NATURAL AND TECHNOLOGICAL DISASTERS

2.17

Perfil Ambiental de España 2012

Natural disasters are a consequence of the interaction, in time and space, of a natural phenomenon together with the vulnerability of the place where it occurs. These episodes cause, in addition to serious loss of human life, major damage to a country's economy, society and environment.

According to the Munich Re Foundation, in 2012 there were 905 natural disasters in the world. Of the disasters registered, 48% were due to floods and other hydrological events, 27% due to tropical storms and other meteorological phenomenon, 12% to climatological phenomenon such as heat waves and droughts, and 7% due to earthquakes and volcanic eruptions. The worst catastrophe registered in 2012 was the typhoon 'Bohpa' in the Philippines, which caused 1,100 deaths. In total, in the year, 9,600 deaths were registered.

By continent, the largest number of disasters was registered in Asia with 334 (36.9%), followed by America with 285 disasters (31.5%). In Europe there were 132 natural disasters registered, 14.6% of the total.

In Spain, the scale of disasters is not comparable to other regions of the planet, however on a smaller scale, each year sees a varying number of people affected and killed by such disasters. Among the events that led to the greatest losses in 2012 must be highlighted the intense rainfall and flooding that, throughout the autumn, affected the south, east and northeast of the penin-

sula as well as the Canary Islands. In this regard, the most significant episode of heavy rainfall was the one that hit the south and east of Andalusia, Murcia and Valencia on 27 and 28 September, with a record 188.9 mm of total accumulated rainfall being measured at Valencia (airport) on 28 September.

In addition to natural disasters, other catastrophes are caused by industrial activities, the transport of dangerous goods, etc. In 2012 the environmental indicator 'Oil spills due to maritime accidents' has not been updated, as no incidents were registered, although some pollution in harbour waters during loading and fuel supply operations were detected.

KEY MESSAGES

- In 2012 there were 35 fatalities, 15 of these were due to floods, 10 to forest fires and 7 to marine storms.
- 2012 was dryer than usual over most of Spain. The highest daily rainfall, of 188.9mm, was registered in the environs of Valencia's airport, on 28 September.
- According to provisional data, during 2012 there were 10,520 incipient forest fires and 5,382 declared fires, giving a total of 15,902 incidents. In 2012 209,855 ha of forest surface were affected, of which 82,201 were wooded.
- In 2011 26 accidents in the transport of dangerous goods by road and rail with possible environmental damage were registered, one more than the previous year.
- In Spain in 2012 there was one accident in industrial installations covered by the SEVESO III legislation.
- During 2012 there have no registered accidents from petrol tankers on the Spanish coasts.

INDICATORS

- Fatalities due to natural disasters
- Drought
- Forest fires
- Road and rail accidents causing possible environmental damage
- Industrial accidents involving hazardous substances

Fatalities due to natural disasters

In 2012 there were 35 fatalities caused by natural disasters, 14.6% less than the previous year

Number of fatalities in Spain due to natural disasters. 1995-2012

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total
Floods	22	110	40	0	5	14	9	13	9	7	8	9	11	6	5	12	9	15	304
Storms	19	13	14	2	20	28	17	12	8	6	8	9	4	3	11	6	2	1	183
Forest fires	8	1	4	4	8	6	1	6	11	4	19	8	1	1	11	9	12	10	124
Landslide	7	8	2	0	0	0	1	1	2	0	0	5	2	1	2	2	3	0	36
Heat wave	0	0	0	0	1	0	0	0	60	23	4	14	0	0	0	2	1	2	107
Snow avalanches	7	1	0	0	0	4	2	4	4	5	1	0	0	4	3	11	2	0	48
Episodes of snow and cold	0	2	5	1	0	2	4	0	0	3	3	0	0	0	1	1	1	0	23
Deaths on land due to maritime storms	19	13	13	36	17	37	27	15	5	20	SD	SD	SD	4	2	5	2	7	222
Earthquakes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	9
TOTAL	82	148	78	43	51	91	61	51	99	68	43	45	18	19	35	48	41	35	1,056

Source: DGPCyE.

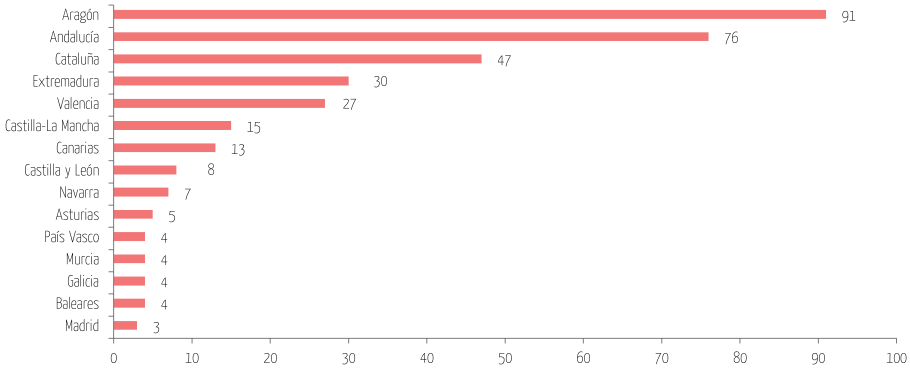
The number of fatalities caused by natural disasters in Spain during the period 1995 and 2012 was 1,056. Analysing the types of disaster that caused the fatalities it can be seen that floods, with 304 victims (28.8% of the total) caused the highest number of fatalities, followed by maritime storms with 222 (21% of the total).

The other types of disasters that have caused a high number of fatalities in this period are storms, including lightning and strong winds, with 183 victims (17.3% of the total), forest fires with 124 victims (11.7% of the total) and heat waves with 107 victims (10.1% of the total).

In 2012 the number of deaths from natural disasters fell compared to the previous year. Regarding the cause of death of the 35 registered victims, 15 were due to floods, six more than in the previous year, 10 were consequence of forest fires, two less than in the previous year, and seven were due to maritime storms (with death occurring on land), five more than the previous year. These disasters have also caused significant damages to persons and property – buildings and infrastructure - and to the natural environment. On the other hand, in 2012, there were no victims from earthquakes, landslides, snow avalanches and episodes of snow and cold.

Floods are the most frequent natural phenomenon in Spain. Analysing floods and freshets registered for the period 1990-2012 it can be observed that they caused 338 fatalities.

Deaths due floods in Spain. 1990-2012 (Total deaths 338)



Source: DGPC y E

By autonomous community, and since the Biescas (Huesca) catastrophe, Aragon has registered the highest number of fatalities (26.9%), followed by Andalusia (22.5%), Catalonia (13.9%) and Extremadura (8.9%).

In 2012, there were 15 fatalities caused by floods and overflows. By autonomous community, seven were registered in Andalusia, six in Navarre and one each in Extremadura and Asturias.

NOTES

- Fatal landslides in Spain are closely associated with heavy rains that cause flooding or freshets. The vast majority of landslides occur during rain or just after, as a consequence of it.
- Fatalities due to maritime storms refer solely to victims on land due to falls, sea surges, etc. These figures do not include fatalities at sea (drowning, falls, etc.) due to these phenomena.
- The indicator does not include volcanic eruptions and droughts, since although these phenomena may occur in Spain they have not caused any deaths in the period under consideration. The Canary Islands are the only part of Spain with active volcanoes and, therefore, the only area in which risk associated with this phenomenon exists. The last eruptions were those of Chinyero (a lateral volcano on the Pico del Teide) on Tenerife in 1909; Nambroque in 1949 and Teneguía in 1971, both on the island of La Palma; and in 2011 the eruption of the submarine volcano of the island of El Hierro.

SOURCES

- Sub-Directorate-General for Planning, Operations and Emergencies. Directorate General of Civil Protection and Emergencies (DGPCyE). Ministry of Interior.
- Maritime Security and Rescue Society. Ministry of Development.

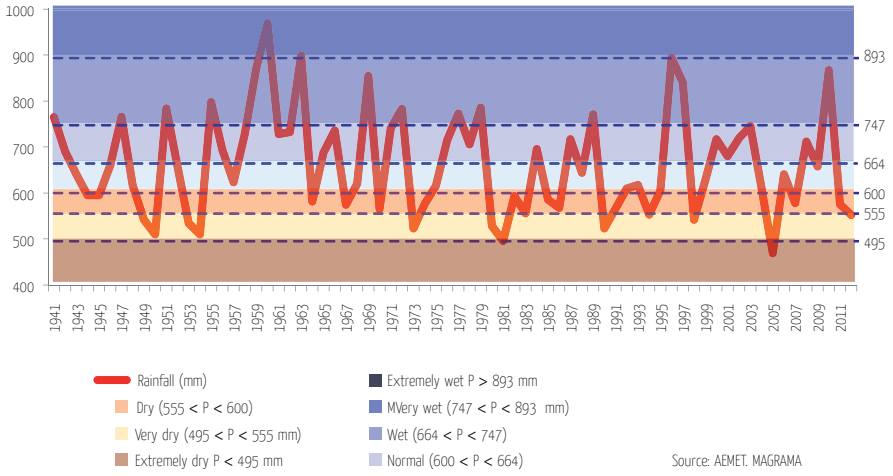
MORE INFORMATION

- http://www.eea.europa.eu
- http://www.proteccioncivil.org/

Drought

2012 was dryer than normal in most of Spain

Average annual rainfall in Spain (mm)



Source: AEMET. MAGRAMA

2012 was dryer than normal in most of Spain. The area with the greatest rainfall deficit was the northwest and the centre of the peninsula, which saw a particularly dry year. The average estimated rainfall in Spain for 2012 was 552.3 mm, 16.8% below the average value (reference period 1941-2012).

For the period 1941-2012, an analysis of the Percentage of Normal Rainfall shows that in 45.1% of years the annual rainfall was higher than average, while in 56.3% of the years the annual rainfall was lower than the average for the period.

A more detailed analysis of the annual average rainfall during this reference period, using the classification of the table below, shows that only 2.8% of the years were extremely wet, with the same percentage being extremely dry, 32.0% of the years were dry or very dry, 20.8% were normal and the rest, 41.7%, were wet or very wet.

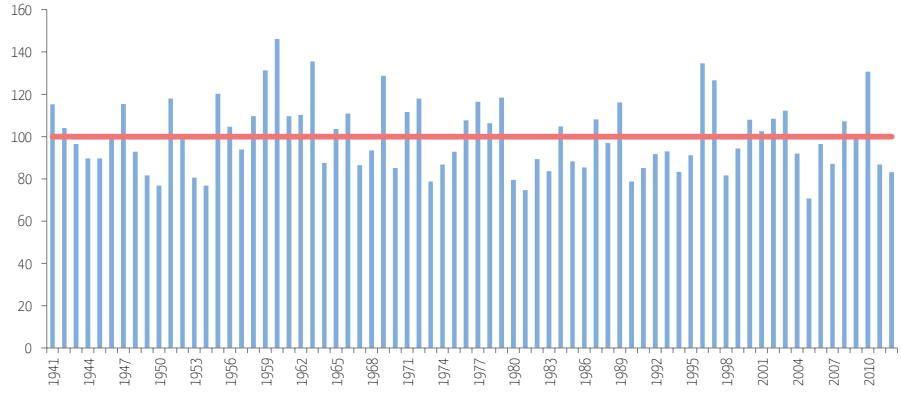
Percentage of years, classified by average rainfall (1941-2012)

Extremely dry P<495 (mm)	Very dry (495<P<555) (mm)	Dry (555<P<600) (mm)	Normal (600<P<664) (mm)	Wet (664<P<747) (mm)	Very wet (747<P<893) (mm)	Extremely wet P<893 (mm)
2.8	15.3	16.7	20.8	23.6	18.1	2.8

Looking at the autonomous communities, 2012 was a very dry year in Galicia, in most of Asturias, Extremadura and Madrid, in the north and east of Castile-Leon, and in parts of Catalonia, the Canary Islands and the Basque Country, with a significant deficit of rainfall compared to average values. It was from normal to dry in general in the rest of Spain, except in parts of Navarre and La Rioja and in the southeast of the peninsula, where it was a little bit more wet than normal.

2012 saw some intense episodes of precipitation. Among the most significant ones were those in the autumn that affected regions of the south, east and northeast of the peninsula, as well as the Canary Islands.

Percentage of normal rainfall (PNR)



Source: AEMET. MAGRAMA

NOTES

- In calculating the indicator, the sum of the monthly estimated rainfall totals from the 2012 Monthly Reports were used to give the average rainfall for 2012, with the average rainfall being an estimated figure.
- A year or several years are classified as drought years when the average annual rainfall is significantly below the average for the period. According to the Spanish Water Information System (Hispagua), the Percentage of Normal Rainfall (PPN) is one of the indicators used to study drought. It is calculated as the ration between accumulated rainfall in a year and the average annual rainfall for a particular region and period, expressed as a percentage. Average annual rainfall is also referred to as normal rainfall and is obtained by averaging annual rainfall over a period of no less than 30 years.
- For AEMET, the 1971-2000 reference period (30 years) is representative of rainfall in Spain and is used to establish the following ranges and create a generic classification within which to place each year in accordance with its average annual rainfall:
  - Extremely dry: rainfall is below the minimum amount recorded in the reference period (495 mm).
  - Very dry: rainfall is less than or equal to the reference period's 20 percentile and is greater than the minimum amount recorded in the reference period (495 mm≤ R≤555 mm).
  - Dry: rainfall is greater than the 20 percentile and less than or equal to the 40 percentile (555 mm ≤R≤600 mm).
  - Normal: rainfall is greater than the 40 percentile and less than or equal to the 60 percentile (600 mm ≤R≤664 mm), in other words, it is around the median.
  - Wet: rainfall is greater than the 60 percentile and less than or equal to the 80 percentile (664 mm ≤R≤747 mm).
  - Very wet: rainfall is greater than the 80 percentile and less than the maximum amount recorded in the reference period (747 mm ≤R<893 mm).
  - Extremely wet: rainfall is equal to or greater than the maximum amount recorded in the reference period (893 mm).
- Scarcity of precipitation (meteorological drought) may cause a shortage of water resources (hydrological drought) needed to supply existing demand. Consequently, there is no universally accepted definition of drought, as it varies from place to place and every water user has its own definition.
- Previous editions of the report included extensive information on the definition, type and consequences of drought. The EU differentiates clearly between 'drought' as a temporary drop in water availability due to lack of precipitation and 'water scarcity', which arises when demand for water exceeds the water resources exploitable under sustainable conditions.

SOURCES

- Rainfall data taken from the Climatologic Monthly Reports of 2012 of the Meteorological State Agency (AEMET). Ministry of Agriculture, Food and Environment.

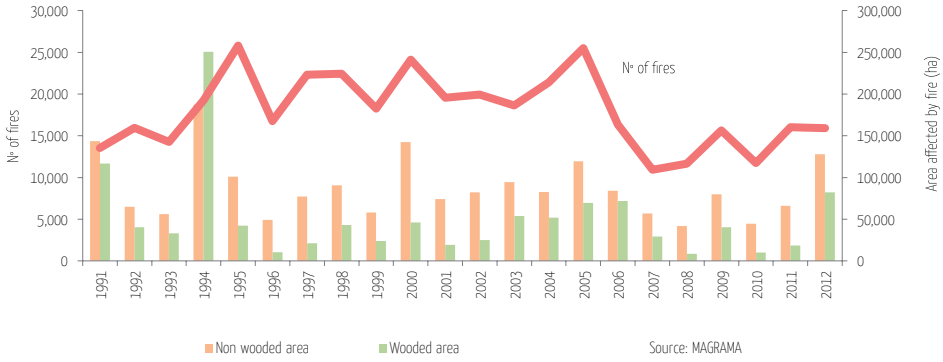
MORE INFORMATION

- www.aemet.es

Forest fires

The forest area affected in 2012 was 82.9% higher than the average of the previous decade. Nevertheless, the number of disasters has decreased by 5.4%

Forest area affected by fire and number of fires (1991-2012)



According to provisional data, in 2012 both the number of incipient fires and fires were slightly below the average of the previous decade (2002-2011). During 2012 there were 10,520 incipient fires registered and 5,382 fires (≤1 ha) giving a total of 15,902 disasters. This means that the number of incipient fires was 2.9% lower than the average, while the number of fires was 9.9% lower. Overall, the total number of incidents was 5.4% lower than the average of the previous decade.

Number of fires and affected surface

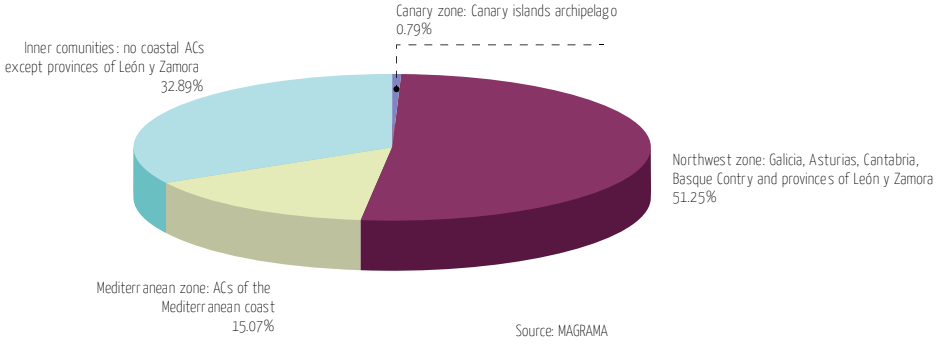
	Average of the decade 2002-2011	2012
Number of incipient fires (<1 ha)	10,841	10,520
Number of fires (>1 ha)	5,976	5,382
Total Number of forest fire events	**16,817**	**15,902**
Wooded surface (ha)	37,831.4	82,201.4
Forest surface (ha)	114,716.7	209,855.2
Area affected / national forest area (%)	**0.415**	**0.759**
Number of major fires	**28**	**39**

Source: MAGRAMA

At the same time, in terms of forest area, the wooded surface and the total forest area affected in 2012 was 117.3% and 82.9% higher compared to the average of the decade 2002-2012. In 2012, 209,855.2 ha of forest area were affected compared to the average of 114,716.7 ha recorded in the previous decade.

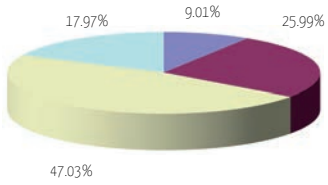
In 2012, the largest percentage of incidents were in the Northwest Area (formed by the autonomous communities of the Basque Country, Cantabria, Asturias and Galicia, together with the provinces of Leon and Zamora), 51.25% of the incidents were registered in this area; next were the inland autonomous communities (non-coastal) which saw 32.89% of the incidents, followed by the area made up by the Mediterranean area and the Canary Islands, which registered 15.07% and 0.79% of the incidents, respectively.

Forest fire events and affected area. Year 2012

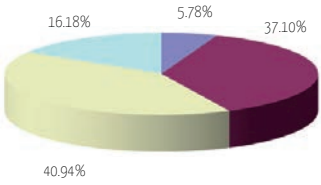


Source: MAGRAMA

Wooded area affected



Forest area affected



The percentage of forest or wooded area affected describes the consequences of forest fire in terms of surface area. In 2012, by proportion of wooded area affected, the Mediterranean area suffered the most, with 47%, followed by the Northeast area (25.9%), the inland communities (17.9%) and the Canary Islands (9.1%). Taking into account the forest surface, the highest values are those for the Mediterranean area (40.9%), followed by the northwest (37.1%), the inland communities (16.2%) and the Canary Islands (5.8%).

In 2012, according to provisional figures provided to the Forest Fire Defence Department by the relevant autonomic administration departments, 39 major forest fires were registered (defined as affecting 500 forest ha or more), that is, 0.24% of the total incidents that occurred that year and which were responsible for 64% of the total burned area.

The fires in Cortes de Pallás and Andilla in the autonomous community of Valencia, and the fire in Castrocontrigo in Castile-Leon, which burned 27,939.7 ha, 19,691.4 ha and 11,592.0 ha respectively, were the three largest fires registered in 2012.

NOTES

- The data for 2012 is provisional.

SOURCES

- Data provided by the Forest Fire Defence Department. Directorate-General for the Natural Environment and Forestry Policy. Ministry of Agriculture, Food and Environment.
- Ministry of Agriculture, Food and Environment, 2013. "Forest Fires in Spain, 1 January – 31 December 2012. Advance information". Published on the website.

MORE INFORMATION

- http://www.magrama.gob.es/es/biodiversidad/estadisticas/

Road and rail accidents causing possible environmental damage

In 2011, there were 26 accidents causing possible environmental damages, one more than the previous year

Number of accidents causing possible environmental damages
During the transport of dangerous goods by road and rail

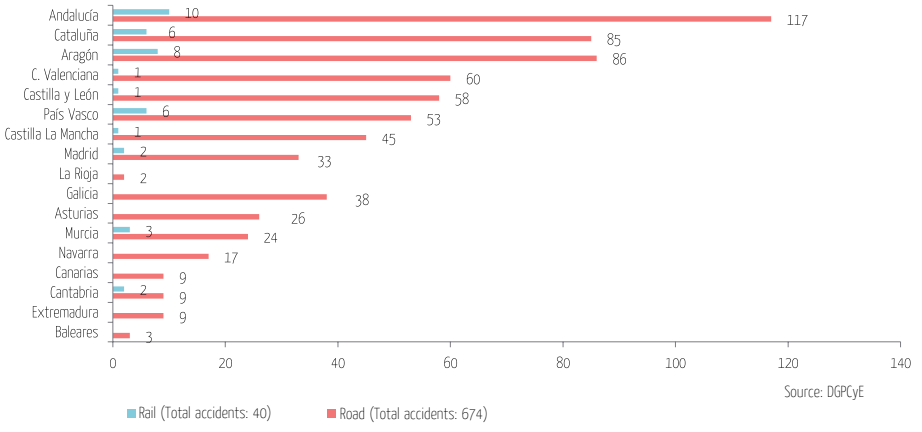
	1997	1998	1999	2000	2001	2002	2003	2004
Road	29	50	34	53	44	47	55	64
Rail	10	8	n/d	4	2	1	5	4
TOTAL	39	58	34	57	46	48	60	68

	2005	2006	2007	2008	2009	2010	2011	TOTAL
Road	61	46	48	45	47	25	26	674
Rail	2	1	2	1	0	0	0	40
TOTAL	63	47	50	46	47	25	26	714

*n/d: no data

Source: DGPCyE

Number of accidents causing possible environmental damage during the transportation of dangerous goods by road and rail (1997-2012)



Source: DGPCyE

During the reference period, 1997-2011, there were 714 accidents causing possible environmental damage during the transport of dangerous goods. These accidents are unevenly distributed between the main modes of transport. Thus, road transport, which handles the largest volume of goods, registered 678 accidents, while rail transport, which is on a smaller scale and less flexible, recorded 40 accidents during the same period.

In 2011 there were 26 road accidents with possible environmental damages, while there were no such rail accidents registered, the same as over the last three years.

The occurrence of accidents is highly conditioned by the condition, the development and the extent of the transport network, as well as, in the case of the autonomous communities, by their geographical location in the community either as a transport hub or because of strategic situation, and by the level of industrialisation. During the period 1997-2011 and at autonomous community level, Andalusia, with 117 road accidents and 10 rail accidents, saw the highest number of registered accidents, followed by Aragon (86 by road and 8 by rail) and Catalonia (85 by road and 6 by rail). At the same time, the communities with the lowest number of accidents were: the Balearic Islands (3 by road), Canary Islands and Extremadura (9 by road) and Cantabria (9 by road and 2 by rail). La Rioja was not included because it does not have a complete data series.

Number of incidents causing possible environmental damage during the transport of dangerous goods, 1997-2011

	1997	1998	1999	2000	2001	2002	2003	2004
Water pollution	5	3	2	4	3	0	8	8
Water pollution	7	11	6	9	5	5	4	14
Soil pollution	36	49	29	51	41	46	57	55
TOTAL	48	63	37	64	49	51	69	77

	2005	2006	2007	2008	2009	2010	2011	TOTAL
Water pollution	17	7	8	4	5	7	7	88
Water pollution	9	8	7	8	2	4	7	106
Soil pollution	49	41	43	39	44	18	21	619
TOTAL	75	47	50	46	47	25	26	774

Source: DGPCyE

The total number of incidents affecting the environment, with possible environmental damages, during the period 1997- 2011 was 774. It is necessary to clarify that the total number of environmental impacts does not coincide with the total number of accidents, as a single accident can affect several environmental media, for instance one discharge can affect both soil and water. Taking this into account, of the total registered 619 incidents led to soil pollution, 106 affected water and 88 air. Proportionally, for another year, soil was the environmental medium that has suffered the most incidents (21 incidents) while both air and water suffered seven each.

NOTES

- When categorising road and rail accidents, dangerous goods are considered to be those substances that, in the case of an accident during transport, may represent a hazard to the population, property and the environment. Possible environmental damage is considered to occur when the existence of a leak or spillage (on land, in water or into the atmosphere) with a potentially pollutant effect is reported.
- It is necessary to emphasise that the number of incidents is not the same as the number of accidents, as a single accident may affect several environmental media.

SOURCES

- Data provided by the Directorate-General of Civil Protection and Emergencies (DGPCyE). Ministry of Interior. White paper on transport.

MORE INFORMATION

- http://www.proteccioncivil.org/
- http://www.eea.europa.eu

Industrial accidents involving hazardous substances

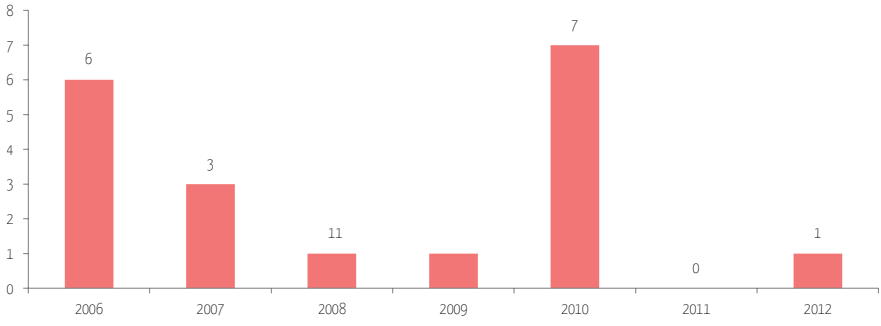
In 2012 there was only one accident from industrial activities within the scope of the SEVESO legislation

The Seveso legislation was prompted by an incident in 1976 in the Italian town of Seveso; an industrial accident occurred during the production of an herbicide, leading to the release into the environment of an aerosol cloud containing a quantity of the dioxin TCDD, among other toxic substances, which reached many populated areas, causing serious environmental and human damage.

The disaster had a major social impact and led to the EU (the thirteen members countries at the time) to adopt the legal measures included in Directive 82/501/EEC, known as the Seveso Directive. In 1996, after a review, Seveso II was brought into force, being published in the Official Journey of the European Union as Directive 96/82/CE.

Recently, Seveso III, Directive 2012/18/EU of 24 July 2012, was published, on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC.

Industrial accidents under seveso directive



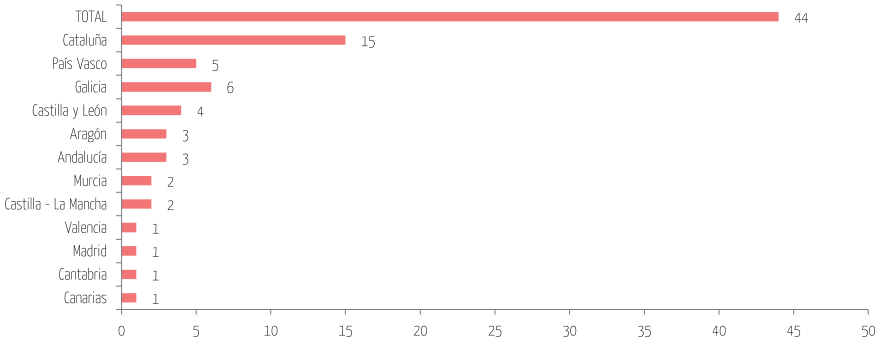
Source: DGPCE. MI

Among the objectives of the new SEVESO III Directive is the introduction of stricter standards for inspections of facilities covered by the Directive, to ensure correct implementation and compliance with the security rules on the prevention of accidents. In Spain in 2012 only one industrial accident falling under the scope of the Seveso III legislation was registered. This number follows the trend seen in recent years that has only been broken in 2010, when there were seven accidents in industrial installations coming within the legislation recorded.

Logically, these accidents tend to be concentrated in those areas with a higher industrial density. The accident registered in 2012 took place in Galicia, an autonomous community that has registered a total of six industrial accidents since 1987.

Over the whole period (1987-2012) there were a total of 44 accidents. Most of these registered incidents took place in the autonomous communities of Catalonia (34.1%), Galicia (13.6%), the Basque Country (11.4%) and Castile-Leon (9.0%), which also have the largest number of industrial facilities covered by the Seveso Directive and which are also the largest in size.

Industrial accidents under SEVESO directive 1987-2012



Source: DGPCyE

The majority of the accidents considered took place in the petrochemical and oil refining industries, and in the manufacturing of general or basic chemical products; these activities are the most abundant in Spain and handle the largest quantity of highly flammable and highly reactive substances.

NOTES

- The accidents referred to are those covered by the Seveso Directive, occurring in the carrying out of industrial activities (chemical, pharmaceutical, energy industry, etc.) and include those occurring during storage, distribution and sale of dangerous substances and products.
- Directive 96/82/CE on the control of major-accident hazards involving dangerous substances (Seveso II) is intended to prevent this kind of accidents and reduce their consequences for human health and safety and the environment. It replaces Directive 82/501/CEE, (SEVESO I). The Seveso II directive has been transposed into Spanish law by Royal Decree 1254/1999, of 16 July, which approved measures to control major-accidents hazards involving dangerous substances. This Royal Decree was subsequently amended by Royal Decree 119/2005 of 4 February and by Royal Decree 948/2005 of 29 July. This regulatory framework is complemented by Royal Decree 1196/2003, of 19 September, which approved the Civil Protection Guidelines for the Control and Planning of Major-Accident Hazards involving Dangerous Substances (BOE no 242, of 9 October 2003). On 24 July 2012, Directive 2012/18/EU, Seveso III, was published, on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Directive 96/82/EC.
- Serious accidents: any incident such as emissions in the form of leaks, spills, fires, or major explosion as a consequence of an uncontrolled process during the operation of an facility to which Royal Decree 1245/1999 applies, and that represents a major-accident hazard, of either immediate or delayed effect, to human health, property or the environment, whether inside or outside the facility, and in which one or more dangerous substances are involved.
- It should be pointed out that other types of accidents exist, that although no less serious for the environment, do not fall within the scope of the Seveso Directive. These include mining accidents, such as the one caused by the failure of the Aznalcollar dam (Seville), in April 1998.

SOURCES

- Data provided by the Sub-Directorate-General of Planning, Operations and Emergencies. Directorate General for Civil Protection and Emergencies (DGPCyE). Ministry of Interior.

MORE INFORMATION

- http://www.proteccioncivil.org