity to respond to these risks. Until now it has been self-sufficient. For the purposes of the actions of public authorities, the system is structured as a cycle divided into processes that rationally cover the phases that develop catastrophes. Its current strengths are planning and intervention in emergencies and it maintains notable actions in prevention and rehabilitation, with an effective and unique insurance system. Its weaknesses come, however, from the coordination and, above all, from the integration of all resources.

Like any other public policy, it has been adapting to the changing needs of society and power. It has evolved from mere reaction when catastrophes occurred, to preventive risk management. Both in a strictly national framework.

There are natural phenomena that, if they occur, have negative consequences for people, or for their environment, and may cause death or economic loss of various kinds.

When the phenomena are of a physical nature, they are considered as processes or "natural risks", while if the phenomenon is a consequence of creations or human activities, we speak of technological or induced risks. Disasters caused by natural risks are usually sudden and short-lived events, although there are also continuous processes over time capable of producing a gradual, but no less serious, degradation of the environment.

Natural risks have very different consequences in each region, depending on the greater or lesser incidence of dangerous situations and the population exposed to them. For this reason, the expected losses in Spain as a result of natural disasters differ from one geographical area to another. They are practically zero in some sparsely populated areas, but they reach very high values on the coast, around the main cities and in certain regions exposed to significant risks.

Among the most significant risks, The best known are the earthquakes, associated with seismic risk, and whose effects are attempted to be reduced by earthquake resistant standards. The major earthquakes that have occurred in Spain, throughout history, have reached sufficient destructive power to devastate entire populations. An example is the earthquake that occurred in Granada in 1884 and that of Lorca in 2011. In addition, there is volcanic hazard in the Canarias Islands, where the only Spanish region currently exposed to this type of risk is located. The most recent eruption was registered in 2021 on the island of La Palma.

The most widespread and frequent risk that produces the greatest number of events, is that of flooding, a phenomenon that is analyzed on the map "historic floods".

The forest fires are another of the problems that seriously affect the Spanish territory, without any region being free of them. However, in addition to the economic losses they cause and the danger they entail for people and human property, fires cause important environmental impacts and, a serious degradation of the environment.

1.1 Definitions:

➤ Seismic risk

Seismic risk is the "probability of suffering, due to an earthquake, various losses or harmful consequences such as property damage, social and economic disruption, loss of life or injury, etc." It is measured according to the relationship between the seismic hazard of the region, the seismic vulnerability conditions of the structures and the value of the elements of an area. A seismic hazard zone is one in which earthquakes that have occurred in the past make it advisable to take certain preventive measures aimed at mitigating a possible seismic disaster. An area has a higher seismic risk.

In Spain the seismic risk has a moderate character, the areas of greatest danger are the south and southeast of it.

➤ Tidal waves or tsunamis

When an earthquake occurs, there are other indirect or derived seismic hazards that are of great importance, such as tsunamis caused by earthquakes occurring at sea, which can affect numerous populations on the coast.

The coastal regions of Spain that could be most affected are those corresponding to western Andalucía (Atlantic coast), followed by the Canarias Islands and Galicia.

➤ volcanological risk

The risk, in this case, is also the expectation that losses will occur, either in the form of human lives, material goods, productive capacity, etc. And it is evaluated as in the case of earthquakes.

In Spain there are several volcanic areas, such as the Canarias Islands, the region of La Garrotxa (Girona), Cabo de Gata (Almería), Cofrentes (Valencia), the Columbretes Islands (Castellón) and Campos de Calatrava (Ciudad Real). Among them, only in the Canarias Islands have eruptions occurred in recent years.

➤ Floods

Floods are the most frequent manifestation of meteorological risks, which in Spain also include drought, windstorms, extreme cold or heat waves... Floods cause significant economic damage each year in our country.

Floods have their origin in intense and torrential rains that cause river floods, but to a large extent they are also caused by the excessive development of economic activities in coastal and island spaces related to leisure. That is why Spain is one of the territories with the highest level of risk in the European Union.

➤ Forest fires

Between 1961 and 2016, 7,791,098 hectares of area of Spain was burned, according to the ANE. A very high figure, but it does not affect all territories equally.

Among the causes of forest fires, there are factors such as the drought that withers the undergrowth, the plantation of fast-growing pyrophytic species, the absence of firebreaks or not taking care of them, the non-use of livestock to lighten the undergrowth or the poorly controlled urbanization of the forest.

1.2 Key risks in Spain

The key risks identified in the National Civil Protection Strategy are described below, going into greater detail on the risks directly related to climate and climate change.

➤ floods

In Spain, the rainfall varies a lot both temporally and spatially and sometimes there are localized precipitations that in a few hours can reach values similar to the annual precipitation. These extraordinary rains cause extreme flows, which can lead to floods, avenues or floods that overflow riverbeds, cause flooding and affect people and property.

Sudden floods, caused by torrential rains, of short duration, great intensity and very localized, are a fairly frequent phenomenon in Spain, causing loss of human life. On the other hand, storms lasting several days that affect large basins produce another type of slower flooding, which basically causes economic damage and, more rarely, personal damage. Sometimes there are also floods due to a very rapid melting of the snow, which are beginning to be relevant in some basins such as the Ebro. For their part, coastal flooding depends mainly from the tides -meteorological and astronomical-, waves and the increase in the average level of the sea.

The main factors that enhance the risk of flooding in Spain lie in the intensive occupation of the territory, which gives rise to a high exposure of the populations. To this must be added the increase in the frequency and intensity of extreme precipitation caused by climate change, together with the rise in sea level.

➤ Forest fires

A forest fire is a fire that spreads uncontrollably through forest land that was not meant to burn. To the obvious forest and environmental damage it causes, we must add the consequences on the civilian population and their property that make forest fires an issue to be addressed by civil protection and emergency services.

According to forest fire statistics, in Spain there are an average of 17,000 forest fires per year. According to the records of the General Directorate of Civil Protection and Emergencies, an average of 80 forest fires have consequences on the population, mainly due to preventive evacuations, but there are also deaths, injuries, cuts in communication routes and services, infrastructure damaged etc

Their number, in absolute terms, is very high compared to the EU countries, although it is the second European country in extension of the forest area, and the fourth in area occupied by wooded masses.

Forest fires are the most important cause of degradation of forest ecosystems, causing high ecological and economic damage and even loss of human lives. The growing degree of urban development in forest environments, means that forest fires that occur in these areas represent a particularly serious risk.

The main factors that enhance the risk of forest fires are the prevailing climate in the Mediterranean area of Spain, (prolonged droughts with high summer temperatures and, on occasion, strong winds), climate change that intensifies these characteristics, even outside the usual times, and socioeconomic and demographic conditioning factors such as the loss of value of forest products and the depopulation of rural areas.

➤ earthquakes

Spain is not an area of large earthquakes, although it does have significant seismic activity with earthquakes of moderate magnitude capable of causing very serious damage. About 6,000 earthquakes are recorded annually in the Iberian Peninsula, in most cases of low magnitude.

➤ Adverse weather events

An adverse meteorological phenomenon is considered to be any atmospheric event capable of producing, directly or indirectly, damage to people and their property or significantly altering human activity.

Adverse meteorological phenomena are the phenomena that cause the greatest number of annual fatalities in Spain. Since the beginning of the century, around 83% of fatalities in Spain due to natural phenomena are due to adverse weather events, whether due to direct or indirect causes

The phenomena that usually produce the greatest impact in our country are the intense and persistent rainfall associated with isolated depressions, storms, heat waves and strong winds, both on land and along the coastline. In addition, in recent years, extra-tropical storms have

also affected the Canary archipelago in particular. Drought also systematically affects the Spanish territory, causing socioeconomic problems of various kinds.

Climate change causes an increase in the frequency and intensity of adverse weather events, enhancing the associated risks. Changes in land use, urban development and the development of transport infrastructure, together with the concentration of the population in urban centers and coastal areas, are some of the elements that increase the exposure and vulnerability of the population

2. DEVELOPMENT OF CIVIL PROTECTION IN SPAIN

The field of action of civil protection is currently conceptualized as a management process called the disaster cycle, with three interrelated phases: the previous one, the emergency and the later one. And these are subdivided into several processes: the previous one, in anticipation or anticipation and prevention; the emergency intervention of rescue and relief and repair; and the later, in rehabilitation and reconstruction.

The action of the Civil Protection System is entrenched in all processes, but in the intervention and repair of minimum services, the rescue and relief services of the Civil Protection System share intervention in many cases with those of humanitarian aid, traditionally in charge of non-governmental organizations. They are complementary and require mutual support. The subsequent rehabilitation process is fully governmental and the Civil Protection System promotes and channels aid to carry it out. However, reconstruction is usually carried out through other far-reaching public policies of cooperation and development, usually outside the strict civil protection. In this sense, when we talk about comprehensive risk management,

2.1 Phases in disaster management

Emergency management in disaster situations is divided into 4 phases: planning, response, recovery and finally analysis and application of lessons learned.

➤ Planning

Planning encompasses all the preparatory actions and preventive measures that are taken before a disaster. Different aspects must be taken into account: the frequency with which the different specific catastrophes occur (not forgetting the infrequent ones), their effects on the population and the environment, the characteristics of the populations with the greatest risk of being affected, the quantity and quality of available resources and the ability to function autonomously, without external resources, for a given period. Disaster response planning is not only the responsibility of state agencies but also of community organizations (schools), Primary Care centers, hospitals, non-governmental organizations and even families themselves³. In fact, the American Academy of Pediatrics recommends that families have their own plans to deal with a catastrophe at home.

➤ Response

Disaster response encompasses all actions taken during and immediately after a disaster. This phase can last from hours to weeks and includes the initial search and rescue of victims, damage assessment, evacuation and sheltering of people, among others.

➤ Recovery

The recovery phase is one in which the community affected by the catastrophe dedicates its efforts to re-establish its self-sufficiency, rebuilding and restoring the damaged infrastructure.

➤ Analysis and application of lessons learned

During this period, all aspects of disaster management are analyzed to draw lessons that can prevent the recurrence of the disaster or mitigate the effects of others in the future. Examples of measures adopted in this phase are the modification of building codes and practices, the redesign of public facilities and services, the review of mandatory evacuation and warning practices, and the education of community members.

From a medical perspective, the response and recovery phases can be problematic, because injuries can increase during damage assessment and reconstruction. In addition, during these stages emotional and psychic disorders often begin to manifest.

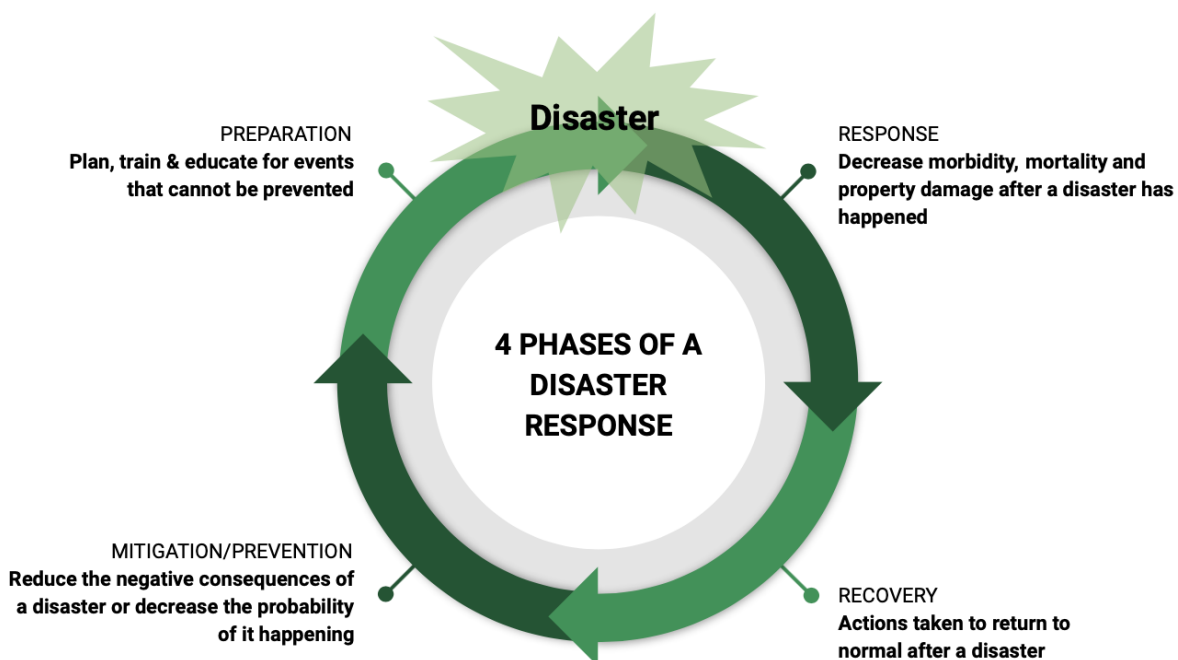


Photo 1 Phases of disaster

2.2 Immediate intervention in disasters

In most cases, the intervention phase must be foreseen in the previous processes, especially in the planning process. The intervention begins, then, where the planning ends and once the programmed preventive measures have not worked. All efforts must first be aimed at ensuring that catastrophic events do not occur and, if they do occur, that there be a solvent response in accordance with what was planned.

In all plans it is mandatory to establish common levels of activation of the plan to which corresponds a graduated system intervention according to the seriousness of the events. These common levels range from the first moment of pre-emergency or alert, as it is called in some plans, to the maximum level 3, which corresponds to its maximum degree with an emergency of national interest in the cases established in the Basic Standard in compliance of the sentences of the Constitutional Court already analyzed. The pre-emergency is not formally declared, but it allows the means of the response system to act, when there are unfavorable forecasts of one or several risk situations. The rest of the levels are scalable and integrated, so that level 1 in the mildest cases can be declared at the local level, which should alert the corresponding regional response system; the local level 2 would allow the joint action of local and regional response means of support, theoretically in its emergency level 1; and, once this is exceeded, the local plan would be raised to level 3 and the emergency would no longer be managed in the local area to go to regional level 2, in which, depending on the development of events, it could request help from the national media, which would mean being at level 1, and so on.

2.3 The recovery of normality, Rehabilitation

Rehabilitation for a return to normality begins as soon as the emergency is over, and basically consists of enabling economic and financial measures in the form of aid to carry out the works, services or emergency supplies necessary to alleviate the damage caused by the catastrophe, prior declaration of a catastrophic area by the Government. Usually it is the State that articulates this type of aid through the General Directorate of Civil Protection and Emergencies, although autonomous communities and local entities participate with their own actions of the same or different type. All this in concurrence with the compensations that correspond by the Insurance Compensation Consortium

2.4 Reconstruction

Of all the phases of the disaster cycle, reconstruction is probably the longest, the most expensive and the most complex.

We are in the time of prevention, but on many occasions it is forgotten that a large part of the long-term prevention programs, which are really the ones that solve chronic vulnerability problems (urban planning, for example) can take advantage of reconstruction phases to be able to apply them. This does not mean that long-term prevention actions have to wait for the catastrophe to occur, quite the contrary, that they must be used to do what must be done, which, in other circumstances, is tremendously difficult. In this sense, reconstruction is seen as an opportunity to make long-term changes to reduce vulnerabilities in urban planning, housing and infrastructure, for example, and to improve social, economic and cultural capacities, especially resilience. They are complex and long-term programs, different from those of immediate help that are restricted to the previous process, rehabilitation.

3 PLANNING AND FRAMEWORKS

3.1 Description of strategic frameworks for disaster risk reduction

➤ National Civil Protection System

One of the pillars of the disaster risk management framework is the National Civil Protection System which, for certain disasters is among the best developed in the world. It has different levels of disaster planning that cover all phases of the emergency cycle, with Law 17/2015 of the National Civil Protection System, the Basic Civil Protection Standard, and the General State Plan for Civil Protection Emergencies being the regulatory pillars and organization of the National Civil Protection System.

The National Civil Protection System establishes that Civil Protection is the public service that protects people and property, guaranteeing an adequate response to the different types of catastrophes caused by natural causes or derived from human action. It integrates the Civil Protection of all Public Administrations, within the scope of its powers, in order to guarantee a coordinated and efficient response throughout the entire disaster risk management cycle: anticipation, prevention, planning, response, recovery, monitoring and evaluation. The actions of the System are governed by the principles of collaboration, cooperation, coordination, interterritorial solidarity, subsidiarity, efficiency, participation, inclusion and universal accessibility of people with disabilities.

➤ National Civil Protection Strategy

The key risks and threats identified in the National Civil Protection Strategy are as follows:

1. Floods,
2. forest fires.
3. earthquakes.
4. volcanic.
5. Adverse weather events

➤ National Plan for Adaptation to Climate Change

The national plan for adaptation to climate change has been approved by agreement of the council of ministers on september 22, 2020, it constitutes the basic planning instrument to promote coordinated and coherent action against the effects of climate change in Spain and is part of a battery of planning instruments in energy and climate matters aimed at avoiding or reducing the negative effects of climate change, among which the draft law on climate change and energy transition, the long-term strategy for a modern, competitive economy and climate neutral.

The plan defines the objectives and a series of guiding principles, 18 areas of work and more than 80 lines of action to face risks, promote adaptation and strengthen resilience to climate change. Among the areas of work is "Disaster Risk Reduction" which includes the following lines of action:

- Prospective evaluation of disaster risks considering climate change projections and scenarios.
- Integration of criteria and adaptive measures in the National Civil Protection System
- Support and reinforcement of preventive measures, especially Nature-based Solutions, as well as observation, early warning, communication and education systems in the face of disaster risk.
- Consideration of risk analyzes associated with climate change in the study, analysis and definition of self-protection measures and promotion of self-protection for the different disaster risks related to climate change.

➤ Conceptual framework for assessing the impacts and risk of climate change.

Climate change causes or aggravates the losses and damages associated with disasters, being an amplifying factor of risk. Non-linear change in the intensity and frequency of climate-related hazards is already a reality. By affecting the intensity and breadth of hazard distribution, climate change can generate more intense storms, exacerbate coastal and inland

flooding, and cause higher temperatures and longer droughts, with direct consequences on wildfire danger for instance.

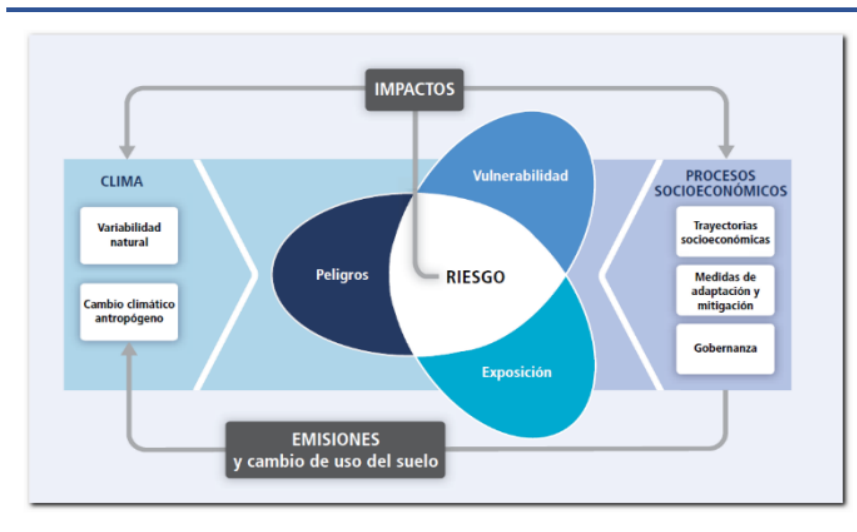


Photo 2 Climate impact

Risk is the result of the interaction of the dangers derived from climate change, with the vulnerability and exposure of human and natural systems to the aforementioned dangers. Risk is expressed as the probability of occurrence of a hazardous (climate-related) event multiplied by the magnitude of its impact should the event occur.



Photo 3 Basic norm civil Protection

3.4 Flood Risk Management Plans

The community regulations on floods, Directive 2007/60/EC on the evaluation and management of flood risks, has among its objectives to reduce the possible consequences of floods, through coordinated action between all administrations and the society. To do this, it establishes 3 consecutive phases of action, which are cyclical in nature, and must be repeated and reviewed every 6 years.

Within the Preliminary Risk Assessment, the first phase, the Areas with Significant Potential Risk of Flood (ARPSIs) have been identified in each Hydrographic Demarcation of Spain. Subsequently, in the second phase, they have drawn up the Flood Hazard and Risk Maps corresponding to those selected channels with potential risk, according to the different probability scenarios required by the Directive.

The last phase involves the adoption and execution of a series of measures chosen specifically for each of the risk areas studied in the previous phases, according to their characteristics of danger and risk and the particularities of Basin. These measures are included in the Flood Risk Management Plans.

The approved flood risk management plans include, among prevention measures in terms of land use planning and urban planning, the preparation of technical guides to reduce the vulnerability of exposed elements in flood-prone areas and promote adaptation to the risk of flooding in different economic sectors, with the aim of increasing the perception of risk among the population and improving their self-protection strategies.

Also in terms of prevention, the flood risk management plans include the importance of conserving and maintaining the riverbeds in good condition in order to reduce the damage caused by the floods and the preparation of a guide is included as one of the measures technique of good practices in conservation and maintenance of riverbeds.

3.3 Plans for the prevention and fight against forest fires

The State Civil Protection Plan for Emergencies due to Forest Fires (approved by the Government in October 2014) establishes the organization and action procedures of those resources and services of the State that are necessary to ensure an effective response from all public administrations in situations for forest fires in which the national interest is present, as well as the support mechanisms for the Plans of each Autonomous Community, in the event that they require it or do not have sufficient response capacity.

The State Plan contemplates a series of operational phases in the event of an emergency due to fire or forest fires, which includes the (i) alert and monitoring phase, (ii) the operational management phase and (iii) the emergency phase of national interest . The Special Civil

Protection Plans for Forest Fire Emergencies, which are the responsibility of the Autonomous Communities, establish the hierarchical and functional organization, as well as the action procedures for the resources and services owned by the Autonomous Communities, in order to deal with fire emergencies. forestry, within its territorial scope.

The Special Plans provide for the coordination mechanisms and procedures with the State Emergency Civil Protection Plan for Forest Fires and contemplate the development of local and self-protection plans in order to reduce and minimize the risk of forest fires for the protection of the health of people, goods and the environment, coordinating interdepartmental actions.

The knowledge generated about the enhancing effect of climate change on forest fires contributes to better planning and risk management. Aspects such as the times of danger and the intensification of the risk factors related to the forest fire must be re-evaluated in view of the results that the projections of the fire risk index show due to the effect of climate change.

3.4 Earthquake plans

The prevention and management of earthquake risk implies the need to develop different lines of action, some more directly aimed at forecasting and prevention and others whose objective is to have operational planning that makes it possible to mitigate damage and act in coordination in the event of an earthquake. an emergency situation.

➤ risk analysis

The risk is defined following a probabilistic approach, as the degree of losses due to the seismic action expected at each point of the territory with a certain probability of exceedance or given return period.

It should be clarified that since it is a probabilistic approach, the seismic action considered at each point does not correspond to a specific earthquake, as it would be in the case of a deterministic approach. Said action has been estimated by means of a hazard analysis, in which the expected movement has been evaluated by integrating the contribution of all the zones that can influence a given location and time. This is the usual criterion that is followed for design purposes, considering not a specific movement, but any movement that may affect the structure in its useful life.

$$R = H * V * E * C$$

being:

H, Seismic hazard that determines the expected movement in the population.

V, Vulnerability of structures.

E, Exposure or density of structures and inhabitants.

C, Cost of repair or loss.

- Characterization of the phases of the Emergency.

Monitoring and Information Intensification Phase (Pre-emergency).

In this phase, the seismic phenomena occur without causing victims or significant material damage, which is why, from the operational point of view, it is fundamentally characterized by the instrumental monitoring and study of said phenomena and by the consequent process of informing the bodies and competent authorities in matters of civil protection and the population in general.

Emergency phase.

This phase will begin with the occurrence of an earthquake that causes material damage or casualties and will last until all the necessary measures for the relief and protection of people and property have been put into practice and basic services have been restored in the affected areas

SITUATION 1 Seismic phenomena have occurred, whose attention, in relation to the protection of people and property, can be ensured through the use of local means and resources.

SITUATION 2 There have been seismic phenomena of such severity that the damage caused, the number of victims or the extension of the affected areas, exceed the attention capacity of the local media and resources.

SITUATION 3 Situation in which several Autonomous Communities or several States are affected by an earthquake with serious consequences, or when it affects only one Autonomous Community, due to its serious effects, it is declared a situation of national interest.

Normalization Phase.

Phase consecutive to the emergency phase that will last until the reestablishment of the minimum conditions essential for a return to normality in the areas affected by the earthquake.

During this phase, the first rehabilitation tasks will be carried out, basically consisting of the reinforcement or, where appropriate, the demolition of damaged buildings; repair of the most relevant damages suffered by the infrastructures of transport, telecommunications and the supply of water, electricity and fuels; provisional relocation of people who have lost their homes; etc.

The plan directorate may declare the beginning of the Normalization Phase when the emergency is under control.

When the emergency and normalization phases are completed, the director of the plan may consider the emergency to be over and the Plan will be deactivated.

Evacuation/Accommodation

Evacuation is the urgent transfer of a group, from its usual place of residence, to another considered safe from the threat. When deciding on an evacuation, it will be necessary to evaluate the specific conditions of the incident and weigh the advantages against the inconveniences that this measure entails.

Planning the evacuation involves:

- Assign the personnel in charge of the evacuation.
- Inform the population of the measure adopted and the rules to follow for its orderly and effective implementation.
- Enable access roads for the transfer of evacuees. It is recommended that these routes be declared for exclusive use, to avoid crowds.
- Arrange means of transport for the collective transfer, if so decided.
- Provide ambulances or other special means of transport for the evacuation of disabled people.
- Select the concentration centers of the personnel to be evacuated. These centers must be far from dangerous facilities and located in areas with easy access to means of transport.
- Select and condition the shelter centers where the evacuated population will settle.
- Schedule the action plan to return to homes at the end of the emergency

The shelters are the centers planned to welcome the evacuees and evacuees. These centers can be hotels, residences, schools and even warehouses or hangars. Likewise, provision should be made for the installation of temporary camps.

The shelter places must meet a series of conditions that facilitate basic needs. They will have different areas for this, such as:

- Supply area.
- accommodation area
- Health area.
- Hygiene area.
- Social assistance area.
- Management and control area.

4 DESCRIPTION OF MEASURES TO DEAL WITH DISASTER RISK IN SPAIN

There is a wide range of disaster risk prevention and response measures that are synergistic with climate change adaptation actions. In Spain, these measures have been identified and characterized by analyzing the risks they address as a basis for planning risk reduction and adaptation to climate change.

In Spain, in general, sectoral plans are the framework for applying risk prevention measures, while civil protection plans are responsible for preparedness and response measures. However, there are also mixed models of plans that include all kinds of measures.

The prevention, preparedness and response measures to face the key risks in Spain, where climate change adaptation measures are integrated, together with horizontal knowledge management and governance measures, are presented and described in this section following the following structure:

4.1 Prevention measures

➤ Nature-based solutions

Nature-Based Solutions are “solutions to societal challenges that are inspired and supported by nature and that are cost-effective, while simultaneously providing environmental, social and economic benefits and helping to build resilience” Therefore, nature-based solutions must benefit biodiversity and support the provision of ecosystem services.

Some solutions based on nature for the prevention of specific risks are, among others:

Nature-based solutions for river flood risk prevention:

- Natural Water Retention Measures
- Recovery of the morphology and natural dynamics of the riverbeds.
- Reclamation and reconnection of floodplains.
- Maintenance of riparian forests and vegetation bands.
- Hydrological-forestry restoration in high basins.
- Wetland reclamation and restoration

Nature-based solutions for forest fire risk prevention:

- Reduction of the flammability of fuels through less prone species and mixed masses.
- Improved resilience of vegetation through the use of landscapes adapted to changing conditions.
- Forest maintenance.

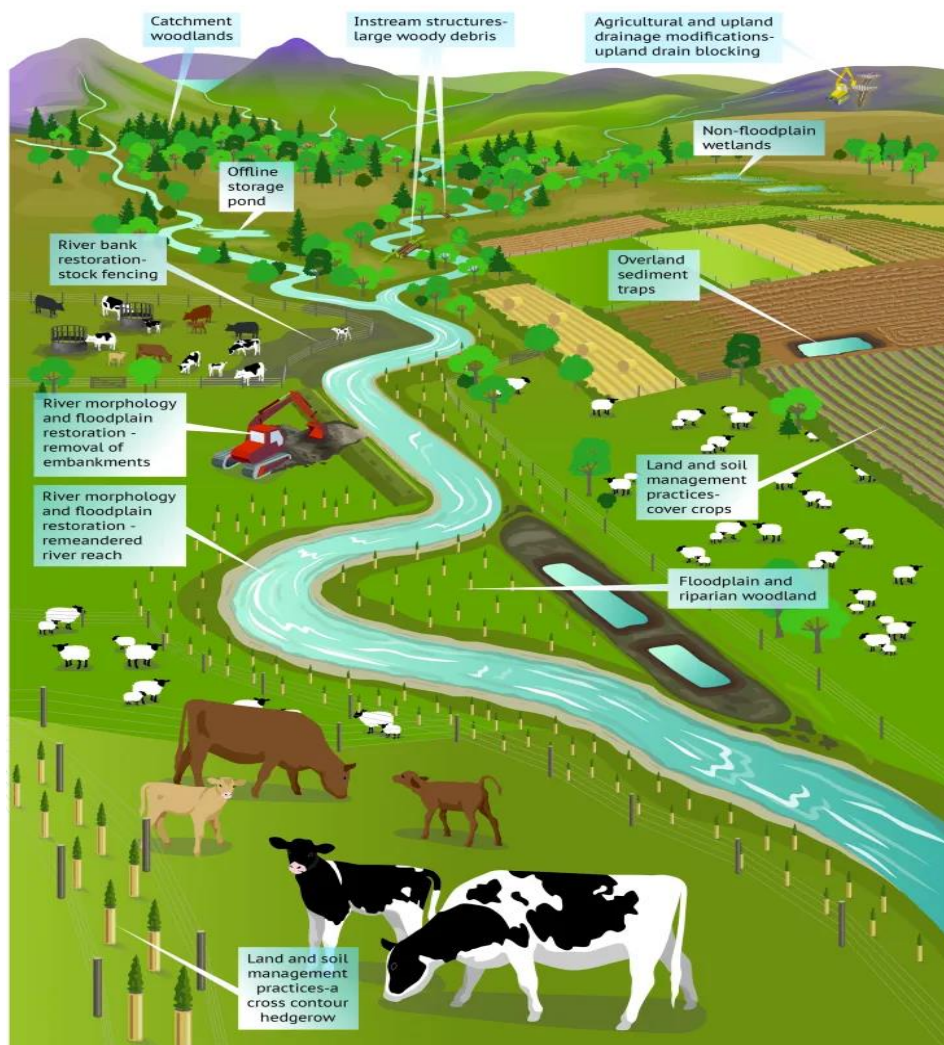


Photo 4 Nature-bases solutions

➤ Reduced vulnerability of buildings

Construction techniques to improve resilience against natural hazards have become an important component of the integrated risk management approach. This relatively undeveloped area has become important in recent years due in part to a drive from advances in building technologies and materials and in part to pressures related to land use planning and a general acceptance of the need to live with the recurring occurrence of certain risks in certain places. The design and construction of new buildings, as well as the adaptation or retrofitting of existing buildings to make them more resilient, can play an important role in mitigating damage caused by natural hazards and speeding up the recovery process.

➤ Relocation of people or assets.

Traditional natural disaster recovery solutions often recreate pre-disaster situations, thereby continuing to contribute to future disaster-related problems. Relocation is considered a measure to break the cycle of disaster-damage-repair-disaster, as it reduces the exposure of communities to risks by relocating populations or assets to sites not prone to recurring risks. Although the relocation of settlements and assets is well known, it is not widely used as a risk mitigation measure. Relocations are important decisions that have to be decided on a case-by-case basis, in consultation with the affected population.

➤ Adaptation or improvement of infrastructures.

Infrastructures for the protection of the population or assets need regular maintenance and reinforcement to maintain their protection capacity and meet security requirements. The climate scenarios confirm a forecast of an increase in extreme weather events that should lead to reconsidering the security requirements and creating new protections in the identified weak points or increasing and strengthening the existing ones.

Adaptation or improvement of infrastructures to prevent the risk of river flooding:

- improvement of dikes, dams and other existing infrastructure.
- Compartmentalisation of the region to be protected into zones through the use of dikes.

Adaptation or improvement of infrastructures for the prevention of the risk of forest fires:

- Increase in surface area protected by firebreak areas and other forest defense actions.
- Adequacy of the density value of defense tracks.
- Increase in water points for recharging firefighting means.

- Early warning systems.

Early warning systems, including climate services, against risks are a fundamental adaptation measure in the context of climate change, as they seek to enable people and communities to respond timely and adequately to hazards and thus reduce the risk of damage. The reinforcement of these early warning systems is conditioned by the availability of adequate meteorological observations and predictions, increasingly precise and with greater spatial and temporal resolution, as well as information communication systems that respond to the needs of those groups that they must respond to climate risks or encourage those in danger to take action.

4.3 Response measures

- Intervention of means to combat forest fires

In the case of forest fires, the regulatory and strategic framework generally establishes a system for the mobilization of means where they are necessary, prioritizing those situations of greater seriousness and guaranteeing equal treatment for all autonomous territories when they request extraordinary state means.

- Salvage and rescue operations

The objective of this measure common to all the risks considered is the search, rescue and rescue of isolated or dragged people, for which the coordination of numerous people and action groups is necessary, at a local, regional, state and international level. .

- Supply, shelter and social assistance

The objective of this measure common to all the risks considered is the coordination of efforts to provide the population with food, shelter and those basic needs of social assistance, including information work on relatives residing in the affected area, as well as support psychological.

4.4 Horizontal measures to improve knowledge and governance

Investments in research and development to improve knowledge regarding disaster risk management and adaptation to climate change are considered fundamental in the continuous learning process that implies the management of both aspects, jointly and separately.

On the other hand, the improvement of governance, which includes the implementation of political, legal, social, managerial and financial measures, is useful to maintain a strategic link and synergies between disaster risk management and adaptation to climate change, lead to carry out multi-scalar planning or improve regional cooperation. This can help avoid mismatches, make it easier to combine multiple funding sources, or reduce the possibility of maladaptive actions. The increasing complexity of adaptation practices implies that learning both in general terms and at the institutional level is necessary in an effective framework for disaster risk management and adaptation to climate change.

These measures are considered horizontal to the prevention, preparedness and response phases, and include, among others:

- Generation of knowledge on disaster risk and adaptation to climate change.
- Improvement of vertical and horizontal coordination to improve coherence, efficiency and effectiveness in the definition, implementation and financing of policies
- Promotion of integrated approaches to adaptation and resilience and disaster risk reduction.
- Linking policies and measures at different levels with financing options.

5 PRIORITIZATION OF MEASURES

The methodology carried out for prioritization does not imply that any identified measure is no longer considered as part of the general adaptation and disaster risk management strategy.

The exercise of prioritizing the measures implies expert knowledge based on existing information, if it exists, or otherwise, based on the judgment derived from their experience. Thus, as in other prioritization processes for decision-making in public policies, it has been decided to apply a multi-criteria methodology made up of four criteria evaluated in this way:

- Risks addressed by the measurement and economic impact of said risks, based on the previous sections.
- Lack of capacity to carry out the measure considered, understood as the set of human, financial and/or legal resources.
- Efficacy of the measure or benefits in terms of avoiding damage, interruptions and reconstruction costs.
- Efficiency of the measure or capacity to use the available resources to optimize the investment with respect to the benefits achieved.

The analysis and assessment of these elements and their relationship with risks depends on specific sectoral and local knowledge, so each element is evaluated based on the criteria of experts and sector managers, supported by existing studies and documents.

Each criterion is scored on each measure with 3 if the priority is high, 2 if the priority is medium, and 1 if the priority is low.

From the scores achieved by each measure, 3 groups of the same range of scores are made. In this way, the measures are prioritized according to their score in 3 groups: Needs with very high priority, Needs with high priority and Needs with normal priority. The prioritization obtained by applying this methodology is understood to be applicable on a national scale.

	risks addressed	shortcomings capacity	effectiveness	efficiency
Preventive measures				
Natural Water Retention Measures	1	3	3	2
Reclamation and reconnection of floodplains	1	3	3	3
Maintenance of riparian forests and vegetation bands	1	3	2	2
Reduced flammability	1	2	2	2
Reduction of vulnerability of buildings	2	2	2	1
Adaptation or improvement of infrastructures	3	2	2	2
Improved efficiency in water use	1	1	2	2
Response measures				
Salvage and rescue operations	3	1	2	2
Supply, shelter and social assistance	3	1	2	2
Emergency rehabilitation of infrastructures	3	2	2	1

Photo 5 Prioritization of measures

As a result of this exercise, some examples of measures according to priorities would be:

➤ very high priorities

- Natural Water Retention Measures
- Adaptation or improvement of infrastructures
- Reclamation and Reconnection of Floodplains

➤ high priorities

- Maintenance of riparian forests and vegetation bands
- Salvage and rescue operations
- Supply, shelter and social assistance
- Infrastructure emergency rehabilitation

➤ normal priorities

- Reduced flammability
- Building vulnerability reduction
- Improved efficiency in water use

6 DISASTER RISK MANAGEMENT.

All processes for designing, implementing, and evaluating strategies, policies, and measures aimed at improving the understanding of disaster risk, fostering disaster risk reduction and financial protection, and promoting continuous improvement of preparedness, response, and recovery practices for disasters, with the explicit goal of increasing human security, well-being, quality of life, resilience and sustainable development.

As explained in the Main Technical Document of the Index of Governance and Public Policies in Disaster Risk Management, in the conceptual framework it is examined through the following components:

- General Framework of Governance for Disaster Risk Management: existence of an adequate regulatory base for the organization and coordination of DRM, which includes both the specific regulations on DRM and the enabling territorial and sectoral regulations that guarantee its viability. Likewise, the availability of resources for the implementation of DRM processes, and the establishment of adequate mechanisms for information and citizen participation, and for monitoring, evaluation and follow-up of said processes.

- Identification and knowledge of risk: it is the process focused on knowledge about the origins, causes, scope, frequency and possible evolution, among other aspects, of potentially dangerous phenomena, as well as the location, causes, evolution and resistance and recovery capacity of exposed socioeconomic elements. This process includes the anticipated analysis of the consequences and admits both objective and scientific interpretations as well as social and individual perception.

- Risk reduction (RR): DRM process focused on minimizing vulnerabilities and risks in a society, to avoid (prevention) or limit (mitigation) the adverse impact of threats, within the broad context of sustainable development. This process includes prospective and corrective disaster risk interventions, and for its proper implementation requires a good information base on risk conditions. In the conceptual framework, reference is made to the existence of a normative, institutional and budgetary framework that allows the timely and adequate intervention of the causes that generate the conditions of vulnerability.

- Response Preparations (RP): in the DRM process whose objective is to plan, organize and test society's response procedures and protocols in the event of a disaster, guaranteeing adequate and timely care for affected people, allowing normalization essential activities in the area affected by the disaster. Preparation is carried out by monitoring events and defining risk scenarios, planning, organization, training, provision of resources and simulation for alert, evacuation, search, rescue, relief and humanitarian assistance actions that must be carried out. in case of emergency.

- Post-disaster recovery planning: process that focuses on preparation for the rapid and adequate restoration of acceptable and sustainable living conditions through the rehabilitation, repair or reconstruction of infrastructure, goods and services destroyed, interrupted or deteriorated in the affected area, and the reactivation or promotion of the economic and social development of the community under conditions of less risk than what existed before the disaster. In the conceptual framework of the iGOPP, it refers to the existence of a normative, institutional and budgetary framework that allows the implementation of mechanisms for the restoration of livelihoods, basic services and infrastructures in such a way that improvisation is reduced,

- Financial protection (FP): is the DRM process that seeks the optimal combination of mechanisms or financial instruments for risk retention and transfer in order to access timely economic resources, which improves the response capacity in the event of disasters (events minor and recurring and major disasters of low recurrence) and protects the fiscal balance of the State. In the conceptual framework of the iGOPP, it refers to the existence of a regulatory, institutional and budgetary framework that allows the design and implementation of an adequate structure for the retention and transfer of disaster risk.

7 MOST DANGEROUS AREAS

7.1 Earthquake risk

The seismic hazard in Andalusia is the highest in Spain, although on a global scale it can be considered moderate. The situation of the Iberian Peninsula, on the plate border between Africa and Eurasia, is what determines the existence of seismically active zones in it

The team of researchers from the University of Alicante (UA) has developed a map that indicates the risk of the probability of collapse of reinforced concrete buildings on the peninsula. In said study, this possibility is considered based on the design acceleration indicated in the seismic-resistant regulations and the seismic hazard curve.

Thanks to this map, updated data has been obtained on the seismic danger of Spain, the cities with the greatest danger are: Granada, Almería, Murcia.

Among these three localities, the city of Granada is the one with the greatest probability of an earthquake occurring, as well as being a city that has previously suffered earthquakes.



Photo 6 Seismic Danger in Spain

➤ Granada

In the city of Granada there are several areas that would be more affected in the event of an earthquake. The most vulnerable areas of the city are located in the south and west of Granada, which affects the Zaidín, Ronda, and la Vega areas, which are particularly fragile due to the type of soil.

In the event of an earthquake greater than 4 degrees on the Richter scale, the emergency plan would be activated.

In the event that people need to be evacuated from their homes, there are two possibilities. Short-term temporary accommodation or long-term accommodation.

In the case of short-term accommodation, it would be sports halls that have toilets, controlled access for people and a large space available. Thus complying with the regulations. Some examples of pavilions that could be used as a refuge would be the municipal sports pavilion, the university pavilion or the La Veleta sports pavilion.



Photo 7 Municipal sport pavilion



Photo 8 La Veleta sport pavilion

In the case of long-term accommodation, larger spaces will be necessary, in this case the best place would be fairgrounds such as Almanjáyar. These precincts will be run by the Red Cross and the Emergency Military Unit.

Due to the current COVID situation, both short-term and long-term accommodation must set up an area for infected people and thus prevent the virus from spreading rapidly, since they will accommodate many people in a small space.



Photo 9 Fairground of Almanjayar



Photo 10 Shelter example

7.4 Flood risk

A study carried out by the Spanish data analysis company Dotgis reveals that there are 2,075 municipalities with frequent river flooding.

Thus, the research indicates that the Valencian Community is the region with the greatest risk of flooding. In addition, it specifies the ten provinces with the largest area (km²) that are most likely to suffer from this phenomenon: Zaragoza, Navarra, Burgos, Lleida, Huesca, Teruel, La Rioja, Soria, Córdoba and Álava.



Photo 11 Risk of flooding in Spain

Annually in the Valencian Community there are many cases of flooding in different localities of the community, but none of them has been enough to evict citizens from their homes. But in the event that the flood is very devastating, citizens are recommended to take refuge in tall buildings, at a minimum height of 2-3 floors. (Photo)

The city of Valencia has only suffered one major flood and it was in 1984, this is due to heavy rains that caused the river that runs through the city to overflow and cause flooding, the water reaching the first floor of many buildings.

After this flood, it was decided to divert the riverbed to prevent another possible flood of this caliber from occurring.



Photo 12 Flood in Valencia 1984



Photo 13 Flood in Valencia 2022

7.5 Fire risk

Along the Spanish coast it has been built mixing buildings and forest for its tourist attraction. And it poses a serious risk.

The autonomies must supervise that the municipalities at risk approve a specific fire prevention plan. However, there is no public information that allows knowing if the localities are complying or not.

Cristina Montiel, professor of Geography at the Complutense University of Madrid, explains that in Spain "there is a lack of land use planning plans that protect it from the risk of fires to prevent it from being urbanized in certain places"

Of all the autonomous communities, Castilla-La Mancha is the one with the most towns in risk areas.

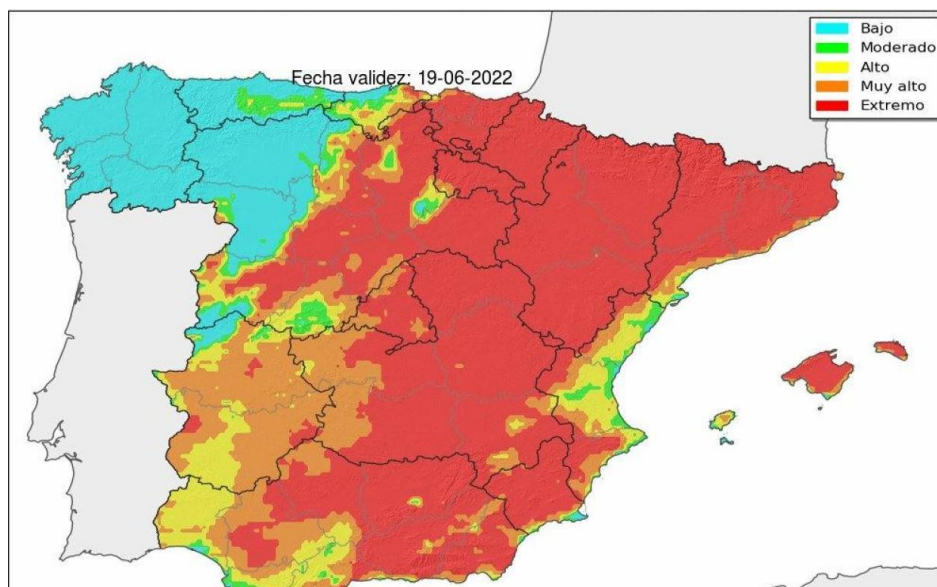


Photo 14 Risk of fire in Spain

In case of having to evict the residents of the area due to a fire, they will be sheltered in the municipal sports centers of the nearby towns that are not dangerous, since as I have mentioned before, this will be of short duration, until it goes out the fire.

8 EXAMPLES

➤ Lorca

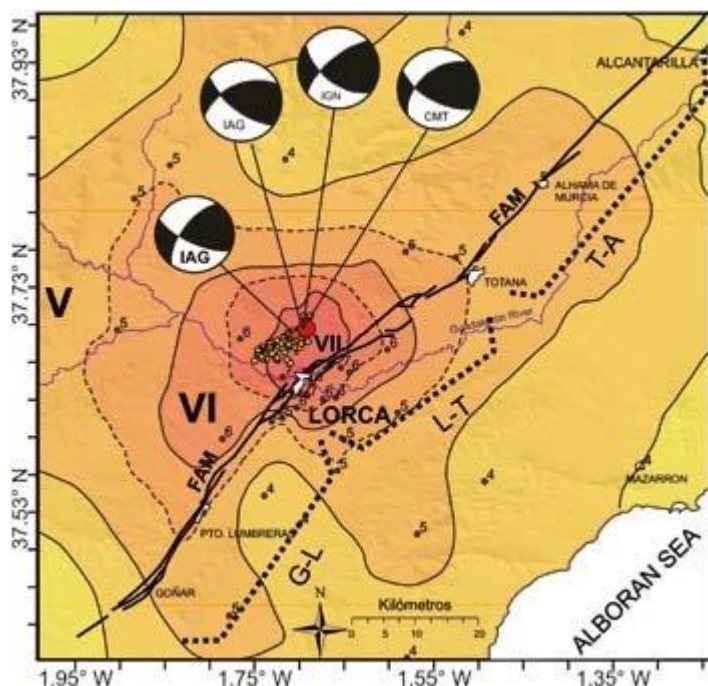


Photo 16 Lorca earthquake



Photo 15 Lorca Earthquake

On May 11, 2011, two earthquakes of magnitudes 4.5 and 5.1 on the Richter scale occurred that affected the Region of Murcia, especially Lorca. The first earthquake caused multiple material damage, but it was not until the second earthquake that 9 fatalities and around 300 injuries occurred due to falling cornices and various elements of the building facades.

Given the seriousness of both personal and material damage, emergency situation 2 was declared, contemplated in the Special Plan for Civil Protection against Seismic Risk.

The management and coordination of the emergency was exercised within a Management Committee, made up of the Minister of Justice and Citizen Security on behalf of the Autonomous Administration and the Government delegate on behalf of the General State Administration.

The Emergency Military Unit was activated following the request made by the Autonomous Government, to collaborate in the work of searching and rescuing people, assessing the damage and helping the victims. The Advanced Command Post was established and from the Advanced Command Post the actions of the Action Groups were coordinated in situ.

The municipal Emergency Service deployed five units to different areas of the city for damage assessment and control, and reinforced its remote center. The different districts were contacted to check the level of damage caused by the earthquake. The Emergency Service

unit was alerted, telling them to prepare the logistics and shoring material to send immediately to Lorca.

The rapid estimation of habitability was carried out from the Coordination Center for Damage Assessment and Needs Analysis.

Coordination of architects, quantity surveyors and civil engineers.

Creation of brigades composed of a team leader and technicians.

cleaning and debris removal and evaluation brigades.

Initial structural evaluation of the buildings after the earthquake and classification with color codes (green, yellow, red) to determine the possibility of accessing them or not.

From the Coordination Center, the different organizations were asked about the state of the road and hydraulic infrastructures, as well as the situation of the electrical, gas, and water infrastructures. Information was also requested on the state of health centers and nursing homes.

Regarding the state of the road infrastructure, the following was confirmed:

Tunnel: the motorway viaducts were affected. They were repaired in 30 hours.

Roads: traffic was interrupted in both directions around Lorca.

Train: the railway line between Lorca and Águilas remained closed, as a result of the danger that existed due to the poor condition of a building.

Gas: The natural gas supply valves in Lorca were closed to avoid any risk.

Later, gas began to be supplied in those areas where it had been verified that there was no risk, such as hospitals.

Camps were set up in the most damaged neighborhoods. A main camp was set up at the Huerto de la Rueda fairgrounds, which welcomed some 4,000 people.

That same year, in mid-May, the camps in the city of Lorca were dismantled and a single camp was created in La Torrecilla, where the population that did not have a home to stay was transferred. The capacity of the Camp was 1,800 places, arranged in 102 tents.

Several functional areas were organized:

– Security Area: access control and surveillance of the interior of the camp. These actions were carried out by a private surveillance company and the Civil Guard (Rural Security Group).

- Health Area: with a primary care team, vaccination campaigns and a public health team for sanitary control of the tents and food review, and psychosocial help for residents.
- Maintenance Area: The council was responsible for the maintenance of the municipal facilities and the cleaning of the camp.
- Social Assistance Area: A non-governmental organization was in charge of assisting children and municipal social services for contingencies with adults.
- Education Area: three training classrooms were installed until the end of the school year. One classroom has been dedicated to Early Childhood Education, another to Primary Education and the third to Compulsory Secondary Education.
- Logistics Area: By the logistics support group of the General Directorate of Citizen Security and Emergencies, volunteers from Civil Protection and the Red Cross.

Once the situation of each of the families housed in the camp had been analysed, so that they could return to their homes or find a rehousing option for them, a housing solution was given to the entire population of the camp.

➤ La Palma Catastrophe



Photo 17 Volcano La Palma 2021

On September 19, 2021, a volcanic eruption began on the island of La Palma, in the municipality of El Paso, with two large fissures, separated by about 200 meters, 9 eruptive mouths and two lava flows going down in the direction to the sea, all this after intense seismic activity and deformation recorded during the week prior to the eruption, according to data from the National Geographic Institute.

On the same date, the General State Plan for Civil Protection Emergencies (PLEGEM) was activated in the Alert and Permanent Monitoring phase. On the other hand, the Emergency Situation Level 2 and the volcanic traffic light at red level were activated, corresponding to the Special Plan for Civil Protection and Emergency Attention due to volcanic risk of the Autonomous Community of the Canary Islands (PEVOLCA). With the beginning of the volcanic activity, the Military Emergency Unit (UME) was moved to the island, along with numerous means of the State Security Forces and Bodies.

The eruption has been expelling a flow of intense lava and pyroclastic materials into the atmosphere, presenting intermittent phases of different volcanic explosiveness that have already forced the preventive evacuation of more than 6,000 residents of the municipalities of El Paso, Los Llanos de Aridane and Tazacorte, and has destroyed hundreds of homes and farms. In turn, after ten days from the beginning of the expulsion of volcanic lava, it reached the sea along the coast of Tazacorte.

Within the measures of immediate impact, Royal Decree 820/2021, of September 28, has been adopted, which approves the direct granting to the Autonomous Community of the Canary Islands of a subsidy to finance the acquisition of first-class homes and equipment. intended for families affected by the volcanic eruption in the area of Montaña Rajada, on the island of La Palma (Santa Cruz de Tenerife). This measure allocates 10.5 million euros to co-finance the purchase of up to 107 publicly or privately owned homes for the relocation of

those people who have lost their homes after the volcanic eruption, as well as for the acquisition of basic necessities.

Likewise, through an Agreement of the same date, the Council of Ministers has also declared the island of La Palma an area seriously affected by a civil protection emergency (ZAEPC) due to the eruption of the volcano, thus enabling all the ministerial Departments to determine the necessary aid to recover all the damage caused by the volcano.

Despite the adoption of the aforementioned measures, the dimension and magnitude of this natural catastrophe, together with the unpredictability of the evolution and duration of the phenomenon produced by the Cumbre Vieja volcano, justify that the Government of the Nation carry out actions, as quickly as possible, aimed at mitigating the damage that this eventuality is causing.

Learned lessons

We can say that today much has been improved and no one questions the role of the autonomous communities in emergency management and as subjects of civil protection. Moreover, an important responsibility falls on them and they are the ones that contribute a more than significant number of resources.

Advances in this field in recent years have been very important, but even so we should try to go deeper when looking for mechanisms that increase collaboration between all and that enable the exchange of experiences, both between the autonomous communities and between these and local entities, mainly town halls and with the State Administration.

In these cases, without any doubt, we should have as a reference the General Directorate of Civil Protection and Emergencies that has the competences in the matter. Undoubtedly, among what we must highlight is what the UME makes available, both in terms of its number and its specialization, as a complement to the resources of the autonomous communities.

Likewise, progress should be made in achieving greater integration of technological platforms, including communications, as essential elements when dealing with a major emergency or catastrophe.

9 JAPAN VS SPAIN

9.1 Current situation in Japan

Japan is a nation characterized by its culture of prevention, being recognized worldwide for the efficiency and diligence of its way of proceeding that make Japan a world power. Its geographical location, the island where said country is located, is a high-risk area in terms of natural disasters, with volcanic and seismic activities being extremely significant. Faced with this reality, the Japanese government has provided a significant budget to deal with contingencies and, with the close collaboration of the population, has implemented a series of measures to minimize the damage caused by a natural disaster during its occurrence and to care for its victims and repair the damage as soon as possible. Despite having suffered multiple disasters, Japan is an economic superpower. Your careful planning,

The customs of Japanese society are not broken despite the time that has passed, even after a natural disaster that has devastated a large amount of territory and a large number of deaths and victims in this country, all this is attributed to strict education in which the Japanese are educated and from a very young age they are taught the measures to be taken in the event of a strong seismic movement.

Japan, being a first world country, has high-quality technology that allows it to carry out disaster preparedness measures, emergency measures and restoration measures without inconvenience, for this the relevant authorities together with state institutions and the support of Japanese citizens proceed to collect, process, analyze, and transmit disaster information quickly and accurately.

In Japan, in addition to collecting and analyzing information on disasters, exclusive communications networks have been established such as the Central Radio Communications System for Disaster Management which connects national organizations, fire disaster radio network which connects organizations fire departments, and regional and municipal radio communication networks that connect not only disaster management organizations but also the local population.



Photo 18 Measure against earthquakes

In recent years there has been an advance in construction since they use materials that absorb shocks, among these resistant materials steel can be highlighted since in addition to this material buildings are equipped with shock absorbers, among these types of shock absorbers that are used in construction we have: base shock absorbers and vibration control, with this type of measures that have been implemented it is ensured that earthquakes in case of presenting a large scale magnitude, the affectation in the structure will be minimal.

It is mentioned that in addition to the constructions, there are security measures for trains, such as, for example, when detecting a seismic movement, it activates an emergency brake. Japan Railways created the UrEDAS (Urgent Earthquake Detection and Alarm System), which is a system that only 4 seconds after the start of an earthquake, is capable of detecting its magnitude, locating the distance from the epicenter and its depth. With these variables combined, it is known which trains in the network are in danger and these will be stopped to prevent them from derailing.

Japan also has a Regional Disaster Prevention and Attention Plan such as the following best-known general strategies:

- Promote the identification and estimation of risks as a result of natural and technological hazards.
- Promote the development of risk prevention and reduction projects.

Promote the incorporation of the concept of prevention in the planning of integrated regional development.

- Promote institutional strengthening with the active participation of the various commissions.
- Promote community participation in disaster prevention.
- Optimize the response to emergencies and natural disasters through an efficient communication and logistics system.

Due to its extensive experience and many natural disasters, these days Japan is working hard to promote international cooperation in Disaster Management.

Cooperation activities are promoted by the Government of Japan in four different areas, which are:

1. Technical Cooperation, such as training for specialists from other countries that are also prone to natural disasters and the transfer of specialists to those countries.
2. Contributing Funds.
3. Providing loans.
4. Multilateral cooperation through the UN.

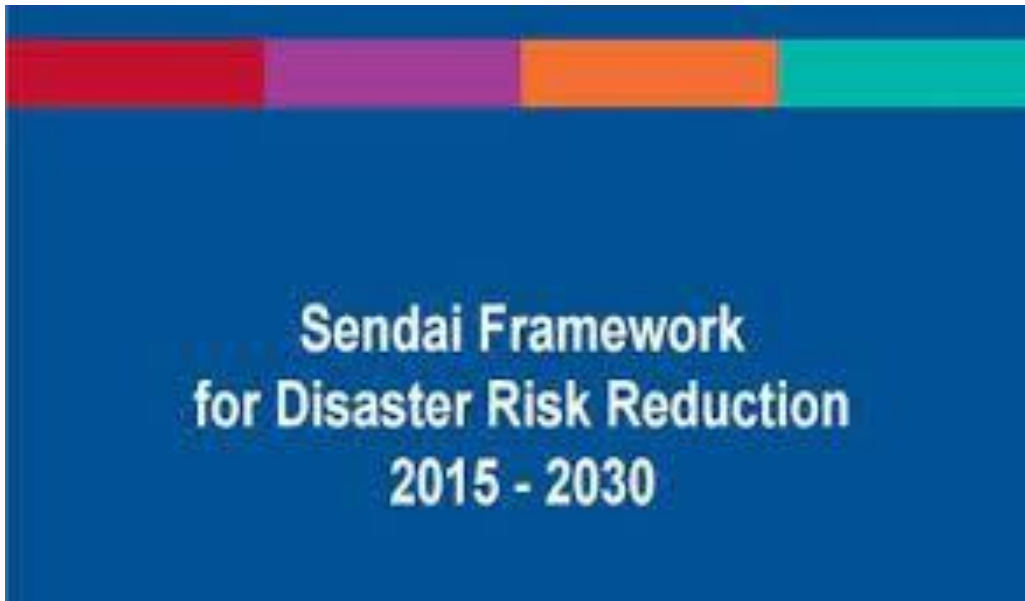


Photo 19 Sendai framework

Japan was the host country for the world risk reduction, where the Sendai Framework for Disaster Risk Reduction 2015–2030 was adopted at the Third United Nations World Conference on Disaster Risk Reduction, held from 14 to 18 March 2015 in Sendai, Miyagi, Japan, which represented a unique opportunity for countries:

- (a) To adopt a concise, focused, forward-looking and action-oriented post 2015 framework for disaster risk reduction;
- (b) To complete the assessment and review of the implementation of the Hyogo Framework for Action 2005–2015: Building the Resilience of Nations and Communities to Disasters;¹
- (c) To consider the experience gained through the regional and national strategies/ institutions and plans for disaster risk reduction and their recommendations, as well as relevant regional agreements for the implementation of the Hyogo Framework for Action;
- (d) To identify modalities of cooperation based on commitments to implement a post 2015 framework for disaster risk reduction;
- (e) To determine modalities for the periodic review of the implementation of a post 2015 framework for disaster risk reduction

The intergovernmental negotiations on the post 2015 development agenda, financing for development, climate change and disaster risk reduction provide the international community with a unique opportunity to enhance coherence across policies, institutions, goals, indicators and measurement systems for implementation, while respecting the respective mandates. . Ensuring credible links, as appropriate, between these processes will contribute to building resilience and achieving the global goal of eradicating poverty.

Taking into account the experience gained through the implementation of the Hyogo Framework for Action, and in pursuance of the expected outcome and goal, there is a need for focused action within and across sectors by States at local, national, regional and global levels in the following four priority areas:

Priority 1: Understanding disaster risk.

Priority 2: Strengthening disaster risk governance to manage disaster risk.

Priority 3: Investing in disaster risk reduction for resilience.

Priority 4: Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction.

9.2 Comparison Japan and Spain

In Spain, there is even more need to plan and carry out in the Emergency Operations Center, plans that guarantee levels of coordination and action in the event of disasters and/or emergencies.

It is also necessary to highlight the need to consolidate a Prevention and Training policy aimed at preparing the population for emergencies and generating a culture of prevention that supports the action of coordinating development for the reduction of vulnerabilities, whether economic, social, political and environmental, thus giving sustainability to disaster prevention in development planning.

In Japan, they educate citizens from a young age on how to act in the face of a disaster and what actions they should take to prevent it as much as possible. As with learning centers like the one in Ikebukuro that teaches how to act during these types of situations, Japanese families have a backpack prepared with emergency items such as food, a flashlight and a radio.

Faced with this type of disaster, the Japanese remain calm, all the people who are in the office hide under the table, go to higher places, among others. All the people who are in their workplaces, shopping malls, homes, schools, etc. They hide under the table.

There are even drills that people take very seriously, in order to learn how to act.

If we compare this with Spain, a big difference can be seen, since despite the fact that it is a country with a slight possibility of an earthquake or some other disaster, that possibility still exists and citizens are not prepared by informing them that they must carry out in the event of a disaster or the simple fact of having an emergency backpack ready at all times just in case, it is something that costs nothing. But the citizens are not aware of these things and are not aware.

Another aspect where a difference can be seen between Japan and Spain is the citizen information and communication network. Japan has the Central Radio Communications System for Disaster Management which connects national organizations, which manages to connect all organizations by radio and would not be influenced in the event that cell phone towers or others were affected by the disaster. . This allows maintaining good communication that will improve the coordination of the teams, as well as keeping citizens informed at all times so that they can evacuate in time or prepare.

In this regard, Spain has indeed realized the lack of a system like this, and over the years it is evolving and developing a communication network that can work at all times in the event of a disaster, and a network of information to keep citizens abreast of any changes or important information and that they can act according to the situation as required.

Last but not least, the difference in construction methods. From my point of view, in this respect, Japan is much more advanced than the rest of the European countries, and above all, than Spain. As I have mentioned before, Japan builds its buildings and infrastructure in such a way that they can absorb a part of the vibrations in the event of an earthquake, which can prevent the building from collapsing, thus causing further damage.

It is true that Spain is aware that these new methodologies must begin to be applied, which have not been applied up to now because they are more expensive and we do not have as much probability, but bearing in mind the 2011 tragedy in Lorca and that in almost all There is a risk in the southern part of the country, I believe that this type of prevention measures should begin to be implemented when building new homes or infrastructure. Since it could save lives and cause much less damage.

10 PROPOSALS FOR IMPROVEMENT

Having seen the main differences with Japan on how to deal with various natural disasters, I am going to propose a series of improvements.

First of all, a proposal that from my point of view should already be carried out, and that is the construction methodology. Conventional buildings are prepared to resist their weight, that produced by gravity. Instead, when an earthquake occurs, the shaking causes the building to move in a horizontal direction. With this movement, the different floors of the building can collapse. One of the methodologies or ways of construction would be that on all floors, the structure of the building must have articulated encounters because they allow certain mobility. Another technique would be base isolation, which consists of neoprene insulators being interposed between the foundation and the structure. When there is an earthquake, the building moves with the movement of the ground, offering no resistance and therefore does not collapse. The basic principle is that you have to decouple the movement of the ground and the movement of the structure. This second technique is used above all in countries with soft soils. Both techniques will be accompanied by the use of flexible materials subjected to many tests to verify said flexibility.

Japan is not the only country that applies this methodology, there are already many countries that use this method and the materials necessary to reduce the risk of collapse of buildings. In Spain, it could begin to be applied in newly constructed buildings, and what could be carried out is in a town or city in the south of Spain where it is more likely to occur, begin to build buildings in this way, in this way it will be possible to see how the buildings react to the small earthquakes that the south of Spain suffers, as I have already mentioned before. In Spain, not having such a soft floor compared to Japan, we could only consider the use of flexible materials and apply articulated encounters.

As for the buildings already built, small modifications can be made to try to improve their resistance, such as adding structural walls of reinforced concrete and diagonal bars.

Another proposal would be the construction of permanent warehouses where all kinds of essential supplies are stored, in order to have a quick distribution to the different shelters in case of a disaster and citizens have to be evacuated, in this way it improves the ability to react.

Another measure would be to try to make people more aware of the possible risks and teach them how they should react according to different cases, for that different courses could be carried out that people should take, talks in different places to make people aware , and even in schools begin to teach children how they should act.

Finally, one of the disasters that most affects Spain are forest fires, currently the best measure that everyone knows is to keep the forest and mountains clean of both garbage and dry and dead plants, for this the measure that What I propose is that the government leave this work in the hands of the residents of the different localities that are close to these risk areas, encouraging them in some way so that they themselves are the ones who help with these maintenance and cleaning tasks, since they They will be the first to suffer the consequences in the event of a fire. Currently it is the government that is supposed to carry out these tasks, but they are not enough, either due to lack of personnel or for any reason. With this measure I believe that the risk of fire could be greatly reduced in many places in Spain

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