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The top 7 loss events for the Extraordinary Risk Insurance of the last 15 years

> Since storm Klaus in 2009, we have entered a phase in which heavy loss events are not merely incidental. Moreover, out of the seven events which have represented the most consequential claims experiences since Klaus, six of them are among the 10 most substantial in terms of cost for extraordinary risk insurance over the past 50 years.

Summary

Editors Board

The Consorcio de Compensación de Seguros digital magazine "Consorseguros" (CCS) is published every six months,
its content particularly addressing matters related to the Consorcio's activities in
various fields of insurance, reflecting on and analysing them.

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Summary

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Editorial

Since storm Klaus in 2009, we have entered a phase in which heavy loss events are not merely incidental. Moreover, out of the seven events which have represented the most consequential claims experiences since Klaus, six of them are among the 10 most substantial in terms of cost for extraordinary risk insurance over the past 50 years.

In the space of just 20 years between 1990 and storm Klaus, the total sum assured for property damage with the Consorcio de Compensación de Seguros (CCS) rose from roughly 1.6 to 5 trillion euros, and the figure of somewhere in the region of 5 to 6 trillion euros has remained fairly stable ever since.

It would be reasonable to think that this is attributable to some factor such as climate change. Without, of course, being dismissive of the significant bearing that this aspect might have on increasing hazard levels, the chief reason for this build-up of major events is greater exposure. In the space of just 20 years between 1990 and storm Klaus, the total sum assured for property damage with the Consorcio de Compensación de Seguros (CCS) rose from roughly 1.6 to 5 trillion euros, and the figure of somewhere in the region of 5 to 6 trillion euros has remained fairly stable ever since . Underlying this, the period of rapid economic development from the 90s through to the opening decade of this century translated into a spectacular burgeoning of the insurance industry and, by extension, of the overall sum assured, and this is logically the main reason why the loss figures in these past few years are at a palpably higher level and we are witnessing events of such magnitude.

These seven high-impact events which we review in this edition are: storm Klaus itself in 2009; the Lorca earthquake of 2011; the flooding which the cut-off lows of 2012 and 2019 led to; the loss and damage which the cyclone Gloria triggered in 2020; the volcanic eruption on the island of La Palma in 2021, and the flooding in the upper third of the Ebro basin (especially in Navarre) which also took place in 2021.

The front-page article is an in-depth study conducted by the technical sub-directorate at the CCS, and this edition then continues with accounts of several of these claims experiences:

- Klaus, by the sub-directorate for the Expertise Area;
- The Lorca earthquake, by Alfonso Manrique, who for many years was deputy director of the Expertise Area at the CCS;
- The cut-off lows of 2012 and 2019, which was written by various deputy directors and territorial representatives at the CCS;
- The latter is in turn supplemented by an article on this kind of atmospheric phenomenon, as well as others, by Dr José Luis Sánchez of the University of León;
- Cyclone Gloria, written by the CCS territorial representative in Catalonia;
- These articles end with a piece on the floods in the upper third of the Ebro basin, which was written by the three territorial representatives at the CCS who were affected by this claims experience.

We have not included a special contribution on the La Palma volcanic eruption in this edition because we devoted a sizable part to it in the previous edition of Consorseguros Digital.

We round off this edition with a review of case law by José Antonio Badillo.

Analysis of the seven most significant events which the Consorcio de Compensación de Seguros covered in the 2009-2021 dataset

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Introduction

Since its inception in 1954, the Consorcio de Compensación de Seguros (hereafter CCS) has helped to provide stability to the insurance industry by offering coverage under a system of indemnities for those losses which relate to risks assured that are not open to protection under an ordinary private policy, since they are caused by extraordinary phenomena occurring in Spain which affect risks located there.

All the perils or causes which are included within the Spanish system for covering extraordinary risks are defined in law taking account, not of their quantitative aspect (total amount of loss inflicted), nor of their geographical impact (extent of the area disturbed), but instead of their qualitative side and bearing in mind the very nature of such risks, which are generally typified by their relatively rare occurrence and their high intensity. This means that although such events are prone to producing huge losses, it is not a necessary condition that they should give rise to high-cost loss or damage for the insured victims to be entitled to compensation.

CCS publishes statistics on extraordinary risks on an annual basis including detailed information on exposure and the loss rate arising, for both events featuring high amounts claimed and those that are less significant. Against this backdrop, this article examines the comparatively major events which the CCS covered in the past 13 years, from 2009 to 2021.

For these purposes, an event is taken to mean any happening which prompts losses from a single cause (whether natural or human) or causes acting in combination (such as flooding and storms), where these are inflicted over a period of several successive days over a very extensive or very tightly concentrated geographical area (according to the circumstances) and involve substantial economic value.

The economic values given relate to indemnities paid out and/or provisioned for (pending settlement or payment) as at 30 April 2022. Thus, neither losses that have taken place yet not been reported, nor costs linked to processing claims, such as payments to adjusters or lawyers and other expenses, are included.

All of the economic values are updated to their worth in euros on 31 December 2021.

The loss or damage shown is for Property and Business Interruption coverage. Personal injury (number of victims) is exclusively reviewed in the section on coverage by type (property, pecuniary loss and personal injury).

Selection and general analysis of events

Over the period under review (2009-2021) there have been seven very considerable events with an assortment of causes that make them particularly significant.

The causes of the seven events selected were natural phenomena; flooding (including sea-battering along coasts), atypical cyclonic storms (ACS), earthquake and volcanic eruption, no major event having been caused by humans.

Accordingly, the big events in the 2009–2021 dataset, in chronological order, were:

Amounts in Euros as of 31 December 2021

No	Month and year of the event	Affected area	Peril/cause	Loss	Number of handlings	Mean cost	Insured capital	‰
1º	January 2009	Widespread	Windstorm (Klaus)	600,585,658 €	271,347	2,213 €	1,669,312,181,115 €	0.36
2º	May 2011	Murcia Region	Earthquake (Lorca)	552,298,293 €	28,856	19,140 €	66,223,141,561 €	8.34
3º	September 2012	Peninsular SE	Flood and windstorm	238,983,502 €	25,854	9,244 €	160,194,784,948 €	1.49
4º	September 2019	Peninsular SE	Flood	474,701,759 €	56,067	8,467 €	199,845,872,073 €	2.38
5º	January 2020	Widespread	Flood, coastal flood and windstorm	217,368,110 €	54,323	4,001 €	212,964,399,614 €	1.02
6º	December 2021	Widespread	Flood	91,707,101 €	7,766	11,809 €	34,431,307,823 €	2.66
7º	September to december 2021	La Palma	Volcanic eruption and earthquake	223,189,828 €	6,209	35,946 €	5,181,852,345 €	43.07
		Total general		2,398,834,250 €	450,422	5,326 €	2,348,153,539,480 €	1. 02

Table 1. Details of events.

The causes were flooding, windstorm, or a combination of both, earthquakes and volcanic eruption (the eruption was accompanied by a few earth tremors, which produced comparatively minor losses).

The economic loss from these selected events ranges from 91.7 million euros to over 600 million euros.

The range for the number of claims handled runs from 6,209 for the La Palma eruption to 271,347 for storm Klaus.

The differences in the average cost per claim handled are mainly due to the cause of the event (which we shall go on to discuss below), where this ranges from 2,213 euros to 35,946 euros, with the extreme levels with respect to the number of claims being the other way round in this case, i.e., the smaller average cost was for storm Klaus, while the larger one was for the La Palma volcanic eruption.

The last columns show the sums assured in the claims policies (not including motor vehicles/autos, which have no sum associated with them) and the percentage (per mille or parts per thousand) of the loss indemnified compared to the sum assured, where once again the differences (between 0.36‰ and 43.07‰) are closely related to the cause of the loss. This percentage must be used solely to compare one event with another, since it is not the loss to sum exposed ratio, but rather the loss to sum assured in the policy, which can include risks from all over Spain.

To frame the aforementioned events in due context it is worth describing the relationship between the claims incurred by the selected events and the overall loss which the CCS covers for each of the years in the dataset under review:

Amounts in Euros as of 31 December 2021

Year	Total			Event			Percentage	
	Loss	Handlings number	Mean cost	Loss	Handlings number	Mean cost	Loss	Handlings number
2009	862,938,599 €	299,549	2,881 €	600,585,658 €	271,347	2,213 €	70%	91%
2010	546,510,661 €	124,804	4,379 €	---	---	---	---	---
2011	762,315,530 €	54,408	14,011 €	552,298,293 €	28,856	19,140 €	72%	53%
2012	309,079,230 €	42,137	7,335 €	238,983,502 €	25,854	9,244 €	77%	61%
2013	199,607,104 €	62,705	3,183 €	---	---	---	---	---
2014	182,798,414 €	53,589	3,411 €	---	---	---	---	---
2015	203,292,988 €	46,109	4,409 €	---	---	---	---	---
2016	202,781,722 €	38,559	5,259 €	---	---	---	---	---
2017	207,628,021 €	100,067	2,075 €	---	---	---	---	---
2018	259,427,160 €	47,469	5,465 €	---	---	---	---	---
2019	763,171,785 €	137,594	5,547 €	474,701,759 €	56,067	8,467 €	62%	41%
2020	370,334,596 €	92,650	3,997 €	217,368,110 €	54,323	4,001 €	59%	59%
2021	539,771,956 €	81,423	6,629 €	314,896,929 €	13,975	22,533 €	58%	17%
Totals	5,409,657,766 €	1,181,063	4,580 €	2,398,834,250 €	450,422	5,326 €	44%	38%

Table 2. Total loss covered by the CCS and claims incurred by the selected events that are representative for the year when they occurred.

The seven events selected together account for 44% of indemnities and 38% of claims handled by the CCS over the 2009–2021 period.

In 2021 two significant events accrued - the La Palma volcano and the December flooding.

We can also see the weight of events relative to the year when they occurred. For economic value this ranges from 58% in 2021 to 77% in 2012 while the interval for the number of claims handled runs from 17% in 2021 to 91% in 2009.

In graphic terms the seven events would be represented thus:

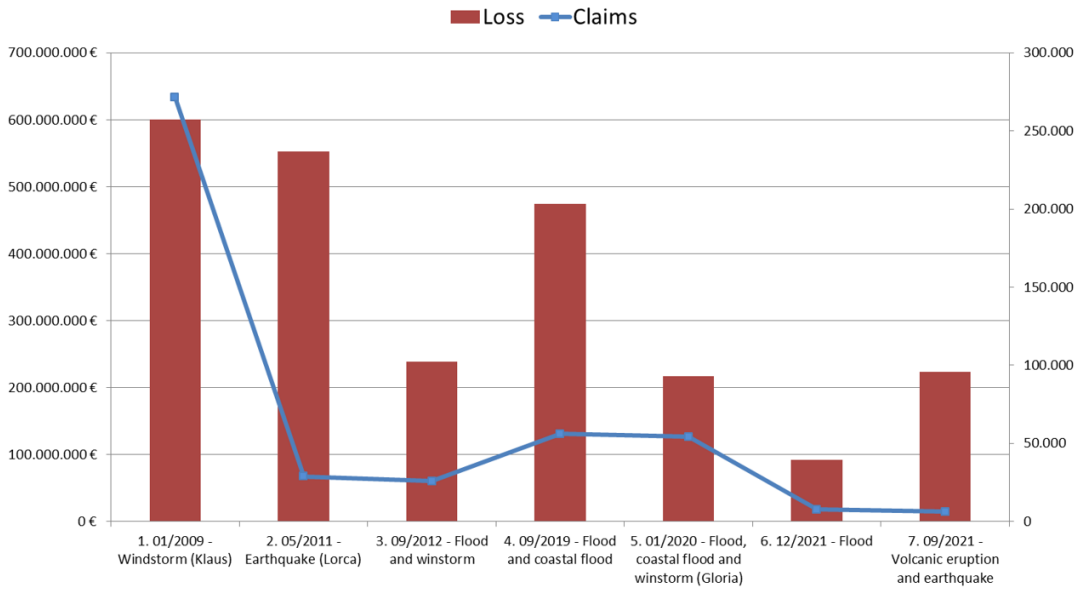


Figure 1.
Loss and claims handled per event.

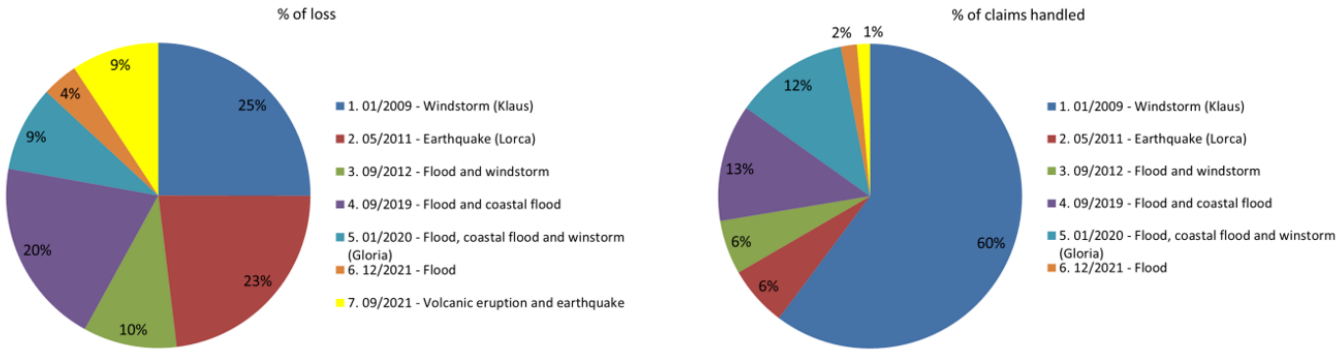


Figure 2. Percentage of loss and claims handled per event.

As can be appreciated, the event having the largest amount paid out is Klaus (January 2009), which tops 600 million euros, followed by the Lorca earthquake (May 2011) with over 550 million euros and the flooding (from a cut-off low) in the south-east of the Iberian Peninsula (September 2019) at 475 million euros. These events respectively account for 25%, 23% and 20% of the total for the selected events.

The events with the largest number of claims handled is (as mentioned) the windstorm named Klaus (January 2009), which had a widespread effect over a large part of Spain, surpassing 270,000 claims filed and representing 60% of those for the selected events.

The most substantial average costs occurred for geological risks, specifically the volcanic eruption on the island of La Palma, from September to December 2021, with a figure of in excess of 35,000 euros, followed by the Lorca earthquake of May 2011 with an average cost of more than 19,000 euros.

The next sections will examine the events from several different standpoints:

- By type of coverage.
- By cause.

- By the kind of property suffering loss or damage.
- According to spatial distribution.
- By brackets of indemnity amount for claims handled.

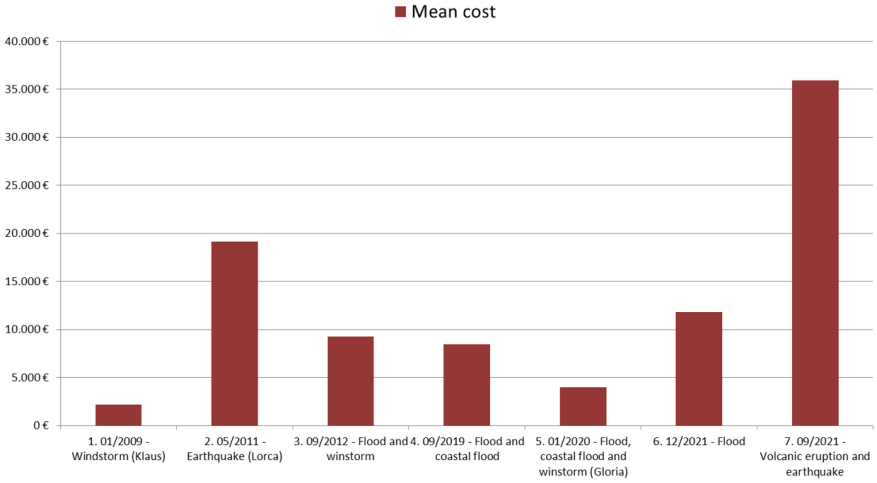


Figure 3. Average cost of indemnities per event.

Analysis by type of coverage (property, pecuniary loss and personal injury)

The table below shows the indemnities and number of claims handled by coverage concerned: **property and business interruption**.

Event	Loss				Claims handled			
	Propertand	%	Business interruption	%	Propertand	%	Business Interruption	%
1. 01/2009 - Windstorm (Klaus)	590,290,147 €	98.3%	10,295,510 €	1.7%	271,177	99.9%	170	0.1%
2. 05/2011 - Earthquake (Lorca)	532,988,250 €	96.5%	19,310,043 €	3.5%	26,060	90.3%	2,796	9.7%
3. 09/2012 - Flood and windstorm	235,111,521 €	98.4%	3,871,981 €	1.6%	25,456	98.5%	398	1.5%
4. 09/2019 - Flood and coastal flood	464,975,050 €	98.0%	9,726,709 €	2.0%	55,593	99.2%	474	0.8%
5. 01/2020 - Flood, coastal flood and windstorm (Gloria)	208,145,540 €	95.8%	9,222,570 €	4.2%	54,189	99.8%	134	0.2%
6. 12/2021 - Flood	88,310,490 €	96.3%	3,396,611 €	3.7%	7,635	98.3%	131	1.7%
7. 09/2021 - Volcanic eruption and earthquake	216,591,813 €	97.0%	6,598,015 €	3.0%	5,597	90.1%	612	9.9%
Totals	2,336,412,811 €	97.4%	62,421,439 €	2.6%	445,707	99.0%	4,715	1.0%

Table 3. Amount of indemnities and number of claims handled which they account for by coverage.

Coverage for property is that which has the largest share in both indemnities (97.4 %) and number of claims handled (99%), whereas the coverage for business interruption does not account for much with respect to total indemnities and total number of claims handled (2.6% and 1%, respectively).

As we can observe, events caused by geological phenomena —the Lorca earthquake and the volcano on the island of La Palma– have a different distribution as regards the number of claims handled relative to the other events studied, with a weight of around (90%) in property and (10%) in business interruption.

Turning to the form of coverage of **personal injury**, the next table gives us the number of victims who had CCS coverage itemised by the degree of seriousness of the harm caused (temporary injuries, permanent injuries or death):

Event	Temporary injuries	Permanent injuries	Death	Total victims
1. 01/2009 - Windstorm (Klaus)	1	5	1	7
2. 05/2011 - Earthquake (Lorca)	1	4	4	9
3. 09/2012 - Flood and windstorm	2	3	8	13
4. 09/2019 - Flood and coastal flood	1	---	4	5
5. 01/2020 - Flood, coastal flood and windstorm	3	---	3	6
6. 12/2021 - Flood	---	---	---	---
7. 09/2021 - Volcanic eruption and earthquake	---	---	---	---
Totals	8	12	20	40
	20%	30%	50%	100%

Table 4. Number of victims indemnified as a result of each of the events.

The first five events did in fact lead to personal injury in the range of five to thirteen victims, whereas in the last two cases no personal injury covered by the CCS was caused.

In 20% of cases there were temporary injuries, in 30% permanent injuries and in the other 50% there were fatalities.

Breakdown by cause

The table below shows the indemnities, number of claims handled by coverage and the average cost per cause for the seven events all taken together:

Peril	Loss	%	Claims handled	%	Mean cost
COASTAL FLOOD	47,062,399 €	2.0%	1,870	0.4%	25,167 €
VOLCANIC ERUPTION	223,125,133 €	9.3%	6,183	1.4%	36,087 €
FLOOD	904,624,306 €	37.7%	99,258	22.0%	9,114 €
WINDSTORM	671,659,425 €	28.0%	314,229	69.8%	2,137 €
EARTHQUAKE	552,362,987 €	23.0%	28,882	6.4%	19,125 €
Totals	2,398,834,250 €	100%	450,422	100%	5,326 €

Table 5. Indemnities, claims handled and average cost by peril/cause.

In this table the events originated by various different causes (flooding and windstorm or volcano and earthquake) have been separated out to show the causes in purer form.

The cause having the largest amount paid out is flooding, which tops 900 million euros, followed by the ACS with over 670 million euros and the earthquake at 552 million euros. These causes respectively account for 38%, 28% and 23% of total indemnities for the selected events.

The peril which unites the biggest volume of claims handled is windstorm, which saw over 314,000, speaking for 70% of the total. This was followed by flooding, with close to 100,000 claims handled, or 22% of the total. These two causes together account for 92% of overall claims handled for the events selected.

The cause with the highest average cost is the volcanic eruption with a figure of over 35,000 euros, followed by coastal flood (a special type of flood which above all affects marinas and infrastructure, largely with a high repair cost) at 25,000 euros, and the earthquake with an amount approaching 20,000 euros.

Although flooding and windstorm led the way in both amount indemnified and total claims handled, in respect of their average amount indemnified they are just shy of 9,200 euros and 2,200 euros, respectively.

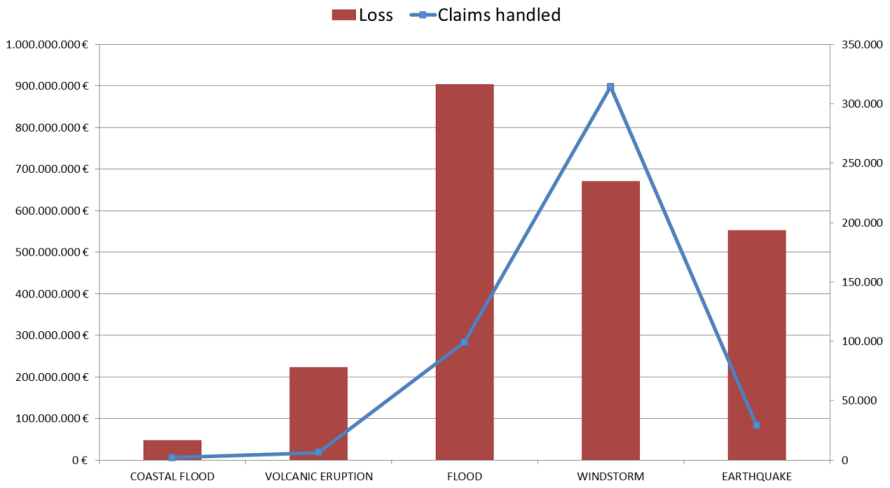


Figure 4. Indemnities and claims handled by peril/cause.

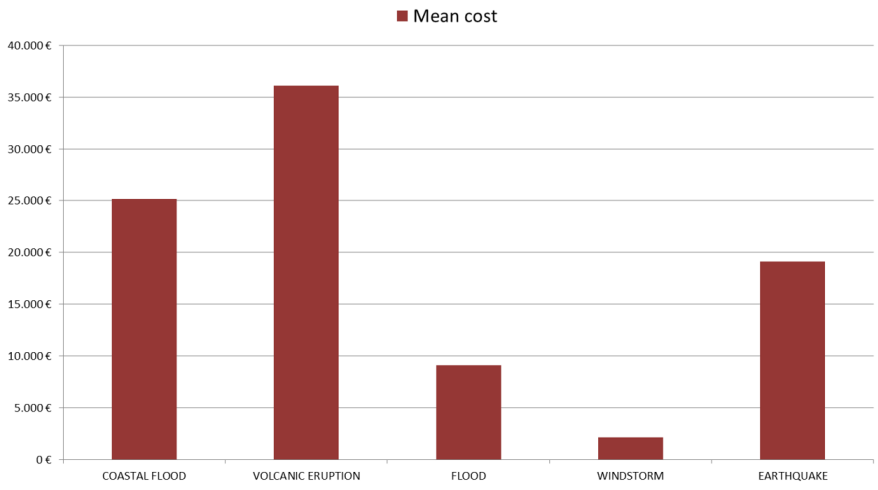


Figure 5. Average cost of indemnities by cause.

To summarise, geological hazards or swells, which can easily cause structural damage to buildings, generally reap more expensive losses than flooding or gales, which bring about more localised damage which is seldom structural.

Analysis by kind of property affected

The table below shows the indemnities, number of claims handled by coverage and the average cost per risk class for the seven events all taken together:

Kind of property	Loss	%	Claims handled	%	Mean cost
SHOPS, WAREHOUSES AND OTHER PROPERTIES	413,815,455 €	17.3%	28,433	6.3%	14,554 €
INDUSTRIES	369,157,486 €	15.4%	19,523	4.3%	18,909 €
CIVIL WORKS	46,586,099 €	1.9%	202	0.0%	230,624 €
OFFICES	22,416,407 €	0.9%	2,006	0.4%	11,175 €
MOTOR VEHICLES	128,475,320 €	5.4%	35,610	7.9%	3,608 €
RESIDENTIAL	1,418,383,483 €	59.1%	364,648	81.0%	3,890 €
Totals	2,398,834,250 €	100%	450,422	100%	5,326 €

Table 6. Indemnities, claims handled and average cost by kind of property.

The kind of property with the highest sum paid out are residential properties at more than 1,400 million euros, followed by shops, warehouses and other properties, at in excess of 400 million euros, and industries with verging on 370 million euros. These kind of properties respectively account for 59%, 17% and 16% of overall indemnities for the events selected.

The kind of property with the highest number of claims handled are residential properties at more than 369,000 and representing 81% of them.

The average cost of civil works appears very substantial and surpasses that for the other kinds of property.

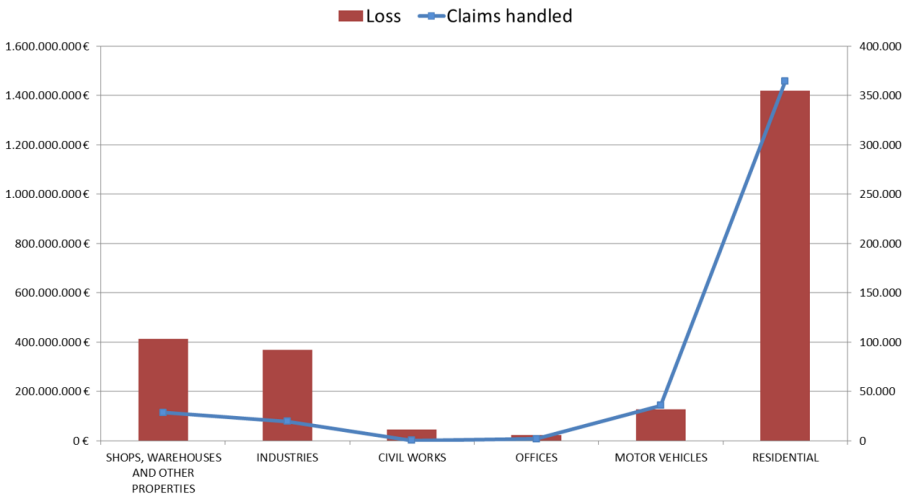


Figure 6. Indemnities and claims handled by risk class.

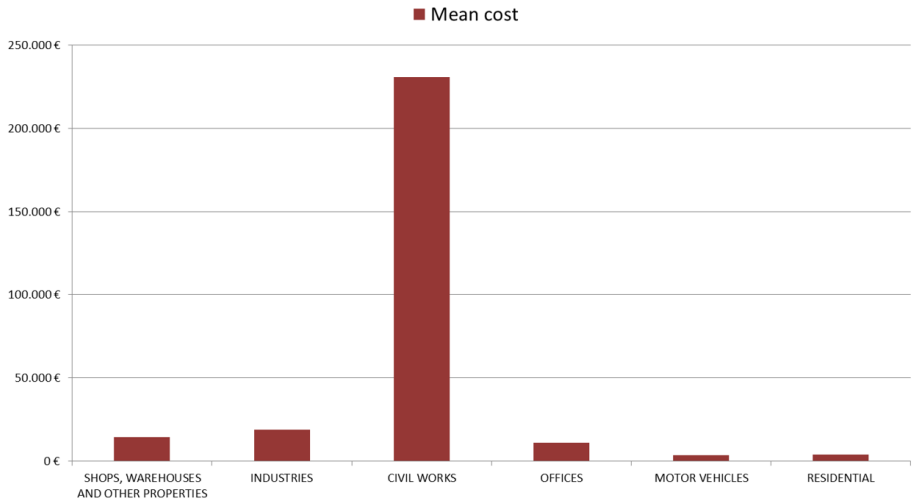
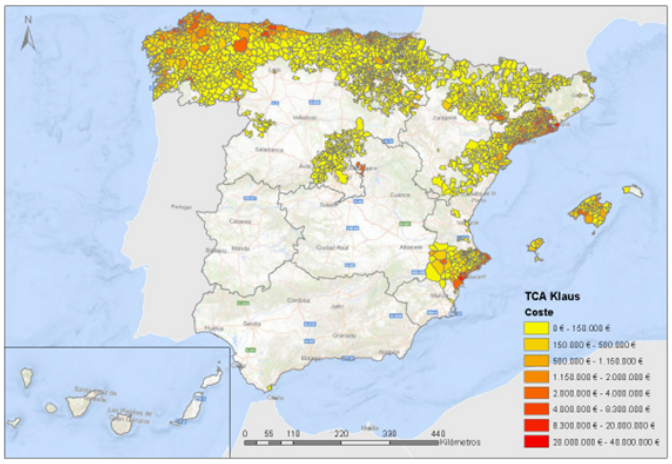


Figure 7. Average cost of indemnities by kind of property.

Spatial distribution

For each of the seven selected events we now go on to present a series of figures which depict the spatial distribution of the losses indemnified by municipal district and cost, as well as the affected percentage distribution according to each kind of property.



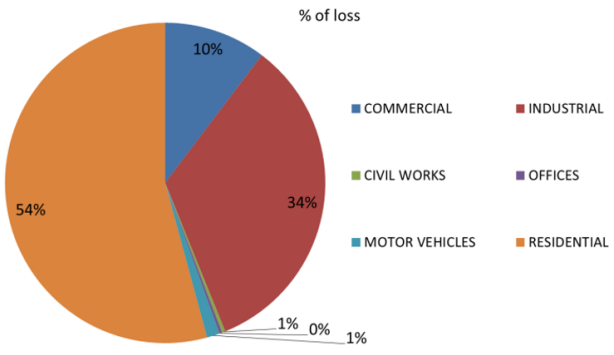
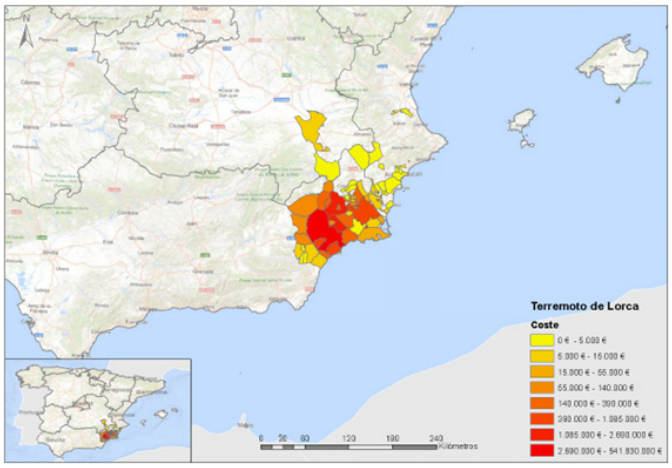


Figure 8. Windstorm Klaus, January 2009. Spatial and property class distribution for indemnities.



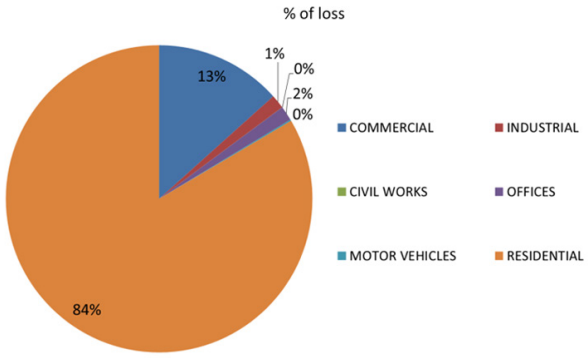
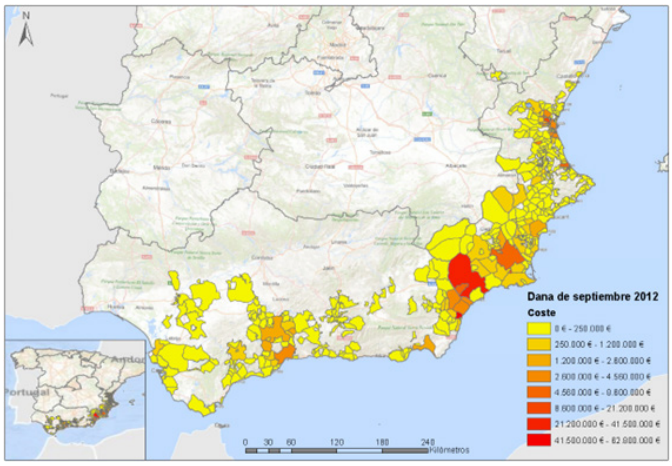


Figure 9. Lorca earthquake, May 2011. Spatial and property class distribution for indemnities.



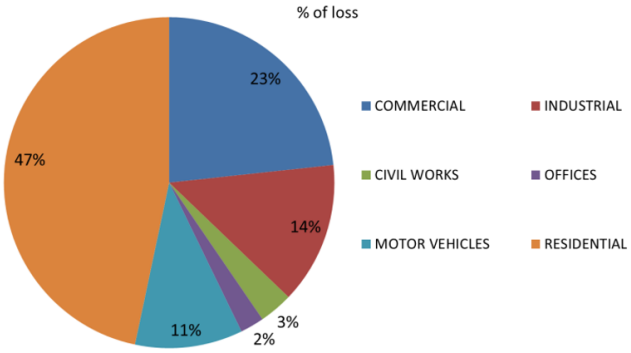
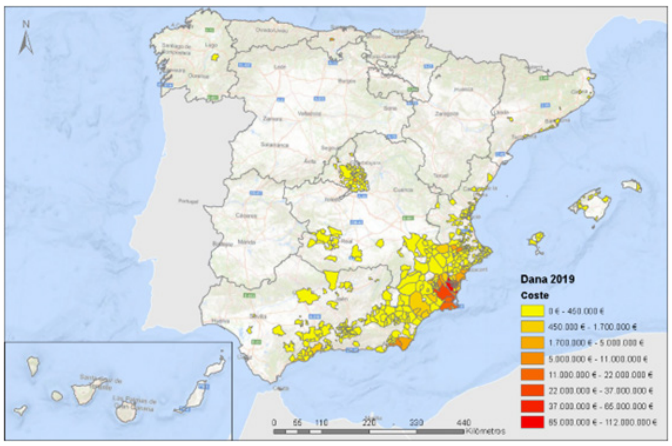


Figure 10. Cut-off low-caused flood of September 2012. Spatial and property class distribution for indemnities.



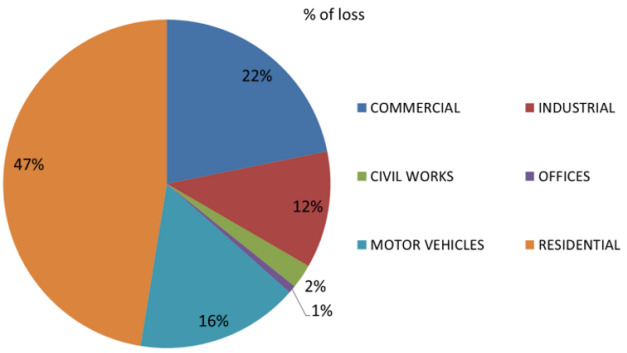


Figure 11. Cut-off low-caused flood of September 2019. Spatial and property class distribution for indemnities.

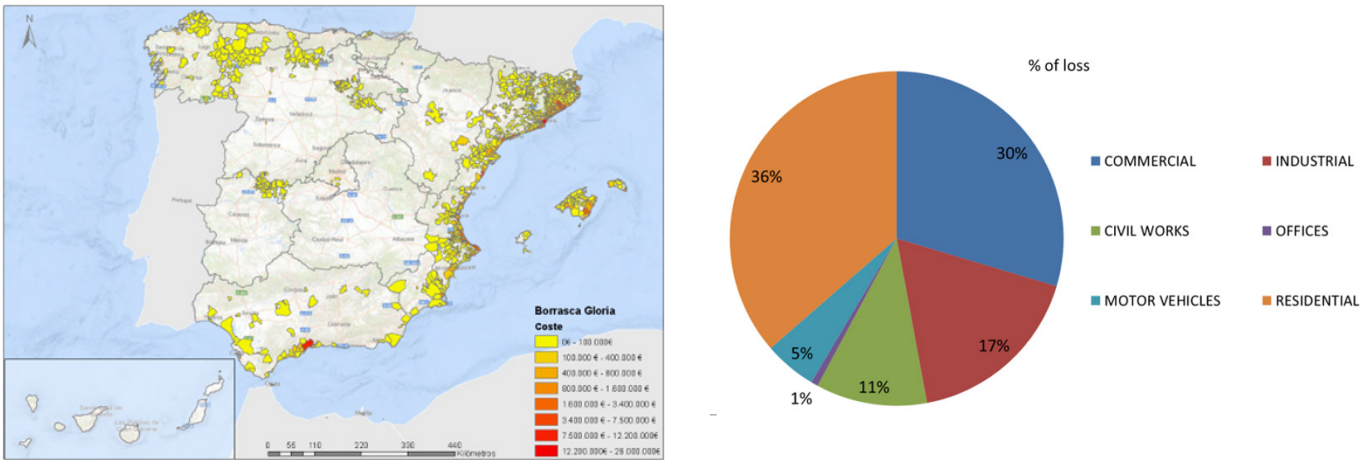


Figure 12. Storm Gloria of January 2020. Spatial and property class distribution for indemnities.

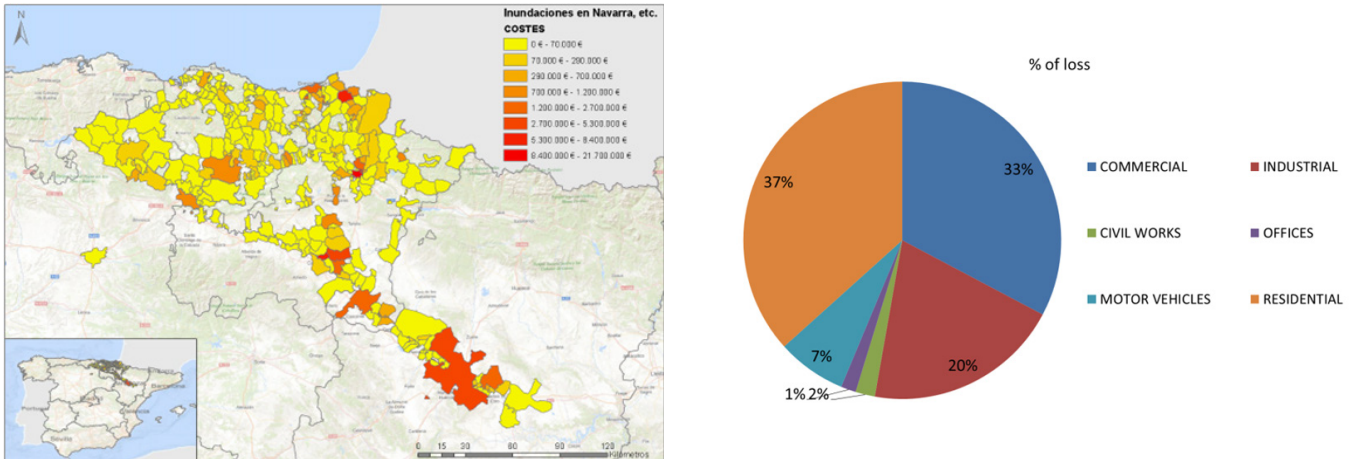


Figure 13. Floods in Navarre, the Basque Country, Burgos and Aragon, December 2021. Spatial and property class distribution for indemnities.

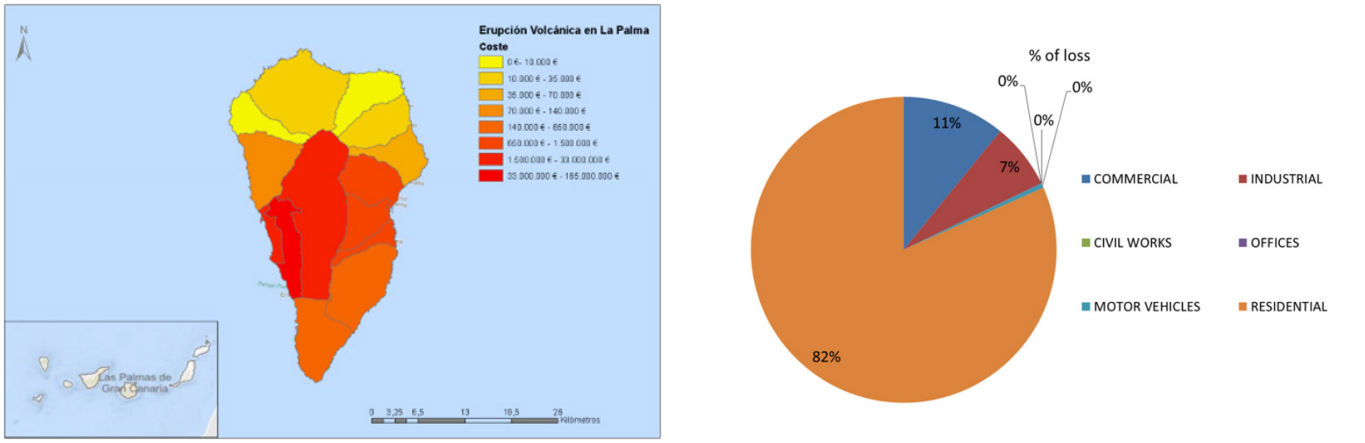


Figure 14. La Palma volcanic eruption of 19 September to 13 December 2021. Spatial and risk class distribution for indemnities.

In short, figures 8 to 14 perfectly summarise the composition of total losses according to property class: geological risks mainly affect residential properties (over 80 % of them), whereas floods are more spread out among residential, commercial and industrial, with autos accounting for a notable share of losses, while episodes featuring sea-battering cause a relatively high percentage of loss and damage to civil works. Even so, we should point out that the percentage of insured civil works is lower than for other risk classes, since not much infrastructure is insured and instead it is the public authorities who repair damage which they charge to their own budgeting (in other words the authorities self-insure to a large extent). Thus, it is that the percentage of losses for civil works tends to be relatively lower than for other risk classes, which have a higher rate of insurance take-out.

The degree of impact for the seven events taken together by province:

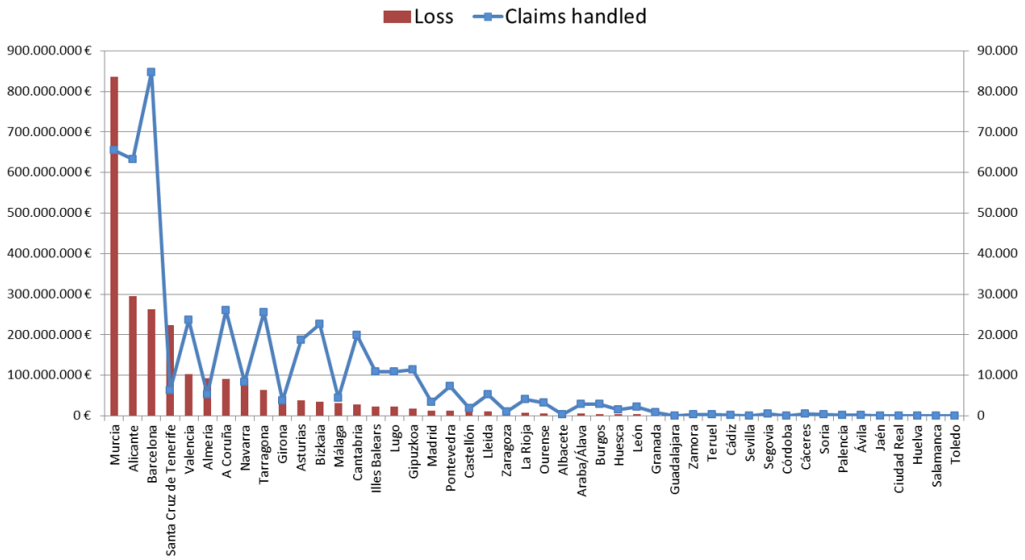


Figure 15. Indemnities and claims handled by province.

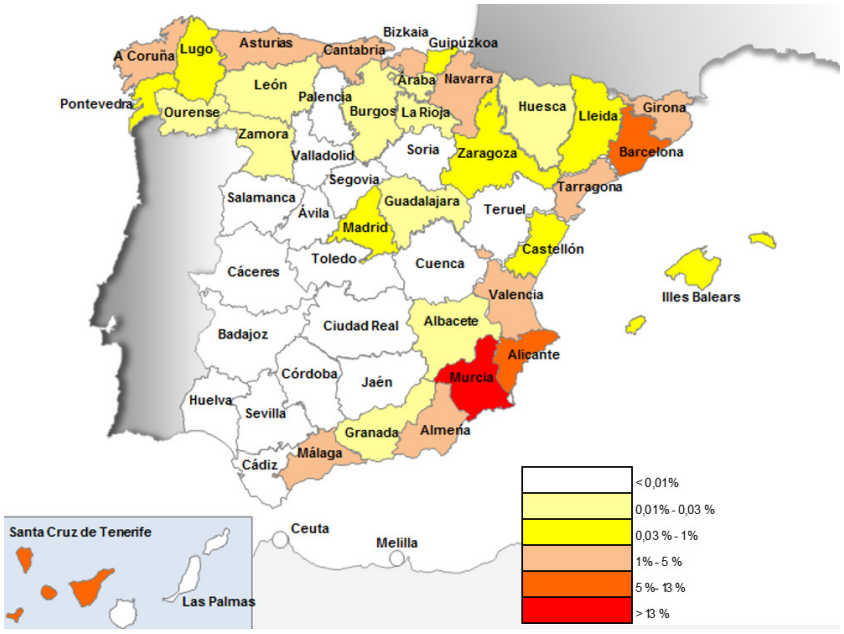


Figure 16. Percentage of indemnities by province.

There was a notable build-up of losses from these major events in the Murcia Region, where several different causes all appeared, namely earthquake, flooding and windstorm activity.

After Murcia, the next most significant provinces by volume of indemnities were Alicante, Barcelona and Santa Cruz de Tenerife, and, to a lesser degree, Valencia, Almería, A Coruña, Navarra, Tarragona and Girona.

The concentration of losses in the south-east and north of the Peninsula is noticeable, as well as in the province of Santa Cruz de Tenerife.

Analysis by indemnity bands

The following tables assess the distribution of loss according to bands for the amount in each claim handled for the whole set of seven events:

Indemnity band	Loss	Accumulated loss %	Claims handled	% of accumulated claims handled	Mean cost
1. 0 € - 500 €	34,147,674 €	1.4%	143,985	32.0%	237 €
2. 500.01 € - 1,000 €	61,702,851 €	4.0%	85,338	50.9%	723 €
3. 1,000.01 € - 3,000 €	207,477,807 €	12.6%	116,557	76.8%	1,780 €
4. 3,000.01 € - 6,000 €	210,285,327 €	21.4%	49,682	87.8%	4,233 €
5. 6,000.01 € - 20,000 €	414,895,394 €	38.7%	39,962	96.7%	10,382 €
6. 20,000.01 € - 60,000 €	322,630,715 €	52.2%	10,147	98.9%	31,796 €
7. 60,000.01 € - 120,000 €	204,437,563 €	60.7%	2,372	99.5%	86,188 €
8. > 120,000.01 €	943,256,919 €	100%	2,379	100%	396,493 €
Totals	2,398,834,250€	100%	450,422	100%	5,326 €

Table 7. Indemnities, number of claims handled and average cost by band of indemnity.

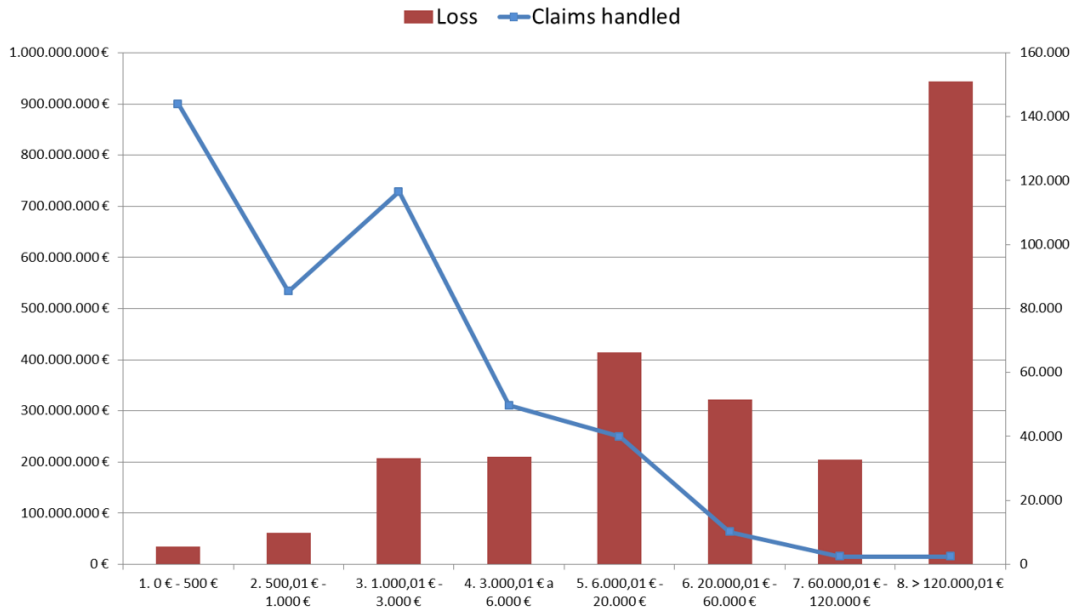


Figura 17. Indemnities and claims handled per band of indemnity.

In 87.8% of claims handled and opened with the CCS, the indemnity per case is at a cost of less than or equal to 6,000 euros; in 99.5% of claims handled the cost will come to less than or equal to 120,000 euros; and in less than 1% of claims handled the cost is over 120,000 euros.

Within the last band there are 137 claims handled where the indemnity is more than one million euros.

Conclusion

The 2009-2021 period seems particularly significant to analysis of major events bearing in mind that over those 13 years seven events occurred out of the fifteen most significant of them within the full set of available data since records began (a 51-year series running from 1971 to 2021). Furthermore, the information on them is more complete given how recent they have been.

The analysis of the information in this article shows that the cause (flooding, windstorm, or an earthquake or volcano) will be decisive as regards the variables that come to define the event, chiefly as regards the geographical area affected and the average costs per claim handled, as well as, though to a lesser degree, with respect to other variables, such as the property class concerned and distinction between types of coverage (damage and pecuniary loss).

Storm Klaus

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Introduction

An explosive cyclogenesis event occurred in the Atlantic on 23-25 January 2009 and caused a high-impact storm named Klaus. The storm gave rise to very high winds and significant property damage and personal injuries in Spain and France. Storm Klaus resulted in more than 265,000 claims handled and more than 564.1 million euros in indemnities paid out by Consorcio de Compensación de Seguros (CCS). It is by far the most severe episode of extreme winds CCS has had to face and at the time posed a major challenge to the insurance industry as a whole. The approaches employed to tackle this historic loss event laid the foundation for managing subsequent extreme windstorms and are a model for public-private cooperation in the field of property insurance in Spain.

CCS has had to deal with such major and harmful catastrophes as the Lorca earthquake and the September 2019 closed low referred to above, and these unquestionably put a strain on the handling capacity of CCS on its own. Even so, the sheer number of claims ensuing from storm Klaus far outstripped its handling capacity. CCS was therefore confronted with a major challenge: handling an unprecedented number of losses far in excess of its direct handling capacity and its ability to coordinate with the private insurance companies without impairing the quality of service provided to the insured.

Changes in the concept of extreme winds over time

The definition of extreme winds as a legal concept has been evolving continuously since the CCS's inception in 1954.

In the initial stage lasting until 1963, winds were defined as extreme if they had sustained speeds above 91 km/h. This initial definition was imprecise, in that what sustained wind speed actually was had not been clearly defined.

The concept of extreme wind was redefined in 1963 as wind classified as extreme by the authorities in each individual instance based on its exceptional intensity and characteristics and the extent of the damage produced, without prescribing any additional condition or objective threshold for coverage.

A dual-faceted concept of atypical cyclonic storm (TCA, for the Spanish) was introduced in 1986:

- violent tropical cyclones with wind speeds above 96 km/h averaged by 10-minute intervals and precipitation in excess of 40 l/m^2/h
- and intense cold lows, with wind speeds higher than 84 km/h averaged by 10-minute intervals and temperatures lower than 6 ºC below zero measured at the closest point on the coast.

Since then, the CCS's coverage of wind events has no longer depended on a declaration by the authorities but, providing that the pre-established conditions and thresholds are met, is instead based on a new definition that could be used to define these events quickly, automatically, and objectively.

An important change took place in 2004, when the legal concept of TCA was expanded to include two new types:

- tornadoes – a violently rotating column of air, narrow in diameter, that is in contact with the ground and descends from a cumulonimbus cloud
- and extreme winds, gusting at speeds higher than 135 km/h.

The two last-mentioned TCAs, tornadoes and extreme winds, are the kinds that occur most frequently and cause nearly all claims from wind paid out by the CCS.

Finally, some years later, in 2011, the current definition of a TCA took effect, reducing the threshold for extreme wind coverage from 135 to 120 km/h.

Therefore, when storm Klaus hit in January 2009, the threshold for extreme wind was 135 km/h.

The following table summarises the timeline for the successive legal definitions of extreme wind.

Time period	Definition of extreme wind
From 1956 to 1963	Sustained wind speed of more than 91 km/h
From 1963 to 1986	No quantitative definition; instead, a **declaration** of extreme wind by the **authorities** based on the exceptional intensity and characteristics of the wind and the extent of the damage produced.
From 1986 to 2004	The concept of **atypical cyclonic storm** (TCA) was introduced, including: 1º.- **Violent tropical cyclones** with wind speeds above 96 km/h averaged by 10-minute intervals, i.e., covering a distance of more than 16,000 m during that interval, and precipitation in excess of 40 l/m²/h. 2º.- **Intense cold lows**, with advected Arctic air, comprising wind speeds higher than 84 km/h, likewise averaged by 10-minute intervals, i.e., covering a distance of more than 14,000 m during that interval, coupled with potential temperatures lower than 6 ºC below zero measured at sea level pressure at the closest point on the coast.
From 2004 to 2011	Two new types of atypical cyclonic storm were included: 3º.- **Tornadoes**, defined as extratropical cyclones generating rotating storms produced by an extremely violent storm, taking the form of a cloud column narrow in diameter projecting downwards from a cumulonimbus cloud to the ground. 4º.- **Extreme winds**, defined as winds gusting at speeds higher than 135 km/h. A gust is defined as the highest wind speed sustained for a three-second interval.
From 2011	The coverage threshold for atypical cyclonic storm type 4 (extreme winds) was lowered from 135 km/h to **120 km/h.**

The Implementing Regulations for the Reglamento del Seguro de Riesgos Extraordinarios [Extraordinary Risk Insurance Scheme] provides that the wind data will be furnished to CCS by the Agencia Estatal de Meteorología [Spain's National Weather Service] (AEMET from the Spanish abbreviation). Therefore, systematically, whenever a windstorm occurs, CCS immediately asks AEMET for a report so that it can determine the locations where the TCA has struck.

Coverage for wind damage in Spain: a shared risk

Unlike other extraordinary perils, wind is shared by private insurance companies and the CCS. This makes these organisations interdependent and requires good coordination between them to be able jointly to offer good services to the insured.

Three regions can be established based on the highest gust reached during a given event as depicted in the following Figure:

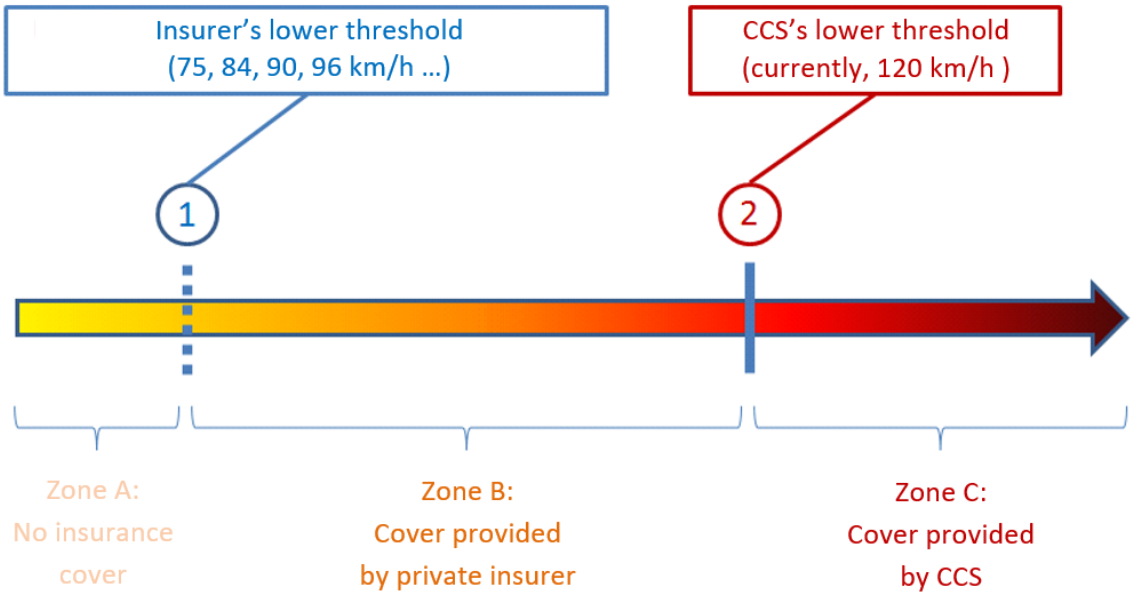

Figure 1. Distribution of coverage for wind damage between the CCS and private insurance companies depending on the peak gust.

In region A, the winds are below the coverage threshold set by the insurance company (point 1), and the damage is not covered by insurance. It is important to point out that there is no single coverage threshold. Instead, each insurance company sets its own peak gust of 75 km/h, 84 km/h, 90 km/h, 96 km/h, etc.

Private insurance companies cover wind damage if the gusts are located in intermediate region B (between points 1 and 2), where the winds are higher than the insurer's coverage threshold but lower than the threshold for coverage by CCS.

A peak gust in excess of 120 km/h (135 km/h until 2011) moves us into region C, where the winds are higher than the threshold for coverage by CCS (point 2), and damage is consequently covered by the public insurance compensation scheme.

Klaus: the strongest windstorm

TCAs are Spain's second most damaging exceptional peril, accounting for 16.2% of all the indemnities paid over the historical series from 1987 to 2021, after flooding, which accounts for 71.0% of total indemnities (Table 1).

Property, business interruption and personal injury loss
Aggregated data, 1987- 2021 series. By peril / cause

Amounts in Euros as of 31 December 2021

Peril	Claims handled	%	Loss	%	Mean costs
Flood (incl. coastal flood)	783,323	48.8%	6,897,387,229 €	69.6%	8,805 €
Earthquake	54,964	3.4%	622,038,013 €	6.3%	11,317 €
Volcanic eruption	6,052	0.4%	223,070,187 €	2.3%	36,869 €
Windstorm and tornado	728,401	45.4%	1,571,795,561 €	15.9%	2,158 €
Meteorite falling	3	0.0%	110,394 €	0.0%	36,798 €
Terrorism	22,375	5.0%	496,122,161 €	5.0%	22,173 €
Riot	153	0.0%	1,241,356 €	0.0%	8,113 €
Social commotion	7,082	0.9%	91,021,462 €	0.9%	12,853 €
Acts of armed forces in times of peace	2,524	0.1%	5,822,825 €	0.1%	2,307 €
TOTAL	1,604,877	100%	9,908,609,189	100%	6,174 €

Table 1. Property damage, pecuniary losses, and personal injuries. Time series 1987-2021.

As shown in Table 2, over the period 1987 to 2020, the CCS received nearly 700,000 claims as a result of TCAs and paid out indemnities totalling over 1.5 billion euros for that same cause. Nearly 40% of those are attributable to just one event, storm Klaus in January 2009, the single most important windstorm the CCS has had to deal with, much larger than other significant storms like Delta, Floora, Xynthia, Kurt, and Gloria.

Series 1971-2020
Updated loss as of 31 December 2020

Month / Year	Name	Claims		Loss	
		No.	%	Amount (M€)	%
November 2005	TCA Delta	15,482	2%	100.7	7%
January 2009	TCA Klaus	265,243	38%	564.1	39%
January 2010	TCA Floora	39,348	6%	48.9	3%
February 2010	TCA Xynthia	39,259	6%	65.7	5%
January 2013	TCA Gong	17,104	2%	15.4	1%
December 2013	TCA Dirk	23,587	3%	28.7	2%
December 2014	TCA Cataluña	16,490	2%	26.3	2%
February 2017	TCA Kurt	57,361	8%	72.0	5%
December 2019	TCA Daniel, Elsa y Fabien	34,061	5%	37.2	3%
January 2020	TCA Gloria	41,630	6%	57.5	4%
Other windstorms		143,004	21%	415.6	29%
Total series 1971-2020		692,569	100%	1,432.1	100%

Table 2. Main exceptional windstorms.

Management of storm Klaus: a major challenge

Until storm Klaus, CCS managed exceptional windstorm events directly, receiving claims for compensation from the insured parties or their representatives. It assessed the damage using its own network of associated adjusters, reviewed the documents for each claim using its own processing services, and finally compensated the insured by bank transfer. The procedure followed was the same as the procedure used to handle any other exceptional peril like floods, earthquakes, or volcanic eruptions.

The largest windstorms —storm Klaus in particular– impact extremely broad areas and give rise to large numbers of claims, though with an appreciably lower average cost than claims caused by earthquakes, floods, or volcanic eruptions. Table 3 compares[1] Klaus with two other past natural disasters, the Lorca earthquake and the September 2019 cut-off low flood event. The Table shows that while the total indemnities paid out were similar in all three cases, around 500 million euros, the average cost paid out for Klaus was much lower than for the cut-off low —one-fourth as much– and for the Lorca event —one-ninth as much.

Event	Claim number	Loss	Mean cost
Windstorm Klaus (January 2019)	**271,347**	**600,585,658 €**	**2,213 €**
Lorca earthquake (May 2011)	**28,856**	**552,298,293 €**	**19,140 €**
SE peninsular floods (September 2019)	**56,067**	**474,701,759 €**	**8,467 €**

Table 3. Totals current as of 31 December 2021.

Experience shows that the difficulty attaching to claims handling depends mainly on the volume of claims, more than on the size of the damage.

CCS has had to deal with such major and harmful catastrophes as the Lorca earthquake and the September 2019 closed low referred to above, and these unquestionably put a strain on the handling capacity of CCS on its own. Even so, the sheer number of claims ensuing from storm Klaus far outstripped its handling capacity. CCS was therefore confronted with a major challenge: handling an unprecedented number of losses far in excess of its direct handling

[1] The figures in some of the Tables in this article are current as of 31 December 2021 and others are current as of 31 December 2020, and this could give rise to differences in the valuation of the monetary costs. Furthermore, "processing" is conceptually different from "claim", and this too could give rise to some slight variations in the figures in certain cases.

capacity and its ability to coordinate with the private insurance companies without impairing the quality of service provided to the insured.

Mapping TCA Klaus

To plot the map of TCA Klaus, AEMET used a geostatistical interpolation method called universal kriging. Besides the wind data observations recorded at weather stations, this approach also considers another three variables, ground elevation, distance to the sea, and the peak wind gust fields from the HARMONIE-AEMET numerical model. AEMET still uses this method, with some changes and enhancements, in drawing up TCA maps (that is, in determining municipalities in which CCS is to pay wind losses after a given storm).

A few days after the storm, AEMET sent CCS its initial provisional report. That report already noted the large size of the storm, which covered more than 20 provinces. In these circumstances, in its information note issued on 28 January 2009, CCS had already made plans for the insurance companies to settle claims from their insured parties and afterwards to apply to CCS for reimbursement by way of an alternative to the usual procedure of direct claims handling by CCS.

As its analysis of the storm progressed, between February and May 2019 AEMET issued a further four reports, expanding the area that had been covered by the storm. The final report was issued on 2 July 2009. Based on that last report, CCS finally determined the coverage area, taking into account such other factors as the uncertainties and complexities intrinsic to windstorms and other indicative data, such as wind measurements in the neighbourhood of the coverage threshold and data reported by the insurers. The coverage area consisted of the following three zones:

- Cities and towns where gusting was over 135 km/h (shown in blue on the map on the left below).
- Cities and towns where gusting was very close to that 135 km/h threshold and hence for that reason, and also based on geographical proximity, the probability that they were directly affected by the atypical cyclonic storm could be assumed to be reasonably high (shown in red).
- Cities and towns that were located at the edge of the coverage area based on the two preceding factors and so could have been affected by the atypical cyclonic storm (shown in yellow).

The map spanned 2,778 municipalities with an overall affected population of 13.5 million inhabitants, that is, almost 30% of the population.

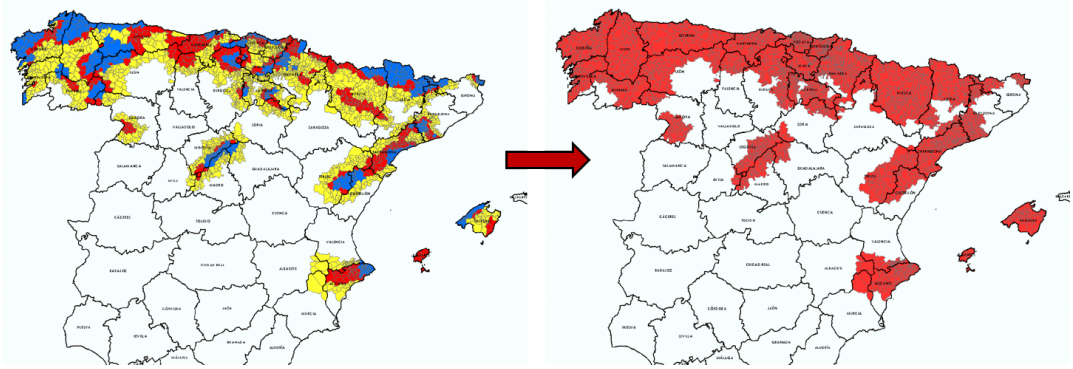

Figure 2. Map of the areas affected by ACS Klaus.

Handling storm Klaus: an example of cooperation between CCS and private insurers

It was clear from the very first that the size of the TCA ruled out direct handling by CCS. For this reason, through the Spanish Insurers' Association, UNESPA, private insurers in Spain and CCS set up a joint handling procedure for storm Klaus set out in a document entitled "Claims handling and reimbursement protocol for the atypical cyclonic storm on 23-25 January 2009" ["*Protocolo sobre gestión de siniestros y reembolsos derivados de los mismos con motivo de la tempestad ciclónica atípica producida entre los días 23 a 25 de enero de 2009*"]. Both parties signed the Protocol at the end of July 2009 after the final map of the TCA had been published at the beginning of that month.

The Protocol set the rules and time limits for claims handling by the private insurers and subsequent review and reimbursement by CCS.

Besides the indemnity paid to the insured or the costs of repairs paid, reimbursement covered the adjusters' fees and other external expenses for claims handling paid by the private insurers.

The supporting documents to be submitted by the private insurers included the full contract of insurance (general, special, and particular terms and conditions), the damage appraisal (the adjuster's report or the invoice or estimate from the company making the repairs), and proof of payment for all sums to be reimbursed (proof of payment of the indemnity, of the repairs, of the adjusters' services, or of other external expenses).

The following procedure was put in place for submitting documents and review by CCS:

- The insurers were to group their reimbursement requests together and send them to CCS in batches of cases.
- An online procedure was developed to expedite submission of the batches of reimbursement requests, though submission of hard copies was also allowed.
- Since the insurers had already paid out the indemnities or repairs to the insured, it was agreed that CCS would reimburse 80% of the sum requested immediately on receipt, with reimbursement of the remainder depending on the outcome of the review.
- CCS reviewed all requests for reimbursement greater than or equal to 30,000 euros and reimbursed the total resulting from the review.

- Requests for amounts below 30,000 euros were reviewed by means of random samples taken from batches for reimbursement of that amount or less, with a tolerable error of 7% and a confidence level of 95%.
- All the cases included in the samples taken were reviewed by a team of adjusters associated with CCS.
- Where the review of a batch yielded a difference of more than 5% between the sum requested and the sum calculated by the review, a second more precise sample was taken with a tolerable error of 5%, i.e., less than the tolerable error of 7% of the first sample.
- The final outcome of the sample-based review was then extrapolated to the reimbursement request for the corresponding batch.

It is important to highlight that working within the scope of the reimbursement protocol did not prevent the insurers from asking CCS to process and indemnify individual losses directly because of their complexity or high monetary cost or because this was requested by the insured.

It should also be noted that in the period before the Protocol was signed, from late January to late July 2009, CCS had handled and indemnified claims directly at the request of insured parties whose properties were located within the TCA area based on the prior information periodically submitted by AEMET.

Klaus in numbers

General statistics

Number of cities and towns affected: 2,778.
Population affected: 13.5 million inhabitants.

	Direct indemnification to policyholders	Reimbursement to insurance companies	Total
Claim number	**36,838**	**228,405**	**265,243**
Indemnified amount [1]	**220.5 M€** [2]	**343.6 M€**	**564.1 M€**

[1] Totals current as of 31 December 2020.
[2] Of this amount, 22% or 48.5 million euros was for damage to the overhead electrical grid caused by trees or other items falling on electric lines or by downed transmission towers, and 10% or 22.1 million euros was for damage to wind power generating facilities.

Table 4. General statistics.

Kind of property	Claim No.	Loss [5]	
		M€	%
DWELLINGS	**230,325**	**307.3**	**54.5%**
AUTOS	**6,281**	**7.2**	**1.3%**
SHOPS, WAREHOUSES AND OTHERS	**13,175**	**58.3**	**10.3%**
BUREAUS	**708**	**1.6**	**0.3%**
INDUSTRIES [4]	**14,693**	**187.8**	**33.3%**
CIVIL WORKS	**61**	**1.9**	**0.3%**
Total of loss event	**265,243**	**564.1**	**100%**

[4] A major component was the high level of indemnities for industrial risks, which tend to have light-weight enclosures and roofs spanning large areas that are extremely vulnerable to strong winds.

[5] Totals current as of 31 December 2020.

Table 5. TCA Klaus. Indemnities by kind of property.

Province	Claim No.	Loss [6]	
		M€	%
HUESCA	1,494	3.5	0.6%
TERUEL	335	0.5	0.1%
ZARAGOZA	313	0.7	0.1%
CANTABRIA	19,494	26.6	4.7%
ASTURIAS	18,271	34.6	6.1%
ÁVILA	15	0	0.0%
BURGOS	1,748	2.1	0.4%
LEÓN	2,055	3.2	0.6%
PALENCIA	146	0.1	0.0%
SEGOVIA	541	0.6	0.1%
SORIA	136	0.2	0.0%
ZAMORA	250	0.2	0.0%
NAVARRA	2,618	6.7	1.2%
LA RIOJA	3,886	7.2	1.3%
ARABA/ÁLAVA	2,685	3.6	0.6%
BIZKAIA	21,882	32.6	5.8%
GIPUZKOA	10,608	11.5	2.0%
A CORUÑA	25,311	85.8	15.2%
LUGO	10,519	20.9	3.7%
OURENSE	3,083	6	1.1%
PONTEVEDRA	7,168	11.5	2.0%
BARCELONA	52,149	161.7	28.7%
GIRONA	936	1.9	0.3%
LLEIDA	4,847	9.5	1.7%
TARRAGONA	23,697	46.5	8.2%
ALACANT/ALICANTE	36,905	59.6	10.6%
CASTELLÓ/CASTELLÓN	203	0.3	0.1%
VALÈNCIA/VALENCIA	2,977	3.8	0.7%
MURCIA	264	0.3	0.1%
ILLES BALEARS	8,715	14.7	2.6%
ALBACETE	204	3.5	0.6%
GUADALAJARA	31	2.3	0.4%
MADRID	1,757	1.9	0.3%
TOTAL	265,243	564.1	100.0%

[6] Totals current as of 31 December 2020.

Table 6. Indemnities by province.

Statistics on the management of reimbursements to insurers

Number of insurance companies that adhered to the Protocol. 56.
38 of these companies submitted information using the online procedure and 18 chose to submit documents in the form of hard copies.

Number of reimbursement batches submitted by the insurers: 196.

	Batches of less than 30,000€	Batches of 30,000€ or more	Total
Number of reinbursement requests reviewed	**7,926**	**631**	**8,557**
Number of reinbursement requests received	**228,405**	**631**	**229,036**
Sample size	**3.5%**	**100.0%**	**3.7%**
Reinbursement requested	**278.0 M€**	**70.6 M€**	**348.6 M€**
Actual reinbursement	**273.8 M€**	**69.8 M€**	**343.6 M€**

Updated loss as of 31 December 2020

Table 7. Requests for reimbursement submitted to CCS by insurers.

Conclusion:

To date, storm Klaus was the largest windstorm CCS has had to deal with in its entire history. The huge size of the storm and the tremendous amount of insured damage far outstripped CCS's direct claim handling capacity at the time and posed an enormous challenge not only to CCS itself but also to the insurance industry as a whole.

To be able to handle claims efficiently without impairing the quality of the services provided to the insured, a coordinated handling procedure was devised in which claims by the insured were handled and indemnified by the insurance companies, which then applied to CCS for reimbursement of the sums they had already paid out.

Joint coordinated handling of this historic loss event by CCS and private insurers is an example of public-private cooperation, and with some changes and improvements the handling procedure devised then is still in effect and has been used successfully for high-impact windstorms that hit after Klaus (Floora and Xynthia in 2010; Gong and Dirk in 2013; Kurt and Ana in 2017; Daniel, Elsa, and Fabien in 2019; and Gloria, Jorge, Karine, Miriam, and Norberto in 2020).

Claims experience for Lorca, 11 May 2011

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Introduction

On 11 May 2011 two earthquakes took place with their epicentre close to the city of Lorca (Murcia); the first at 17:05, with a magnitude of 4.5 Mw, and the second at 18:47, with a magnitude of 5.1 Mw. These earthquakes caused the death of nine persons and left 300 injured, some seriously, as well as widespread damage to the city's buildings, which was acute in some of them .

This earthquake was the biggest which the Consorcio de Compensación de Seguros (CCS) has had to deal with in its entire history.

Before anything we should note the substantial efforts to assist which the Lorca Civil Protection Service and the Regional Autonomy of Murcia made.

The major earthquake occurred at 18:47 and the Civil Protection Service swiftly ordered that the entire city be evacuated for fear of any aftershocks. The Lorca municipal district had over 92,000 inhabitants, most of whom (some 60,000 people) were living in the main urban cluster, meaning that all of these people had to evacuate the city from 19:00.

In the old part of the city there were many homes that had rooms located in the building on the adjacent plot of land, which had at one time been split up, which gave rise to a whole set of problems when it came to justifying the actual insurance coverage for such abodes or rooms. The quandary also arose of illegal structures or unlawful extension of areas where building is allowed, such as on terraced roofs.

The following day, the Civil Protection Service organised an inspection of all buildings, one by one. Via the professional associations, they were assisted in their endeavours by construction experts from across the whole regional autonomy, who disinterestedly and selflessly collaborated alongside the specialists from the City Council. The city and regional fire brigades, as well as the Military Emergencies Unit (the "UME") had to pull down those structural elements that were still hazardous, such as safety railing and parapets, suspended ceilings, etc., building by building. They also had to shore up unstable structures still in danger of falling down. It was highly commendable work.

We shall now go on to outline certain exceptional incidents which emerged from this claims experience as regards the CCS.

Preliminary work at the CCS. Estimates

The day after the earthquake, together with adjusters who were regular collaborators with the organisation and who were familiar with the affected area, CCS specialists travelled to Lorca to make an initial estimate of losses and to assess needs in terms of adjusters.

Right from the start, it was evident that every single one of the buildings in the urban centre of Lorca was affected to a greater or lesser extent, so the number of case files would have to be the same as the number of buildings in the city, which was estimated to be some 30,000. During the first visit it was not clear that the damage to the buildings was so serious, as the worst of this was hidden from view, which meant that the average amount for estimated losses was inevitably misjudged. As time passed, more and more structural damage came to light, some of which was hugely significant and would call for major action to be taken, for which reason the initially estimated average amount of loss was gradually revised upwards as more extensive information and evidence was noted. Based on the figure for estimated case files the number of adjusters required was reckoned to be two hundred.

Incoming claims

Over 33,000 claims were received; 59% via the Helpline Service (CAT for the Spanish), 35% through the CCS website, and the rest by other available means.

Though comparable to other CCS claims experiences, these relative figures were unique for the swiftness with which they were filed. By the 13th, only two days after the earthquakes, 2,477 claims had been filed, while by the 20th, barely nine days afterwards, this figure had climbed to 18,591. 17 May was the day when most claims came in, with a figure of 4,976.

The Geographic Information System (GIS) and allocation of case files among adjusters

Once case files have been opened, they then have to be assigned to adjusters for assessment work to begin.

CCS uses a GIS to geo-reference the location of every loss-affected risk situation, place it on digital maps and allow files to be allocated to adjusters based on a geographic parameter.

Here we should recognise that Murcia Region presents a whole raft of problems as regards its toponymy, in that it is original and unique in Spain for dividing municipal districts into “councils” or administrative bodies, and due to the fact that in 2011 the digital street maps of Lorca which CCS used (among these the “CartoCiudad” cartographic system) had certain shortcomings. On the other hand, most multi-family buildings have a name by which all the locals know them, yet which do not appear on the digital street maps. When claims are filed citing these and without providing the postal address it becomes impossible to geo-reference the building in question. The problems attaching to geo-referencing in Lorca prompted CCS to seek a new procedure based on the cadastre (tax assessment registry pinpointing the location, dimensions and boundaries of properties) for the purposes of future loss event claims.

Adjustment criteria and pricing tables

Although standardised assessment should form the basis of adjustment work, in a claims experience involving so many adjusters (and such a concentration of so many insured parties), who in many cases had to deal with unusual types of intervention (such as shoring up, bracing and repair work for structures), uniformity of this kind takes on particular significance. To this end it is important to be able to use a pricing table featuring the most common project units for repairing damage.

Due to the fact that there were several geo-referencing problems in the first month, it was not possible to draw up such a specific pricing table for the most usual types of repair work, so the adjusters were advised to use the pricing tables from CYPE's commercial structures calculation program or else that of the Guadalajara Building Engineers and Quantity Surveyors' Association, which are commonly-used references in the construction industry. Later on, they managed to draw up a pricing table for structural repairs to unify assessments as these were highly important quantitative and qualitative appraisals which called for technical rigour and uniformity. Thus, they would have items to check against when faced with repair estimates that sometimes lacked substance and were poorly justified with respect to the viability of solutions and the costing of these. Unique criteria were also devised to value pre-existing buildings, which enabled not only comparison with the insured capital and whether or not there had been under-insurance but also valuation of buildings in the event of demolition.

Certain distinctive problems

In the old part of the city there were many homes that had rooms located in the building on the adjacent plot of land, which had at one time been split up, which gave rise to a whole set of problems when it came to justifying the actual insurance coverage for such abodes or rooms. The quandary also arose of illegal structures or unlawful extension of areas where building is allowed, such as on terraced roofs .

Insurance of damaged property

The level of insurance in Lorca in May 2011 was rather uneven. Because people were still feeling the effects of the 2007 economic and financial crisis most commercial premises were left uninsured and in many cases policies for them had been discontinued on account of the crisis. On the other hand, factories and industrial enterprises did have insurance policies. Business interruption cover was not very extensive in such industrial concerns however, and far less so among commercial premises.

Even so, most homes did have insurance and housing buildings tended to be over-insured with two policies under contract; one for individual own homes and another for the home-owners' community. In most cases these also had uninhabitable home and loss of rent insurance.

Earthquake intensity. Loss and damage

According to the European Macro-seismic Scale EMS-98 the intensities of the Lorca earthquakes were VI for the first earthquake with a moment magnitude of 4.5 Mw, and VII for the second one, with a moment magnitude of 5.1 Mw.

The EMS-98 seismic intensity scale classifies the severity of earth movement based on the effects which seismic tremors have on a set of objects that can be found in an everyday environment. This is one of the major advantages of the scale as a tool: it does not require instruments to be measured. The sensors that have been used historically can be broken down into four groups: *Living things, Ordinary objects, Buildings and The natural environment*. It thus allows the compression of a description of earthquake effects into a single symbol, a number.

The scale of EMS-98 seismic runs through twelve degrees, from I to XII. According to this scale, an intensity of VII, as in Lorca, is for events where most people are frightened and try to run outdoors. Furniture is shifted and objects fall from shelves in large numbers. *Buildings* suffer a higher or lower grade of damage depending on their structural vulnerability. Both concepts —"vulnerability class" and "grade"– are defined in the scale itself according to structure type.

In Lorca brick buildings generally suffered damage of grades 2-3, while those of reinforced concrete also experienced grade 2-3 damage.

The EMS scale defines damage grades in the following way:

For brick buildings:

- Grade 2: Moderate damage: Cracks in many walls, falling of fairly large pieces of plaster and partial collapse of chimneys.
- Grade 3: Large and extensive cracks in most walls. Roof tiles detach. Chimneys fracture at the roof line. Damage to individual non-structural elements (partitions, gable walls and roofing).

For reinforced concrete buildings:

- Grade 2: Moderate damage: Cracks in columns and beams of frames and in structural walls. Cracks in partition and infill walls. Falling of brittle cladding and plaster. Falling mortar from the joints of prefabricated wall panels.
- Grade 3: Substantial to heavy damage: Cracks in columns and beam column joints of frames at the base and at joints of coupled walls. Spalling of concrete cover, buckling of reinforcement rods. Large cracks in partition and infill walls. Damage to individual infill panels.

And we should recognise that the actual damage was substantial, according to the adjusters, due to the shallowness of the hypocentre or focus, its proximity to the city of Lorca and a very high peak acceleration (0.37g), but above all to the usage of resistant patterns (such as the usage of dwarves which we go on to discuss) and architectural configurations (such as roof barriers) a lack of awareness of the seismic dangerousness of the area, which increased the vulnerability of buildings.

The main damage to buildings with a reinforced concrete structure, which was the type which predominated in Lorca, was cracking and fissuring in masonry (partitioning, enclosures, suspended ceilings, safety railing and parapets, chimneys, etc.) and damage to structural columns. The greatest damage was on the ground and top floors. There was also damage to the stringer beams of the staircase.

The most serious damage was to supports and columns, often fractured in their upper section and sometimes in the lower portion. This damage to supports and columns was often prompted by the very panelling and partitioning that surrounded them, given its greater rigidity. There was also a lot of damage to stump columns, which are very rigid due to their lack of height, meaning that they absorb greater levels of stress. There was also serious damage to buildings, since the slabs of a building acted as "battering rams" against the columns and supports of the neighbouring building given that there were no gaps between both buildings and there were differences in height between the slabs. Furthermore, there were several cases of durability defects in the reinforcements of supports on account of rusting, where such impairment clearly had nothing to do with the earthquake.

Repair work

Repair work on damage to masonry was the most common kind, filling in the cracks with mortar and meshing prior to painting over the whole plaster finish. In the case of major cracking the partitioning had to be demolished and rebuilt, with the increased costs that this implied from the installation and fitting work. More problems arose in repairing damaged columns and supports.

With respect to structural issues and for the more complex cases, the CCS and its team of adjusters received technical advice from a reputable company of renown called Intemac with objective expertise in the defects and problems besetting unsound buildings. Generally speaking, the repair work was undertaken via proposed action to take on columns and, where feasible, suggested means of restoring the safe and functional conditions of buildings that existed before the earthquake; in other words, attempting not to change rigidity and stress distribution conditions among the various different structural elements. To achieve this, the suggestion was, subject to prior shoring and bracing, to repair the damaged portion of the column with special mortars, stabilise and treat or bolster reinforcements and, in the case of major cracking, to apply propping and redo all or part of the column. In the case of fracturing, it was held to be sufficient to seal it and inject it with fluid sorts of mortar according to the recommendations in the relevant literature on the subject.

Nevertheless, the specialists and construction firms which the insured and the home owners' associations hired preferred above all to reinforce columns with metal splint sections and plating, and to fill in the gaps with types of mortar, even though this was generally without clear criteria regarding their capacity to reinforce or potential to become load-bearing, despite the fact that this sheet metal and plating was reckoned to withstand all stresses without taking into account the concrete support column. Sometimes the solutions proposed involved adding rigidizers lengthways. All of these solutions add uncertainty in that they alter the rigidity of the damaged column relative to those that were left unharmed, which means that exactly how the structure behaves given another earthquake of some significance becomes even more unpredictable.

Construction in Lorca

An earthquake comprises a series of waves that pass through the natural terrain from the hypocentre or focus which causes movement of the earth that feeds through to each building, becoming increasingly intense and making it shake or vibrate. The building behaves like a pendulum. The period over which the building vibrates and the wave lasts is important. The terrain on which the building has its foundations is also highly significant.

According to the experts and adjusters, buildings have been erected in Lorca without taking into account the NCSE-02 seismic resilience standard or previous versions, which means, for example, that care has not been taken to ensure that there is a small space between adjacent buildings that allows buildings to vibrate without harming neighbouring structures, since each building has a different vibration period and will shake differently. Likewise, permission has been given to put up railing and parapets on terraced roofs or many squat columns have been put up on the ground floor. On the other hand, it is very positive that there are many buildings standing alone that can vibrate freely.

Buildings in technical and economic ruination

On 18 May 2011, seven days after the earthquake event, Lorca Council made a start on demolishing the first building, the "Princesa" residential community comprising numbers 57, 59 and 61 on the Granada road.

The chief characteristic of the Lorca claims experience for CCS was the large number of buildings that were demolished and which had to be indemnified by appraising their rebuilding value. CCS had never paid out for so many entire buildings. Neither have insurers had experiences involving so many total losses for buildings as CCS.

To justify knocking down buildings Lorca Council began resorting to declarations of technical ruin. In quite a few cases the firm specialising in structural defects and problems which was advising CCS (Intemac) held that it was possible to undertake repairs to buildings using commonly-applied techniques and at a reasonable cost. Yet jurisdictional authority lay with the Council and moreover it had other technical reports to cite which did actually claim that the buildings were in a state of technical ruin.

After a certain time, Lorca Council encouraged the demolition of buildings based on declarations of economic ruin. Let us now define these concepts:

- Technical ruin. The building displays evidence that its structural or fundamental elements have been rendered generally no longer usable.

- Economic ruin. The building exhibits damage to the extent that the cost of repair work to restore it to its former state of safety and sound condition is more than 50% of the present value of the building excluding the land value.

It is readily understandable that with buildings of a certain age their current value was very low, so consequently, even though the cost of repairing them was low, it is likely that this might exceed 50% of the value of the building, leading to them being declared in a state of economic ruin. Faced with this situation, CCS found itself saddled with an insurance policy that was taken out subject to a valuation set at replacement as new, which meant that in the event of demolition due to economic ruination it would be asked to defray the cost of rebuilding the structure in question instead of repairing it. The decision to rebuild instead of undertaking repair is not a rational one. This was why CCS decided that in the case of economic ruin, it would not shoulder full indemnification of the building but would instead appraise the damage to be repaired and pay out compensation for that amount. This decision led to many buildings declared to be in a state of economic ruin not being demolished.

For those buildings that were demolished CCS established a procedure for valuing loss or damage: Intemac drew up a plan and a repair proposal, a pricing table for project units was formulated and a team of adjusters who were specialists in construction was set up who drafted a repair proposal for each building using the information mentioned.

Appraisal of demolished buildings

The fact that many buildings had been pulled down posed a novel problem for CCS which it had never encountered before. Although it is true that on the odd occasion it had had to indemnify an entire building, this had always been an isolated case. In the insurance industry a valuation of the building is carried out to calculate the premium and, where appropriate, apply under-insurance, but in only a few cases will this suffice to rebuild the structure.

From the very beginning it was decided to devise a straightforward procedure which would allow consistency among the adjusters and make use of pricing tables and tools which architects utilise in their work.

To this end CCS decided to use CYPE's modules. This is a software which the company CYPE Ingenieros, S.A. produces and is widely used among construction specialists in the Spanish Levant and also throughout the rest of Spain. The Murcia Region uses it in its technical and tax-related calculations.

CYPE's modules provide for the construction cost for three quality classes of different kinds of residential buildings: single family homes, multi-family housing, according to the number of housing units and depending on whether it is a stand-alone block of dwellings or a block enclosed by streets. It was thought that the modules which dated from 2011 were accurate, except at basic-quality level, which was held to be on the low side and augmented by 15%. The module was applied to the amount of the home's number of built square metres. A set of costs were added to this estimate: budget items for health and safety, general costs and contractor's profit, geo-technical survey, architect and quantity surveyor's fees, VAT, urban development licenses and constructor's guarantee insurance. This is how we arrived at the amount to be indemnified, which we paid out without asking for approval. As expected, several home owners' communities did not agree, not because the criterion was in error, but since the insured wanted the

new building to have more functional capability than the old one such as, for example, an underground garage, quality enhancements, etc.

In cases of disapproval of this kind, CCS followed a more detailed procedure. It asked the Council for the old technical plan for the building. This provided information on quality levels, precise measurements, etc. Besides resource modules, the CYPE software also has a function called a budget reckoner, which enables a detailed estimate to be obtained by keying in information and measurements which define the specific building. This is arrived at having selected from different options under the various headings for a building estimate.

This estimate was then adjusted to allow for the measurements and quality levels in the technical drawings for the old building. As is logical, those enhancements that were mandatory according to the Technical Building Code were accepted. This produced an up-to-date estimate also in keeping with the quality levels of the building to be indemnified. This estimate was the one which was disputed with the insured's adjuster, who ended up accepting the criterion used by CCS. Normally an estimate below the initial result emerged, but the latter was maintained.

We should concede that the insured persons claimed several expenses that were not provided for in our procedure, such as notary's fees, processing and administration costs, commercial expenses, etc. In general, these were minor and could be assimilated by the discrepancy in estimates.

Intemac's advisory work

It was very important for CCS to have been backed up and advised by the company Intemac in the Lorca claims experience with respect to structural damage cases.

Intemac's technical experts studied some 350 buildings in Lorca for which they drafted damage reports, assessed the suitability of the repairs which the technical specialists of the insured or construction companies recommended and, together with the adjusters, took part in work meetings with them where they discussed repair procedures or even structural faults and defects observed. Besides this, as we said earlier, they drew up repair plans for buildings in a state of economic ruin.

Finally, at the request of CCS, they wrote up their experience in a book which CCS published called "The Lorca earthquake. Effects on buildings."

Via this book, CCS kept up its interest in publishing the experience of adjusters and specialists in earthquake loss events, thus following in the footsteps of the book by Higinio Arcos Trancho and María Cristina Porcu titled "Seismic movement and walled structures. Origin, impact and assessment of damage to traditional homes" which featured the experience drawn from the Mula earthquake of 1999. This was published in 2003.

In the wake of Lorca, advisory assistance from firms and technical experts for CCS adjusters has become more commonplace where structural defects and problems, geo-technics and other specialist subjects are concerned.

The insured's adjusters

At the beginning, the adjusters from Murcia Region who usually work as adjusters for the insured played no part in events, because most of the damage related to housing and they were used to performing adjustment only for industrial and business risks. The technical experts from construction companies that had won contracts for repairs and rebuilding work therefore stood in for them. Subsequently, when they observed how the damage was severe and complex, they started to accept work as adjusters acting for a party.

Conclusions

The Lorca earthquake of 11 May 2011 was the most substantial claims experience prompted by an earthquake which the CCS has had to deal with.

In certain cases, the procedures which were adopted in Lorca have since been retained as CCS working procedures.

Lorca was a claims experience that involved a lot of buildings that were a total loss and therefore entailed major indemnities, which is not common in the world of insurance, even in other natural disasters which CCS covers. This forced CCS to perform a detailed examination of valuation for buildings and establish a procedure to calculate for the pre-existing condition, since this not only applies to checking up on the sum assured and any under-insurance, but it also has a direct bearing on the indemnity. This procedure for valuing pre-existing condition using the CYPE modules which began in Lorca is the one which CCS still uses today.

The geo-referencing problems experienced in Lorca for assorted reasons, such as the shortcomings of street maps, forced CCS to seek out new geo-referencing procedures. It was based on the Lorca experience that geo-referencing was developed using the cadastre and the cadastral reference as a national ID number for buildings.

In the wake of Lorca, advisory assistance for adjusters on structural defects and problems and geo-technics has become more commonplace.

And finally, we should highlight the publication of a book on earthquakes which the Intemac technical experts wrote.

The most common adverse weather phenomena impacting the Iberian Peninsula

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Introduction

In recent years the media have been focusing attention on bombogenesis events, cut-off lows, heavy coastal storms with high winds and high waves, and even some tornados. These weather phenomena take place occasionally, that is to say, infrequently. Nevertheless, they can in some cases cause high human casualties and have a high economic cost . While their probability is low, when they do occur they leave long-lasting after-effects, and that is why they are often referred to as high-impact weather events.

The atmosphere is a layer surrounding our planet, with most of the weather phenomena affecting us being located in a region extending up to 10-12 km in altitude. This region is known as the troposphere. Masses of air move through this layer in the direction of the rotation of the Earth, giving rise to a sort of engine – anticyclones – that for the most part occupy semipermanent positions at latitudes of around 30º - 33º in both hemispheres.

It comes as no surprise that the vast expanses occupied by the atmosphere should contain air masses that have different characteristics and thus that they have different temperature and humidity levels. When these masses come into contact with each other, certain weather phenomena like storms occur. When the contrasts between air masses are more pronounced, the associated weather events form and evolve more quickly. Where other factors triggering these processes are also involved, the probability that these phenomena will turn violent increases. That is how many of these adverse weather events come about, through the convergence of several factors in a synchronised manner at the same time. That is, first there needs to be a set of predisposing conditions, then there needs to be a triggering mechanism.

The remnants of extratropical cyclones have sometimes reached the Canary Islands. This is very unusual but should not be overlooked.

The storms Gloria and Filomena are two examples of events like those described. They caused heavy economic losses, and much has been written about them.

Modelling and improved systems for making observations have made it possible to make progress in detecting and predicting these events. One very interesting case, to some extent forgotten, took place on 11 March 2011. There was a break in the troposphere with intense penetration by stratospheric air to a height of 600 hPa. Modelling has provided much more detailed information about that episode. The snowfalls in the mountain ranges near Segovia and Madrid were spectacular.

They can sometimes affect large areas, i.e., they develop into large-scale events meteorologists broadly call closed low pressure systems or hurricanes. In other cases they are smaller, referred to as meso or microscale events. Mountain waves and tornados are examples of these.

Since they are uncommon, they are called extreme phenomena, defined as those with a very low probability (sometimes a threshold is set at a frequency rate of 5%). These events have been seen to be becoming more and more extreme and are being associated with global warming, something that appears to be quite reasonable, in that raising the temperature by 1ºC or a bit more in an enclosed space, e.g., a house, requires considerably higher energy inputs. Succinctly put, warming has made the atmosphere more capable of producing more severe weather phenomena. One example is the torrential downpours associated with closed low pressure systems, which seem to be becoming more frequent.

Most but not all high-impact processes are associated with cyclones (a generic term encompassing hurricanes, typhoons, low pressure areas, polar lows, medicanes, and the like). These are low pressure systems where the winds blow counter-clockwise in the Northern Hemisphere (clockwise in the Southern Hemisphere).

This article concerns itself with the systems that are more frequently encountered in the Iberian Peninsula.

Synoptic scale disturbances: genesis of polar cyclones

The general motion of air masses in the atmosphere on a planetary scale can be seen to follow a wave pattern of movement. This was first studied in some depth by the Swedish-American Rossby in 1939, and it has taken his name. There are basically two reasons for their wave nature: the disturbances undergone by air masses in their movement around the globe (e.g., those caused by large mountain ranges) and the action of the Coriolis force produced by the rotation of the Earth. Their wavelength is several hundred kilometres long, and they move around the planet from west to east.

A look at a weather map suffices to show that thanks to their wave nature they have troughs (in meteorology this is associated with the action of troughs around a low-pressure centre) and ridges (in this case caused by the presence of anticyclones). Therefore, the larger or smaller size of Rossby waves depends on the presence of rotating structures of this type, with low pressure areas tending to occur at around 60º latitude and high-pressure areas at around 30º - 33º latitude.

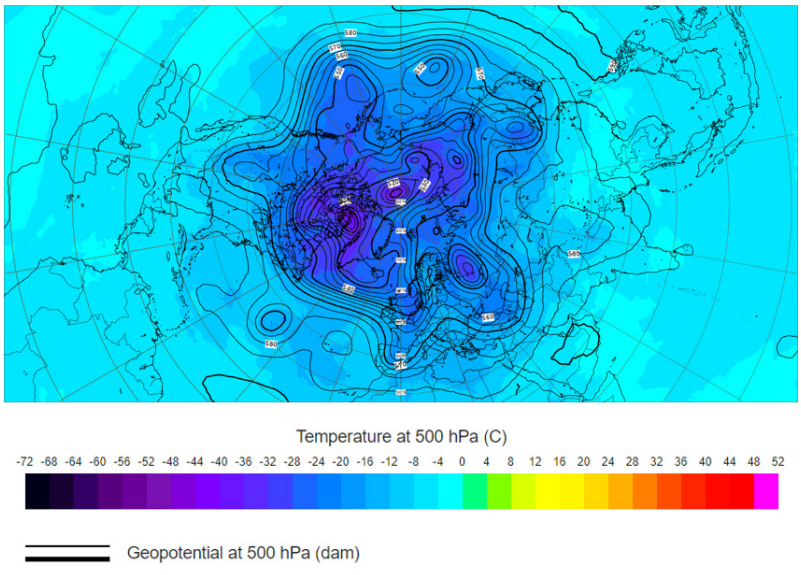


Figure 1. ECMWF map showing the 500 hPa geopotential isolines in decametres and temperature in ºC.

Figure 1 shows a weather map depicting Rossby waves and the undulations formed by the presence of cyclonic and anticyclonic flows at the level of 500 hPa (at an altitude of around 5,500 m). By way of a first approximation, we can say that the wind blows along the isolines moving from west to east because of the rotation of the Earth. In meteorological terms, we say that this form of motion is caused by geostrophic approximation, in which the wind blows parallel to the isobars. It generally realistically maps what is happening at mid to high altitudes but becomes less realistic as we come down to ground level.

Looking at Figure 1 in detail, we can see that the temperature distribution does not always adhere closely to the course of the isolines. Where it does, that area is said to be barotropic, and where it does not, baroclinic. Where the latter occurs, the wind blows across the isotherms, producing what is known as advection. The air from higher density, hence colder, masses may sometimes be carried to lower density, hence warmer, regions. This is referred to as cold air advection. However, the opposite can also happen, in which case it is referred to as warm air advection. Colder, denser air tends to drop to levels closer to the ground and warmer air tends to rise to higher altitudes. This produces conditions conducive to the formation of cyclonic flows rotating counter-clockwise in the Northern Hemisphere.

After the First World War, a group of Norwegian meteorologists led by Vilhelm Bjerknes developed a conceptual model that explained cyclone formation and development at middle latitudes based on the cyclonic waves generated by warm/cold air advection. This air thus consisting of two masses with differing characteristics ends up producing vorticity, i.e., rotation. These studies gave rise to the polar front theory, which was associated with inputs of cold air from higher latitudes, displacing the warm air at lower latitudes.

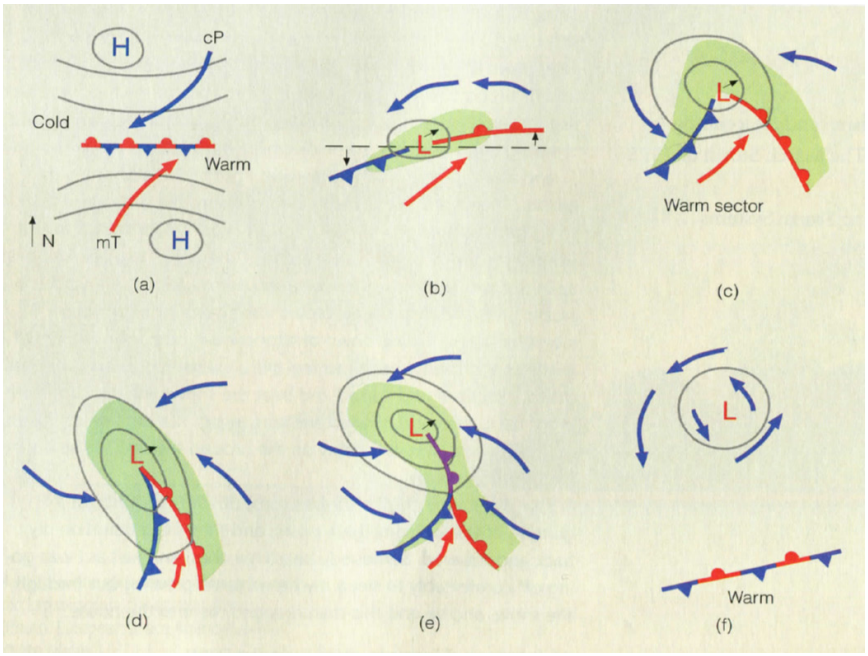


Figure 2(a) and (f). Plots showing the formation of mid-latitude cyclonic flows and the associated polar fronts.
Source: From C.D. Ahrens, Thomson Publications.

Figure 2 illustrates the formation of a warm and cold polar front caused by the presence of cold continental polar air (*cP*) displacing warmer, less dense maritime tropical air (*mT*). The Figure shows how in the initial phase of cyclogenesis there are two anticyclonic centres *(H*), with cold air masses (*cold*) at higher latitudes and warmer (*warm*) air masses further south. The separation between the two air masses is called a polar front, a cold front if the colder air mass tries to displace the warmer air mass and conversely a warm front if the opposite occurs.

The motion of cyclonic circulation causes the warm and the cold air masses to reach a situation in which they mix, giving rise to a third air mass that could be termed tepid, thus producing a new type of front called an occluded front. The formation of this front is an indication that the cyclonic flow cycle is coming to an end.

This conceptual model is relatively simple and somewhat incomplete. Numerical models that attempt to explain the three-dimensional movement of air masses have resulted in revisions to the Norwegian model, giving rise to another, more complex type of model in which air movements are treated as if they were similar to motion on a conveyor belt. These models take into account rising and falling air. An in-depth explanation is outside the scope of this article aimed at the general public.

High-impact lows

Hurricane force winds, heavy waves, and conditions producing high levels of precipitation or hail are in the main caused by several different sets of circumstances. This article focuses on three.

Bombogenesis

Mid-latitude vorticity formation can sometimes reach very fast levels of development and give rise to extremely adverse events. One example of this is a type of cyclogenesis that occurs in conditions of high thermal contrast between the warm and cold air masses that is much more pronounced than "ordinary" conditions.

These cases give rise to cyclonic flows that rotate at very high speeds, and the air is displaced upwards from lower layers very quickly. In these conditions, pressure at ground level decreases appreciably. When this happens at middle latitudes, if the pressure decreases between 9 and 10 hPa in 12 hours or even 18 or 20 hPa in 24 hours, we say that explosive cyclogenesis occurs, with the formation of low-pressure areas that can have very severe repercussions.

To understand how structures of this kind can form, we need to bear in mind that there has to be an interaction between two phenomena occurring concurrently. On the one hand, there has to be cyclonic flow at low levels, a wave when all is said and done, with a sharp contrast between cold dry air and warm moist air. Vorticity begins and the warm air starts to rise, causing different situations that serve as triggers.

1. Very strong winds at high levels (sometimes in the presence of a trough) can draw the air from lower layers upwards. This causes the low pressures at ground level to deepen and quickly increases vorticity. That is why this situation is termed explosive.

2. It can also happen that there is a warmer than usual air mass at high levels (in fact this is a warm anomaly that causes the geopotential to be situated at a lower level than "usual"). In these conditions it may interact with the warm, moist air layers as they rise, producing a form of circulation that in meteorological terms is called a deepening of the low, which develops rapidly and can become explosive.

3. A variation on the preceding case is a break in the tropopause that allows warmer, very dry air to enter from the stratosphere, the layer of the atmosphere located above the troposphere. That air then "replaces" the troposphere. In these cases, interaction with strong convection from the lower layers can result in explosive cyclogenesis.

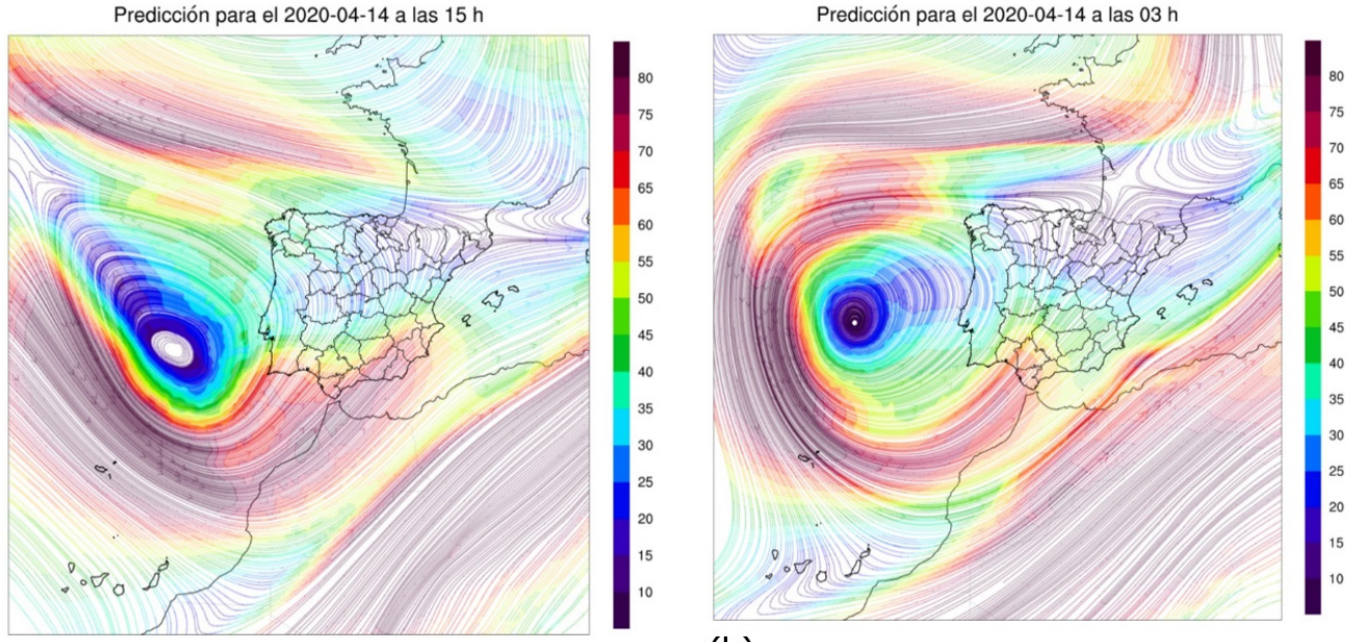
We should not overlook the fact that there must be a contrast between a cold (and therefore dry) air mass and other warmer, moister than usual air masses at ground level. One of these situations may be caused by the remnants of a

tropical cyclone whose course has shifted to higher latitudes, where it can be located next to a cold air trough. This gives rise to a strong thermal contrast, which is one of the elements necessary to produce cyclogenesis that can turn explosive, with very strong winds.

Higher level cut-of lows

A closed low pressure system, or cut-off low, occurs when the jet stream shifts from its usual latitude more or less at around 60º to other, lower latitudes, giving rise to an offshoot that is ultimately cut off from the general circulation. This shift moves cold, dry air at high levels towards other regions where the air mass is warm and moist at lower levels. This strong thermal contrast causes the air to rise, creating a vortex and cyclonic flow. The result is a system that can result in heavy precipitation. It is not explosive but rather a consequence of a twist in the flow, as shown in Figures 3(a) and 3(b). That Figure depicts the wind at the level of 300 hPa at a height of about 9,000 m. Formation of a closed low pressure system west of Portugal caused by displacement of the polar jet stream is observable. The air current lines have been plotted in this case and show that once the closed low pressure system has been isolated, the "eye" of the jet stream appears, circulating around the cyclone.

The precipitation associated with closed low pressure systems depends on a series of factors: first of all, inputs from low levels. The warmer and moister the air that is displaced upwards and the greater the vertical thermal gradient, the heavier the precipitation. If, moreover, the disturbance is long-lasting, the likelihood that greater impacts will be produced becomes higher. This happens with some frequency in the Mediterranean region, but it is not exclusive to that region. There are important indicators suggesting that we are going through a period in which situations of this type are increasing in different parts of the world.



Figures 3 (a) and 3 (b). Plot of wind at the level of 300 hPa according to models used by the Atmospheric Physics Group at the University of León. Regions with very high speeds, a sign that the jet stream is present, are the regions with the highest intensities. Figure 3(a) shows a closed low pressure system in formation, Figure 3(b) shows it already formed. An "eye" can be seen in both cases, an indication that high vorticities are present.

Mesocyclones

What can sometimes happen at middle latitudes is that an area of mesoscale rotation appears, produced by highly organised convection caused by rising warm, moist air. This is what happens in the case of storms.

We can, rather infrequently but by no means exceptionally, have small cyclones called mesocyclones with highly organised convection centred around a single central axis inside the storm. These structures are formed by a vortex of air that is usually not more than 10 km in diameter. When this occurs, we speak of supercells that have a structure that can be mapped using weather radar. We have measured (and experienced) ascending currents with speeds higher than 20 m/s on scientific flights through storms of this kind.

Hydrometeor measurements in these cases taken using instruments suitable for these observations have yielded interesting data. The surveys we have conducted in the framework of the EURICE project using the INTA (Spanish abbreviation for National Aerospace Technology Institute) cloud physics platform showed that as a storm grows more intense, microphysically speaking it becomes more organised. That is, regions where different processes are taking place can be distinguished inside the storms. When the storm starts to dissipate, that organisation begins to be dispelled, and hydrometeors become much more mixed.

Figure 4 depicts the cloud particles observed and measured on one of those flights inside a hailstorm. Cloud physics instruments of this kind are capable of taking and even classifying images particle by particle. The scale of the vertical bar is about 1.12 mm. Larger, irregularly shaped hydrometeors are termed “graupel” and in this case are the nuclei of hailstones. The rounder images are supercooled water droplets (less than 0°C). The smallest, most irregularly shaped ones are ice crystals. The particles that have been classified appear in black, particles that have not been classified appear in red (the latter are usually termed “artefacts”).

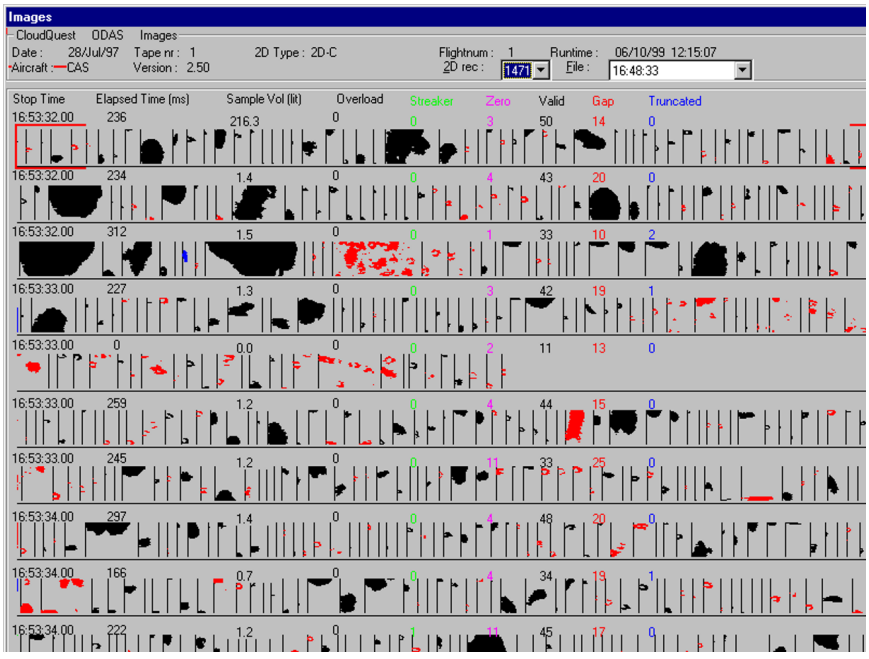


Figure 4. Images of hydrometeors taken on a flight into a hailstorm (explained in the text). Most can be seen to be hailstone nuclei.

On some flights the author has been able to make into summer hailstorms, the fastest ascending currents inside the storm tend not to be less than 10 m/s, allowing the hailstones to stay inside the storm until they grow to a size where they weigh too much, when they precipitate out. That is why it is not uncommon for hailstones as large as 10 cm to fall. Figure 5 shows two images of the aftermath of storms of this kind, like one that took place in Alcañiz on 16 August 2003.

Figure 5. The aftermath of hail that fell in Alcañiz on 16 August 2003. At left, holes left in a PVC table, and at right, one of the hailstones that fell, an aggregation of hailstones cemented together by supercooled liquid water (SLW) as if it were glue.

Storms that have one of these mesocyclones inside produce both intense precipitation and high winds. This imparts added energy to the hail, so the force they strike with is much greater and the damage caused is also greater. The left-hand image in Figure 5 is an example of this.

Supercells may very occasionally be accompanied by tornados. They are not entirely uncommon in the Iberian Peninsula. They tend to be highly localised, making it difficult to record them. There are usually more than 200 in Europe each year, and it is likely that the Iberian Peninsula has around 10 a year. They are nearly always low in intensity. We also need to take into account comparable phenomena that take place at sea, where they are called waterspouts. They tend to be more highly concentrated around the Balearic Islands, where they are feared because of the damage they do to boats.

Some cases of highly adverse cyclones

The remnants of extratropical cyclones have sometimes reached the Canary Islands. This is very unusual but should not be overlooked.

The storms Gloria and Filomena are two examples of events like those described. They caused heavy economic losses, and much has been written about them. They are extreme cases, but as mentioned at the beginning of this article, because of their consequences they are not readily forgotten.

Modelling and improved systems for making observations have made it possible to make progress in detecting and predicting these events. One very interesting case, to some extent forgotten, took place on 11 March 2011.

There was a break in the troposphere with intense penetration by stratospheric air to a height of 600 hPa. Modelling has provided much more detailed information about that episode. The snowfalls in the mountain ranges near Segovia and Madrid were spectacular .

Figure 6 is a representation of the vertical profiles for the PVU value (potential vorticity related to the dynamic troposphere height) in the vicinity of the Navacerrada (Segovia) mountain pass. The values in red are equivalent potential temperature[1] (EPT) and the values in green are humidity relative to 100%. These situations are opportunities to further our knowledge of disturbances caused by sudden stratospheric collapses.

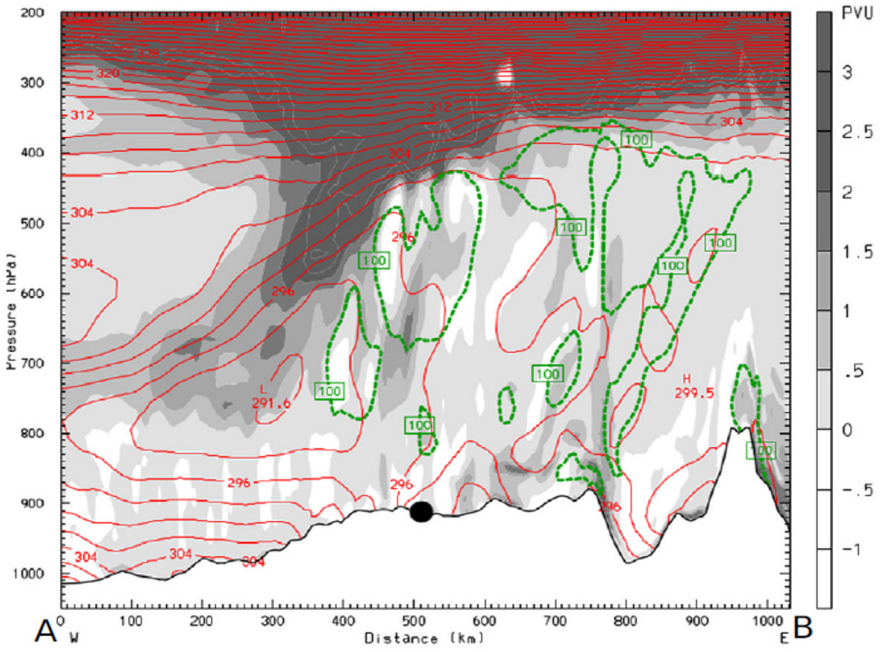


Figure 6. Figure 6. Vertical profiles for PVU and EPT along the W–E axis in the vicinity of the Navacerrada mountain pass (explained further in the text). A PVU value of 1.5 or higher is indicative of inputs of air from the stratosphere. The black dot shows the location of the Navacerrada mountain pass.

As long as the planet continues to warm up, the atmosphere will have more energy available to use in its processes. It is nearly impossible to attribute a given "anomalous" event to global warming, but it seems reasonable to expect extreme whether phenomena to become more common. This is not the same as saying that they are new. What the data do show is that they are becoming more frequent.

[1] Equivalent potential temperature is the temperature that a volume of air would have if all the moisture it contains was condensed and it was compressed adiabatically (i.e., without exchanging heat with its surroundings) to a reference level of 1,000 hPa. It is helpful in determining the source of the air, because this value is conserved rather well through all the changes experienced by air masses.

References:

Ahrens C.D. Meteorology Today. Thomson 7th ed. 2002.

Gascón E.; J.L. Sánchez; S. Fernández-González; L. Hermida; L. López; E. García-Ortega; A. Merino. Monitoring a convective winter episode of the Iberian Peninsula using a multichannel microwave radiometer. Journal of Geophysical Research. 120 - 4, pp. 1565 - 1581. 2015.

Gascón E.; J.L. Sánchez; D. Charalambous; S. Fernández-González; L. López; E. García-Ortega; A. Merino. Numerical diagnosis of a heavy snowfall event in the center of the Iberian Peninsula. Atmospheric Research. 153, pp. 250 - 263. 2015.

Michaelides S.; T. Karacostas; J.L. Sánchez; et al. (3/). 2018. Reviews and perspectives of high impact atmospheric processes in the Mediterranean Atmospheric Research. 208, pp. 4-44.

Tapiador, F.J.; Villalba-Pradas, A.; Navarro, A. Martín A.; Merino, A.; García-Ortega, E.; Sánchez, J.L.; Kwonil K.; Gyuwon L. A satellite view of an intense snowfall in Madrid (Spain): The storm 'Filomena' in January 2021 Remote Sensing. 13-14, pp. Art. 2702.

The claims incurred from Gloria

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Territorial Representative of the CCS in Catalonia

Introducción

Consorcio de Compensación de Seguros (CCS) uses the term "claims experience" (siniestralidad for the Spanish) to describe a set of losses covered under Extraordinary Risk Insurance when they occur in one or more geographical zones within a relatively short time-span, which, in the case of those that are meteorologically induced, ranges from 1 to 7 days.

What we have come to refer to as "the Gloria claims experience" comprises loss events that took place from 18 to 25 January 2020, and at its core was the "storm Gloria", which the State Meteorological Agency (AEMET) described thus:

AEMET dubbed the depression (the seventh of the 2019-2020 period) Gloria on Friday 17 January at 00:00 UTC (01:00 local peninsular time) due to the issuing of red and orange alert levels in view of the gusts of wind, rain, snow and coastal phenomena that materialised from early in the morning of Sunday, 19 January across a sizeable portion of the north and east of the Iberian Peninsula, as well as over the Balearic Islands. Depression Gloria lasted as such only briefly, since it was absorbed by a larger low pressure system centring on the south of the Peninsula over the course of Monday, 20 January, which remained active throughout the rest of the week. The wind, rain, snow and sea storm which Gloria triggered and which the broader low-pressure area continued over the following few days was exceptional in nature, on account of both the meteorological readings and the effects experienced,
(...)

According to data from the Civil Protection Service and other sources, the tally of deaths which can be linked to Gloria was 13 (as well as three missing persons), most of them in the Mediterranean over 20 and 21 January. There were also interruptions across the road and rail networks, electricity and telephone services were disrupted, the snow left some population centres cut off, several rivers burst their banks and both seafronts and large sections of the coast were destroyed, especially in the Ebro delta, which was completely flooded.[1]

The extent of extraordinary flooding was very substantial, with 16,926 claims recorded in 913 municipalities in the regional autonomies of Catalonia, Valencia, Andalusia, the Balearic Islands, Murcia and Aragon at a cost of some 145.35 million euros.

Leading the way in the breakdown of the number of claims by kind of property were (as is usually the case) homes and condominiums with 11,047 claims, while business risks stood out in terms of overall costs, which, altogether totalled 73.82 million euros. The highest average costs were for civil works, notably harbour facilities, which were hard hit by sea-wash.

Turning to personal injury, the most recent figures put this at 13 deaths and 4 missing persons, mostly in Catalonia and the Balearic Islands and in the main attributable to the storm at sea.

[1] https://www.aemet.es/es/conocermas/borrascas/2019-2020/estudios_e_impactos/gloria

Figure 1. Gloria at midday on 19 January, with its focal point lying between Ibiza and Cape Nao (MODIS image from the SUOMI-NPP satellite) (AEMET).

A low-pressure storm as such is not a cause for a claim which CCS covers, but instead it should come under one of the forms of cover in Art. 2) of the Extraordinary Risk Insurance Regulations (RD 300/2004, hereafter the "Regulations"). In Gloria's case, two of the causes in the regulations were present:

- The extraordinary flooding defined in Art. 2.1.c) of the Regulations[2], in both manifestations of this: flooding of land and sea-washes.

- Atypical Cyclonic Storms (TCAs, for the Spanish) where these feature gusting of wind at over 120 km/h, as defined in Art. 2.1.e), 4 of the Regulations[3].

This two-fold cause gives rise to a doubling up of handling work, since CCS deals with flooding claims from start to finish (reporting, adjustment and payment), whereas almost all claims caused by TCAs are initially handled and settled by private insurers who subsequently apply for reimbursement via the mechanisms defined in the agreements which CCS and the insurance industry (represented by UNESPA, the Spanish Union of Insurance and Reinsurance Companies) enter into.

The handling of this claims experience was particularly complex: the causes of claims were numerous, it took in a vast geographical expanse and it followed hard on the heels of the historic cut-off lows of September and October 2019, while the Covid-19 lockdown was ordered at a typically critical moment some 40 days after the event. For the whole of this scenario, this marks the culmination of a period which put to the test the organisation's ability to tackle a situation of supreme stress which had to be sorted out just when Covid-19 left society in a state of shock and suddenly forced working from home to become widespread.

[2] c) Extraordinary flooding: flooding of land caused by the direct action of rainwater, from thawing or lakes that have a natural outlet, from rivers or sea inlets, or from natural surface water courses when they overflow their usual channels, and sea-washes on coasts. This shall not be taken to include the kind caused by water from dams, canals, drains, main sewers and other underground watercourses built by man when they burst, break or stop working due to factors that do not count as extraordinary risks covered by Consorcio de Compensación de Seguros, nor rain that has fallen directly on the insured risk, or which has collected on its decking or terraced roof, in its drainage system or courtyards.
[3] 4º.- Extraordinary winds, defined as those with gusting at over 120 km per hours. Gusting shall be understood to mean the greatest wind-speed maintained over a three-second interval.

The situation which the cut-off lows of September and October 2019 gave rise to has been examined in another article, so we will not delve any further into it. We shall merely recall that in January 2020 the CCS network of adjusters and its claims-handling structure were still experiencing a high degree of stress given the magnitude of those particular claims experiences and the flooding and sea-washes which came afterwards in November and December, when these occurred against the backdrop of depressions Amelie, Bernardo, Cecilia, Daniel, Elsa and Fabien. Thus, when the CCS had to face up to this event in January 2020 it did so with its network of adjusters and all of its central and territorial units handling compensation pay-outs under huge strain.

With regard to adjustment work, in combination with adequate allocation of available adjustment resources both novel usage of tele-adjustment and the cooperation of the insurance industry made it possible to take on this challenge within reasonable time-frames. With respect to internal management, the situation was overcome thanks to the fact that the organisation already had a tried and tested technology infrastructure in place so as to be in a position to share out the workload among the whole network of local offices, meaning that the pace of pay-outs kept up with that of adjustment work, albeit not without a huge effort.

Extraordinary flooding

The extent of extraordinary flooding was very substantial, with 16,926 claims recorded in 913 municipalities in the regional autonomies of Catalonia, Valencia, Andalusia, the Balearic Islands, Murcia and Aragon at a cost of some 145.35 million euros.

Leading the way in the breakdown of the number of claims by kind of property were (as is usually the case) homes and condominiums with 11,047 claims, while business risks stood out in terms of overall costs, which, altogether totalled 73.82 million euros. The highest average costs were for civil works, notably harbour facilities, which were hard hit by sea-wash.

Turning to personal injury, the most recent figures put this at 13 deaths and 4 missing persons, mostly in Catalonia and the Balearic Islands and in the main attributable to the storm at sea.

The claims experience was not even across all zones and neither were costs uniform among them. The biggest differences arose due to the force of sea-wash, a factor that is normally associated with serious losses, as well as from the variation in risk values according to whether these were located in industrial or holiday areas or zones having extremely disparate economic levels. We will now examine these characteristics for the claims in Catalonia, the Valencian Autonomous Community, the Balearic Islands and Andalusia, since this is where we find the greatest losses.

Province	Nº of Municipalities	Claims	Cost	Average cost
Barcelona	219	3,825	44,718,324.98 €	11,691.07 €
Girona	171	2,226	39,517,103.17 €	17,752.52 €
Tarragona	84	1,148	12,910,450.62 €	11,246.04 €
Lleida	42	102	600,034.15 €	5,882.69 €
Catalonia, Total	516	7,301	97,745,912.92 €	13,388.02 €
València/Valencia	160	2,909	8,366,106.44 €	2,875.94 €
Castelló/Castellón	34	1,787	10,262,880.61 €	5,743.08 €
Alacant/Alicante	83	1,716	9,280,109.23 €	5,407.99 €
Valencian Autonomous Community, Total	277	6,412	27,909,096.28 €	4,352.64 €

Province	Nº of Municipalities	Claims	Cost	Average cost
Málaga	22	2,330	13,197,980.91 €	5,664.37 €
Almería	9	21	41,532.30 €	1,977.73 €
Granada	3	4	4,042.07 €	1,010.52 €
Andalusia, Total	34	2,355	13,243,555.28 €	5,623.59 €
The Balearic Islands	50	462	5,462,285.17 €	11,823.13 €
Murcia	22	355	798,975.80 €	2,250.64 €
Teruel	10	38	176,596.76 €	4,647.28 €
Zaragoza	3	3	19,902.47 €	6,634.16 €
Aragon, total	13	41	196,499.23 €	4,792.66 €
Gloria flooding, total	913	16,926	145,356,324.68 €	8,587.75 €

Kind of property	Claims	Cost	Average cost
Homes and condominiums	11,047	40,170,177.35 €	3,636.30 €
Motor vehicles	2,934	9,860,858.36 €	3,360.89 €
Shops, stores & warehouses and other simple risks	2,380	57,607,108.26 €	24,204.67 €
Offices	110	1,203,190.66 €	10,938.10 €
Industrial	354	15,011,476.12 €	42,405.30 €
Civil works	101	21,503,513.93 €	212,906.08 €
Gloria flooding, total	16,926	145,356,324.68 €	42,405.30 €

Flooding in Catalonia

In Catalonia river discharges rose sharply to flood levels, causing, among other losses, major damage to water treatment and distribution infrastructure, although overflows were not widespread, with the significant exception of the river Tordera at the border between the provinces of Barcelona and Girona, where costs were also very high. At the same time the sea prompted very serious wash losses, especially to harbours and uninsured public property, such as seafronts and beaches.

Losses were spread over wide areas, particularly on the coast, with claims reported from 516 municipalities, 54% of the regional autonomy, this rising to 77% in the province of Girona and 70% in that of Barcelona. Even so, the figure of 100 claims was only surpassed in 11 municipalities and in the vast majority we find less than 10, with an average of 14.

Province	Municipalities	Municipalities with claims	% of municipalities with claims	Claims	Claims / Municipality
Barcelona	311	219	70%	3,825	17
Girona	221	171	77%	2,226	13
Lleida	231	42	18%	102	2
Tarragona	184	84	46%	1,148	14
Cataluña	947	516	54%	7,301	14

Province	Municipality	Claims	Cost	Average cost
Barcelona	Malgrat de Mar	1,037	8,895,413.20 €	8,578.03 €
Barcelona	Castelldefels	653	3,177,370.80 €	4,865.81 €
Tarragona	Cambrils	196	1,183,050.76 €	6,035.97 €
Girona	Blanes	170	4,132,846.74 €	24,310.86 €

Province	Municipality	Claims	Cost	Average cost
Girona	Girona	169	5,369,137.77 €	31,770.05 €
Barcelona	Barcelona	145	6,409,321.00 €	44,202.21 €
Tarragona	Mont-Roig del Camp	142	1,654,682.26 €	11,652.69 €
Girona	Tossa de Mar	128	1,310,125.29 €	10,235.35 €
Barcelona	Tordera	124	1,551,019.39 €	12,508.22 €
Tarragona	Tortosa	117	218,956.58 €	1,871.42 €
Barcelona	Sant Pol de Mar	104	626,233.37 €	6,021.47 €

Kind of property	Claims	Estimated cost	Average cost
Homes and condominiums	4,538	16,669,090.63 €	3,673.22 €
Motor vehicles	1,066	3,477,489.07 €	3,262.18 €
Shops, stores & warehouses and other risks	1,275	42,138,999.32 €	33,050.20 €
Offices	59	845,107.61 €	14,323.86 €
Industrial	275	13,508,770.74 €	49,122.80 €
Civil works	88	21,106,455.55 €	239,846.09 €

The wide dispersal of claims was highly significant from the point of view of managing adjustment work, requiring adjusters to be highly mobile and spend a lot of time travelling, which made organising zones more complicated and slowed down the pace of visits. On top of this, a large portion of the risks concerned were in tourism areas or those where second homes were located, meaning that they were unoccupied when the flooding took place, for which reason flood scenarios were often only discovered and reported at a late stage, with many of them involving very tight time-frames in which to arrange visits.

Such dispersal is typical of heavy yet short-lived bursts of rain without overflowing of rivers - so called pluvial floods or run-off flooding. The water does not tend to cover wide areas but instead builds up where the topography favours this —in hollows and gullies and low-lying plains– or on account of urban development, which hinders the ground from soaking up the water so it penetrates risks directly from street level and prompts flow-backs to private drainage systems from the public sewerage or drainage network by overloading it or due to design defects. Such claims experiences do not usually involve high average costs as the water does not climb very high, except in basements.

The "extraordinary flooding in the zone" which Art. 6 g) of the Regulations[4] refers to was concentrated in just a few municipalities (mainly those in the Tordera and Castelldefels delta) while the rest were excluded from the movements of hillsides and landslides which rainfalls absorbed by wholly or partially exposed slopes tend to provoke.

The flooding in the municipality of Castelldefels, which lies in the area around the Llobregat delta (largely flat and at a low height above sea level) was the only significant instance of a concentration of losses primarily caused by rain-water flooding, with 653 claims. The average cost of 3,177 euros illustrates how the flooding was relatively less severe, as well as the lack of industrial risks.

[4] Article 6. Excluded risks.
(...)
g) Those caused by natural phenomena other than those stated in article 1 and, in particular, those occurring due to a rising water table, movement of hillsides, landslides or a build-up of earth, rock-falls and similar phenomena, unless these were evidently caused by the action of rain-water which also caused a situation of extraordinary flooding in the area and they occurred simultaneously with the flooding.

The worst-affected zone was the area surrounding the final stretch of the river Tordera in the municipalities of Blanes, Tordera, Malgrat de Mar and Palafolls, where rainfalls, overflows and sea-wash all combined and 1,416 claims were reported at a cost of 16.55 million euros.

Notable in the flooding were the cost in the industrial areas in the vicinity of the river and the high number of claims at several campsites located within its delta, where it caused losses to both their facilities and hundreds of caravans parked there.

The flooding at campsites prompts us to reflect on how vulnerable such premises are, often (and clearly in this case) being located in evidently floodable areas. This loss event did not turn into a tragedy thanks to the fact that occupancy was minimal in the winter season when this happened.

Overflowing of the river Tordera (Blanes, Tordera, Malgrat de Mar and Palafolls)	Claims	Cost
SHOPS, STORES & WAREHOUSES AND OTHER RISKS	131	6,186,493.45 €
INDUSTRIAL	22	1,432,858.74 €
CIVIL WORKS	5	3,427,389.76 €
OFFICES	3	571,427.62 €
MOTOR VEHICLES	233	792,354.24 €
HOMES AND CONDOMINIUSM	1,022	4,138,978.12 €
Total for the river Tordera overflow (Blanes, Tordera, Malgrat de Mar and Palafolls)	1,416	16,549,501.93 €

> Note: caravans mostly appear as homes, although they may feature as motor vehicles depending on the type of insurance, which is in turn according to whether they are used as mobile caravans or stationary homes, the latter being true in by far the majority of cases.

The sea-wash or coastal flood along virtually the entire coast was the most costly event, given that overall, even though it accounted for only 7% of losses, it represented 30% of the claims experience figure at 29.119 million euros, causing very substantial damage to harbour areas, especially marinas, at a cost of 11.08 million euros.

The sea's encroachment hit the paddy fields in the Ebro delta very hard, which did not have Extraordinary Risk Insurance cover, although they did have this under Combined Agricultural Insurance.

Cause	Claims	% of Claims	Cost	% of Cost
Flooding	6,764	93%	68,626,969 €	70%
Coastal Flood	537	7%	29,118,943 €	30%
Catalonia, total	7,301		97,745,912.92 €	

Finally, owing to the immense volume of water flowing and dragging matter from rivers along with it, there were losses to numerous items of water distribution and purification infrastructure, reaching a cost of some 6.07 million euros.

Flooding in the Valencian Region

Developments during storm Gloria in the Valencian Region were in certain respects similar to those in Catalonia, particularly with regard to the extent and dispersal of claims, how tourist areas were affected and the major losses which coastal flooding brought about, the scale of which was relatively greater than in Catalonia, in terms of both number of claims and cost, and this accounted for 45% of losses.

Cause	Claims	% of Claims	Cost	% of Cost
Flooding	5,039	79%	15,372,116.28 €	55%
Coastal Flood	1,373	21%	12,536,980.00 €	45%
Valencian Autonomous Community, total	6,412		27,909,096.28 €	

Although there were no substantial breakage or averages at harbours or in civil works that were insured, the damage on seafronts and beaches was naturally very extensive, especially in Valencia province, even in the capital.

The sea-wash reached the buildings ranged along the sea-front where catering businesses tend to concentrate and the impact of the wave hits hardest and causes the greatest damage. Nonetheless, in several population centres the water penetrated as far as the third line of buildings or even further inwards, helped along by the orientation of the beach or features of the terrain.

Run-off flooding by rainwater was very abundant and in many municipalities this coincided with sea-wash. The river Júcar was also seen to burst is banks near its mouth in Cullera (Valencia), without any serious consequences for insured property.

While still relatively widespread, claims were somewhat less dispersed than in Catalonia, with an average of 23 losses reported per municipality, though those municipalities with over 100 losses were more numerous. Within this reach we can highlight two major zones:

- The coastal northern part of the province of Castellón, including places such as Peñíscola, Benicarló or Vinaroz. Quite apart from political and administrative divisions, this area was part of the same storm phase that affected the Ebro delta, with an extremely high proportion of losses associated with sea-wash.

- The southern half of Valencia's coast and the northern part of that of Alicante, from Valencia's metropolitan zone as far as Jávea, where the sea-wash was very substantial and the particularly heavy downpours of rain caused multiple losses relating to run-off.

The degree to which civil works were affected by sea-wash or flooding was barely 1%, whereas 51% concerned dwellings, 38% related to shops and simple risks and 7% to motor vehicles. The share involving industry was minimal, at only 3.5% of the cost.

Province	Municipalities	Municipalities with claims	% of municipalities with claims	Claims	Claims / Municipality
Castelló/Castellón	135	34	25%	1,787	53
Alacant/Alicante	141	83	59%	1,716	21
València/Valencia	266	160	60%	2,909	18
Valencian Autonomous Community	542	277	51%	6,412	23

Province	Municipality	Recorded claim applications	Estimated cost	Average cost
Castelló/Castellón	Peníscola/Peñíscola	719	6,401,878.62 €	8,903.86 €
Alacant/Alicante	Dénia	563	2,587,033.15 €	4,595.09 €
València/Valencia	Daimús	366	884,619.13 €	2,416.99 €
Castelló/Castellón	Moncofa	281	809,032.23 €	2,879.12 €
València/Valencia	Cullera	254	1,091,934.06 €	4,298.95 €
València/Valencia	Oliva	243	893,682.77 €	3,677.71 €
València/Valencia	Tavernes de la Valldigna	234	943,587.69 €	4,032.43 €
Alacant/Alicante	Altea	188	2,117,218.50 €	11,261.80 €
Alacant/Alicante	Jávea/Xàbia	186	1,718,007.79 €	9,236.60 €
València/Valencia	València	160	603,377.32 €	3,771.11 €
Castelló/Castellón	Almassora	147	411,800.23 €	2,801.36 €
València/Valencia	Gandia	121	315,583.38 €	2,608.13 €
València/Valencia	Xàtiva	116	298,267.32 €	2,571.27 €
Castelló/Castellón	Benicarló	115	390,137.59 €	3,392.50 €
València/Valencia	Miramar	113	193,043.00 €	1,708.35 €
València/Valencia	Sueca	108	238,570.43 €	2,208.99 €
Castelló/Castellón	Almenara	104	817,963.71 €	7,865.04 €

Kind of property	Claims	Estimated cost	Average cost
Homes and condominiums	4,873	14,135,225.06 €	2,901 €
Motor vehicles	713	1,862,736.79 €	2,613 €
Shops, stores & warehouses and other risks	733	10,654,244.79 €	14,535 €
Offices	28	54,015.49 €	1,929 €
Industrial	54	943,523.98 €	17,473 €
Civil works	11	259,350.17 €	23,577 €

Together with the dispersal and relative significance of sea-wash, the third distinctive feature of this claims experience is that losses largely affected second homes and tourist facilities, such as bars, restaurants and hotels, precisely due to being located in the immediately vicinity of the coastline. As has already been pointed out, the claims experience in the low season for tourist areas makes it more complicated to organise timetables for adjusters, given that there are certain properties that cannot be visited until some months have passed since the loss event and several visits have to be made on public holidays, etc. For example, Peñíscola has a stable population of around 8,000 inhabitants which rises to 120,000 in summer, so 93% shifts location and a very high proportion of properties are shut off-season, not just the homes but also a large segment of business and catering operations that attend exclusively to visitors.

Flooding in Málaga

In Andalusia the flooding took place almost solely in the province of Málaga, particularly in the capital, which led to a very different pattern of claims experience to those in Catalonia and the Valencian Region. Losses were concentrated geographically in an urban setting and involved usual places of residence rather than holiday homes, while there was no damage from sea-wash. This urban aspect led to a considerable relative share of the total in vehicle claims, at 54% by number and 33% by cost. This was thus the largest item; even bigger than homes.

Only Málaga itself and Torremolinos topped 100 claims and, of the other four municipalities which saw over 50, three were in the immediate vicinity.

Flooding was especially fierce in the Campanillas working-class district of Málaga because the river of the same name burst its banks. This is a low-income "dormitory suburb" where we can find an abundance of basements fitted out as homes, which were flooded to the top. The water knocked down walls of schools, carried off several vehicles and destroyed shop windows. The event was exceptionally serious from a social standpoint, as it affected many families who experienced great hardship in replacing even their most basic belongings, which called for a particularly swift and considerate response from the CCS.

Although this concerned a poor urban cluster, the force of the spate and the layout of the zone caused the average cost of damage to homes and condominiums was comparatively high, at 6,443 euros, although this was obviously far below the like figure for the Balearic Islands (11,445 euros) which was brought about in districts populated by those with significant purchasing power.

Municipality	Claims	Cost	Average cost
Málaga	1,708	11,377,023.65 €	6,661.02 €
Torremolinos	174	554,248.92 €	3,185.34 €
Cártama	79	239,491.32 €	3,031.54 €
Marbella	74	172,891.32 €	2,336.37 €
Coín	72	145,952.68 €	2,027.12 €
Alhaurín de la Torre	55	321,027.73 €	5,836.87 €

Kind of property	Claims	Estimated cost	Average cost
Motor vehicles	916	3,808,515.98 €	4,158 €
Homes and condominiums	575	3,704,484.03 €	6,443 €
Shops, stores & warehouses and other risks	188	3,291,763.16 €	17,509 €
Offices	18	295,866.17 €	16,437 €
Industrial	10	147,128.54 €	14,713 €
Civil works	1	129,265.77 €	129,266 €

Flooding in the Balearic Islands

The low-pressure storm in the Balearic Islands hammered tourist areas particularly hard and the effects of the sea-wash were proportionally the greatest.

The losses essentially took place on the island of Majorca, on the southwestern and north-eastern coast and in some inland areas and, to a lesser extent, on the island of Minorca. In no municipality did they exceed 100, the places with most losses being Manacor, due to rain, and Felanitx, a coastal town affected by coastal flooding, with almost triple the cost.

As we saw with the claims experiences in Catalonia and the Valencian Region, sea-wash has tremendous destructive capacity. It can produce very high costs, most of all if it affects infrastructure, as in the case of Catalonia. Defined as a form of flooding in the Regulations, it is not a straightforward case of the immersion of items in water, since it entails the added harmful impact of the mechanical energy which wave action provides; it does not merely engulf objects in water but it also breaks them, physically undermines building structure and is capable of causing serious damage to major infrastructure, among other end results.

In the case of the Balearic Islands the sea-wash mainly struck high-end homes and residential communities forming condominiums, forcing up total and average costs. It was precisely the homes and condominiums that accounted for the most claims (79%) and cost (77%) in the claims experience, and the average cost of these (11,445 euros) is strikingly greater in comparison with that for the Valencian Autonomous Community (2,901 euros) and given similar causes. This speaks to the disparate force of the phenomenon, as well as the discrepancy in the value of properties.

Cause	Claims	% of Claims	Cost	% of Cost
Flooding	290	63%	2,732,388.09 €	50%
Sea-wash	172	37%	2,729,897.08 €	50%
The Balearic Islands, total	462		5,462,285.17 €	

Kind of property	Claims	Cost	Average cost
Homes and condominiums	365	4,177,415.07 €	11,444.97 €
Motor vehicles	26	109,538.99 €	4,213.04 €
Shops, stores & warehouses and other risks	62	843,306.80 €	13,601.72 €
Offices	3	6,425.28 €	2,141.76 €
Industrial	5	317,156.59 €	63,431.32 €
Civil works	1	8,442.44 €	8,442.44 €

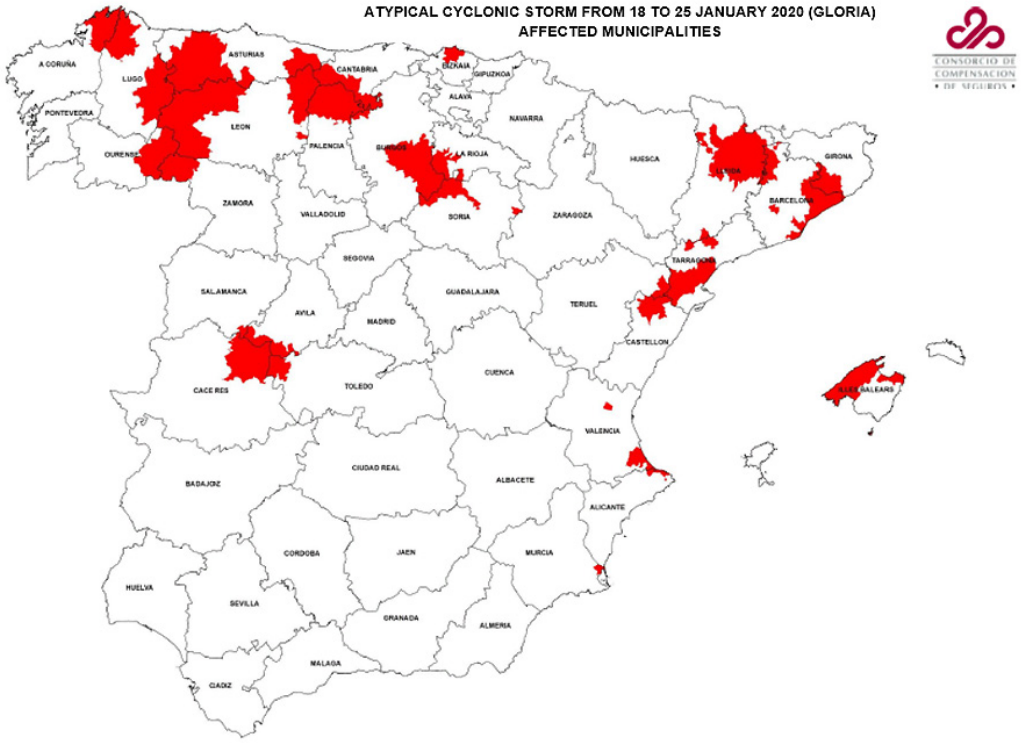
Island	Municipality	Claims	Cost	Average cost
Mallorca	Manacor	97	650,224.57 €	6,703.35 €
Mallorca	Felanitx	87	1,609,683.62 €	18,502.11 €
Mallorca	Santanyí	45	532,964.00 €	11,843.64 €
Mallorca	Sant Llorenç des Cardassar	36	360,459.43 €	10,012.76 €
Menorca	Sant Lluís	35	1,097,625.74 €	31,360.74 €
Mallorca	Son Servera	22	46,011.00 €	2,091.41 €
Mallorca	Capdepera	18	287,809.99 €	15,989.44 €
Menorca	Ciutadella de Menorca	13	136,552.64 €	10,504.05 €
Mallorca	Palma	10	324,271.48 €	32,427.15 €

Wind loss (atypical cyclonic storm)

Accompanied by the rainfall and coastal flooding, storm Gloria had a strong wind component, which impacted on some of the flooded zones, though on several others besides. The simultaneity of these was significant in part of Lleida and on the Catalonian coast (although it also extended to the interior of Tarragona and penetrated Teruel), certain areas of the Valencian coast, at the boundary where the provinces of Valencia and Alicante meet, and on the western coast of Majorca.

The wind blew through a good part of the north of the peninsula without bringing flooding, where this affected the north and east of Galicia, part of Asturias and Cantabria, the southeast of La Rioja, the north of Cáceres in Extremadura and entered Castilla-La Mancha in Toledo and other areas of several provinces in Castilla y León that border on the latter zones, as well as part of Biscay and certain municipalities in Murcia next to the Mar Menor.

After the claims had been incurred, CCS asked AEMET for information on the zones that might have been affected by TCA. With events of this magnitude, the initial findings which AEMET offers are checked against the information received from the industry on strongly affected areas which might have been omitted for want of measurements. AEMET examines this information along with the data obtained from its teams and ultimately draws up a wind-speed map. Via a geo-referencing system, this is converted into a map of municipalities. By applying what is stipulated in the final sub-section of Art. 2.1.e) of the Regulations[5] , we arrive at the final delimitation of the coverage zone which extends to the municipalities, both where the data and estimates with regard to wind gust speeds are very reliable and those in the neighbourhood where some degree of doubt remains.



[5] For the purposes of geographically delimiting the area which the weather phenomenon described affected, Consorcio de Compensación de Seguros will furnish the State Meteorological Agency with any measurements beyond the latter's scope which it receives or may receive, so that the Agency can check them comparatively, and shall seek its collaboration in marking out the geographical delimitation by extrapolation of existing measurements using the most advanced scientific criteria with a view to achieving the greatest possible level of homogeneity in defining the area in question and avoiding exclusion of isolated points regarding which there is reasonable doubt, even if these might be lacking in specific measurements and taking into account readings taken in bordering municipalities and, where appropriate, those adjoining these.

In the case of the TCA named as Gloria, this geographical delimitation exercise which the CCS conducted was made public via a briefing note of 31 July 2020 that was disseminated via the CCS website and sent out to insurers through UNESPA. This also gave notice that the handling of reimbursement for pay-outs of compensation sums to insured parties by insurers would be processed pursuant to Clause 10 of the "collaboration agreement on the handling of claims and reimbursements arising from them on account of the materialisation of extraordinary risks". CCS and UNESPA signed a new addendum to this on 30 July 2020, thereby passing the specific aspects of handling, adjustment and pay-outs for claims into the form of a single document.

This addendum did not just reference the Gloria TCA but applied the same reimbursement system to a further four TCAs that occurred within a three-month period around Gloria:

- TCA from 11 to 14 December 2019.
- Daniel, Elsa and Fabien TCAs, from 16 to 22 December 2019.
- TCA in the Canary Islands from 22 to 24 February 2020.
- Jorge, Karine, Myriam and Norberto TCAs, from 27 February to 7 March 2020.

The addendum did not substantially change the system already in place since the handling of TCA Klaus, but instead retained and brought up-to-date certain enhancements already established following the handling of other TCAs that had taken place over the 10 years of the agreement's life; essentially the reduction of "dispatches" or blocks of case files which each insurer claims to two plus one reopening (this was originally three plus one) and the complete disappearance of paper-based processing work.

In broad terms the system consists of the payment of an advance of 80% of the amount claimed having received each dispatch, following which the sums involved in claims of over 30,000 euros and a sample from those of less than 30,000 euros are reviewed and adjusted by applying the conclusions from the sample analysis to the whole set of claims, while the possibility of double sampling exists if any of the parties does not consider the conclusions from the initial one to be representative. After the adjustment has been made, the resulting difference is settled. The reimbursements claimed after this process are examined on an individual basis.

An external team of adjusters performs the task of reviewing and adjusting, being supervised by another internal team of adjusters.

Not all of the private insurers are party to the agreement, mainly due to not being members of UNESPA (firms operating under the Freedom to Provide Services regime) or to specialising in business risks with terms and conditions that are not in harmony with the dynamics of the reimbursement process (large deductibles). There are also policies without wind coverage, especially in the line of auto insurance with only third-party coverage. In all these cases compensation is paid out under the usual procedure of direct settlement of claims to the insured. The figures which we provide in this article refer to reimbursement under both the agreement and these special circumstances.

Volume of claims and costs itemised by region in relation to TCA Gloria

As one might expect, the major TCAs which the wind causes produce a far higher number of claims than floods lead to (except in very extreme circumstances), although the average cost is much lower. Thus, compared to the cost of nearly 8,600 euros for flooding, windstorm does not even come to 1,400 euros, yet this does vary a lot depending on the ferocity experienced in each zone. Even though Aragon is an outlier relative to the mean with a very low number of claims in Teruel, it is Catalonia which has the highest average cost, and this despite the downward pressure which the large number of claims reported suggests. Within the rest of the scope of the TCA we only find significant figures in the Valencian Region and the Balearic Islands, which is consistent with the seriousness of the impact of sea-wash in the three autonomous communities; a phenomenon necessarily associated with wind.

This distribution is also in keeping with the notion of "Spain left empty", as large areas included within coverage are only scarcely populated with little economic activity, and ultimately have only small exposure.

Regional autonomy	Province	Claims	Cost	Average cost
Aragón	Teruel	25	122,588.23 €	4,903.53 €
Asturias	Asturias	30	13.913.60 €	463.79 €
Cantabria	Cantabria	2	319.38 €	159.69 €
Castilla - La Mancha	Toledo	4	1,000.35 €	250.09 €
Castilla y León	Burgos	646	446,395.71 €	691.02 €
Castilla y León	Ávila	116	124,297.77 €	1,071.53 €
Castilla y León	Soria	163	91,998.27 €	564.41 €
Castilla y León	León	79	59,333.15 €	751.05 €
Castilla y León	Palencia	84	50,367.52 €	599.61 €
Castilla y León	Zamora	12	11,133.92 €	927.83 €
Castilla y León	Salamanca	17	6,571.92 €	386.58 €
Castilla y León, total		1,178	27,920 €	787.71 €
Catalonia	Barcelona	28,981	41,527,407.66 €	1,432.92 €
Catalonia	Girona	1,172	2,930,125.27 €	2,500.11 €
Catalonia	Tarragona	428	754,972.62 €	1,763.95 €
Catalonia	Lleida	165	186,806.66 €	1,132.16 €
Catalonia, total		30,746	45,399,312 €	1,476.59 €
Valencian Region	València/Valencia	5,365	6,075,175.27 €	1,132.37 €
Valencian Region	Alacant/Alicante	1,876	2,344,320.15 €	1,249.64 €
Valencian Region	Castelló/Castellón	13	25,767.93 €	1,982.15 €
Valencian Region, total		7,254	8,445,263 €	1,164.22 €
Basque Country	Bizkaia	14	3,858.43 €	275.60 €
Extremadura	Cáceres	524	335,040.38 €	639.39 €
Galicia	A Coruña	56	57,720.65 €	1,030.73 €
Galicia	Lugo	71	52,887.58 €	744.90 €
Galicia	Ourense	17	8,078.76 €	475.22 €
Galicia, total		682	457,586 €	670.95 €
The Balearic Islands	Illes Balears	1,521	1,531,953.93 €	1,007.20 €
La Rioja	La Rioja	1	218.85 €	218.85 €
Murcia Region	Murcia	590	713,138.08 €	1,208.71 €
Gloria ACS, total		41,972	57,475,392.04 €	1,369.37 €

Risk class	Claims	Cost	Average cost
Homes and condominiums	37,693	34,293,702.47 €	909.82 €
Motor vehicles	2,109	19,571,020.47 €	9,279.76 €
Shops, stores & warehouses and other risks	1,594	2,821,950.66 €	1,770.36 €
Offices	449	510,117.22 €	1,136.12 €
Industrial	119	184,545.62 €	1,550.80 €
Civil works	8	94,055.60 €	11,756.95 €

Conclusion

The claims experience which the low-pressure storm Gloria caused represents one of the events having the most profound impact in the recent history of the CCS.

On the one hand, because of the concurrence of wind, flood and sea-wash losses, which in turn affected very diverse zones in Spain.

On the other hand, as regards its timing, Gloria took place over a time of major prolonged stress —it was preceded by a succession of high-impact claims experiences from September to December 2019, then followed up (right in the midst of the handling work for it) by the declaration of a state of emergency and lockdown prompted by Covid-19.

Finally, these circumstances led to a Public-Private Partnership to handle compensation pay-outs being developed, not only to tackle the handling of extraordinary wind (TCA) claims but also to extend in some cases to insurers who voluntarily collaborated with CCS by supplying adjusters to value flood and sea-wash damage.

The cut-off lows of 2012 and 2019 in the south-east of the Iberian Peninsula

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Introduction

As has been discussed in this and other editions of the magazine, the concept of a closed upper-level low (i.e., a cut-off low) refers to a minimum of geopotential and a pocket of cold air that is cut off from the general westerly current and presents maximum baroclinity in its eastern sector. Put in layman's terms, this is a phenomenon which occurs when the undulations in the polar jet stream belt represented by Rossby waves, which circulate round the poles from west to east within the mid and upper levels of the atmosphere, bend so much that they close up on themselves and break (meaning that a cut-off low is created). This closed circulation at mid and upper levels traps part of the cold air left in the north and to the left of the polar jet stream belt and then steers it over lower latitudes, where the surface is considerably warmer. This facilitates vertical air movements (convection) on the leading edge of the cut-off low (i.e., its eastern part), particularly when the cold mass lies over sea air with a high temperature (as tends to happen in late summer in the western Mediterranean). Figure 1 illustrates this process from 27 to 30 September 2012. On the 27th we can see substantial curvature in the jet stream (shown by the yellowish colours for a geopotential of 500 hPa[1]), meaning at the height over the surface of the atmospheric layer where the pressure is 500 hPa (remember that the average pressure at sea level is 1013 hPa). The average height of this 500 hPa layer is 5,500 m. 24 hours later, on 28 September, an area of circulation cut off from the jet stream now appears over the south-west of the Peninsula, which moves along the southern coast and over the Levant of the Peninsula on the 29th and the 30th, after which (although the image does not show this) it is re-absorbed and weakened by the general flow.

> Together with a very extensive adjuster network comprising experts trained in different fields, the other great mechanism to afford flexibility which CCS currently has available is *shared handling for claims experiences* prompted by extraordinary ris ks, which enables deployment of all of CCS' claims handling units as interconnected channels to sha re out the workloads of all of the handlers in them equally, in both central services and the territorial offices.

Figure 2 shows the same process of the cut-off low's formation and progress in September 2019, where we can note the great similarities between both situations. This was with two differences in the 2019 event which made it even more severe: one is that the cut-off low moved backwards from east to west, which kept the adverse impact on the affected zone in play for longer, and the other is that route taken by the surface flow of winds (which can be made out in these maps from the isobars —the white lines– of the pressure field at sea level) extends further over the Mediterranean, bringing sustained winds from the east with a great deal of humidity from passing over the sea, which were also conducive to the cut-off low itself shifting backwards. This situation on the surface is what is known as an atmospheric river and it becomes highly significant when there is a major build-up of rainfall since it means that there is sustained input of humidity and heat at low levels.

[1] Hectopascal (hPa) and millibar (mb) are equivalent units although, according to the International System of Units, it is more correct to refer to the former than the latter.

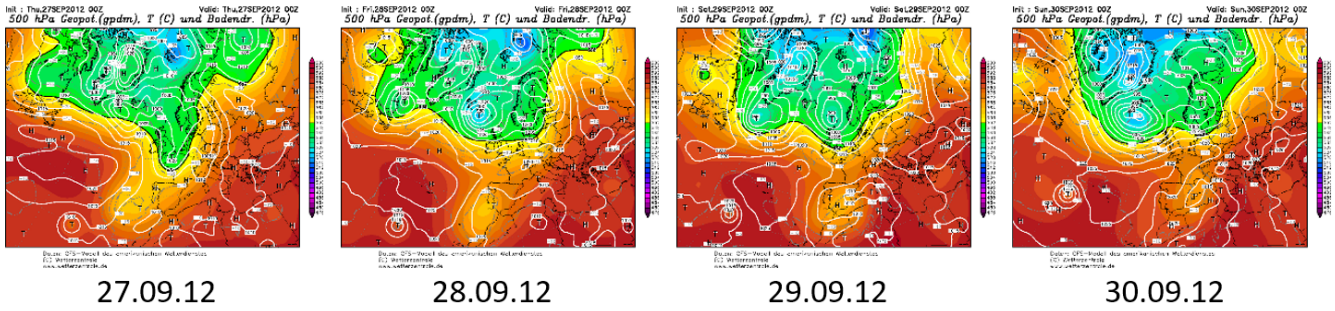

Figure 1. Height of the geo-potential of 500 hPa (m), pressure (hPa) and temperature (° C) on the surface at 00 UTC (02 AM local time) from 27 to 30 September 2012, according to the re-analysis of the GFS model (Source: Wetterzentrale).

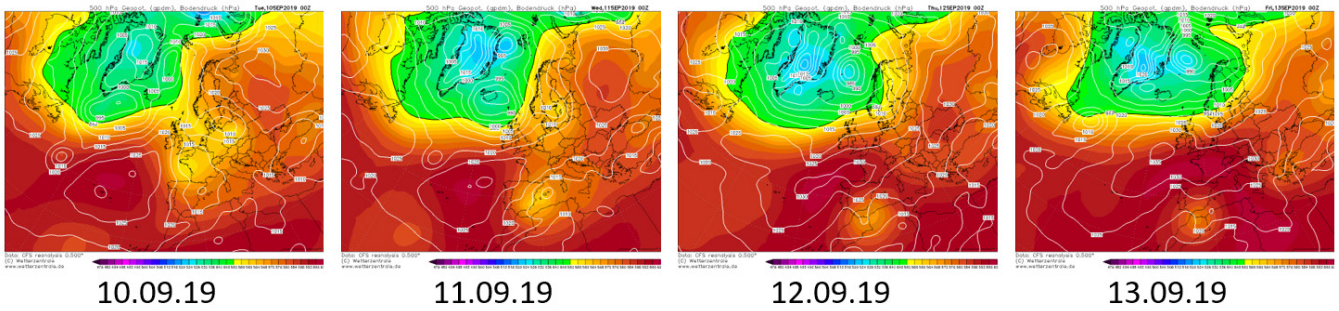

Figure 2. Height of the geo-potential of 500 hPa (m), pressure (hPa) and temperature (° C) on the surface at 00 UTC (02 AM local time) from 10 to 13 September 2019, according to the re-analysis of the GFS model (Source: Wetterzentrale).

The process of forming a cut-off low is similar to a meander cut-off on a river, with a pocket of cold air breaking away from the main circumpolar current, which is what gave rise to the German concept of *Kaltlufttropfen*, which is where we get the most famous synonym to describe these events from: "cold drop" –*gota fría*– in Spanish (due to the similarity of a drop which "falls" from the main jet stream), although it is far more correct and less confusing to use the term "cut-off low" or DANA in Spanish.

In the northern hemisphere, mid-level cut-off lows within the atmosphere mainly form at latitudes higher up (between 45° and 55° N), particularly in the north-western Atlantic and the north-eastern Pacific. Even so, because of the consequences they have, it is the secondary maximums that are of greater interest, which occur at lower latitudes (between 35° and 45° N), both in the Atlantic opposite coasts on the Iberian Peninsula (as is the case with these instances in September 2012 and 2019), and across the whole Mediterranean, especially Italy, as well as in relation to the American continent, opposite and above California (Muñoz *et al*., 2020). It is held that the interaction of the polar jet stream belt with high-pressure zones that block it, as well as with major landforms, encourages the stream to undulate a lot and potentially come to close up over itself to create a cut-off low.

Although European cut-off lows happen over the entire year with few intra-annual variations, they are relatively more frequent in spring, with a secondary maximum in autumn. It is thus other factors, such as the ready supply of energy in the form of heat and damp which the Mediterranean provides in late summer, which are what normally make their effects more severe between August and October.

In edition number 11 of this magazine we observed the large share of total flooding indemnities from the CCS which cut-off lows represent and how these become particularly significant in September.

The cut-off lows in September 2012 (named after Saint Wenceslaus in Murcia Region, where they apply nomenclature that references the calendar of Saints' Days) and September 2019 (the Saint Mary episode) are the two most notable in the past 15 years. Both are paradigms of loss events of this type, which especially affect the south-east of the Peninsula, where an atmospheric trigger combines with seasonality, adding in interesting (and exacerbating) factors such as territorial occupancy, i.e., exposure and the vulnerability this entails (Olcina *et al.*, 2017; Giménez-García *et al*., 2022).

The cut-off low of September 2012

Initial estimates

The floods mainly affected the south-east of the Peninsula, specifically the administrative divisions of Alto Guadalentín in Murcia and the Almeria Levant, though also, albeit less intensely, other areas of Andalusia (mainly Malaga, Seville and Cadiz), the Valencian Autonomous Community and, to a lesser extent, Madrid, Castilla-La Mancha and Catalonia.

To cover this vast geographical area and produce an initial estimate of the number of property assets affected and the scale of the damage 13 preliminary reports on the number of incidents had to be drafted by adjustment departments or independent collaborating appraisal experts. According to this preliminary information, which was logged in the hours following the occurrence of the floods, it was estimated that the CCS could stand to receive some 18,500 claims applications totalling 90 million euros.

Organisation of the claims volume by the CCS

Over the first few days the high number of claims applications pouring in (in just the first week 12,200 claims files were registered) was proof that the actual magnitude of the claims experience was going to be considerably greater than first thought. Thus, it became necessary to step up the number of adjusters and gather together a team of 170 - 135 of them for housing, businesses, factories and civil works, and a further 35 to appraise motor vehicle (auto) losses.

The task of the adjusters was arranged using a geographical reporting system by geo-referencing the claims applications and setting up zones of adjustment clusters for adjusters to work in groups to reduce travel time and make the adjustment criteria for each zone more uniform.

In south-east Spain, and specifically in certain zones that had been harder hit by the floods, the urban development situation in 2012 was highly disorganised. Overlaying this, multiple rural areas were flooded which had buildings scattered about that were not accurately pinpointed on the digital mapping available at the time. On the other hand, the information on the whereabouts of damaged properties which the insured reported often failed to tally with the addresses shown on the digital mapping since many of them were given in incomplete or imprecise form (along the lines of "Saladar Property, un-numbered"; "Mediterranean Avenue, exit 583, un-numbered") or using non-standard details ("Station Road, next to the shop"). For these three reasons, in the case of this claims experience a huge effort

was required to make a manual adjustment of addresses to manage to geo-reference the claims files, although, even so, a host of errors and inaccuracies still remained.

Business data and characteristics in the claims experience

A total of 33,607 claims applications were received. Out of these, 7,198 (21.5% of the total) were rejected, either because they concerned loss or damage from causes outside extraordinary risk insurance or due to not having a currently valid insurance policy.

The average sum paid out in this claims experience was very high (8,800 euros), which is even more than in the other recent major episode that the cut-off low of September 2019 prompted.

As can be seen in Table 1, which gives the claims figures by risk class, 27.5% of property items indemnified (7,000 claims applications) relate to autos. This is a very big percentage, the more so if we recall that in 2012 only those vehicles which had some kind of own damage insurance in their policy were covered, since it was not until 2016 when extraordinary risk insurance coverage was extended to include all autos.

Amounts updated as of 12/31/2020.

Property loss	Claims paid	Claims rejected	Estimated total loss
DWELLINGS	15,164	4,588	102,119,481 €
AUTOS	7,026	1,251	23,311,582 €
SHOPS, STOREHOUSES AND OTHER RISKS	3,329	1,080	50,931,218 €
BUREAUS	269	101	5,092,021 €
INDUSTRIES	604	176	30,871,029 €
CIVIL WORKS	14	5	7,014,758 €
Total event	26,406	7,201	219,340,088 €

Table 1.

The table below shows claims applications and amounts indemnified by province.

Province	Claims paid	Estimated total loss
ALMERÍA	3,625	75,138,327 €
CÁDIZ	205	605,102 €
CÓRDOBA	52	384,731 €
GRANADA	189	680,960 €
JAÉN	12	133,840 €
MÁLAGA	1,124	11,547,115 €
SEVILLA	55	254,237 €
CEUTA	0	0 €
BARCELONA	15	51,934 €
GIRONA	2	3,015 €
LLEIDA	0	0 €
TARRAGONA	41	138,686 €

Province	Claims paid	Estimated total loss
ALACANT/ALICANTE	1,565	5,227,801 €
CASTELLÓ/CASTELLÓN	9	71,536 €
VALÈNCIA/VALENCIA	11,249	67,674,626 €
MURCIA	6,993	60,477,989 €
ALBACETE	40	131,116 €
CIUDAD REAL	6	9,514 €
CUENCA	1	529 €
TOLEDO	24	63,336 €
MADRID	429	2,233,231 €
	25,636	224,827,625 €

Table 2.

The worst affected province was Almeria, with 3,625 claims applications and a total amount of 75.1 million euros. The intensity of the damage in this province, at an average indemnified sum of 20,700 euros, is far higher than for the other zones. It is in the municipal district of Vera (in Vera-Playa to be precise) where most of the claims experience was focussed, with a little over 2,000 claims, 58.3 million euros in pay-outs and a very high average sum indemnified of close to 29,000 euros. In Vera-Playa the river Antas burst its banks along its last section (Figure 3), which provoked serious damage to the housing developments near its course, with hundreds of homes evacuated and businesses brought to a standstill, as well as to the vehicles in the area, most of which proved beyond recovery (Figure 4).

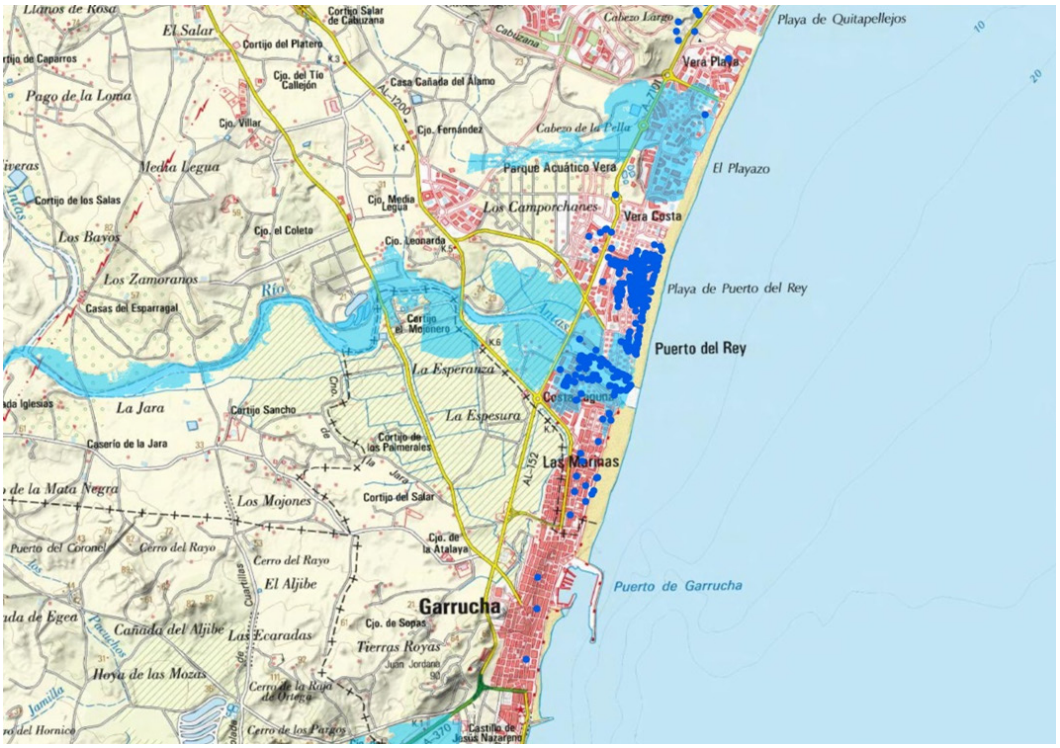

Figure 3: Overflowing of the river Antas at its mouth in Vera-Playa.
Sources: CCS and SNCZI.

Figure 4. Flooded zone in Vera-Playa.
Source: CCS.

The province with the second biggest volume of compensation pay-outs was Valencia, with 11,249 claims at a total of 67.7 million euros. Specifically, the worst hit municipal district was Paterna, with 2,141 claims at 19.7 million euros, although the intensity of the damage was far less severe than in Almeria (and than in Murcia, as we shall see below) with an average sum indemnified of 6,000 euros.

Although most of the indemnities paid out were for flooding, it is worth mentioning that there was a tornado on 28 September associated with severe convection from the cut-off low itself in the municipal districts of Gandía and Xeraco (Valencia), which triggered 1,226 claims applications and pay-outs totalling 8.7 million euros (Figure 5).

Figure 5. Tornado damage at the Gandía fairground.
Source: CCS.

In Murcia Region almost 7,000 claims applications were received, leading to a total amount paid out of 60.5 million euros. The most affected zone was the Alto Guadalentín administrative division, more precisely the municipal districts of Lorca and Puerto Lumbreras, with figures of 3,500 claims and 44.2 million euros. The most heavy damage occurred to the south of the city of Lorca, in its Campillo and Purias districts and in the Puerto Lumbreras provincial council of El Esparragal, all of which are located in the Guadalentín hollow. This is a fairly flat zone where drainage is difficult and where major watercourses flow into it from the neighbouring mountain ranges, such as those of the Murciano, Torrecilla, Béjar and Nogalte ravines. The Biznaga watercourse runs longitudinally through the plain itself and takes up the water from these watercourses until it opens out into the river Guadalentín. In 2012 the Biznaga stream-bed exemplified the disorganised urban development situation as its course lay unprotected and encroached on by buildings and farmed areas (Figure 6).

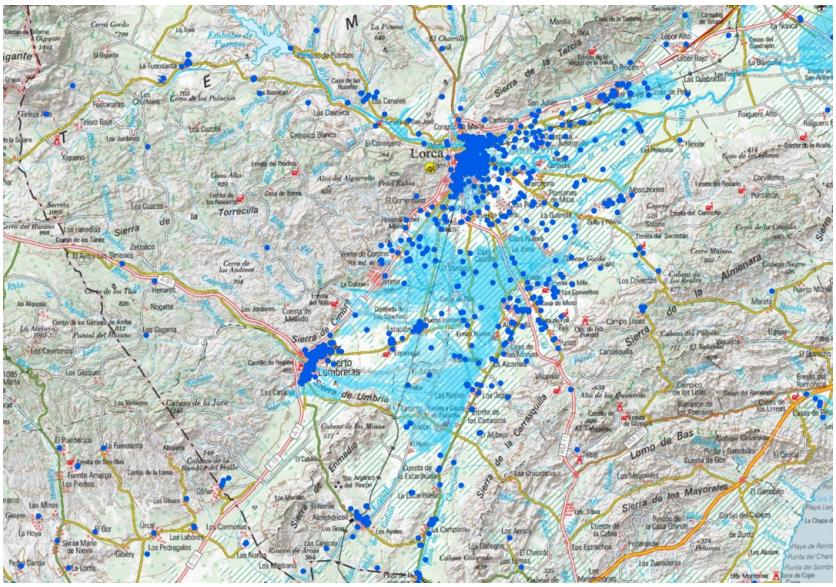

Figure 6. The Guadalentín hollow, though which the Biznaga stream-bed runs until it opens out into the river Guadalentín downstream of the city of Lorca, showing the positioning of the claims filed with the CCS.
Sources: CCS and SNCZI.

As a result of the heavy and persistent flooding, the Guadalentín plain experienced changes to drainage channels accompanied by some examples of the damming effect caused by linear civil works, as in the case of the Murcia-Águilas railway line as it runs through the station at Puerto Lumbreras (Figures 7 and 8).

Figure 7. Execution of new drainage works on the Murcia-Águilas railway line due to shifting of drainage channels following the 2012 flooding.

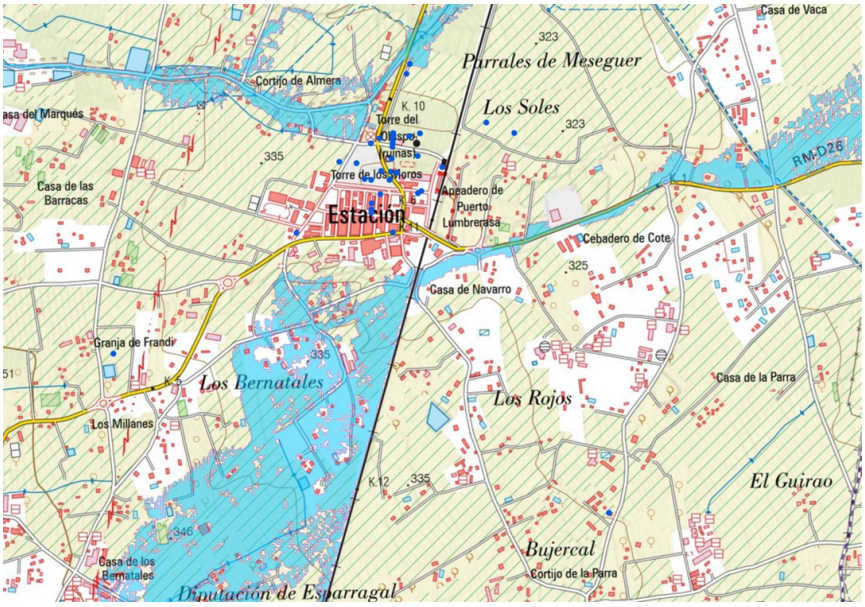

Figure 8. Damming effect at the Puerto Lumbreras station caused by the Murcia-Águilas railway line and the flooding of properties located upstream.
Sources: CCS and SNCZI.

At Puerto Lumbreras station, which belongs to El Esparragal council, and on the industrial estate of El Saladar de Totana sub-surface or piping erosion phenomena occurred, which consist of the formation of ducts and conduits from erosion provoked by the groundwater on certain areas of land which lend themselves to dispersal. In certain cases, the piping caved in and cracks emerged on the surface, as we can see in Figure 9.

Figure 9. Piping phenomenon at the Los Soles spot in Puerto Lumbreras station.

The cut-off low of September 2019

From 10 to 14 September 2019 a new cut-off low plagued the Spanish Levant, producing historic flooding, in terms of both its geographical reach (it affected the whole of Spain's Levant) and the volume of rainfall, since as many as six weather stations in the Valencian Region recorded historical highs on those days, according to the figures from the State Meteorological Agency[1].

Because the area affected was so enormous, the CCS immediately commissioned 18 reports on the loss rate from adjusters in the various different zones to be in a position to be able to have estimated figures to hand right from the start on the magnitude of the disaster and to scale both the adjuster network and the team of claims handlers. As a result of this cut-off low the CCS received around 70,000 claims, 58,000 of which were filed in the 33 days from Tuesday 11 September to Sunday 13 October 2019, numbers peaking at 10,175 on 18 September 2019 (Figure 10).

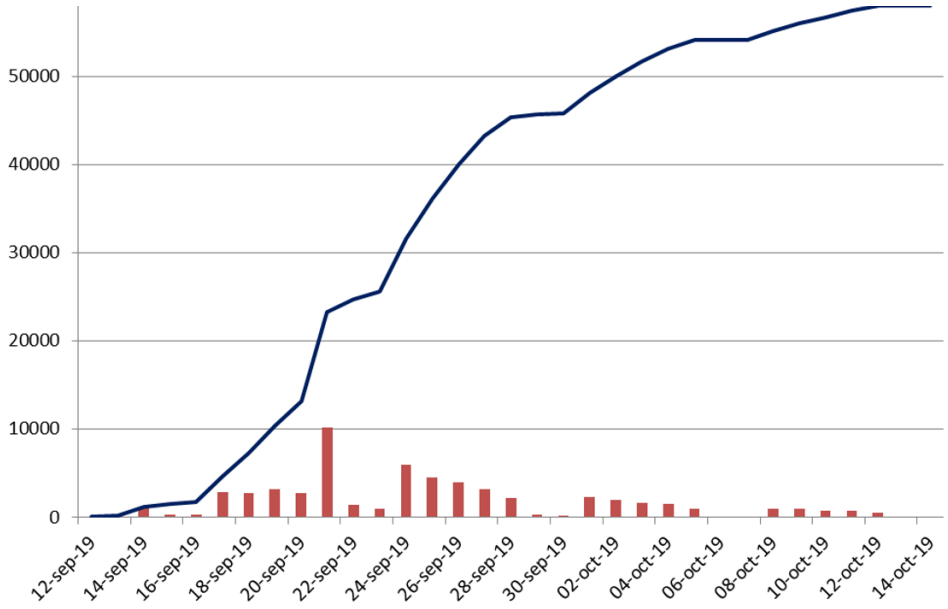

Figure 10. Number of daily claims applications received (red bars) and cumulative claims (blue line) received by the CCS in the 33 days following the occurrence of initial damage.
Source: CCS.

The figures give us some idea of the celerity with which the CCS can record claims reported by the insured by combining the internet channel with a helpline centre attended by specialist personnel which does not effectively debar those persons who are not sufficiently digitally literate from the system on account of their age or for some other reason. Moreover, filing claims (digitally or by phone) is allowed to be done by both the insured themselves and a representative acting for them (a qualified insurance broker, an employee at an insurer, a lawyer, an agent or administrator, employee of the municipal social services...).

For this event, 70% of the victims used the web, connecting directly to the CCS portal to furnish information and commence processing, whereas the other 30% approached the CCS helpline centre. It was the intermediaries

[i] Agencia Estatal de Meteorología (19 september 2019). An unprecedented rainstorm over the past 100 years in the Vega Baja del Segura administrative division http://www.aemet.es/es

(insurance agents or brokers) who filed most of the applications (52%), followed by the insured themselves or their representatives (family members, friends or employees) with 28% of claims registered, and lastly the insurers, who accounted for 20%.

When the damage is reported, the information on the location of the risk affected is collected, as well as its type (housing, home-owners' community, factory, business...) and both the insurer's name and the policy number. The contact details of the insured are also required, along with those of their representative if it is indeed this person who files the claim. This phase having been completed, the damage assessment process is triggered almost immediately, as every morning the notifications that have been filed the day before are codified by the Geographic Information System (GIS) at the CCS and allocated to the adjuster in charge of the zone where the risk concerned is located.

Thus the quality and reliability of the information received (via both the helpline centre and the website) are vital to the whole process although, as was mentioned in the case of the 2012 cut-off low, it is not uncommon for some of the claims reported to experience delays due to either a lack of precision or straightforward error as regards both the site of the loss (i.e., the claim is allocated to an adjuster for a different zone) and the contact details (the adjuster cannot track down the person to contact to organise an initial visit).

The number of cases of damage reported, the scale of these and the speed with which claims for them were filed make this cut-off low the most significant flood event which the Consorcio has had to deal with, even though it was surpassed in monetary terms by the rainfalls of 1983 in Bizkaia.

To take on the task of performing the loss adjustment for the damage which this cut-off low caused, CCS engaged 300 insurance adjusters with the administrative backing of their respective departments. Loss adjustment becomes more complex in the case of homeowner's policies because the properties flooded are often second homes where it is hard to match up the timing of adjuster visits with moments when the insured are staying there. This situation became even more problematic when, on 14 March 2020, the state of alert was declared at a time when around a thousand loss claims had not been reported yet and there were still six thousand assessments pending finalisation, which forced CCS to resort to remote adjustment systems, which are usually only used for checking and verification.

	Assigned to experts	Finalised by experts	Expert pending	Validated by claims manager	Claims manager pending
Property (ex. autos)	48,885	42,811	6,074	40,472	2,339
Motor vehicles	19,672	18,768	904	18,314	454
TOTALS	68,557	51,579	6,978	58,786	2,793

Table 3. Situation of adjustment work and claims settlement as at 14 March 2020.
Source: Own research.

As can be seen in Table 3, on that particular date (185 days after the flooding began) the adjusters still had a shade over 10% of their tasks to complete, while the Consorcio's claims handlers had reviewed, ordered or rejected pay-outs for almost 86% of reported claims for damage.

	Assigned to experts	Finalised by experts	Expert pending	Validated by claims manager	Claims manager pending
Property (ex. autos)	51,517	51,454	63	51,444	10
Motor vehicles	20,232	20,223	9	20,223	0
TOTALS	71,749	71,677	72	71,667	10

Table 4. Situation of adjustment work and claims settlement as at 31 May 2020.
Source: Own research.

Table 4 shows the situation for the same work as of 31 May 2020, on which date the claims processing can be considered virtually finalised with the full complement of files having been settled. Having gone through the similar, though less severe situation (involving almost half the total loss figure and somewhat less than half the number of claims applications) which the cut-off low of 2012 in the south-east of the Peninsula led to for the CCS, the cut-off low of 10 to 14 September 2019, which affected locations from Madrid to the entire Levant and the Balearic Islands while taking in Castilla-La Mancha as well, meant that the full extent of CCS' capability was put to the test.

Both the overall number of claims and the intensity of the damage as well as the swiftness in reporting it (with daily peaks of as many as 10,000 filings) meant that, even though it continued to rain, the capacity of the helpline centre adjusted and expanded accordingly, while the website's ability to cope improved too and the entire network of adjusters was contacted. Right from the start, CCS applied internal flexibility to its claims handling, launching several processing lines in parallel, from the most urgent to the most indispensable.

Together with a very extensive adjuster network comprising experts trained in different fields, the other great mechanism to afford flexibility which CCS currently has available is *shared handling for claims experiences* prompted by extraordinary risks, which enables deployment of all of CCS' claims handling units as interconnected channels to share out the workloads of all of the handlers in them equally, in both central services and the territorial offices.

The insured in the affected zones had become used to CCS operating very rapidly, with settlement of claims in under three months. In this case, given the scale of the claims experience, the arranging of zones and adjusters was more arduous than usual and arrival at the affected locations was relatively delayed as there were some risks which were impossible to visit until the water level had abated sufficiently. Despite mobilising the whole network of adjusters, the claims files to adjuster ratio topped three hundred, thereby beating another historical record and putting pressure on the pace of work. To try to offset this new cause of slowdown all of the available staff at CCS began ringing round all of the insured to provide them with a reference point in connection with the situation of their reported claims. Meanwhile, the first pay-outs were made.

The work carried out meant that claims file settlements achieved a considerable pace after the first month in spite of the initial backlog.

As a result of the magnitude of the catastrophe, as well as the need to speed up handling and attend to the insured properly, CCS took the extraordinary step of raising the threshold for losses above which it advised its partnering adjusters to check up on the sufficiency of the sums assured from 5,000 to 10,000 euros. Subsequently the measure led to the drafting of a basis of indemnification which has ultimately become established as another of the usual criteria for handling claims. CCS also drew up and sent out to its partnering adjusters a pricing table featuring the most typical work units so as to make appraisals more uniform. The prices were increased in line with the inflation that always comes into play in the worst affected zones and in the months following major claims experiences.

One of the hardest hit zones was La Vega Baja del Segura, with nearly 22,000 claims applications and pay-outs amounting to 185.2 million euros. Specifically, Orihuela saw the most damage, with 56% of indemnities for the entire administrative division. The flooding in this zone was exacerbated by the breaking open of one or two dykes and, above all, the channelling for the river Segura on its left bank level with Almoradí.

Figure 12. Breakage of the channelling of the river Segura at Almoradí.
Source: Segura River Basin Authority.

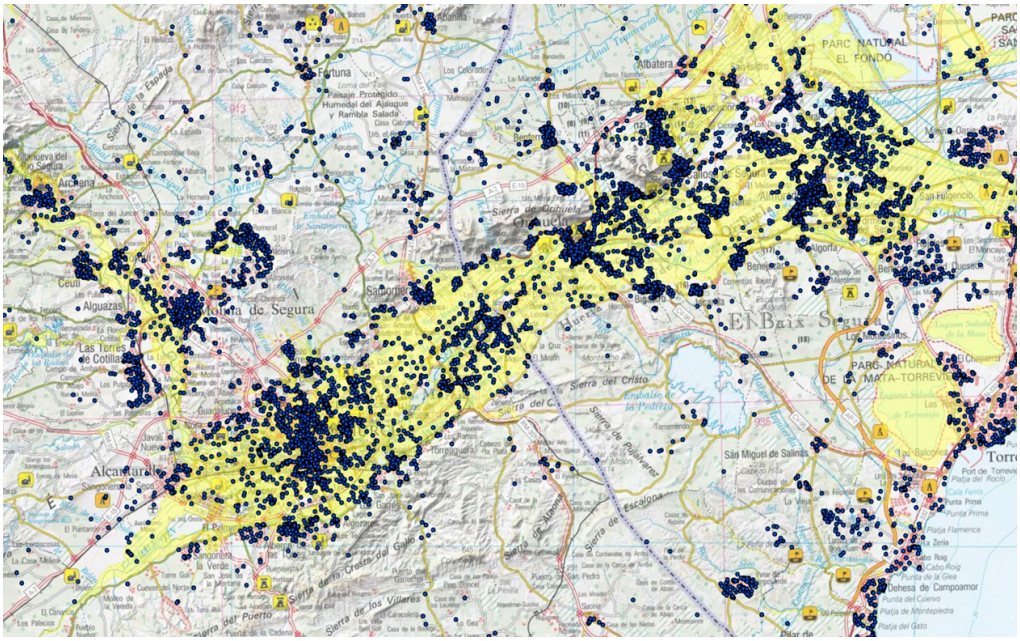

Figure 13. Flooding in La Vega Baja.
Sources: CCS and SNCZI.

The other most affected administrative division was Campo de Cartagena, with 20,300 applications and 132 million euros paid out in compensation. To be precise it was Los Alcázares which was the worst affected municipal district, accounting for 46% of the total.

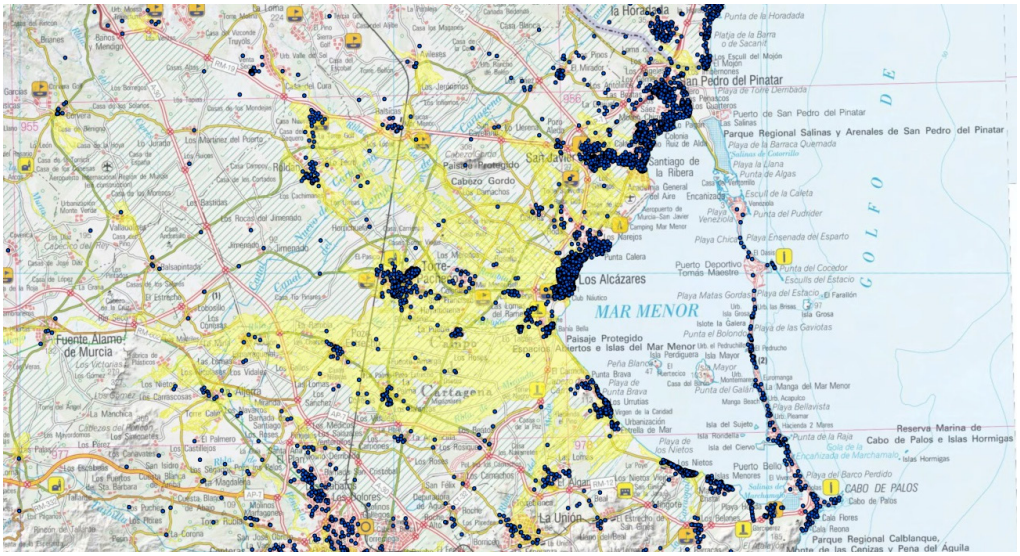

Figure 14. Flooding in Campo de Cartagena.
Sources: CCS and SNCZI.

Barely three years before the cut-off low of September 2019, in December 2016, other serious floods occurred in Los Alcázares, chiefly on account of the overflowing of the La Maraña watercourse. Between both episodes and after the 2019 cut-off low there were also other minor episodes of flooding, all of which has conspired to convert Los Alcázares in one of the most harshly punished zones by floods in the recent history of the Consorcio, as can be verified from the figures on flood damage at municipal level published in another edition of this magazine. These serious and repeated episodes have led the Ministry for Ecological Transition and the Demographic Challenge to publish Royal Decree 1158/2020 whereby, through its Directorate General for Water, it provides direct subsidies to five municipalities of Campo de Cartagena (Los Alcázares, San Javier, Torre-Pacheco, Cartagena and San Pedro del Pinatar) to adapt existing buildings to flood risk. The rationale for sharing out the 3 million euros available for each municipal district is based on the proportion of pay-outs from the CCS in each one of these municipalities, and Los Alcázares is thus the one which is the biggest beneficiary. At the time of writing, another similar Royal Decree for La Vega Baja del Segura is at the approval stage.

References:

Giménez-García, R., V. Ruiz-Álvarez, R. García-Marín (2022) ***Chronicle of a forecast flood: exposure and vulnerability*** on the south-east coast of Spain. Natural Hazards. https://doi.org/10.1007/s11069-022-05400-0

Muñoz, C., D. Schultz and G. Vaughan (2020) ***A Midlatitude Climatology and Interannual Variability of 200- and 500-hPa Cut-Off Lows***. Journal of Climate, 33(6), 2201-2222..

Olcina, J., A. Pérez, A. Rico, S. Gil and F. López (2017) ***La importancia de la vulnerabilidad y la exposición en el aumento del riesgo de inundaciones en el litoral mediterráneo.*** From En Consorseguros Digital, número 7.

Flooding in Navarre, the Basque Country, Aragon and Burgos, 2021

Ricardo Blanco Rodríguez - CCS Territorial Representative in the Basque Country
Daniel Hernández Burriel - CCS Territorial Representative in Aragon, Navarre and La Rioja
José Ángel Renero Arribas - CCS Territorial Representative in Castilla y León

In the territories of Castilla y León, the Basque Country, Navarre and Aragon flooding frequently occurs as a result of the river Ebro and its tributaries breaking their banks or this happening in the various rivers in the Basque Country and Navarre on the Cantabrian side of the watershed.

There are several reasons that might explain the overflowing of rivers, which include thawing or, sometimes, draining activities, although the main culprit can always be traced back to heavy rainfalls.

Thanks to all the warning systems belonging to basin authorities and official weather services, there are even estimates available of the highest river discharges. The cumulative experience ac quired over time, enhancement and upgrading of monitoring systems, as well as the use of new te chnologies and procedures such as big data ena ble prediction of trends for rivers hours or even days in advance, always from a probability-based perspective, which allows the readings and mea surements to be taken which the protection plan ning establishes.

Over the past 10 years the river Ebro has experienced extraordinary spates in 2013, 2015, 2018, 2019 and 2021, which have significantly affected certain population centres. Among these were, for example, the sudden rises in the water level of the Ebro of 2015 in Miranda de Ebro (Burgos) and along the river banks in Aragon, at a cost to the Consorcio de Compensación de Seguros (hereafter the CCS) of over 34 million euros, or the bursting of the banks of the Arga in the administrative district of Pamplona in 2013, which bore a cost in indemnities for the CCS of 15.5 million euros.

In the Basque Country there was heavy flooding in 2011, which particularly affected Gipuzkoa (the basin of the river Oria), leading to a total of 5,500 claims files and indemnities that topped 60 million euros.

Over November and December 2021 there were frequent rainfalls in the catchment area of basins. To cite a few examples, in Balmaseda (Biscay) 150 mm were recorded between 27 and 28 November; in Pamplona it rained for 15 straight days (from 22 November to 7 December) and more than 215 mm fell; and from 9 to 10 December figures approaching 175 mm were registered in Añarbe (Gipuzkoa) and Gorbea (Araba), and over 200 mm in areas of the Pyrenees and on the Cantabrian side of the watershed.

Over this period the emergency warning systems of the various different departments of the Civil Protection Service issued alert bulletins on successive days warning of heavy rain and snow falls (such as the orange level alerts which the Basque Country regional government issued on 27 and 28 November and from 9 to 11 December), as well as warnings of heavy flows in several different rivers —q.v. the alert issued by CECOPAL (the Municipal Coordination Centre) of the Miranda de Ebro Council (Burgos)– on 29 November on account of the flood risk to its old quarter and the triggering of level 2 flood alerts/emergencies by the regional governments of Navarre and Aragon on 10 December due to overflows on the rivers Arga and Ebro.

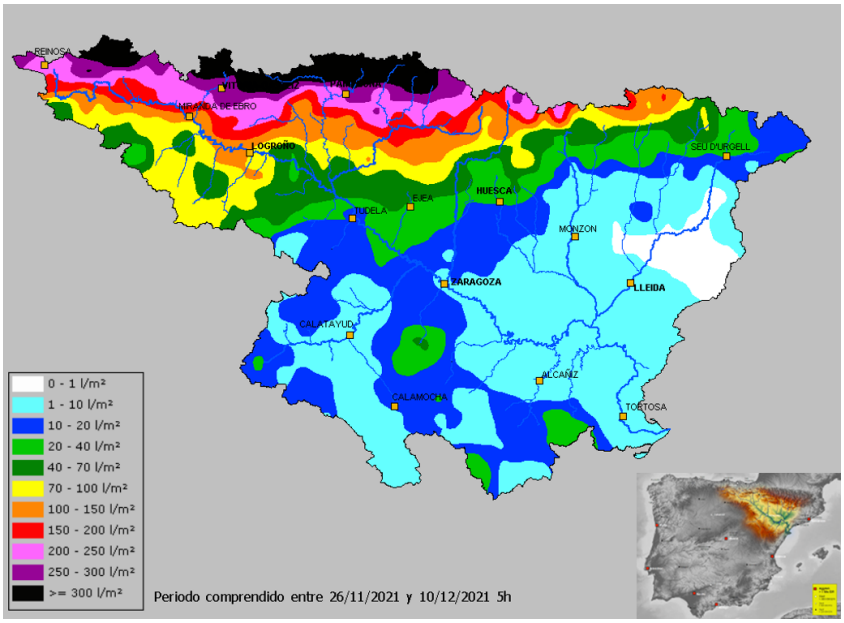

Figure 1. Rainfall recorded in the Ebro basin between 21 November 2021 and 10 December 2021. Source: Ebro Hydrographic Confederation.

27 Noviembre 2021

ALERTA NARANJA. RIESGO: NIEVE

Riesgo: Debajo de 1000. desde las 03:00 hasta las 24:00 hora local. La cota de nieve irá bajando, situándose en torno a 900-700 m de madrugada, en torno a 700-500 m por la mañana y 500-400 m durante la tarde-noche, ocasionalmente pudiendo estar más baja. Precipitaciones débiles a moderadas; en la vertiente cantábrica muy abundantes y persistentes, y las precipitaciones ocasionalmente serán tormentosas y vendrán acompañadas de granizo. Espesores previstos: 20-50 cm a 1000 m, 5-25 cm a 600 m, 0 cm a 200 m.

AVISO AMARILLO. RIESGO: PRECIPITACIONES

Riesgo: Persistentes. desde las 00:00 hasta las 24:00 hora local. Se pueden acumular más de 60-80 l/m² en 24 horas en la vertiente cantábrica. En la vertiente cantábrica precipitaciones moderadas, muy abundantes y persistentes, y ocasionalmente serán tormentosas y vendrán acompañadas de granizo, con posibilidad de que localmente sean fuertes.

AVISO AMARILLO. RIESGO: MARÍTIMO-COSTERO

Riesgo: Navegación. desde las 00:00 hasta las 24:00 hora local. La altura de ola significante rondará los 3.5 m de madrugada e irá subiendo hasta los 4-5 m durante la mañana. La mar de fondo del noroeste levantará olas en torno a 3 m. Periodo 10-12 s. Viento del noroeste con fuerza 6 a 7. Originará mar gruesa a mar muy gruesa.

28 **DOMINGO**
Noviembre 2021

AVISO AMARILLO. RIESGO: PRECIPITACIONES

Riesgo: Persistentes. desde las 00:00 hasta las 15:00 hora local. Se pueden acumular más de 60-80 l/m² en 24 horas en la vertiente cantábrica. En la vertiente cantábrica precipitaciones moderadas, muy abundantes y persistentes, y ocasionalmente serán tormentosas y vendrán acompañadas de granizo, con posibilidad de que localmente sean fuertes.

ALERTA NARANJA. RIESGO: PRECIPITACIONES

Riesgo: Persistentes. desde las 15:00 hasta las 24:00 hora local. Se pueden acumular más de 60-80 l/m² en 24 horas en la vertiente cantábrica. En la vertiente cantábrica precipitaciones moderadas, muy abundantes y persistentes. Durante la tarde-noche las precipitaciones seguirán siendo presistentes y abundantes, a la vez que va subiendo la cota de nieve, favoreciendo el deshielo y aumentando el riesgo de inundaciones.

Figure 2. Summary of weather alerts in the Basque Country. Source: Basque Country regional government.

Ayuntamiento de Miranda de Ebro
Alcaldía

vivirmiranda

CECOPAL

RIESGO DE INUNDACIONES (ALERTA O EMERGENCIA)

FECHA: 29/11/2021 **HORA:** 22:30

En aplicación del Plan de Protección de Miranda de Ebro, la Directora del PEMME en virtud de las competencias que tiene establecidas, declara el **NIVEL DE GRAVEDAD 1** con las siguientes características:

Descripción del riesgo:

Inundación derivada al incremento de caudal del Rió Ebro y afluentes próximos a Miranda de Ebro.

Ámbito afectado:

Casco urbano de Miranda de Ebro.

Texto complementario:

En el día de hoy, 29 de noviembre de 2021, se ha producido un incremento exponencial del caudal del río Ebro a su paso por Miranda de Ebro así como de sus afluentes, principalmente el río Bayas y el río Zadorra.

Este hecho ha producido que zonas del casco urbano de Miranda de Ebro se hayan visto afectadas por el agua.

Se ruega permanezca en contacto con el CECOPAL a través del número de teléfono 648 00 47 49 donde se irá facilitando nueva información.

En Miranda de Ebro, a las 22:30 horas del día 29 de noviembre de 2021.

Figure 3. Flood risk alert bulletin.
Source: Miranda de Ebro Council.

Two events can be distinguished for the period under review. Heavy rainfalls in late November which caused several floods and then another event in mid-December featuring the combined effects of a sudden thaw due to sharply rising temperatures and persistent rainfalls in the northern part of the Ebro basin. All of this led to flows moving to river basins, which initially affected the Ebro at the point where it passes through Miranda de Ebro (Burgos), with alerts for extraordinary surging of the rivers Trueba and Nela in Burgos, and the Arga and Ega in Navarre, with the flooding ultimately arriving at the mid-section of the Ebro. The basins of the Bidasoa, Oria, Deva and Urumea, running into the Bay of Biscay, were also affected. Against this backdrop the river Arga recorded one of the highest figures in its historical dataset with a flow of up to 524 m^3/s where it runs through Pamplona.

Figure 4. Overflowing of the river Arga in Burlada near Pamplona.
Source: CCS.

This situation produced miscellaneous significant adverse effects: on agriculture and livestock as a result of flooding of fields and farms, industrial and urban areas, transport and communications networks, and finally two deaths among the communities in Sunbilla and Elizondo (Navarre).

Figure 5. Flooding at the Water Park in Zaragoza.
Source: CCS.

The municipal districts hardest hit by these river overflows were:

- **The Arga basin:** Pamplona and Burlada (Navarre), from where 2,700 compensation claims were received at a cost to the CCS of 30.2 million euros.
- **The Bidasoa basin:** Lesaka (Navarre), with 50 compensation claims costing 6.4 million euros.
- **The Ega basin:** San Adrián (Navarre), with 925 compensation claims files costing 7.7 million euros.
- **The Ebro basin:** Miranda de Ebro (Burgos) (261 compensation claims at a cost of over a million euros) and Zaragoza (438 compensation claims with a value of 5 million euros).

Handling these claims was characterised by being a new episode of the river Ebro and its tributaries bursting their banks, which was yet another among those that have taken place in the past 10 years. Moreover, two types of situations arose simultaneously: on the one hand, communities in Navarre experienced a high number of losses due to the extraordinary volume of flows along the rivers Arga and Ega (among these, we might cite Burlada, Pamplona or San Adrián as examples), and on the other hand there was a broad scattering of losses in other municipalities where, although serious damage occurred to housing developments or facilities close to the Ebro, generally speaking the losses were relatively smaller and very widely spread out along the basins. The time of year when these floods happened was also an influential factor. The drawing to a close of the irrigation and watering season and the fact that this took place in the first quarter of the hydrological year meant that the reservoirs had substantial available storage capacity, which brought about very significant diminishment of the effects of the rises in water levels. On this occasion, for example, according to figures from the Ebro Basin Authority the Yesa and Itoiz reservoirs (on the rivers Aragón and Irati) each at certain times held up peak flows of over 700 m^3/s (more than the highest volume of flow running through Pamplona for the Arga during this episode). Furthermore, it is relevant here that the soil's drainage capacity was still below the level of aquifers, such as in the middle Ebro valley.

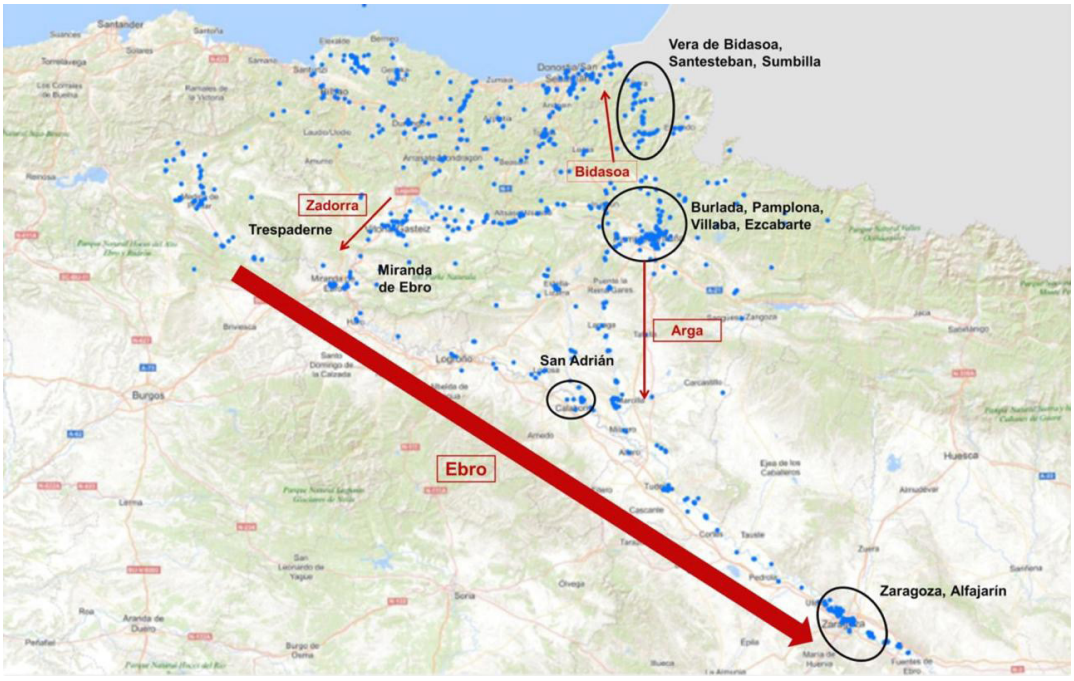

Figure 6. Geographical distribution of claims files and direction of river courses.
Source: CCS.

Fluvial flooding caused by rivers overflowing (with the exception of flash floods) are characterised by their progress being visible from the riverbanks. We can observe how rivers steadily rise above their banks and flood fields and roads until many of them end up flooding population centres or industrial estates.

Thanks to all the warning systems belonging to basin authorities and official weather services, there are even estimates available of the highest river discharges. The cumulative experience acquired over time, enhancement and upgrading of monitoring systems, as well as the use of new technologies and procedures such as big data enable prediction of trends for rivers hours or even days in advance, always from a probability-based perspective, which allows the readings and measurements to be taken which the protection planning establishes.

Figure 7. Factory premises in Vitoria.
Source: CCS.

This is what happened this time. For example, in Pamplona or Miranda de Ebro, where, thanks to arrangements which Civil Protection Service departments made, any damage capable of being scaled down was considerably reduced. In these areas (as well as in several others) there have been cases where owners of vehicles that are parked in the most vulnerable areas have received messages on their mobiles so they can remove them in anticipation of possible river overflows, which allows a major reduction of property damage to be achieved and lives saved by raising awareness among the population and taking self-protection measures.

These systems also enable corrective or preventive structural measures to be taken, such as, for example, the actions which the URA (Basque Water Agency) has implemented at problematic points in the various different basins within the Basque Country (Cadagua, Oria or Ibaizábal, to name a few), which have had a positive impact on diminishing the effects of these recent surge-based flooding incidents.

Figure 8. Civil hydraulic projects.
Source: URA (Basque Water Agency).

This also enables active reservoir management, the holding up of flows and substantially lowers the level which the water reaches and, by extension, water damage below reservoirs.

While it is not easy to control how rivers act, preventive measures help mitigate the impact of such surge flooding in terms of reducing both the risk to people themselves and property damage.

Emergency management entailed the removal of rubbish bins, cutting off streets and roads (such as in Las Merindades in Burgos), and evacuating buildings (for example, "El Vergel" in Pamplona, where there the power supply cut out) and residential homes, in Funes (Navarre) or Monzalbarba (Zaragoza), as well as dependant people, in Boquiñeni, Cabañas and Pradilla (Zaragoza), and housing developments in Martiket (Navarre), as well as Torre Urzáiz and Los Huertos in Zaragoza province. This also helped to enable the evacuation of animals from multiple farms located in the vicinity of rivers.

Figure 9. Bridge over the Ebro where it flows through Gallur (Z).
Source: CCS.

Moreover, on an individual basis, in the context of self-protection measures, many of those affected removed vehicles from garages, moved out of businesses, cleared out lumber rooms or raised the furniture in their homes. The relatively high frequency with which these types of phenomena occur means that garages and homes still have high-water marks that show how far up the water reached in previous floods in the same way as those which can be seen in some squares and on bridges.

During the recovery phase attempts are made to bring a bit of order into this whole chaos. Top priority is work on getting rid of water and removing the sludge and detritus which the spate has left behind, followed by an initial estimate of loss or damage and undertaking the requisite planning to begin the recovery process. In this respect the CCS pays out the first indemnities just a few days after the flooding, being keenly aware of the importance of having some money kept aside to be in a position to restore any activity and return to previous normality as soon as possible.

As a result of these river overflows in late 2021, the CCS received approximately 6,200 claims for loss or damage to housing, 1,900 in relation to motor vehicles and 1,700 for assorted other risks (businesses, factories and civil works) which totalled almost 100 million euros in compensation.

Region	Recorded claim applications	Cost (in euros)
Aragón	**795**	**9,306,066.87 €**
Castilla y León	**697**	**3,011,669.73 €**
La Rioja	**34**	**351,343.13 €**
Navarra	**6,184**	**71,894,309.37 €**
País Vasco	**1,893**	**15,324,811.43 €**
Total general	**9,603**	**99,888,200.53 €**

Table 1. Number of claim files and cost.
Source: Own research.

These figures would have been far higher, above all as regards motor vehicles, had the authorities not issued warnings that enabled removal of them from the vicinity of the watercourses that were ultimately affected.

Handling this major volume of claims for loss or damage required the collaboration of 114 adjusters (who travelled in from across Spain) and 12 CCS territorial offices.

Given that this concerned recurring events, several of those affected had already been previously acquainted with the CCS and how it functions. This helps towards the inflow of claims being much swifter, which expedites their settlement. The downside of this is that such a situation calls for collaborating adjusters to perform a more in-depth study of claims since they have to check that the loss or damage claimed does not actually relate to detriment caused by previous floods.

All of these actions mentioned always leave room for improvement. We need to look into how effective and efficient dissemination of alerts and warnings is, from the point of issue all the way to potential victims. We should also examine potential enhancements to our ability to predict and regulate river spates, and finally we have to review the scope and coverage of insurance for damaged property.

Even though in many river basins there have been more serious floods in the past (Zaragoza or Miranda de Ebro were far worse hit by the water level rise on the Ebro in 2015, or San Sebastián during the floods of the Urumea in 2011 or 2015), the floods in Navarre marked historic records. Many flow volumes surpassed existing reading levels, leading to river discharges with return periods in excess of 40 years.

We have been able to observe how the flood maps for this event have turned out to be very similar to the flood risk mapping drawn up in the context of the associated plans for managing this particular risk. A good example is the map of claim files received by the CCS from across the La Rochapea neighbourhood in Pamplona (Figure 10), where we can note that most cases are in the flood area with a 50-year likelihood.

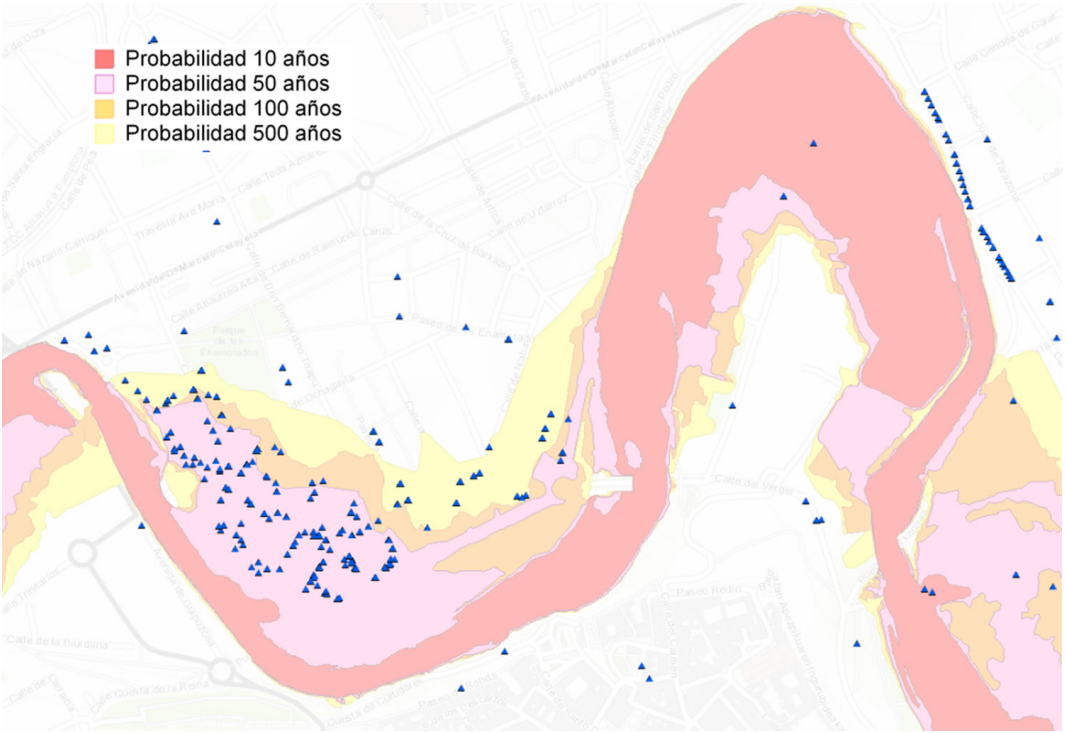

Figure 10. Claim files registered by the CCS and flood risk zones. La Rochapea Quarter, Pamplona.
Source: Own research.

And as a result, despite the efforts of government agencies, citizens and companies to keep damage down, the numbers for claims for loss or damage filed and indemnities paid out have marked a historic high, as the figures given illustrate (Table 2).

	Recorded claim applications	Cost (in euros)
Overflows of the river Ebro, Burgos		
January 2015	1,350	9,042,319.95 €
January 2019	627	3,640,576.32 €
December 2021	702	3,064,342.91 €
Overflows of the river Ebro, Zaragoza		
February 2015	2,802	25,311,413.12 €
April 2018	1,397	11,266,515.58 €
December 2021	799	9,183,269.38 €
Overflows of rivers in Navarre		
The Arga, June 2013	1,557	15,457,430.47 €
The Cidacos, July 2019	2,084	25,311,121.21 €
Arga-Ega-Bidasoa, December 2021	6,237	74,716,505.14 €
Overflows of rivers in the Basque Country		
November 2011	5,488	60,613,386.92 €
January 2015	1,420	7,061,403.87 €
Basque Country 2021	1,903	15,549,194.06 €

Table 2. Recent claims experiences across the Burgos, Navarre, Basque Country and Zaragoza area. Number of claim files and cost.
Source: Own research.

As we previously pointed out, generally speaking the flooding of December 2021 did not produce such a high volume of claims and pay-outs as had occurred previously in the same areas and due to the same causes.

If we compare the events of November and December 2021 with other recent episodes, we can see that, in the 2015 flooding from overflows of the river Ebro in Burgos and Zaragoza, double the claims for loss or damage were received at a cost of three times that incurred last year. In the Basque Country the previous flooding episodes, which were characterised by being located in specific basins and affecting a lot of riverside-based companies, led to almost three times as many claims as in 2021, at a cost of almost four times more.

In Navarre, however, the floods marked a historic high, outstripping those caused by the Arga in 2013 and the Cidacos in 2019 by a considerable distance, at a cost in compensation pay-outs of five times and three times respectively their counterparts on the latter two occasions.

The action for subrogation in Article 43 of the Insurance Contracts Act: latest case law in the First Chamber (Civil Division) of the Supreme Court

Comment on the Supreme Court Judgments of 21 July and 22 November 2021

José Antonio Badillo Arias
Territorial Representative of the CCS in Madrid

Introduction

Actions for subrogation are one of the most usual brought by insurers against third parties liable for a loss event and, in many cases, when these parties have a civil liability insurer, against such firms.

As with the cases which are examined in the High Court judgments of 21 July and 22 November 2021, it is common for such an action to be pursued in the context of residents' associations given the frequency of losses that they experience, where the association's insurer who indemnifies the losses to common property is subrogated to the position of its insured (the residents' association) and brings an action for recovery against the perpetrator of the loss. Thus, after the insurer for own damage has indemnified its insured for this particular amount, it is subrogated to their position and exercises the rights and remedies which that insured party might have available against the party liable for the loss if this has indeed been caused by a third party.

Therefore, the first thing that we must take into account is that it is not an autonomous action but is instead the same remedy which the insured had available against the third party, which has different legal effects, above all as regards the period of the statute of limitations, since the time which the insured had to bring a claim against the perpetrator for damages counts for the insurer to bring the action. This is why, if the insurer delays paying out to its insured, its action against the liable third party may have become time-barred, except where the insured themselves have interrupted the prescriptive period in which to act against the third party.

Actions for subrogation are regulated under Article 43 of the Insurance Contracts Act, which stipulates that "having paid out the in demnity, the insurer can exercise those rights and remedies to which the insured might be entitled to pursue on account of the loss event against the persons liable for it, up to the limit on indemnity."

Therefore subrogation of the insurer to the insured's position in relation to the third par ty who has perpetrated the loss shall arise if three conditions are present: a) the insurer has paid out the indemnity by dint and as a result of the insurance contract, b) the option has arisen for the insured of suing the third party for liability, where the latter is neither the policyholder nor an insured party, and c) the requirements are satisfied for civil liability to exist, be this of whatever kind (contractual, extra-contractual or *ex delicto*).

Since this is regulated under Heading I of the Insurance Contracts Act, such a remedy is only viable for insurance against loss or damage, which this Heading oversees. As a result, this does not apply to insurance of persons, except as regards healthcare expenses (Art. 82 of the Insurance Contracts Act). This exception is justified on the grounds that such costs merit legal consideration as damage.

Nature and prerequisites of actions for subrogation

Actions for subrogation are regulated under Article 43 of the Insurance Contracts Act, which stipulates that "having paid out the indemnity, the insurer can exercise those rights and remedies to which the insured might be entitled to pursue on account of the loss event against the persons liable for it, up to the limit on indemnity."

Therefore subrogation of the insurer to the insured's position in relation to the third party who has perpetrated the loss shall arise if three conditions are present: a) the insurer has paid out the indemnity by dint and as a result of the insurance contract, b) the option has arisen for the insured of suing the third party for liability, where the latter is neither the policyholder nor an insured party, and c) the requirements are satisfied for civil liability to exist, be this of whatever kind (contractual, extra-contractual or *ex delicto*).

For it to be possible to pursue such legal action, besides the insurer having paid out the indemnity, there must be a liable third party and the insured must have become entitled to sue the third party for liability. The third party is thus the person who, on causing detriment to the insured, incurs an obligation to pay an indemnity which, via the mechanism of subrogation, the insurer comes to assume. Even so, this may not be a third party who has insured status at the same time. Consequently, the insurer would not be entitled to pursue any remedy against the latter. Specifically, the Supreme Court Judgment of 21 July 2021 (Case Law 2021, 251607) explains the situation thus when it says that "subrogation requires that the insured and the loss perpetrator be separate persons, given that subrogation is not possible against the insured themselves, since this would amount to saying that a right exists to act against oneself."

On the other hand, such an action cannot be exercised to the detriment of the insured, nor either against any of the persons whose acts or omissions produce liability for the insured according to the law, except if liability stems from intentional misconduct or if it is enshrined under an insurance contract (Article 43, paragraph 3 of the Insurance Contracts Act).

Likewise, neither shall the insurer be entitled to subrogation against a perpetrator of the loss who is a relative via a direct or collateral line within the third degree of civil kinship by blood, a father by adoption or adoptive offspring who live with the insurer, save where liability stems from intentional misconduct or if it is enshrined under an insurance contract (Article 43, paragraph 3 of the Insurance Contracts Act).

Judgment No. 557/2021 by the Civil Division of the Supreme Court of 21 July 2021

Introduction

This judgment considers an action for subrogation by the insurer to the rights of a home-owners' community in relation to damage to communal parts as a result of a fire that started on the premises of an owner in the community.

In the case of insurance for home-owners' communities, given that these lack a legal personality, for the purposes of the policy homeowner status changes. On the one hand, homeowners are insured parties with respect to the policy for loss or damage to the owners' community, while on the other hand, for the purposes of civil liability arising from communal elements insurance contracts treat them as third parties in relation to the owners' community.

In my view, from a legal standpoint they are neither fully insured with respect to the common property (as the judgment which we are discussing appears to suggest) nor either are they third parties in the full sense as far as liability is concerned that is attributable to the communal parts. In my understanding they can only be insured parties in proportion to their share in the owners' community and, by the same reasoning, they should be treated as third parties with regard to liability in respect of the full amount of communal property minus their proportionate share in it. In this case, for example, there should be a possibility of deducting a fellow home-owner's proportionate share as regards the losses which the communal property causes to the latter.

The events that occurred and the lower court judgments

The case examined in the judgment we are discussing concerns a fire which started on the premises of a fellow owner and caused damage to the residents' community. These losses are indemnified by the insurer of the owners' community under the own damage insurance which it had taken out.

Having indemnified the home-owners' community for the loss and damage, by dint of an action for subrogation regulated under Article 43 of the Insurance Contracts Act the insurer was subrogated to the position of its insured (i.e. the community) and brought the action against the person responsible for the damage, who was one of the fellow owners in the community.

The judgment which the court of first instance delivered dismissed the suit since it was of the opinion that the cause of the fire was accidental and that there was no risk-producing activity on the premises which the defendant owned that might enable a reversal of the burden of proof. As a result, it was not possible to find for the claimant if there was no liability that could be enforced of the defendant.

In response to the claimant's ordinary appeal, contrary to the contention of the lower court, the Provincial Higher Court held that it was legally possible to attribute the damage caused to the defendant. According to the appeals division "it appears evident that the civil liability arising from the fire which took place on the defendant's premises is not covered under the policy cited since it is not consistent with any of the circumstances described."

The appeal to the Supreme Court

Following this judgment, the defendant filed an appeal with the Supreme Court, essentially using the line of argument that the subrogation to which Art. 43 of the Insurance Contracts Act refers operates in respect of claims which the insured parties have available against the third party who perpetrated the damage, and that, in the event of litigation, filing such a suit would not be in order, given that the defendant has insured status under the policy. In short, subrogation assumes that there is a third party in relation to the insurance contract, against whom the company can bring an action for recovery of the pay-out it made. Moreover, in this particular case the defendant had the status of an owner who was insured against the loss event which was covered, and the insurer cannot exercise the right to which it has been subrogated to the detriment of the insured.

As is self-evident, the bone of contention focusses on determining whether or not an insurer of an owners' community can bring an action for subrogation against one of the fellow owners who is liable for the damage to the

communal areas. In summary, we should resolve the issue of whether or not this fellow owner is considered to be an insured party in the community policy, which, if so, according to Article 43.2 of the Insurance Contracts Act, would produce a situation where the insurer cannot exercise the rights to which it has been subrogated to the detriment of the insured.

The legal basis which the Supreme Court cites

After referring to its body of case law on actions for subrogation resulting from several judgments, the Civil Division dismissed the insurer's claims on the grounds that it believed that subrogation requires that the insured and the loss perpetrator should be separate persons. This is because it is not possible to bring an action for subrogation against the insured themselves, since this would amount to saying that a right exists to act against oneself.

The judgment holds that the insurance contract was arranged by the home-owners' community for the building which the defendant is a part of given his status as the owner of a premises. According to the general conditions in the policy, specifically in Article 10 thereof, the insured is understood to mean "any person who has an economic interest in the property that is the object of the insurance." The defendant indisputably has such status in his capacity as owner of the premises which caught fire, as well as given the fact that he is a co-owner of the building and therefore a joint owner of the communal parts of the building that has coverage.

Therefore, in the opinion of the Civil Division of the Supreme Court, given that it is not possible for the insurer to bring an action for recovery against the insured, it appears appropriate to allow the appeal, bearing in mind the general conditions agreed in the insurance policy which govern the relations of the parties and corresponding interpretation thereof.

Judgment No. 798/2021 by the Civil Division of the Supreme Court of 22 November 2021

Introduction

The judgment which we reviewed in the previous section settles a case that is similar to that which we shall see in this judgment here. As we have indicated, the judgment of 21 July 2021 also concerns an action for subrogation by the insurer of a home-owners' community which, following the breakout of a fire in a housing unit, was subrogated to the position of its insured —namely the community– and brought a claim against the owner of that dwelling. On the other hand, in the judgment of the Civil Division of the Supreme Court of 22 November, the action for subrogation was brought against the tenant of a premises where the fire originated. We will see how the outcome is different when the action for subrogation is brought against a tenant rather than an owner of a dwelling or premises within the owners' community.

The events that occurred and the lower court judgments

The case at hand now is similar, although the premises where the fire broke out that caused damage to both communal areas and the premises was rented. This is why the community's insurer brought a claim for damages for this loss, not from the owner, but instead from the tenant of the premises, who, as regards the community's insurance contract, is considered to be a third rather than an insured party.

In this case the debate essentially turns on the contractual or extra-contractual nature of the action for subrogation which the community's insurer brought, to the extent that deciding that this involves one or the other affects the limitation period. If it is considered that the insurer is subrogated to the position of the home-owners' community, the action brought against the tenant and their insurer is extra-contractual, whereas if it is held that it is subrogated to the position of the owner of the premises (also insured in the community's policy), the action would be contractual.

Both the court of first instance and the Provincial Higher Court were of the view that what we have here is an extra-contractual action, for which the limitations period is one year. The claim was therefore dismissed at both court levels given that it was found that the exceptional limitation period of one year which Art. 1968.2 of the Civil Code stipulates should apply.

The appeals to the Supreme Court and against a decision of the Provincial Higher Court based on a mistake in law

For this reason, in its appeal to the Supreme Court against the decision of the Provincial Higher Court based on a mistake in law, the appellant insurer alleges that the Provincial Higher Court was wrong and altered the cause of action in stating that the claimant insurer was subrogated to the actions which were the preserve of the home-owners' community, when in fact it was subrogated to those which fell to the owner of the premises to bring in the latter's capacity as landlord.

Thus, the insurer which had brought the action for subrogation against the tenant of the premises and the latter's insurer maintains that the suit is contractual, and that it was subrogated to the owner of the premises (also insured under the community policy), since he was the injured party as a result of the fire. The appellant therefore considers that the Provincial Higher Court is attributing injured party status to somebody who was not such a party, because the person who actually has such status is whoever has been indemnified by the insurer, and in this case, this was the owner and landlord of the premises.

The legal basis which the Supreme Court cites

While alluding to its judgment No. 557/2021 of 21 July, which we have made reference to in the previous section, the Civil Division states that according to Art. 43 of the Insurance Contracts Act the claim which the insurer acquires is derivative (it comes from the insured) and is identical to that which the insured has against the third party that caused the loss or damage, which means that bringing it is subordinated to the same legal requirements upon which the insured's claim against the third party depends. And such subrogation entails the actions which the insurer can bring being the same as those which the insured/injured party could pursue.

With regard to this the Court Division believes that even if he is not the policy-holder, the owner of the premises had an economic interest in the property that was the object of the insurance policy in his two-fold capacity as both joint owner of the building (of the communal elements thereof) and owner/landlord of the premises where the fire took place.

On this basis the damage which the insurer indemnified was that which occurred to both the communal parts of the building and the particular premises. This is why it should be understood that, in accordance with Art. 43 of the Insurance Contracts Act, the insurer was subrogated to both of the actions that stemmed from the loss indemnified, to wit (i) that associated with liability in tort which fell to the home-owners' community to bring against the tenant of the premises and insurer thereof for the damage to communal elements of the building (Art. 1902 of the Civil Code) and (ii) the action for contractual liability which the member of the owner's community/landlord had available

against the same tenant for damage to the actual premises rented (Art. 1563 of the Civil Code), which was the action brought in the suit that originated these proceedings.

Matters being thus, the period of limitation, the point at which this starts being calculated and the possibility of interruption will depend on the nature of the claim which gives rise to the action that the insured conveys to the insurer. In other words, if the claim was of a contractual nature, the limitations period in Art. 1964-2 of the Civil Code would apply (or that in the specific regulation governing the particular contract), whereas if it was extra-contractual, the period would come to apply that is envisaged in Art. 1968.2 of the Civil Code.

The Court concludes that when concurrent actions derive from a single detrimental event (the fire), in this case (i) one for contractual liability with the owner of the premises and (ii) another for liability in tort with the home-owners' community, each action has a separate limitations period: that in Art. 1964.2 of the Civil Code in the first instance and that in Art. 1968.2 of the Civil Code in the second. And the decisive factor in this case is that in the lawsuit only the action for subrogation deriving from contractual liability was brought, this being that to which the landlord was entitled to bring against the tenant, meaning that the limitations period is five years, as stipulated in Art. 1964.2 of the Civil Code.

Consequently the High Court gave leave to proceed to the appeal which the insurer had filed to it and ruled that, due to being contractual in nature and having a limitations period of five years, the action had not become time-barred, although it did not actually deliver a judgment on the underlying issue, given that it understood that an appeal to the Supreme Court to review an appellate court judgment is not a new trial which (in the same way as a high court review of a judgment issued by a court of first instance) would have permitted a full hearing of all the background facts de *facto* and de *jure* for consideration thereof. Therefore, the ruling delivered by this particular court had to (as Article 487.2 of the Civil Procedure Act authorises) confine itself to quashing the judgment that was appealed against so that the appeals court might, as a court with full powers to hear all the issues de *facto* and de *jure* in the proceeding, settle these in a judgment, given that it was no longer possible to accept time-barring of the specific action brought in the suit.

Conclusions

After analysing the two judgments returned by the First Chamber (Civil Division) of the Supreme Court, the High Court lays down the requirements regarding actions for subrogation regulated under Article 43 of the Insurance Contracts Act. As we have said, what we have is not an autonomous action which the insurer can bring against the third party with liability, but instead the same action which the insured had available to move against the latter, for which reason the limitations period is the same as that which the insured had in which to act against the third party who had caused the loss or damage. By the same token, the nature of the action (whether contractual or extra-contractual) is the same as that available to the insured against the liable third party, as was effectively stated in the second of the judgments we have discussed.

We have also seen that the action is conditional upon three requirements:

a. The insurer must have paid out the indemnity by dint and as a consequence of an insurance contract.

b. The option of suing the third party for liability must have arisen for the insured in law, where the former is neither the policy holder nor an insured party.

c. The requirements for civil liability to exist must have been satisfied, of whatever nature this might be (contractual, extra-contractual or *ex delicto*).

On the other hand, in the first judgment discussed (that of 21 July 2021) the action for subrogation is brought against one of the members of the owners' community. In this case we have observed that the High Court considers the fellow owners to be the insured in the owners' community policy, and thus believes that the insurer cannot be subrogated when this is to the detriment of the insured, despite the latter being liable for the loss or damage to the community.

In my view this is a controversial matter, because I believe that the fellow owners are insured parties in the community policy only to the extent of their proportional share in the community. They have no insurable interest beyond this proportional share, given that the rest of the community property does not belong to them but instead to the other fellow owners. For this reason, it could be held that the insurer could claim all the losses paid out from the community (the other fellow owners) except for those corresponding to their proportional share, given that they are really the owner and insured as regards the losses.

On the other hand, in the second judgment (that of 22 November 2021) the insurer of the owners' community brings the action for subrogation against a tenant, who was the person responsible for the fire that caused loss and damage to the community property. In this case the Supreme Court does consider him to be a third party and therefore passively entitled to be sued and ordered to pay damages. We have also seen that, as regards the limitation period, the Supreme Court understands that the action which the insurer brings against the tenant is contractual, because this is the action which was available to the owner of the premises to bring against the tenant liable for the fire.

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