OPINION ON THE 2023/2024 (RE)ASSESSMENT OF THE NAT CAT STANDARD FORMULA

EIOPA-BoS-24/462
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European Insurance and Occupational Pensions Authority

OPINION ON THE 2023 2024 (RE)ASSESSMENT EXERCISE OF THE NAT CAT STANDARD FORMULA

1. EXECUTIVE SUMMARY

1.1. In light of climate change, new scientific insights and recent catastrophic events, it is important to ensure that the natural catastrophe parameters of the standard formula remain valid. EIOPA therefore performed the reassessment of the natural catastrophe risk standard formula capital charges. In addition, the Solvency II review which includes a mandate to EIOPA to do a reassessment and, in the case of significant discrepancy, a recalibration was considered for this work.

1.2. The tables below provide a summary of the (re)calibrated parameters. The cases where the reassessment did not result in a change of calibration and where the assessment showed that the risk was not material are also included.

(a) For earthquake:

Country	Assess/ Reassess	Country factor	New factor (%)/Old factor (%)	Aggregation matrix	Risk zones	Correlation between regions
PT	R	No		No	No	No
CH	R	No		No	No	No
RO	R	Yes	1/1.7	Yes	Yes	No
LI	R	No		No	No	No
IT	R	No		No	No	No

(b) For flood:

[Record Number]
EIOPA REGULAR USE
EIOPA-YY/XXX

Country	Assess/ Reassess	Country factor	New factor (%)/Old factor (%)	Aggregation matrix	Risk zones	Correlation between regions
FR	R	No		No	No	No
RO	R	Yes	0.13/0.3	Yes	Yes	No
LU	A	Yes	0.13	Not applicable	Not applicable	Yes
IT	R	No		No	No	No
BE	R	Yes	0.12/0.1	No	No	No
CZ	R	Yes	0.25/0.3	No	No	No
IE	A	Yes	0.17	Yes	Yes	Yes
DE	R	No		No	No	No
NO	A	Yes	0.05	Yes	Yes	Yes
FI	A	Yes	0.04	Yes	Yes	Yes
NL	A	Yes	0.035	Yes	Yes	Yes
DK	A	Yes	0.04	Yes	Yes	Yes
SE	A	Yes	0.045	Yes	Yes	Yes
MT	A	No[1]		No	No	No

[1] Not considered as material for the 2023/2024 exercise.

PT	A	No[2]		No	No	No
LI	R	No		No	No	No

(c) For windstorm:

Country	Assess/ Reassess	Country factor	New factor (%)/Old factor (%)	Aggregation matrix	Risk zones	Correlation between region
PL	R	Yes	0.03/0.04	No	No	No
IE	R	No		No	No	No
IS	R	Yes	0.06/0.03	No	No	No
DK	R	No		No	No	No
PT	A[3]	No		No	No	No
CZ	R	No		No	No	No
FR - Martinique	R	Yes	5/3.19	No	No	No
FR – St Martin	R	Yes	10/5.16	No	No	No
FR - Guadeloupe	R	Yes	6/2.74	No	No	No

[2] Not considered as material for the 2023/2024 exercise.

[3] Not considered as material for the 2023/2024 exercise.

FR - Reunion	R	No		No	No	No

(d) For hail:

Country	Assess/ Reassess	Country factor	New factor (%)/Old factor (%)	Aggregation matrix	Risk zones	Correlation between region
FR	R	Yes	0.02/0.01	No	No	No
IT	R	No		No	No	No
DE	R	Yes	0.03/0.02	No	No	No
BE	R	Yes	0.035/0.03	No	No	No
LU	R	Yes	0.10/0.03	Not applicable	Not applicable	No
NL	R	Yes	0.03/0.02	No	No	No
PL	A	Yes	0.02	Yes	Yes	Yes
NO	A	No		No	No	No

LoB	Assess/ Reassess	Factor	New factor/Old factor	Aggregation matrix	Risk zones	Correlation between region
Motor	R	Yes	10 /5	Not applicable	Not applicable	Not applicable

(e) For subsidence:

Country	Assess/ Reassess	Country factor	New factor (%)/Old factor (%)	aggregation matrix	Risk zones	Correlation between region
FR	R	Yes	0.06 / 0.05	No	No	No
BE	A	Yes	0.02	Yes	Yes	Yes
UK	A	No[4]		No	No	No

In addition, the following changes are proposed to the delegated acts (article 124 (7c)):

- Add definition of the perils covered in the standard formula using the definition mentioned in EIOPA's methodological paper[5] for more transparency (see also Annex 5).
- Correct the formula for motor hail and motor flood (modify the subscript "t" to "i"):

$$SI_{(hail,r,i)} = SI_{(property,r,i)} + SI_{(onshore-property,r,i)} + 10\ SI_{(motor,r,i)}$$

$$SI_{(flood,r,i)} = SI_{(property,r,i)} + SI_{(onshore-property,r,i)} + 1.5\ SI_{(motor,r,i)}$$

2. LEGAL BASIS

2.1. The European Insurance and Occupational Pensions Authority (EIOPA) provides this Opinion on the basis of Article 16a of the Regulation (EU) No 1094/2010[6].

2.2. In addition the Solvency II review (Article 304c (2))[7] which includes a mandate to EIOPA to undertake a regular (re)assessment is also relevant for this work.

[4] Not considered as material for the 2023/2024 exercise.

[5] EIOPA, 2021. Methodological paper on potential inclusion of climate change in the Nat Cat standard formula - European Union (europa.eu)

[6] Regulation (EU) No 1094/2010 of the European Parliament and of the Council of 24 November 2010 establishing a European Supervisory Authority (European Insurance and Occupational Pension Authority), amending Decision No 716/2009/EC and repealing Commission Decision 2009/79/EC (OJ L 331, 15.12.2010, p. 48).

[7] CORRIGENDUM to the position of the European Parliament adopted at first reading on 23 April 2024 with a view to the adoption of Directive (EU) 2024/ ... of the European Parliament and of the Council amending Directive 2009/138/EC as regards proportionality, quality of supervision, reporting, long-term guarantee measures, macro-prudential tools, sustainability risks, group and cross-border supervision, and amending Directives 2002/87/EC and 2013/34/EU

2.3. The Board of Supervisors has adopted this Opinion in accordance with Article 2(8) of its Rules of Procedure[8].

3. CONTEXT AND OBJECTIVE

3.1. EIOPA's opinion on sustainability within Solvency II[9] stated that a regular recalibration of the standard parameters for the natural catastrophe (Nat Cat) risk module of the standard formula (every 3 to 5 years) should consider future developments, as well as the potential effect of climate change using the latest data and science available. As a follow-up to EIOPA's Opinion on Sustainability within Solvency II, EIOPA published a methodological paper on the potential inclusion of climate change in the Nat Cat standard formula (SF)[10]. This paper considered if and how to include climate change in the Nat Cat Solvency Capital Requirement (SCR) calibration in the SF. It identified the need to explicitly consider climate change in the Nat Cat SF calibration for specific perils/regions. The main conclusions from this paper clearly support the formalisation of an approach to re-assess and, where material, recalibrate Nat Cat SCR parameters on a regular basis.

3.2. In addition, the Solvency II review includes a mandate to EIOPA to do a reassessment and, in the case of significant discrepancy, a recalibration in Art. 304c (2) (see legal basis).

The 2023/2024 exercise

3.3. EIOPA has performed a (re)assessment exercise including two steps: (a) (re)assessment of the Nat Cat parameters of the SF and (b) where material, suggest a recalibration of these parameters.

3.4. As set out in the methodological paper[11], EIOPA considered the following items:

- where available and relevant, EIOPA should use commercial Nat Cat models which explicitly consider climate change;
- based on the assessment done in the methodological paper, EIOPA should consider including new countries if material;
- EIOPA should also include a section on the monitoring of new emerging perils;
- the use of an open-source model to complement the views;
- the use of the most robust available data.

3.5. Chapter 3 of this paper sets out the (re)assessment where all perils/regions in scope have been analysed. Chapter 4 describes the perils/regions to be monitored. Chapter 5 provides the impact assessment.

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[8] Decision adopting the Rules of Procedure of EIOPA's Board of Supervisors, available at: https://www.eiopa.europa.eu/sites/default/files/publications/administrative/bos-rules_of_procedure.pdf.

[9] EIOPA, 2019. Opinion on Sustainability within Solvency II (europa.eu)

[10] EIOPA, 2021. Methodological paper on potential inclusion of climate change in the Nat Cat standard formula (europa.eu)

[11] EIOPA, 2021. Methodological paper on potential inclusion of climate change in the Nat Cat standard formula (europa.eu)

3.6. The review covers the parameters for country[12] factors, zonal relativities and correlations as well as the country correlations (for the definition of these parameters please see EIOPA's Methodological paper[13]).

3.7. The 2023/2024 exercise was performed in close collaboration with the national competent authorities (NCAs) and EIOPA's Technical Expert Network on Catastrophe Risks[14].

3.8. EIOPA considered the feedback received to this paper and submits this opinion on natural catastrophe risk to the European Commission by end of 2024. The European Commission will consider this opinion for a potential (re)calibration of the SF parameters.

Scope of the 2023/2024 exercise

3.9. EIOPA launched a call for evidence addressed to the NCAs, insurance and actuarial associations and EIOPA's Technical Expert Network on Catastrophe Risks at the start of 2023. The aim of the call for evidence was to seek feedback on whether the current Nat Cat parameters of the SF are fit for purpose (for example, some Nat Cat parameters have remained unchanged from the first calibration in 2010, model updates, potential effects of climate change…).

3.10. The Call for Evidence sought feedback on new perils and regions to be parameterized, perils to be monitored on an ongoing basis, and potential changes to risk zones. The following sections set out the feedback received and the decisions made on the scope of the review based on that feedback.

New perils/regions to potentially be added or reassessed in the SF

3.11. In this exercise, the parameterisation considers:

a) Parameters relating to perils/regions which needs to be **reassessed** are considered; this means that they are already parameterized in SII but need to be reviewed,
b) Parameters relating the perils/regions which could be **assessed** for inclusion in SII, if material, as they are currently not covered.

3.12. The call for evidence asked for feedback on new perils/regions to be included and which perils/regions should be reassessed. The feedback was taken on board and the following perils/regions parametrizations were (re)assessed. The main reason for the perils/regions which are listed in Table 1 to be (re)assessed is because new evidences/new insights have become available since their last calibration. For example, new models which better reflect the latest scientific evidence also cover the impact of climate change.

[12] Note that the regions considered in the Standard Formula correspond to countries.

[13] EIOPA, 2021. Methodological paper on potential inclusion of climate change in the Nat Cat standard formula (europa.eu)

[14] See Section "Organisations which are members of the technical expert network".

3.13. Many NCAs also proposed countries to be included in the parameterisation of the SF for the first time. When considering the inclusion of these countries, the assessment looked at the materiality of the impact.

3.14. Flood is the peril where (re)assessment of the parameterisation has been proposed for the greatest number of countries. This is linked with the recent events in Europe as well as with the fact that flood is a peril where the impact of climate change has been clearly identified. Due to the rapid changes in precipitation patterns, for example, many regions have also new models which account for the latest scientific evidence.

3.15. The second peril with the most countries to be (re)assessed is hail. This also links with the idea to better capture perils whose patterns are changing with climate change. Further, this reflects the availability of new models.

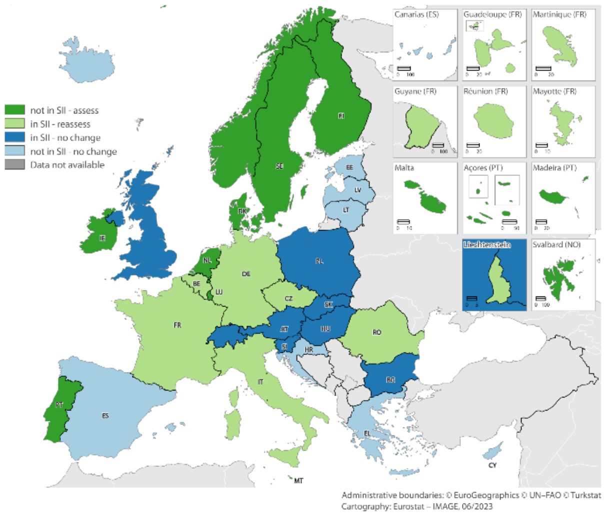
Peril	**Countries to be reassessed**	**Countries to be assessed**
Flood	FR, RO, CZ, IT, BE, LI, DE	PT, IE, NO, SE, FI, NL, DK, LU, MT [15]
Hail	FR, IT, DE, BE, LU, NL	PL, NO
Earthquake	CH, RO, LI, IT, PT	
Windstorm	PL, IE, IS, DK, CZ, FR (oversea territories)	PT
Subsidence	FR	UK[16], BE

Table 1: List of perils/regions to be (re)assessed

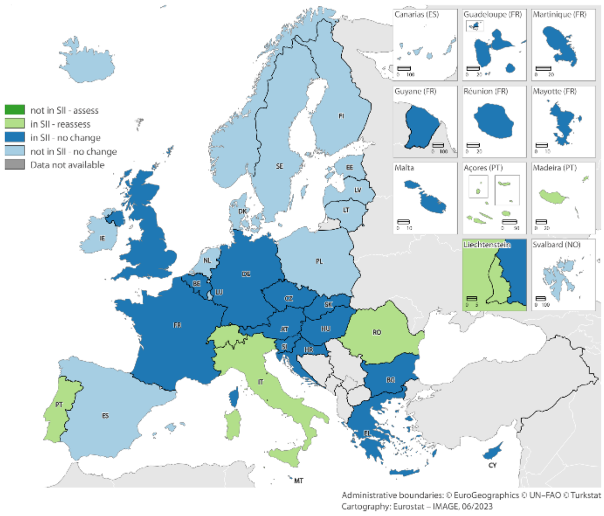
[15] However, for most of the countries to be assessed, there is only one model available.

[16] Note that the Standard Formula parameters consider also the risk factor for the UK as it is important to account for the physical conditions of the insured assets which are determined by their locations. European (re)insurers can have significant exposure in the UK and the risk needs to be assessed accordingly using a risk factor by peril specific to the UK.

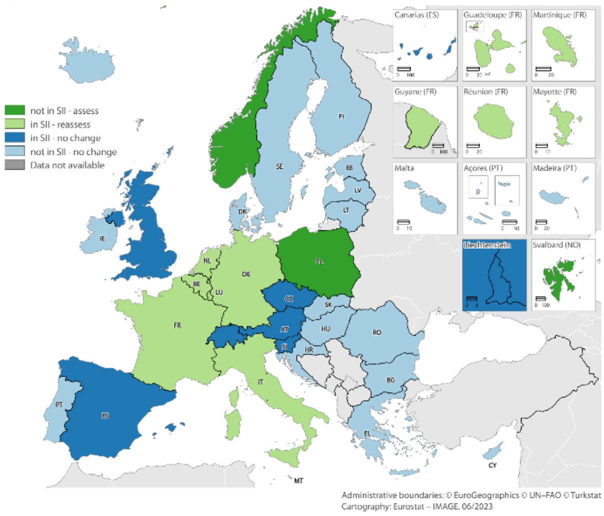
Flood



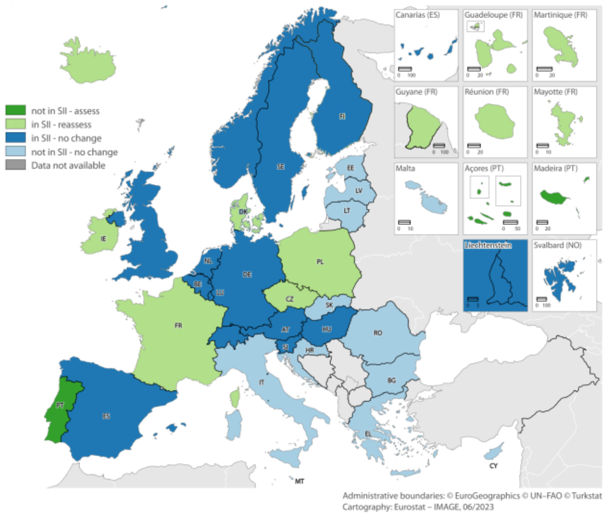
Earthquake



Hail



Windstorm



Subsidence

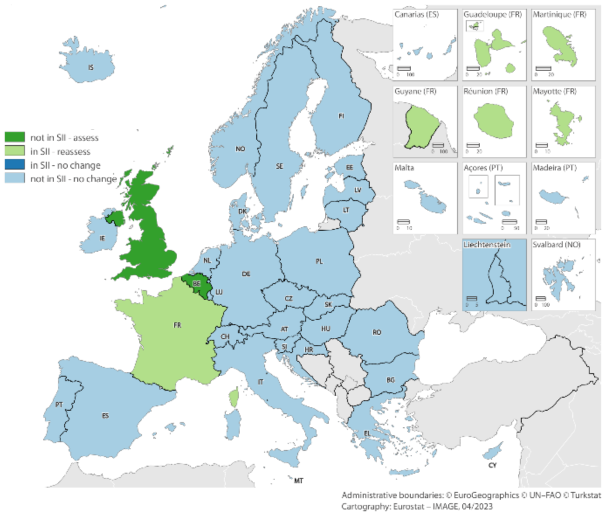


Figure 1: Maps showing the scope of the 2023/2024 (re)assessment exercise.

Perils to be monitored

3.16. EIOPA's methodological paper "on potential inclusion of climate change in the Nat Cat SF"[17] states that EIOPA will start monitoring emerging perils/regions which could potentially have an impact on the insurance sector but where insufficient models and data are currently available. Table 2 sets out the countries and perils that will be considered for monitoring.

Peril	**Countries to be monitored**
Wildfire	Main countries identified by NCAs/Call for evidence: IT, PT and IE but additional relevant countries will be considered in the analysis
Coastal flood	All relevant EU countries with a coast
Droughts	Main countries identified by NCAs/Call for evidence: BE, FR, IT and UK but additional relevant countries will be considered in the analysis.

Table 2: Perils/countries to be considered for the monitoring.

[17] EIOPA, 2021. Methodological paper on potential inclusion of climate change in the Nat Cat standard formula (europa.eu)

Risk zones

3.17. In the Call for Evidence, EIOPA asked which risk zones should be updated as risk zone definitions remain unchanged since 2010. Romania[18] expressed the wish to modify their risk zones (for Romania from currently NUTS3 to CRESTA zones).

Methodology

3.18. The steps to perform the 2023/2024 (re)assessment exercise are:

3.19. 1) Determination of the list of material perils/regions

NCAs, EU insurance associations and members of EIOPA’s Technical Expert Network on Catastrophe Risks responded to the Call for Evidence and provided input on the potential material inappropriateness of the previous calibration. This input is considered when determining the potential scenarios for (re)assessment. Relevant parameters for a scenario are: country, peril, country factor, zone relativity and aggregation matrix. In the (re)calibration only those perils/regions will be considered where, based on evidence received and an analysis performed by EIOPA a (re)calibration is needed.

3.20. The decision on which perils/regions to consider for (re)assessment is based on considerations, such as:

- new or updated models;
- differences in trends from loss ratio obtained from collected historical losses and exposure and loss ratio used in the SF (requires collection of historical claims);
- changes in insurance system in a certain country (e.g., new national pool, new products);
- change in risk because of adaptation measures and exposure vulnerability.

-> Outcome: A list of perils/regions to be considered in the 2023/2024 exercise[19].

3.21. 2) Determination of the input to the (re)assessment: Models and industry exposure data (IED)

Two distinct types of information are needed for the (re)assessment: models and industry exposure data (IED). The number of available models has significantly increased since the first calibration in 2010 and models are now available for most of the scenarios. In the case that industry exposure data is not available, model owners have to use their own data.

Outcome: A list of exposure data and models will be prepared aligning with the perils/regions defined in step 1.

3.22. 3) (Re)assessment of the country factors

The (re)assessment starts with the country factors (200-year Return Period Loss (RPL)/Total Insured Value (TIV)) because of their high impact on a (re)insurance undertaking's SCR for a given scenario.

[18] Finland had also considered to modify the current zoning from own mapping to CRESTA zones but the number of CRESTA zones for Finland is too high.

[19] As set out in Table 1

The TIV were mainly obtained from the model vendors who used their own Industry Exposure Database (IED). IEDs contain all insurable properties and their respective replacement values for a given country, along with information about the occupancy and the physical characteristics of the structures, such as construction type and height classification. Even information pertaining to standard industry policy conditions, such as limits and deductibles, is incorporated into a country's IED. For some countries, in addition to the modeler's own IEDs, some modelers also provided the results using Perils[20]' IED. The 200-year RPL (Gross Loss[21]) was modelled using commercial catastrophe models. To identify a final proposal for a single country factor the following process is carried out (referred to as the "mini-Delphi method"):

Available models for a given scenario are run and the values calculated and collected. In those cases where models are not available for a given scenario expert judgement is provided, using publicly available or sharable proprietary information.

The input values are then anonymized and circulated to the experts. The experts comment on the values and give a vote either to increase or to decrease the value further (or keep it as it is).

A comparison and subsequent consolidation of recommendations are conducted and comments to a "dominant set" of proposals are provided and re-circulated to the experts.

The process is repeated until a single value was identified as the final proposal.

Outcome: (Re)assessed country factors for perils/regions defined in step 1.

3.23. 4) Decision for a (re)calibration

In the previous 2018 exercise, the materiality threshold used to decide whether to include (or not) a specific peril/region in the SF was if its 200-year return period loss exceeds circa 1/15 of the highest 200-year return period peril loss for the region.

A second threshold is required to decide if an existing parameter needs to be recalibrated. The change needs to be sufficiently material to justify recalibration. A list of the previous parameters and new parameters is created to support the decision.

Outcome: List of material country factors for perils/regions defined in step 1.

3.24. 5) Decision on (re)assessment of more granular parameters

Based on the Call for Evidence and results from step 4, it is decided if risk zone weights and/or aggregation matrices need to be (re)assessed. If new perils/regions are added, then all parameters need to be assessed.

Outcome: A List of parameters to be assessed based on list from step 4.

3.25. 6) (Re)assessment of risk zone weights, country correlations and aggregation matrices

For the (re)assessment of risk zone weights, aggregation matrices and country correlations relevant models are determined and industry exposure data collected. The relevant model(s) is then run and a vector of raw risk zone weights and an aggregation matrix are generated. Experts comment on

[20] About | Perils

[21] **Loss** to the insurer after limits and deductibles and co-insurance are applied, but before any forms of reinsurance.

potential inconsistencies/peculiarities they discover when assessing the appropriateness of each parameter (set). Finally, experts receive the output of the previous step for final consistency checks. Outcome: (Re)assessed parameters as defined under step 5 and for perils/regions defined in step 1.

3.26. 7) Monitoring emerging perils

Emerging perils are monitored by:

(1) Monitoring risk: EIOPA will look for analyses, data available to understand the risk in Europe.

(2) Monitoring historical economic and insured losses: historical data can be especially useful to understand the impact of the risk to the entire economy and to the insurance sector.

(3) Understanding the insurance penetration of the private sector in Europe: to understand the materiality to the insurance sector, it is also particularly important to have a good picture about the insurance penetration of these perils and how they are covered in Europe.

(4) Understanding potential future losses: none or few models are available to estimate potential future losses.

Outcome: Analysis of the perils to be monitored.

4. (RE)ASSESSMENT/(RE)CALIBRATION

4.1. This exercise considers the perils/regions described in the section “scope” above and used the steps described in the section “methodology” above in Chapter 1.

Earthquake

4.2. In the 2023/2024 exercise, Switzerland, Romania, Italy, Portugal and Liechtenstein are considered for earthquake (see Scope section in the introduction). During the previous 2017/2018 recalibration exercise, Italy (from 0.80% to 0.77%), Greece (from 1.85% to 1.75%) and Slovakia (from 0.15% to 0.16%) were recalibrated. Switzerland, Romania and Portugal have parameters which have been calibrated in 2010. Liechtenstein is currently added in the SF together with Switzerland.

Important historical events since last calibration

4.3. Considering historical events since the period when the parameters were lastly calibrated is helpful to see if the changes from these events need to be considered. For example, two important earthquake events occurred since Italy was lastly calibrated (see Annex 4). No significant events were identified for the other countries using EM-DAT’s database[22].

National pools

4.4. It is important to understand how national public/private partnership works in each country in order to properly reflect the capital requirement for the private insurance sector. In Switzerland, Italy, Portugal and Liechtenstein, earthquakes are covered only by the private insurance market. In

[22] EM-DAT - The international disaster database. Centre for Research on the Epidemiology of Disasters – CRED Université catholique de Louvain, Belgium “Emergency Events Database (EM-DAT). EM-DAT - The international disaster database (emdat.be)

Romania, earthquake is covered under the Natural Disaster Insurance Pool (PAID)[23], a privately owned monoliner. PAID administers the compulsory home insurance, which covers three risks specific to Romania (earthquakes, floods and landslides). PAID is considered as a specific entity which covers most of the earthquake, floods and landslides risks for the residential assets. However, industrial, commercial and excess residential risks (homeowners could decide to cover more than what is offered via PAID) are covered by primary insurers in Romania.

Implications for the estimation of the SF parameters

4.5. In the SF, it is necessary to consider how to reflect the PAID scheme as this will differ from the parameters which are used currently which do not consider the PAID scheme. It is important to note that the risk covered by PAID is not coming back to individual insurer balance sheet. It has been concluded to propose one new country factor without the risk covered by PAID.

Analysis

4.6. Switzerland, Romania and Portugal were lastly calibrated in 2010. Many earthquake models available for these countries have been updated since 2010. For Italy, four models available have also been updated since the last recalibration in 2017. For Liechtenstein, only one model is available.

Country	**Assess (A) reassess (R)**	**Total number of models considered**	**Last model revision [2004-2007]**	**Last model revision [2008-2011]**	**Last model revision [2012-2015]**	**Last model revision [2012-2015]**	**Last model revision [2016-2019]**	**Last model revision [2020-2023]**
CH	R	3	1			1	1	
RO	R	4		1		1	1	1
IT	R	4	1				2	1
PT	R	4	1			1	1	1
LI	R	1						1

Table 3: View of the model vintage available for the 2023/2024 exercise.

[23] About PAID (paidromania.ro)

4.7. The models are fully probabilistic models covering mainly the effects of earthquake-induced ground shaking. In addition, fire following, liquefaction, landslides and demand surge were also considered where possible.

4.8. After analysis of the different model outcomes, the decision for the recalibration of the SF parameters for earthquake is as follows (see also Table 4):

- For Switzerland (current factor 0.25% - calibrated in 2010), no new significant event occurred since last calibration. Current modelled country factor indicates that the factor might need to be slightly increased (current models propose a range between 0.26% and 0.37%). However, new hazard maps developed for Europe[24] are not yet integrated in the current models used to calibrate the SF. The new earthquake hazard maps show a hazard decrease in multiple European countries. The proposal for Switzerland is therefore to wait until models have integrated new hazard maps.
- Liechtenstein is considered in the SF together with Switzerland. The same conclusions as for Switzerland apply for Liechtenstein.
- For Italy (current factor 0.77% calibrated in 2017). In 2017, the most conservative model used suggested something below 0.65%. The final value was chosen by an iterative process and in order to still account for model uncertainty and risks not modelled. For this exercise, models also indicate the potential need to lower the country factor. However, the model that estimates lower country factors do not explicitly include demand surge, fire following, liquefaction and landslides. Instead, these are included in the model in the highest range, that yields a very close result to the current factor. To be on the prudential side, also considering that new hazard maps are still under development at the national level, the factor for Italy is not proposed for a (re)calibration this time.
- For Romania (current factor 1.7% calibrated in 2010). With the new scheme PAID in place, it is important to review this factor. The new factor in the SF will cover the earthquake risks for industrial, commercial and excess residential risks (homeowners could decide to cover more than what is offered via PAID) which are covered by primary insurers in Romania. The factor will not be adequate for the risks taken by the PAID scheme. The risk zones and aggregation matrix will also be recalibrated to use CRESTA zones instead of NUTS risk zones.
- For Portugal (current factor 1.2% calibrated in 2010). All the country factors obtained from the current models shows that the current factor is too high. However, a lot of research is done to better understand historical earthquakes that have hit the region such as the 1755 Lisbon earthquake. Recent research presented at the European Geophysical Union (EGU) discusses the reactivation of the SW Iberia margin and whether this could lead to the nucleation of a new subduction zone.[25] Estimations from Verisk show that a similar event today would result in ground-

[24] SERA | Home (sera-eu.org)

[25] Tectonics and Structural Geology | Lisbon at the dawn of modern geosciences (egu.eu)

up losses of nearly 20 billion Euros for Portugal (this figure from 2009 reflects damage to insured building and content only – the total damages would be significantly higher)[26]. In this context the current country factor does not appear overly prudent; thus there is no proposal for recalibration.

Country	Country factor	Risk weights	Aggregation matrix	Correlation coefficient for regions
RO	Yes	Yes	Yes	No
CH	No	No	No	No
PT	No	No	No	No
IT	No	No	No	No
LI	No	No	No	No

Table 4: Decision to suggest a (re)calibration of the SF parameters.

New SF parameters for Romania earthquake

Country factor for Romania

4.9. The new country factor considers only industrial, commercial and excess residential risks exposures. From the four models considered, two offered a view of the factor excluding the exposure taken by PAID. One of these two models suggest to significantly lower the current factor however the other is aligned with the current factor. After asking expert views via the mini-Delphi process, a new factor equal to 1% was deemed reasonable especially in comparison to the country factors for the other regions.

Risk zones for Romania

4.10. For the risk zones and aggregation matrix, the SF considers currently NUTS3 regions (41 regions - Judet). The national supervisor is suggesting moving to high resolution CRESTA zones which has 47 zones in Romania (2-Digit Postcode Area (Example: ROU_01)). The changes would be observed only for the Bucaresti region (see also Annex 1).

[26] From 1755 to Today—Reassessing Lisbon's Earthquake Risk | AIR Worldwide (air-worldwide.com)

Windstorm

4.11. In the 2023/2024 exercise, Poland, Ireland, Iceland, Denmark, Czechia, Portugal and the overseas French territories are considered for windstorm (see Scope section in the introduction). During the previous 2017/2018 recalibration exercise, Austria (from 0.08% to 0.06%), Czechia (from 0.03% to 0.04%), Switzerland (from 0.08% to 0.09%), Germany (from 0.09% to 0.07%), Ireland (from 0.20% to 0.22%), Luxemburg (from 0.10% to 0.12%), Spain (from 0.03% to 0.01%), Sweden (from 0.09% to 0.085%) were recalibrated. Also, Finland (at 0.04%), Hungary (at 0.02%) and Slovenia (at 0.04%) were assessed and added to the SF. Poland (at 0.04%) and Denmark (at 0.25%) were also reassessed in 2017/2018 but without changes. The overseas French territories and Iceland have parameters which were calibrated in 2010. Portugal is being assessed for the first time.

Important historical events since last calibration

4.12. Examples of major storm events in the countries being (re)assessed since the last recalibration exercise are shown in Annex 4.

National pools

4.13. It is important to understand how national public/private partnership works in each country in order to properly reflect the capital requirement for the private insurance sector. In all the countries being reassessed windstorm claims are directly covered only by the private insurance market. In France, insurers can, upon request, sign a reinsurance contract with public reinsurer Caisse centrale de reassurance (CCR).

<u>Implications for the estimation of the SF parameters</u>

4.14. The CCR does not provide direct reimbursement to policyholders but acts as a state-backed reinsurer. Hence, it is still important to calibrate the solvency capital requirement before CCR, as the primary coverage is realized through private insurers.

4.15. No national scheme will impact the calculation of the SF parameters for windstorms.

Analysis

4.16. The overseas French territories (Guadeloupe, Saint Martin, Martinique, Reunion) were last calibrated in 2010. The models available for these territories have been updated since 2010. For the countries last assessed in 2017/2018 many of the models available have also been updated since the last recalibration. For Iceland no model is available, the decision to reassess was in this case based on input from the Central Bank of Iceland, who indicated that windstorm risk in Iceland might be underestimated in the current SF, based on analysis performed by the Icelandic meteorological office. For Portugal, which has not been assessed before, there are two models, of which one was recently updated.

Country	Assess (A) reassess (R)	Total number of models considered	Last model revision [2004-2007]	Last model revision [2008-2011]	Last model revision [2012-2015]	Last model revision [2016-2019]	Last model revision [2020-2023]
PL	R	5			1	2	2
CZ	R	5			1	2	2
IE	R	4			1	1	2
DK	R	5			1	1	2
PT	A	2			1		1
GU	R	2					2
MA	R	2					2
SM	R	1					1
RE	R	2			1		1
IS	R	0					

Table 5: View of the model vintage available for the 2023/2024 exercise.

4.17. For Ireland and Denmark, in addition to the modeller's own IEDs, some modellers also provided the results using Perils' IED. The 200-year RPL (Gross Loss[27]) was modelled using commercial catastrophe models (see also Table 1). The models are fully probabilistic models, in some cases modelling storm surge separately and in some cases not. In the case of Iceland there is no model available, so the recalibration depends entirely on expert judgement.

4.18. After analysis of the different model outcomes, the decision for the recalibration of the SF parameters for windstorm is as follows (see also Table 6):

[27] After limits and deductibles

- For Czechia (current factor 0.04% - calibrated in 2017) output from five different models suggest a country factor very close to the current factor. Based on these results and as the last recalibration is recent, the need for recalibration seems doubtful. The factor for Czechia will not be proposed for a recalibration this time.
- For Ireland (current factor 0.22% - calibrated in 2017) there were four different model providers, and seven different proposed country factors (some models were run on two sets of exposure). The proposed country factors were in the range 0.10-0.25%. Some of the models did not consider storm surge. Overall, the range of country factors was somewhat lower than in the previous exercise. As the last recalibration is recent, given that the current country factor of 0.22% does not look materially out of line with updated model outputs and in the context of potential adverse impact of climate change a change was not estimated to be justified and so the country factor for Ireland will not be proposed for a recalibration this time.
- For Poland (current factor 0.04% - calibrated in 2017) there were five different models, all suggesting a country factor slightly lower than the current. Hence, output from the models suggests lowering the current country factor.
- For Denmark (current factor 0.25% - calibrated in 2017) there were five different models and seven different proposed country factors (some models were run on two sets of exposure – detailed and aggregated exposures). The proposed country factors varied significantly, with only one model higher than current country factor. As the last recalibration is recent, the current value of 0.25% doesn't look materially out of line, considering that climate change might amplify storm risk in the future[28]. The factor for Denmark will not be proposed for a recalibration this time.
- For Portugal (no previous factor) there were two models available, both suggesting a country factor more than 10 times smaller than the current factor for earthquake of 1.20%. The materiality of windstorm risk in Portugal still seems doubtful[29]. No country factor for windstorm risk will be proposed for Portugal this time.

[28] Whilst there appears to wide agreement in the scientific community that there will be an increase in the severity and frequency of storms over parts of Europe including Denmark by the end of the century, the projections for the short and mid-term have much less certainty. There is a lot of uncertainty in the climate model performance (as measured using multi-model comparisons) at these shorter time horizons. The natural variability of these complex systems is assumed to dominate over any secular climate change signal under future projections extending out to 2050. What is irrefutable is that sea-levels are rising under all SSP scenarios thus leading to increased Surge risk in low-lying areas in Denmark within that shorter time horizon.

[29] Portugal is affected by windstorms and has had several locally severe windstorms in the last 300 years. These storms occurred before the advent of high-quality scientific instrumentation but anecdotal evidence suggests that they were very damaging. They can happen and they will happen again in the future. The future materiality remains unclear but there is also expected to be an increase in "transitioning" events, i.e. Hurricanes that cross the Atlantic and transition into extra-tropical cyclones. There have been recent examples of this such as Storm Leslie and research suggests that these will be more common in the future.

- For Martinique (current factor 3.19% - calibrated in 2010) there were two models available, one suggesting a country factor slightly higher than the current and the other a factor several times higher. While the large difference between models needs discussion it would seem that the country factor might need to be increased.
- For Guadeloupe (current factor 2.74% - calibrated in 2010) there were two models available, one suggesting a country factor around 10% and the other a factor several times larger than that. While the large difference between models needs discussion it would seem that the country factor probably needs to be increased.
- For Reunion (current factor 2.50% - calibrated in 2010) there were two models available, one suggesting a country factor significantly lower than the current and the other a factor of significantly higher. While the large difference between models makes interpretation somewhat difficult there is not sufficient reason to change current factor. The factor for Reunion will not be proposed for a recalibration this time.
- For Saint Martin (current factor 5.16% - calibrated in 2010) there was only one model available, suggesting a country factor several times higher than the current. This indicates that the country factor probably needs to be increased.
- For Iceland (current factor 0.03% - calibrated in 2010) there was no model available. In 2010, the country factor for windstorm in Iceland was chosen by benchmarking against a particular 1991 windstorm, which was implicitly assumed to be a 1-in-200-year event. However, retrospective analysis performed in the last few years by the Icelandic Meteorological office, indicated that at least under current conditions a storm of this magnitude is more likely a 1-in-50/70 years event. The lack of models means that the calibration needs to depend entirely on expert judgement.

Country	Country factor	Risk weights	Aggregation matrix	Correlation coefficient for regions
PL	Yes	No	No	No
CZ	No	No	No	No
IE	No	No	No	No
DK	No	No	No	No
PT	No	No	No	No
GU	Yes	No	No	No

MA	Yes	No	No	No
SM	Yes	No	No	No
RE	No	No	No	No
IS	Yes	No	No	No

Table 6: Decision to suggest a (re)calibration of the SF parameters.

New SF parameters for Poland windstorm

Country factor for Poland windstorm

4.19. From the Delphi method there was a decision in the technical Expert Network on Catastrophe Risks to lower the country factor for windstorm from 0.04% to 0.03%. All five models considered indicated lowering the country factor and several of the models proposed 0.03%. Already in 2017 it was considered that a small decrease of the country factor for Poland might have been justified. This time, the range of factors proposed by the considered models was even lower than in 2017.

New SF parameters for Guadeloupe windstorm

Country factor for Guadeloupe windstorm

4.20. From the Delphi method there was a decision in the technical Expert Network on Catastrophe Risks to increase the country factor for windstorm from 2.74% to 6%. This is a significant increase yet lower than both factors proposed by the models. The choice reflects experience from hurricane Irma. Both models indicate that the factor needs to be increased and that the factor for Guadeloupe should, based on model results, be higher than the factor for Martinique. Again, however, uncertainty is very large.

New SF parameters for Martinique windstorm

Country factor for Martinique windstorm

4.21. From the Delphi method there was a decision in the technical Expert Network on Catastrophe Risks to increase the country factor for windstorm from 3.81% to 5%. This is slightly higher than the lower of the two factors proposed by the model but significantly lower than the other. The choice reflects experience from hurricane Irma in 2017, that both models indicate that the factor needs to be increased but also that uncertainty is very large and the factor is rounded so as to not give a false impression of very high precision.

New SF parameters for St-Martin windstorm

Country factor for St-Martin windstorm

4.22. From the Delphi method there was a decision in the technical Expert Network on Catastrophe Risks to increase the country factor for windstorm from 5.16% to 10%. This is a very large increase but still much lower than the factor proposed by the only available model. With only one model available, uncertainty is even higher than for the other French overseas territories, but the factor is chosen considering that the only model suggests a very high factor, experience from hurricane Irma in 2017 and the fact that the island, being low-lying, is more exposed than the other territories considered.

New SF parameters for Iceland windstorm

Country factor for Iceland windstorm

4.23. From the Delphi method there was a decision in the technical Expert Network on Catastrophe Risks to increase the country factor for windstorm from 0.03% to 0.06%. While the choice of country factor for Iceland is particularly difficult because there are no models available and no neighbouring countries for comparison, the factor was agreed by considering how the 99.5:th percentile compares to the 98:th in typical modelled curves for windstorm losses.

Flood

4.24. In the 2023/2024 exercise, France, Romania, Czechia, Italy, Belgium, Liechtenstein, Germany, Portugal, Ireland, Norway, Sweden, Finland, Netherlands, Denmark, Luxembourg and Malta are considered for flood (see Scope section in the introduction). France, Romania, Czechia, Italy, Belgium, Liechtenstein, Germany are subject to reassessment. Portugal, Ireland, Norway, Sweden, Finland, Netherlands, Denmark, Luxembourg and Malta are all subject to an assessment.

4.25. During the previous 2017/2018 recalibration exercise, France (from 0.1 % to 0.12 %), Romania (from 0.4 % to 0.3 %), Czechia (0.3 % to 0.32 %), Italy (from 0.1% to 0.15 %), Belgium (from 0.1 % to 0.1 %) and Germany (unchanged at 0.2 %), were recalibrated. The parameters of Liechtenstein have not changed since 2010.

Important historical events

4.26. The table with examples of important flood events occurred is to be found in Annex 4. Many floods occurred since the last time the standard formula parameters have been calibrated. New events generally provide new insights which are reflected in new models.

National pools

4.27. It is important to understand how national public/private partnership works in each country in order to properly reflect the capital requirement for the private insurance sector. In Romania, Norway, the

Netherlands and Denmark, certain type of floods and certain losses are to some degree covered by a national scheme.

Romania

4.28. In Romania, similar as for earthquake, flood is covered under the Natural Disaster Insurance Pool (PAID)30. PAID administers the compulsory home insurance, which covers three risks specific to Romania (earthquakes, floods and landslides). PAID is considered as a specific entity which covers most of the earthquake, floods and landslides risks for the residential assets. However, industrial, commercial and excess residential risks (homeowners could decide to cover more than what is offered via PAID) are covered by primary insurers in Romania. The shareholders of PAID are primary Romanian insurers.

Implication for the estimation of the SF parameters

4.29. In the SF, it is necessary to consider how to reflect the PAID scheme as this will differ from the parameters which are used currently which do not consider the PAID scheme. It is important to note that the risk covered by PAID is not coming back to individual insurer balance sheet, except for a possible change in the value of the equity participation in PAID. It has been concluded to propose one new parameter without PAID.

Norway

4.30. In Norway, the Norwegian Natural Damage Compensation Act is a scheme made to provide compensation following a natural disaster. Its activities are governed by the Natural Perils Insurance Act and the Rules for the Norwegian Natural Perils Pool [31] [32]. The pool is a compulsory cover linked to fire insurance in Norway. All insurers providing fire cover in Norway must be members of the Pool.

4.31. To qualify for compensation the damaged object cannot be covered by a regular insurance and damages needs to be caused by either landslide/avalanche, storm, flood, storm surge, earthquake, or volcanic eruption. Damages from pluvial flood is not covered.

4.32. The pool is organized as an equalization pool, which means that it is the companies themselves who has all contact with their policyholders and conducts the claims handling, while the pool settles claims and expenses in connection with these among the pool's members in proportion to their share of the pool, which corresponds to their share of the market for fire insurance in Norway.

Implications for the estimation of the SF parameters

[30] About PAID (paidromania.ro)

[31] Act on compensation for natural damage (Natural Damage Compensation Act) - Lovdata

[32] Naturskadeordningen - Landbruksdirektoratet

4.33. Due to the national scheme in place in Norway, the undertakings themselves have all the risk regardless of the risk being part of the pool or not, such as the case with damages from pluvial flood. This is fundamentally different from the national scheme in place for Denmark. Therefore, the calibration of the parameters should not be adjusted due to the national scheme in place.

The Netherlands

4.34. In the Netherlands, damage caused by flooding is borne by different parties depending on the type of flooding. Insurance companies insure damages of property and motor stemming from flooding caused by non-primary dikes (pluvial flood, small rivers and canals), as well as damages of motor stemming from flooding caused by primary dikes (North Sea, large rivers and lakes). Companies do not insure property caused by flooding due to primary dikes. A (significant) part of the latter, from a solidarity principle, can be borne by the government through the Act on compensation for damage in the event of disasters (Wet Tegemoetkoming Schade bij rampen en zware ongevallen - Wts), applicable only to uninsurable risks. The government is not expected (nor obliged) to compensate all the damage and is free to determine the level of compensation under the Wts. Part of the damage will thus be borne by the households, businesses and other organisations (e.g., housing associations). After the flooding in Limburg in the summer of 2021, public conversations have started on a public-private scheme for property insurance stemming from flooding due to primary dikes, but that received not enough support by the Dutch Cabinet in June 2024. Instead, the Dutch government will most likely remain the primary actor to compensate damages from flooding caused by primary dikes and insurers will be assigned to execute the respective damage compensation. The precise form of how it will be executed is being determined.

Market penetration flood coverage

	Precipitation (pluvial flood)	Flood (fluvial and storm surge)		
		Small rivers	Non-primary flood defences	Primary flood defences (North Sea, large rivers, large lakes)
Residential buildings	98%	95%	> 90%	< 1%
Residential contents	98%	95%	> 90%	< 1%
Commercial buildings (SME)	> 95%	> 75%	> 75%	< 1%
Commercial contents (SME)	> 95%	> 75%	> 75%	< 1%
Motor other	~100%	~100%	~ 100%	~100%
Business interruption	< 25%	< 25%	?	0%

Insurable
Hardly insurable
Insurable, but low market penetration
% Market penetration

Figure 2: Market penetration flood coverage in the Netherlands (Source: PowerPoint presentation by the Dutch Association of Insurers).

<u>Implications for the estimation of the SF parameters</u>

4.35. Primary flood risk is not insured by insurers but covered by a national Act on compensation for damage in the event of disasters., The evaluation of the Act will take until Q4 2024. Therefore, primary flood risk should not be considered during this exercise.

Denmark

4.36. In Denmark, the Danish Natural Hazards Council is a national insurance scheme which covers when there is storm surge, drought, flooding from streams and lakes (fluvial flood) or windfall[33]. According to the material from the Natural Damage Council, the flood scheme covers damages to buildings, building components, household goods, agricultural land, including crops, fences, and similar if directly affected by floods, e.g., melting snow or accumulation of water from lakes and watercourses (fluvial flood)[34]. To get coverage on the scheme the following conditions must be met[35].

- the fluvial flood must be an extremely high-water level in a watercourse or a lake, which statistically occurs less frequently than every 20 years[36].
- the private insurance must not cover the damage on the regular insurance scheme.
- the insured must have a fire insurance already for the building and/or contents affected by the flooding.

Implications for the estimation of the SF parameters

4.37. Due to the national scheme in place, fluvial flood is for the most part not on the books for the undertakings. Therefore, the parameters for flood risk should either (1) not include fluvial flood risk or (2) include only pluvial flood risk + fluvial flood risks which statistically occurs more frequently than every 20 years[37] .

Analysis

4.38. France, Romania, Czechia, Italy, Belgium and Germany were part of the previous 2017/2018 recalibration exercise. Many models available for these countries have been updated since 2017/2018. The parameters of Liechtenstein have not changed since 2010. For France, two models are available with model updates after 2017/2018. For Romania, two models are available with model updates after 2017/2018. For Czechia, four out of five models available are with updates after 2017/2018. For Italy, three models are available with model updates after 2017/2018. For Belgium, three models are available with model update after 2017/2018. For Germany, four out of five models available have been updated after 2017/2018.

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[33] danishnaturalhazardscouncil.dk

[34] naturskaderådets Dækningsvejledning (naturskaderaadet.dk) naturskaderådets Dækningsvejledning (naturskaderaadet.dk)

[35] Bekendtgørelse af lov om visse naturskader (retsinformation.dk)

[36] The return period for a meteorological event such as a flood might not be the same as the return period of an insured loss.

4.39. For Ireland, Netherlands and Luxembourg there are two models available for these countries.

4.40. For Portugal, Norway, Sweden, Finland, Denmark, Liechtenstein and Malta there is only one model available for these countries.

Country	Assess (A) reassess (R)	Total number of models considered	Last model revision [2013]	Last model revision [2014]	Last model revision [2019]	Last model revision [2021]	Last model revision [2021]	Last model revision [2022]	Last model revision [2020-2023]	Last model revision [2023]	Last model revision [2023]	Last model revision [2023]
FR	R	2							1		1	
RO	R	2				1			1			
CZ	R	5		1	1		1		1		1	
IT	R	3							1	1	1	
BE	R	3						1	1		1	
LI	A	1									1	
DE	R	4	1		1				1		1	1
PT	A	1							1			
IE	A	2							1		1	
NO	A	1							1			
SE	A	1							1			
FI	A	1							1			
NL	A	2							1			1
DK	A	1							1			
LU	A	2							1		1	
MT	A	1							1			

Table 7: View of the model vintage available for the 2023/2024 exercise.

4.41. For flood, some model vendors do not have access to good IED data and therefore use an approximation whereby spatial representation of risk per country are based on gross domestic product (GDP) and therefore do not represent insured loss. Furthermore, when using the GDP as exposure data, limits and deductible are not included and information about the occupancy and the physical characteristics is assumed generic. For these reasons, model vendor results based on GDP exposure and not insured exposure are considered only for countries where no other model was available.

4.42. For Germany, in addition to the modeller's own IEDs, some modellers also provided the results using Perils[38]' IED. The 200-year RPL (Gross Loss[39]) was modelled using commercial catastrophe models (see also Table 1).

4.43. The models are fully probabilistic models covering mainly the effects of precipitation induced floods for both on and off- floodplains. In addition, some models include explicit recognition of flood defences and their failures, demand-surge, seasonality, antecedent conditions. For some countries, the digital terrain models can provide 5m resolution maps, while others are at a resolution at 30m.

4.44. After analysis of the different model outcomes and expert judgement, 31 SF parameters for flood will be proposed for a recalibration following this 2023/2024 (re)assessment exercise (see also Table 8):

- For France: the current country factor for France is 0.12%. The country factor was (re)calibrated in 2017 going from 0.1% to 0.12%. It was agreed to have an increase as 0.1% was the lowest result from the 3 models available at the time. In this exercise, a new model was available for the workstream and suggested a slightly lower value. As the last recalibration is recent, overall it has been concluded that 0.12% seems to be a suitable value for France, therefore no change is proposed for France for this exercise. As such France is not considered further.
- For Romania: the previous country factor for Romania was equal to 0.3% and was (re)calibrated in 2017. The 2010 country factor was equal to 0.4%. In 2017, no model was available but given the neighbouring countries, a decrease appeared justified. With the new scheme PAID in place, it is important to review this factor. The new factor in the SF will cover the flood risks for industrial, commercial and excess residential risks (homeowners could decide to cover more than what is offered via PAID) which are covered by primary insurers in Romania. The factor will not be adequate for the risk taken by the PAID scheme. It has been concluded that a country factor without PAID is needed. The risk zones and aggregation matrix will also be recalibrated to use CRESTA zones in instead of NUTS risk zones. Romania is therefore subject to a reassessment.
- For Czechia: The current country factor for Czechia is 0.3%. The country factor was (re)calibrated in 2017 with a decision of no change from the previous factor of 0.3%. In 2017, the average of the

[38] About | Perils

[39] After limits and deductibles

five models (0.32%) indicated that an increase of the factor could be needed. However, it was found that recent changes to local policy conditions and infrastructure / flood defence would have to be considered for models to be sufficiently accurate. Currently, the most recent models seem to indicate a lower country factor with 4 models available. The models seem to indicate the need to lower the country factor. Furthermore, defences should be better captured in the models available currently. Czechia is therefore considered further.

- For Belgium: The current country factor for Belgium is 0.1%. The country factor was (re)calibrated in 2017 with a decision of no change from the previous factor of 0.1%. In 2017, the decision of not changing the country factor was due to the lack of models. Currently, two models are available with results in the range of 0.10% to 0.14%. The results of the models suggest a slight increase of the parameter. Belgium is subject to a reassessment.
- For Liechtenstein: Liechtenstein was considered together with Switzerland in the SF. After discussion in EIOPA's technical Expert Network on Catastrophe Risks there is no need to consider Liechtenstein alone. The Liechtenstein is part of the Swiss Pool.
- For Italy: The current country factor of Italy is 0.15%. The country factor was (re)calibrated in 2017 with a decision of increasing the factor from 0.10% to 0.15%. In 2017 the output of models indicated that an increase may be needed (e.g., a model offers a result of 0.20%). Currently, there are two models available with following results in the range of 0.12% - 0.18%. It is concluded that the current factor of 0.15% still seems to be a good value for the flood risk in Italy. Therefore, Italy is not considered further.
- For Germany: The current country factor for Germany is 0.2%. The country factor was (re)calibrated in 2017 with a decision of no change from the previous factor of 0.2%. In 2017 the decision of not changing the country factor was since the factor was within the range of 4 model outputs (average 0.16%). Currently, there are four models available with the country factor results. Given that four of the results are still within the range of the current factor, it has been decided not to change the current country factor. With regard to a potential recalibration of the parameters of the risk zones, an analysis using a model which reflects the current flood risk was made to evaluate if the current SF risk zone parameters are still valid. The results showed no clear evidence that a reassessment of the risk zones just for Germany is necessary for this exercise. However, against the background of the improved models for flood a general recalibration of the parameters for all risk zones could be considered in the next reassessment exercise.
- For Portugal: There is currently no flood peril for Portugal in the SF. For this (re)assessment no models were provided. It has been decided not to add a country factor for flood based on expert judgement for this (re)assessment exercise but Portugal should be (re)assessed in the next exercise.
- For Malta: There is currently no flood peril for Malta in the SF. For this (re)assessment no models were provided. It has been decided not to add a country factor for flood based on expert judgement for this (re)assessment exercise but Malta should be (re)assessed in the next exercise.

- For Luxembourg: There is currently no flood peril for Luxembourg in the SF. For this (re)assessment exercise one vendor model has been made available for the workstream. The vendor model results indicated that the flood risk could be material for Luxembourg. Luxembourg is therefore subject to an assessment during this exercise.
- For Ireland: There is currently no flood peril for Ireland in the SF and so it is being calibrated for the first time. For this calibration exercise one vendor model has been made available for the workstream. The results indicate that flood risk is material for Ireland. Ireland is therefore subject to an assessment during this exercise.
- For the Nordic countries: The peril flood is not currently included in the SF for the Nordics, therefore there is no prior calibration. However, flood is deemed material for several reasons. The methodological paper by EIOPA suggests that the flood peril should be added for the Nordic countries of Denmark and Sweden[40]. Flood is argued to be material because climate change is likely to cause higher risk of flooding, more heavy rain and more frequent rain etc. The NCA's of FI, DK and SE all argued during the Call for Evidence that flood risk should be considered in the reassessment exercise of 2023/2024, and that flood risk might be material based on observations about impact of climate change, past loss experience and the results of undertakings internal models. In addition, the technical Expert Network on Catastrophe Risks argued during the Call for Evidence, that the northern parts of Europe will experience more extreme flooding even by 2030 and thus may need recalibration. There is only one vendor model result available to the workstream for the Nordic countries. The initial results of the vendor model suggest that the Nordic countries should be included in the SF. The results of the vendor model were shown to overestimate the risk of flood primarily due to lack of industry exposure. This was concluded during the initial discussions of the vendor model results in the technical Expert Network on Catastrophe Risks. Therefore, the initial results have been rescaled for the Nordics by consideration on a relative basis between countries. It has been concluded that the country factors for the Nordics must be based on expert judgment including scaling process described above. Following, a subgroup for the Nordics been established with the goal to come up with new parameters for the Nordics based on expert judgment.
- For the Netherlands: EIOPA's methodological paper suggests that the flood peril should be added. Flood is argued to be material since climate change is likely to cause higher risk of flooding, more heavy and frequent rain. During the Call for Evidence, the NCA's of NL argued that flood risk might be material for NL. In addition, the technical Expert Network on Catastrophe Risks argued during the Call for Evidence that the northern parts of Europe will experience more extreme flooding even by 2030 and thus may need recalibration. Furthermore, information from technical Expert Network on Catastrophe Risks during the Call for Evidence suggests, that there is a particular commercial interest for flood risk in NL, hence flood risk is considered material. For the

[40] EIOPA, 2021. Methodological paper on potential inclusion of climate change in the Nat Cat SF

Netherlands, one model is available[41] (and supported by two shadows[42] models). With only one viable model result available (and two shadow models) it has been concluded that the parameters for the NL must be based on expert judgment. Following, a subgroup for the NL has been established to come up with new parameters for the NL based on expert judgment.

Country	Country factor	Risk Zone	Aggregation matrix	Correlation coefficient for regions
FR	No	No	No	No
RO	Yes	Yes	Yes	No
CZ	Yes	No	No	No
IT	No	No	No	No
BE	Yes	No	No	No
LI	No	No	No	No
DE	No	No	No	No
PT	No	No	No	No
IE	Yes	Yes	Yes	Yes
NO	Yes	Yes	Yes	Yes
SE	Yes	Yes	Yes	Yes
FI	Yes	Yes	Yes	Yes

[41] The second model shown in Table 7 is a model where the results are based on GDP exposure and not insured exposure and was not considered for the Netherands as other models were available.

[42] models in development not yet available for the general market but expected to be launched in 2024.

NL	Yes	Yes	Yes	Yes
DK	Yes	Yes	Yes	Yes
LU	Yes	No	No	Yes
MT	No	No	No	No

Table 8: Decision to suggest a (re)calibration of the SF parameters.

New SF parameters for Romania

Country factor for Romania

4.45. During the Delphi round a country factor of 0.12% - 0.15% without PAID was proposed. From the Delphi process there was a decision to choose a country factor of 0.13% without PAID.

Risk zone, aggregation matrix and correlation between countries for Romania Flood

4.46. The entire zonal weights were recalibrated to move from administrative regions to CRESTA zones to align with other peril/regions in the standard formula. PAID exposure is taken out of the Standard Formula. The new risk zones and aggregation matrix are shown in Annex 3 and on EIOPA's website (excel file).

New SF parameters for Czechia

Country factor for Czechia

4.47. The Delphi round concluded to reduce to country factor to 0.25% from 0.3%. This is line with recent model results and seems like a good average.

New SF parameters for Belgium

Country factor for Belgium

4.48. A country factor of 0.13% has been proposed during the Delphi round as a country factor of 0.13% is within modelling range and in line with current factor. During the Delphi process it was concluded, that 0.12% seems more appropriate than 0.13% (average proposal = 0.119%; 0.12% is also more consistent with the comments expressed). In consequence, it has been decided to increase the country factor to 0.12% from 0.1%.

New SF parameters for Ireland flood

Country factor for Ireland Flood

4.49. A country factor of 0.17% has been proposed for Ireland during the Delphi round. It was concluded during the Delphi process to add Ireland with a country factor of 0.17% which is the result of combining the single model the experts views received during the Delphi process.

Risk zone, aggregation matrix and correlation between countries for Ireland Flood

4.50. As Ireland Flood is newly added to the SF, it is necessary to calibrate parameters for the risk zones, aggregation matrix and correlation between countries. The new risk zones and aggregation matrix are shown in Annex 3 and on EIOPA's website (excel file). In addition, it is also necessary to estimate the correlation between Poland and the other countries. This can be seen in Annex 2. It is assumed that there is no correlation between countries with Ireland apart the UK.

New SF parameters for Luxembourg

Country factor for Luxembourg

4.51. From the Delphi method, there was a decision to add Luxembourg with a country factor of 0.13%, which is reflecting the result of the single model vendor and the views of the experts.

New SF parameters for the Nordics and the Netherlands

4.52. For the Nordic countries of Norway, Sweden, Finland and Denmark only one model is available to the workstream but no industry exposure database was initially made available to the model vendor for analysis, instead they used proprietary exposure based on GDP with no limits or deductibles. The initial country factor parameters provided by the model vendor overestimated the risk of flood because of this limitation. In addition, other observations support the idea that the initial country factor parameters provided seems to overestimate the flood risk. Such as, when comparing the initial vendor model results to the flood country factor parameters of other countries already in the SF, comparing the relativity of flood risk parameters to the more well-known parameters of storm in the Nordics countries, historic flood loss experience and NCA's knowledge of flood risk and adaptation measures in the Nordics. For these reasons, the estimation of parameters for the Nordic countries is based on expert judgment including use of scaled model results in a subgroup of the workstream and the initial results of the model vendor for these countries has been adjusted.

The use of scaled model results in the calibration of the country factor for the Nordics

4.53. To come up with a better estimate for the Nordic countries it was decided by the subgroup to scale the one model available for the Nordic countries. The rescaling was done for all of the initial country factors of the Nordics based on the difference of the Germany country factor for flood. Germany is already in the SF with factor of 0.2% and four model results has been available for Germany during to the workstream during this exercise. Thus, there is a high level of confidence regarding the flood risk in Germany.

4.54. The comparison of results from a country to Germany assumes that the limits and deductibles applied are the same in both countries. This seems unlikely to be the case. Therefore, two comparisons are made as basis for the rescaling of the country factors for the Nordics; one to Germany, and one to all countries for which there is a current SF factor (Belgium, Czechia, France, Italy, Germany, Romania). Thus, the scaled model results for the Nordics provides a range based on these two comparisons. The comparison to Germany is always at the lower end of the range. The scaled model results are presented in the sections on the individual Nordic countries below new SF parameters for Norway, Sweden, Finland and Denmark. For Finland it is noted that the scaled model results have been further improved by replacing the proprietary exposure data based on GDP with proxy exposure as detailed in “new SF parameters for Finland” below.

The use of “shadow models” in the calibration of the country factor for the Nordics and the Netherlands

4.55. During the work of the subgroup on the Nordics and the Netherlands, model results from models in development (shadow models) has been shared by members of the technical Expert Network on Catastrophe Risks. The unofficial model results from models in development has worked as a good validation against other official model results from table 7 and other observations. This has provided the basis for a more qualified expert judgement than what would otherwise have been possible.

4.56. For the Nordics and the Netherlands, two shadow model results have also been used as input to the expert judgment of the subgroup and to provide some sort of validation against the scaled model result. The two shadow model results are still preliminary and not yet validated by market participants. As such, the shadow models are work in progress.

Country factor for Norway

4.57. For Norway, three vendor models have been made available that can be used as input for setting the SF country factor by expert judgment of the subgroup. Of these vendors, one, has officially submitted their model results for this exercise. This one model has then been scaled was described in the section “the use of scaled model results in the calibration of the country factor for the Nordics”. The other two models are shadow models and still preliminary and not yet validated by market participants. However, these have been used as input in the expert judgement.

4.58. The model results suggest a range of 0.021 % - 0.06 %. A country factor of 0.05 % is proposed for Norway. This country factor captures most of the model results.

Risk zones and zonal correlations for Norway

4.59. For the risk zones it is suggested to use the existing Windstorm national conversion table set out in Annex IX in the delegated acts which uses the 19 low res (2013 and prior) cresta zones which correspond to the counties at the time. These predate both the 2018 north and south Trøndelag merger (& the associated cresta zone change), and the wider reforms implemented in 2020 which resulted in 11 counties.

4.60. The suggested risk zones and zonal correlations for Norway are based on one model vendor.

Country correlations for Norway

4.61. A country correlation of 0 % with all existing countries (countries with the flood peril already in SF) is proposed. This is due because there are no shared boarders of any significance or any shared rivers. Furthermore, a country correlation of 0 % with all the countries added during this exercise including the other Nordic countries is proposed. It has been discussed in the subgroup, that the shared rivers with SE or a snowmelt induced fluvial flood could imply a correlation of 25 %. However, the shared rivers are located at a very unpopulated area and the snowmelt induced fluvial flood is not considered significant by the subgroup. Furthermore, the model vendor results support this.

Country factor for Sweden

4.62. For Sweden, three vendor models have been available that can be used as input for setting the SF country factor by expert judgment of the subgroup. Of these vendors, one, has officially submitted their model results for this exercise. This one model has then been scaled as described in the section "the use of scaled model results in the calibration of the country factor for the Nordics". The other two models are shadow models and still preliminary and not yet validated by market participants. However, these have been used as input in the expert judgement.

4.63. The model results suggest a range of 0.027 % - 0.055 %. It has been concluded by the Nordic subgroup, that the loss history of Sweden suggests higher country factor than the country factor for FI (0.04 %). A country factor of 0.045 % is proposed for Sweden. This country factor captures most of the model results.

Risk zones and zonal correlations for Sweden

4.64. For the risk zones the national supervisor suggests using the Windstorm national conversion table set out in Annex IX which bases approximately on 21 counties (which correspond to NUTS3). This will not create extra work for the technical Expert Network on Catastrophe Risks or the undertakings for WS reassessment.

4.65. The risk zones and zonal correlations for Sweden are based on one model vendor.

Country correlations for Sweden

4.66. A country correlation of 0 % with all existing countries (countries with the flood peril already in SF) is proposed. This is due because there are no shared boarders of any significance or any shared rivers. Furthermore, a country correlation of 0 % with all the countries added during this exercise including the other Nordic countries is proposed. It has been discussed in the subgroup, that the shared rivers with FI or a snowmelt induced fluvial flood could imply a correlation of 25 %. However, the shared rivers are located at a very unpopulated area and the snowmelt induced fluvial flood is not considered significant by the subgroup. Furthermore, the model vendor results support this.

Country factor for Finland

4.67. The single model vendor produced results based on a set of simulated flood events. For Finland a proxy exposure was used based on open building data per postal code reconciled on the aggregated level with the protection gap exposure data[43] and an ad hoc questionnaire sent to the largest undertakings based on the QRT data (S.21.03). The results with proxy exposure and vendor model provided a country factor range of 0.039 % - 0.064 %. Equally a more deterministic “shadow model” based on these same simulations with a different proxy exposure of another vendor gave an interval of 0.035 % - 0.045 %. While the novel feature of surface water flooding is depicted in the model as increasing the factor the flood peril is much dependent on the protection measures in place and recorded especially for the river flooding. The protection records covered areas of mainly the few largest exposures and not all of the Finnish experience-based measures such as controlling of lake reservoirs or use of flood water running upstream of exposed areas. These drivers promote a lower end estimate of 0.040 %. For these reasons, a country factor of 0.04 % is proposed for Finland.

Risk zones and zonal correlations for Finland

4.68. For the risk zones the national supervisor suggests using the Windstorm national conversion table set out in DA Annex IX which bases approximately on the previous exercise NUTS3 mapping to 2-digit-postal code areas – a solution deviating from mainstream in the Annexes, but no extra work for the technical Expert Network on Catastrophe Risks or the undertakings for WS reassessment. Using of e.g. cresta-zones would produce problems as there are 100 pcs producing large tables in the annexes not providing enough extra benefit for the windstorm calculation accuracy (too accurate) nor to flood calculation, as especially in the flood risky northern part of the country cresta-zones cover very wide areas (not accurate enough).

4.69. The risk zones and zonal correlations for Finland are based on one model vendor.

Country correlations for Finland

4.70. A country correlation of 0 % with all existing countries (countries with the flood peril already in SF) is proposed for Finland. This is due because there are no shared boarders of any significance or any shared rivers. Furthermore, a country correlation of 0 % with all the countries added during this

[43] Dashboard on insurance protection gap for natural catastrophes - European Union (europa.eu)

exercise including the other Nordic countries is proposed. It has been discussed in the subgroup, that the shared rivers with SE or a snowmelt induced fluvial flood could imply a correlation of 25 %. However, the shared rivers are located at a very unpopulated area and the snowmelt induced fluvial flood is not considered significant by the subgroup. Furthermore, the model vendor results support this.

Country factor for the Netherlands

4.71. For the Netherlands, three vendors have models available that can be used as input for setting the SF country factor by expert judgement of the subgroup. Of these vendors, one, has officially submitted their model results for this exercise. The other models are shadow models and still preliminary and not yet validated by market participants. However, these have been used as input.

4.72. In general, the models are fairly well comparable for primary flood (not captured in the country factor). The reason for this is that a lot of data regarding the primary flood defences is publicly available. For non-primary flood, model outcomes are less comparable. One of the reasons for the divergence of model outcomes is that less data is available regarding the non-primary flood defence systems. For pluvial flood, there seemed to be consensus amongst the model vendors on the height of the risk factor. As such, non-primary fluvial floods are the most uncertain risk to model for the Netherlands. However, compared to other countries, the Dutch flood risk is seen by the model vendors as a local and controllable risk.

4.73. The resulting country factor ranged from 0.028% to higher than 0.035% but lower than 0.045% for flood in the Netherlands. This range includes three (shadow) model vendors that take both non-primary fluvial and pluvial floods into account. Therefore, 0.035% for flood is considered conservative. Further changes of the country factor in the future are still possible when flood models for the Netherlands are further developed. A country factor of 0.035% for flood is thus proposed as the country factor for the Netherlands.

Risk zones and zonal correlations for the Netherlands

4.74. The suggested risk zones and zonal correlations for the Netherlands are based on one model vendor, which accounts for flooding due to non-primary fluvial and pluvial floods. This results in the national conversion with zonal weights and zonal aggregation matrix as set out in the excel file published on EIOPA's website[44]. The 90 cresta zones correspond to the 2-digit postal code areas. The standard methodology is used to convert the country factor into the zonal weights and correlations based on the 1 in 200 occurrence exceedance probability of the different zones.

[44] Consultation on the 2023/2024 (re)assessment of natural catastrophe risk in the standard formula - European Union (europa.eu)

Country correlations for the Netherlands

4.75. It is proposed that the country correlation between NL and respectively BE and DE are set to 25%. All correlations between NL and other countries are proposed to be 0%. This is based on the reasoning that insured flood events in NL often imply insured flood events in neighbouring countries. However, the other way around is less often the case (i.e., floods in DE or BE do not always imply insured flood losses in NL). One of the reasons is that large rivers are shared with neighbouring countries, but that primary fluvial floods are not insured. Furthermore, the NL flood defence systems are considered relatively good.

4.76. Nearly every insured flood event in NL is also an insured flood event in DE. However, only a very small percentage of flood events in DE also results in flood events in NL. When looking at return periods above 1 in 100 (RP100), the same pattern returns. About 30% of NL RP100 events are also DE RP100 events. Almost none of the DE RP100 events are also an NL RP100 event. As such, the 25% correlation between NL and DE is considered appropriate.

4.77. Similar results are not available between NL and BE, but within the Nordics and NL flood risk expert group there was agreement that the results are expected to be rather similar. As such, the 25% correlation between NL and DE is considered appropriate.

Country factor for Denmark

4.78. For Denmark, three vendor model have been available that can be used as input for setting the SF country factor by expert judgment of the subgroup. Of these vendors one has officially submitted their model results for this exercise. This one model has then been scaled as described in the section "the use of scaled model results in the calibration of the country factor for the Nordics". The other two models are shadow models and still preliminary and not yet validated by market participants. However, these have been used as input.

4.79. Separate approximations based on loss history of the cloudburst event in Denmark in 2011 have also provided another reference point used in the expert judgment. While at the same time being aware, that policy conditions have changes and adaptation measures has improved with the development of flood protection in the major cities of Copenhagen, Aarhus, Aalborg and Odense. However, the quantification of these effects is difficult.

4.80. In addition, internal model estimates of undertakings have been used to provide another validation point which has been used as input to the expert judgment.

4.81. Lastly, windstorm is a well know peril in Denmark with several reliable models available. Thus, the relative relationship between windstorm and flood can also provide some sort of guidance in the expert judgment. At least in terms of an upper limit for flood risk.

Pluvial flood and fluvial flood and the national scheme in place

4.82. Given the national scheme of Denmark, it is important to know how the models consider fluvial and pluvial flood. The actual classification of pluvial and fluvial flood in the model is vital for the resulting country factor. The model results for Denmark suggest that fluvial food is the main risk in Denmark, when it comes to flood. However, loss history in Denmark do not support that fluvial flood is the main risk driver in Denmark, rather flood loss history in Denmark is characterised by cloudburst events. Fluvial flood risk driver is the result of the river network modelled from the terrain data, resulting in a very high-resolution river network that includes very small and ephemeral streams. If river flood was modelled from a lower resolution river network, it would result in the same area flooded, but more of the extent would be classed as pluvial flood. This issue of classification in the city of Copenhagen has been investigated during the expert judgment, concluding that the proper way to interpret the results is to consider the combined flood risk.

4.83. As such, all the details of the national scheme in place will not be fully captured using the approach mentioned above. However, due to the number of models submitted, the limitations of the models available, the uncertainties introduced by scaling the model used already and the maturity, this inadequacy has been accepted.

4.84. The resulting country factor ranged from 0.021 % to 0.11 % for flood in Denmark. However, this range includes model results which vary a lot in quality. Overall, the proposed country factor for Denmark is based on expert judgement, whereby several observations and model results have been used as input in the process. This includes scaled model results, shadow model results, approximations based on loss history, internal model estimates and expert knowledge of adaptation measures. The proposed country factor for Denmark is 0.04 %.

Risk zones and zonal correlations for Denmark

4.85. For the risk zones the national supervisor suggests using the Windstorm national conversion table set out in Annex IX which bases approximately on mapping of 2-digit postcodes / low re CRESTA. A solution deviating from mainstream in the Annexes, but no extra work for the technical Expert Network on Catastrophe Risks or the undertakings for WS reassessment.

4.86. The risk zones and zonal correlations for Denmark are based on one model vendor.

Country correlations for Denmark

4.87. A country correlation of 0 % with all existing countries (countries with the flood peril already in SF) is proposed for Denmark. This is due because there are no shared boarders of any significance or any shared rivers. Furthermore, a country correlation of 0 % with all the countries added during this exercise including the other Nordic countries is proposed. This is proposed due to the no shared borders or shared rivers, furthermore the proximity of major cities like Copenhagen and Malmö and Lund were not considered significant. The vendor model also supports this proposal.

Hail

4.88. As mentioned in the Executive Summary, in order to increase transparency EIOPA proposes to add in the Delegated regulation the definition of the perils covered in the standard formula using the definitions reported in EIOPA's methodological paper[45] (see also Annex 5). This is particularly relevant for hail, for which it should be clarified that although hail is the dominant sub-peril, other sub-perils of severe convective storms, such as tornadoes and lightnings are also included[46]. In order to avoid confusion, however, EIOPA proposes that the peril should not be renamed. Consistently with the definition proposed, in the following the (re)assessment/(re)calibration for hail has been performed on the basis of models for severe convective storms.

4.89. In the 2023/2024 exercise, Belgium, France, Germany, Italy, Luxembourg, the Netherlands, Norway and Poland are considered for hail (see Scope section in the introduction).

4.90. During the previous 2017/2018 recalibration exercise, there was no recalibration of existing factors, but the Czechia and Slovenia were added to the SF. Therefore, Austria, Liechtenstein and Spain have parameters which have been calibrated in 2010.

4.91. The factor to reflect the increased vulnerability of motor business has been calibrated in 2010 as well.

Important historical events since last calibration

4.92. The SF includes in particular hail as the dominant sub-peril, but also other sub-perils of severe convective storms, such as tornadoes and lightning. The historical loss table in Annex 4 summarizes examples of important historical events of severe convective storms (SCS)[47].

National pools

4.93. It is important to understand how potential national public/private partnership works in each country in order to properly reflect the capital requirement for the private insurance sector. In all countries being reassessed hail claims are directly covered only by the private insurance market. There are no national pools.

Analysis

4.94. Belgium, France, Germany, Italy, Luxembourg and the Netherlands were lastly calibrated in 2010. Many severe convective storm models available for these countries have been updated since 2010. In addition, as shown in the table in Annex 4, a number of events occurred since 2010 which need to be reflected in the SF.

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[45] EIOPA, 2021. Methodological paper on potential inclusion of climate change in the Nat Cat standard formula - European Union (europa.eu)

[46] However this module considers mainly only damages from dry events. Heavy rainfall is considered in the flood module.

[47] Hail is one major part of SCS.

4.95. Norway and Poland will be assessed with one model being available for Norway and four models for Poland.

Country	Assess (A) reassess (R)	Total number of models considered	Last model revision [2004-2007]	Last model revision [2008-2011]	Last model revision [2012-2015]	Last model revision [2016-2019]	Last model revision [2020-2023]
BE	R	3				2	1
FR	R	3				2	1
DE	R	3				2	1
IT	R	2				1	1
LU	R	3				1	2
NL	R	3				2	1
NO	A	1				1	
PL	A	4				3	1

Table 9: View of the model vintage available for the 2023/2024 exercise.

4.96. For the estimation of the country factors reference is made to the general description in the chapter "Introduction". In addition, some model vendors also include motor in their models.

4.97. After analysis of the different model outcomes and expert judgement, the following SF parameters for hail will be proposed for a recalibration following this 2023/2024 (re)assessment exercise (see also Table 10):

- For Belgium (current factor 0.03 – calibrated in 2010): No significant event occurred since the last recalibration exercise in 2017/2018. However, current modelled country factors indicate that the factor might need to be increased (current models propose a range between 0.04 and 0.07%). The proposal for Belgium is therefore to recalibrate the country factor.
- For France (current factor 0.01 – calibrated in 2010): Severe storm events occurred since the last recalibration exercise in 2017/2018. The current modelled country factors indicate that the factor

might need to be slightly increased (current models propose a range between 0.01% and 0.03%). In addition, according to the assessment by the NCA there is sufficient evidence that there is a material change of hail risk. The proposal for France is therefore to recalibrate the country factor.

- For Germany (current factor 0.02 – calibrated in 2010): A severe storm event occurred since the last recalibration exercise in 2017/2018. Current modelled country factors indicate that the factor might need to be slightly increased (current models propose a range between 0.02% and 0.03%). The NCA mentioned that since the calibration in 2010 climate change had already and might further increase hail risk and that its own analysis had shown that the hail risk might be calibrated too low. The proposal for Germany is therefore to recalibrate the country factor.
- For Italy (current factor 0.05% - calibrated in 2010): Severe storm, lightning and tornado events occurred since the last recalibration exercise in 2017/2018. Models estimate the current country factor in a range between 0.03% and 0.05%. Since both the number and the intensity of the events are increasing, and since the hail module does not only cover hail but also other severe convective storms sub-perils, the proposal for Italy is not to recalibrate the country factor.
- For Luxembourg (current factor 0.03% - calibrated in 2010): One ssignificant tornado event occurred since the last recalibration exercise in 2017/2018. Current modelled country factors indicate that the factor might need to be increased (current models propose a range between 0.10% and 0.17%). The proposal for Luxembourg is therefore to recalibrate the country factor.
- For the Netherlands (current factor 0.02% - calibrated in 2010): No significant event occurred since the last recalibration exercise in 2017/2018. However, current modelled country factors indicate that the factor might need to be slightly increased (current models propose a range between 0.02% and 0.04%)). The proposal for the Netherlands is therefore to recalibrate the country factor.
- For Norway (no current factor): No significant event occurred since the last recalibration exercise in 2017/2018. There is only one model available that calculated a country factor of 0.02%. However, expert judgement concluded that hail is not a material risk for Norway. The proposal for Norway is therefore not to calibrate a country factor.
- For Poland (no current factor): No significant event occurred since the last recalibration exercise in 2017/2018. Current modelled country factors indicate that the risk is material for Poland (current models propose a range between 0.01% and 0.03%). According to the NCA the increase in the risk of hail requires the inclusion of this risk in the analysis. The proposal for Poland is therefore to calibrate a country factor.
- For motor: previous factor from 2010 was equal to 5. However, all modelled results show that this factor is too low.

Country	Country factor	Aggregation matrix	Risk zones	Correlation between countries

Belgium	Yes	No	No	No
France	Yes	No	No	No
Germany	Yes	No	No	No
Italy	No	No	No	No
Luxembourg	Yes	No	No	No
The Netherlands	Yes	No	No	No
Norway	No	No	No	No
Poland	Yes	Yes	Yes	Yes

LoB	Factor	Aggregation matrix	Risk zones	Correlation between countries
Motor	Yes	Not applicable	Not applicable	Not applicable

Table 10: Decision to suggest a (re)calibration of the SF parameters.

New SF parameter for Belgium

Country factor for Belgium hail

4.98. From the Delphi method there was a consensus among model vendors to increase the country factor for hail from 0.03% to 0.035%. This increase is consistent with countries close by (the Netherlands and France).

New SF parameter for the Netherlands

Country factor for the Netherlands hail

4.99. From the Delphi method there was a consensus among experts to increase the country factor for hail from 0.02% to 0.03%. This increase is consistent with countries close (Belgium and France).

New SF parameter for Germany

Country factor for Germany hail

4.100. From the Delphi method there was a mixed picture among experts between increasing the country factor for hail from 0.02% to 0.03% and keeping the current factor of 0.02%. However, keeping in mind that the German NCA has evidence that hail might be calibrated too low for Germany, considering that the motor factor[48] (see below) should be much higher for Germany and further considering that climate change had already and might further increase hail risk, it is suggested increasing the factor to 0.03%. This increase is consistent with countries close by (Belgium, the Netherlands and France).

New SF parameter for France

Country factor for France hail

4.101. From the Delphi method there was a consensus among experts to increase the country factor for hail from 0.01% to 0.02%. This increase is consistent with countries close by (the Netherlands, Belgium, Germany).

New SF parameter for Poland

Country factor for Poland hail

4.102. A new country factor had to be assessed for Poland. The new factor is equal to 0.02% which corresponds to the middle range of the model outputs.

Risk zone, aggregation matrix and correlation between countries For Poland hail

4.103. As Poland Hail is newly added to the SF, it is necessary to calibrate the risk zones, aggregation matrix and correlation between countries. The new risk zones and aggregation matrix are shown in Annex 3 and on EIOPA's website[49] (excel file). In addition, it is also necessary to estimate the correlation between Poland and the other countries. This can be seen in Annex 2. For hail, it is assumed that there is no correlation between countries.

[48] The motor factor is not country specific.

[49] Consultation on the 2023/2024 (re)assessment of natural catastrophe risk in the standard formula - European Union (europa.eu)

New SF parameter for the Luxembourg

Country factor for Luxembourg hail

4.104. The current country factor which is equal to 0.03% for Luxembourg is underestimating the risk. Indeed, all new models gave significantly higher country factors in the range between 0.10% and 0.17%. After the Delphi process with the technical Expert Network on Catastrophe Risks new proposed factor is equal to 0.10 %. It is also important to note that Luxembourg has only one risk zone which is weighted with 1. The other surrounding countries France, Belgium, Germany have multiple risk zones and the corresponding country factors will therefore be multiplied by the relevant weights which increase the country factors for the surrounding zones.

New SF factor for motor

4.105. Currently the motor sum insured is multiplied by 5 in the SF:

$$SI_{(hail,r,i)} = SI_{property,r,i} + SI_{(onshore-property,r,i)} + 5\,SI_{(motor,r,t)}$$

4.106. The motor factor in the SF corresponds to:

$$Motor\ factor = \frac{\text{Country factor motor}}{\text{Country factor property}}$$

4.107. Country factors for motor and property were compared to assess if the current factor is too low. All modelled results suggest that a motor factor of 5 is too low, on average the models suggest a motor factor equal to 15. The factor in the SF is the same for all countries, but the modelled result indicates that this factor would vary by country. After the Delphi round, a new factor of 10 is proposed as a reasonable balance between modelling results (and variations observed between countries) and the previous factor.

Country	Country factor	Upward Downward	Previous factor	Aggregation matrix	Risk zones	Correlation between countries
Belgium	Yes	Up (0.035)	0.03	No	No	No
France	Yes	Up (0.02)	0.01	No	No	No
Germany	Yes	Up (0.03)	0.02	No	No	No
Italy	No		0.05	No	No	No

Luxembourg	Yes	Up (0.10)	0.03	No	No	No
The Netherlands	Yes	Up (0.03)	0.02	No	No	No
Norway	No			No	No	No
Poland	Yes	Include (0.02)		Yes	Yes	Yes

LoB	Factor	Upward Downward	Previous factor	Aggregation matrix	Risk zones	Correlation between countries
Motor	Yes	Up (10)	5	Not applicable	Not applicable	Not applicable

Subsidence

4.108. Historically, France was the only country considered for subsidence risk in the regulation. In the 2023/2024 exercise, Belgium, France and the United Kingdom are considered for subsidence (see Scope section in the introduction).

4.109. During the previous 2017/2018 recalibration exercise, there was no recalibration of existing factors. Therefore, the parameters for France have been calibrated in 2010.

Important historical events since last calibration

4.110. Since the last calibration, France has seen a consistent increase in its annual average losses due to subsidence. In particular, 2022 has seen the highest yearly loss ever experienced with over 6500 municipalities for which the state of natural catastrophe has been recognized under the Nat Cat regime, as shown in Figure 3.

[Record Number]
EIOPA REGULAR USE
EIOPA-YY/XXX

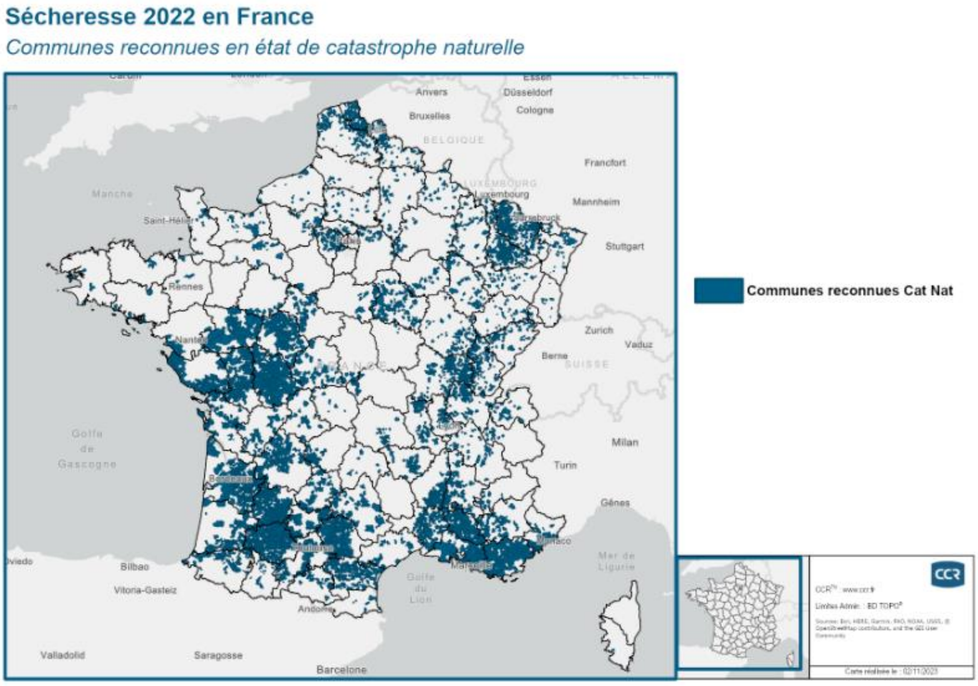


Figure 3: Overview of municipalities recognized as affected by subsidence in 2022 under the French Nat Cat regime (Source: Caisse Centrale de Réassurance (CCR)).

4.111. Furthermore, according to CCR, from 2016 to 2020 subsidence losses have constantly been above their historical long-term average, with an average annual loss of 1.1Bn€[50].

4.112. As for Belgium: In its interpretative Law of 29 October 2021, the legislator as confirmed damage caused by subsidence are fully included in the mandatory covers of natural catastrophe perils included in the fire insurance policy for simple risks. Since the last calibration, losses due to subsidence have increased in Belgium.

National pools

4.113. In France, insurers can, upon request, sign a reinsurance contract with public reinsurer Caisse Centrale de Réassurance. The CCR does not provide direct reimbursement to policyholders but acts as a state-backed reinsurer. Hence, it is still important to calibrate the solvency capital requirement as primary coverage is realized through private insurers.

4.114. In Belgium, it is mandatory for insurers to cover natural catastrophe perils where fire cover is provided for 'simple risks'. Coverage includes earthquake, flood, overflow or blockage of public drainage, landslides and subsidence, storm, hail and weight of ice or snow. The fire insurance simple risks itself is not mandatory. There is some public intervention in the form of a Calamities Funds,

[50] CCR reportCCR report : « Rapport au ministre de l'économie, des finances et de la souveraineté industrielle et numérique sur le régime d'indemnisation des catastrophes naturelles sur le régime d'indemnisation des catastrophes naturelles », December 2022

which takes up losses that exceed the compensation limits or losses for some other Natural catastrophes that are not compensated by the insurers. The “State intervention” depends on the region (Walloon region, Flemish region or Brussels region).

Analysis

4.115. Based on the above, it seems that subsidence risk is now under-evaluated in the regulation and a reassessment of the risk is needed. During the consultation phase, little information has been received from modellers due to its unique situation (less volatile than other Nat Cat such as windstorm, reinsured mostly by CCR in France, leaving little space for private model initiatives). To overcome the modelling difficulties a subgroup has been created relying on expert judgments and historical losses. Following these discussions, the risk in France and Belgium was included in the recalibration while the risk in the United-Kingdom was considered marginal, as historical losses and expert opinions suggest.

Country	Country factor	Aggregation matrix	Risk zones	Correlation between countries
Belgium	Yes	Yes	Yes	Yes
France	Yes	No	No	Yes
United-Kingdom	No	No	No	No

Table 11: Decision to suggest a (re)calibration of the SF parameters.

New SF parameter for Belgium

Country factor for Belgium subsidence

4.116. A single model was available to be used as input for setting the SF country factor by expert judgement of the subgroup. The resulting country factor is set to 0.02% for subsidence in Belgium and the risk zone parameters are presented in table 12.

Risk zone, aggregation matrix and correlation between countries For Belgium subsidence

Risk zone	BE	W(subsidence,i)
1	1	0.4
2	2	0.6
3	3	1.7
4	4	0.9
5	5	1.1
6	6	0.9
7	7	1.5
8	8	1.8
9	9	1.2

Table 12: Risk zones factors for Belgium subsidence.

4.117. Cross-country comparison shows consistent parameters between France and Belgium in areas with similar level of risks.

4.118. It is proposed that the country correlation between Belgium and France is set to 0%. This is based on expert judgment, considering the different nature of the risk (e.g., soil, building types) and of differences in legal recognition criteria.

New SF parameter for France

Country factor for France subsidence

4.119. Discussions were hold between European model vendors and supervisors. Being a peril reinsured thanks to French national pool, subsidence risk is monitored actively by CCR. Considering the increasing trend in losses as mentioned above, recent legal changes improving subsidence insurance coverage and the absence of recalibration since the launch of the Solvency 2 framework, it was decided to increase the country factor for France subsidence from 0.05% to 0.06%. Pending on models developments and confirmation of increasing insured losses, a further increase could be considered in the next exercise.

5. MONITORING

5.1. Considering climate change, new perils could be added to the perils currently covered by the SF. The reasons for supporting this would be that due to climate change, the frequency and intensity of certain perils might change. Perils which might not have been relevant for the (re)insurance sector in the past might become more relevant. This would need to be captured in the SF. However, it will always be necessary to keep in mind that the new perils/countries need to have a material impact to the insurance sector to be included in the SF. EIOPA's methodological paper identified a number of perils to be monitored such as droughts, wildfire and coastal floods.

Wildfire

5.2. In recent years, wildfires have repeatedly affected Europe, in particular the five Mediterranean countries Portugal, Spain, Italy, Greece and France which on average account for around 85% of the total burnt area in Europe per year (measured in hectares (ha)). In these five countries, the average damage between 1999 and 2016 was more than 400 thousand ha, and higher than 700 thousand ha one year in five. In 2017, the worst year for the last two decades, the total annual burnt area of Portugal, Spain, and Italy alone exceeded 0.8 million ha.

5.3. Alongside these environmental damages, wildfires have caused substantial amounts of economic losses, with an impact on GDP. In particular, recent estimations suggest an average contemporary decrease in a region's annual GDP growth rate of 0.11% – 0.18% conditional on having experienced at least one wildfire. For an average wildfire season this leads to a yearly production loss of 13 – 21 billion euros for Southern Europe (Meier et al., 2023[51]).

5.4. Due to the high impact of this peril, EIOPA has decided to start a monitoring of wildfire, looking at the effects on the insurance sector and therefore at its potential inclusion in the Nat Cat SF in future recalibration exercises.

Risk materiality

5.5. Based on a first assessments provided by the NCAs, the risk of wildfire was considered as relatively low: 69% of respondents perceived the risk as "low" and 27% as "medium". Only one NCA (Greece) estimated the risk to be "high".

Climate change view

5.6. Wildfire is driven by elevated temperature, low precipitations, vegetation conditions and composition which can worsen either the likelihood of ignition, or the behavior of the fire once ignited.

[51] Meier, S., Elliott, R. J., & Strobl, E. (2023). The regional economic impact of wildfires: Evidence from Southern Europe. Journal of Environmental Economics and Management, 118, 102787.

5.7. The relative risk is expected to increase in frequency and intensity in southern parts of Europe, in line with the expected increase in temperature (see Figure 4). Moreover, these extremes of fire danger may be expected to increase significantly with the changing climate characterized by mild winters that promote fuel accumulation, and dry hot summers propitious for fire ignition and spread (Fernández-García et al., 2022[52]).

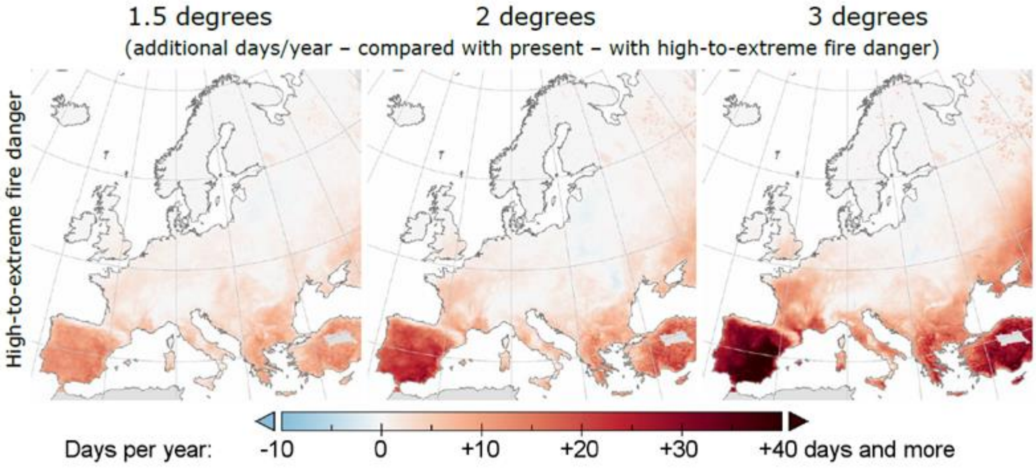


Figure 4: Number of days per year with high-to-extreme fire danger (Source: EU, 2020)

5.8. Continuing greenhouse gas emissions are likely to cause further long-term warming, and consequences in terms of changes in frequency and severity of natural catastrophes and climate-related extremes are considered almost certain.

Materiality for the insurance sector in Europe

5.9. To assess the potential future impact of wildfire risk on the insurance sector, it is essential to understand the materiality of the current exposure to these perils and the specificities of different markets and risks. Overall, wildfire risk for the insurance sector was considered as low by the NCAs: 92% of respondents assessed the materiality of the risk as "low" and 8% as "medium". No NCA assessed the materiality to be "high".

5.10. This evaluation could be strongly connected with the extremely low recourse to the insurance sector. Indeed, the low insurance penetration is an important driver for a materiality evaluation. The insurability and pricing of wildfires are however expected to increase in the future as an effect of the growing number of events due to climate change, to make specific Nat Cat parameters relevant in the future.

5.11. Indeed, the effects of these climate-related changes are likely to be substantial for a sector whose business model involves offering financial protection against the consequences of such events. The

[52] Fernández-García, V., Beltrán-Marcos, D., Fernández-Guisuraga, J. M., Marcos, E., & Calvo, L. (2022). Predicting potential wildfire severity across Southern Europe with global data sources. *Science of the total environment*, *829*, 154729.

consequences on the pricing and underwriting of risks are likely to be substantial for a sector whose business model involves offering financial protection against the consequences related to these phenomena.

How to include the risk in the SF

5.12. Based on the assessments provided by the NCAs, wildfire should be considered in the SF as a separate peril (named «wildfire» or «fire») once its materiality for the insurance sector becomes relevant, at least in some countries.

5.13. However, difficulties in the treatment in the SF of this risk arise when considering that wildfires are connected both to natural and man-made factors. Indeed, it should be noted that damages caused by fire to properties are already included in the Fire risk sub-module of the Man-made catastrophe risk sub-module. Therefore, the possible inclusion in the Natural catastrophe risk sub-module – if not limited to damages to forests – may determine issues of double counting that should be thoroughly analysed.

Coastal flood

5.14. Coastal flood is a hydrological hazard and is defined as "higher-than-normal water levels along the coast caused by tidal changes or thunderstorms that result in flooding, which can last from days to weeks" according to the EM-DAT[53]. Up to now, coastal flood is only considered for the UK in the windstorm peril of the Nat-Cat risk module of the SF. However, due to the potential impact climate change may have and to better understand coastal flood risks EIOPA decided in its Methodological Paper on potential inclusion of climate change in the Nat Cat SF to monitor this peril.

Risk materiality

5.15. Based on a first assessment provided by NCAs from countries with a coast, the risk of coastal flood was low: 64% of the respondents perceived the risk to be "low", 27% to be "medium" and 9% to be "high" (DK and IE).

Climate change view

5.16. Coastal floods are expected to increase due to a rise in sea levels and more intensive coastal storms because of climate change. Naturally, coastal flood is more relevant for countries with long

[53] EM-DAT - The international disaster database. Centre for Research on the Epidemiology of Disasters – CRED Université catholique de Louvain, Belgium "Emergency Events Database (EM-DAT). EM-DAT - The international disaster database (emdat.be)

coastlines or with many islands. According to the Joint Research Center PESETA IV project[54] it is projected that sea levels could rise by up to one meter or more in Europe by 2100 and annual damages from coastal floods could increase from currently ca. 1.4 billion Euro to ca. 240 billion Euro in the EU and the UK, under the assumption that no mitigation and adaptation measures will be taken.

5.17. Figure 5 provides an overview of the damages and people exposed to coastal floods in the EU and the UK, considering today's situation and two different emission scenarios by 2100 where adaptation measures will be taken or not. Compared to "no action" (i.e., high emissions and no adaptation measures) 95% of damages could be avoided if adaptation measures were taken in combination with moderate mitigation. Therefore, mitigation measures and adaptation measures, such as building dikes and installing forecasting and warning systems, play a key role when assessing coastal flood. Figure 6 shows the reduction in damages and therefore the benefits of adaptation measures (in the form of raised dikes) for each EU Member State exposed to coastal flood risks and the UK.

		High emissions		Moderate mitigation	
	Present	No adapt	Adapt	No adapt	Adapt
Damage (€ billion/year)	1.4	239	23	111	12
People exposed (million/year)	0.1	2.2	0.8	1.4	0.6

Figure 5: Overview of the damage and people exposed in the EU and UK (today and in two different emissions scenarios, with and without adaptation measures (Source: Vousdoukas et al. 2020).

[54] Vousdoukas M., Mentaschi L., Mongelli I., Ciscar J-C, Hinkel J., Ward P., Gosling S. and Feyen L., Adapting to rising coastal flood risk in the EU under climate change, EUR 29969 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-12990-5, doi:10.2760/456870, JRC118512.

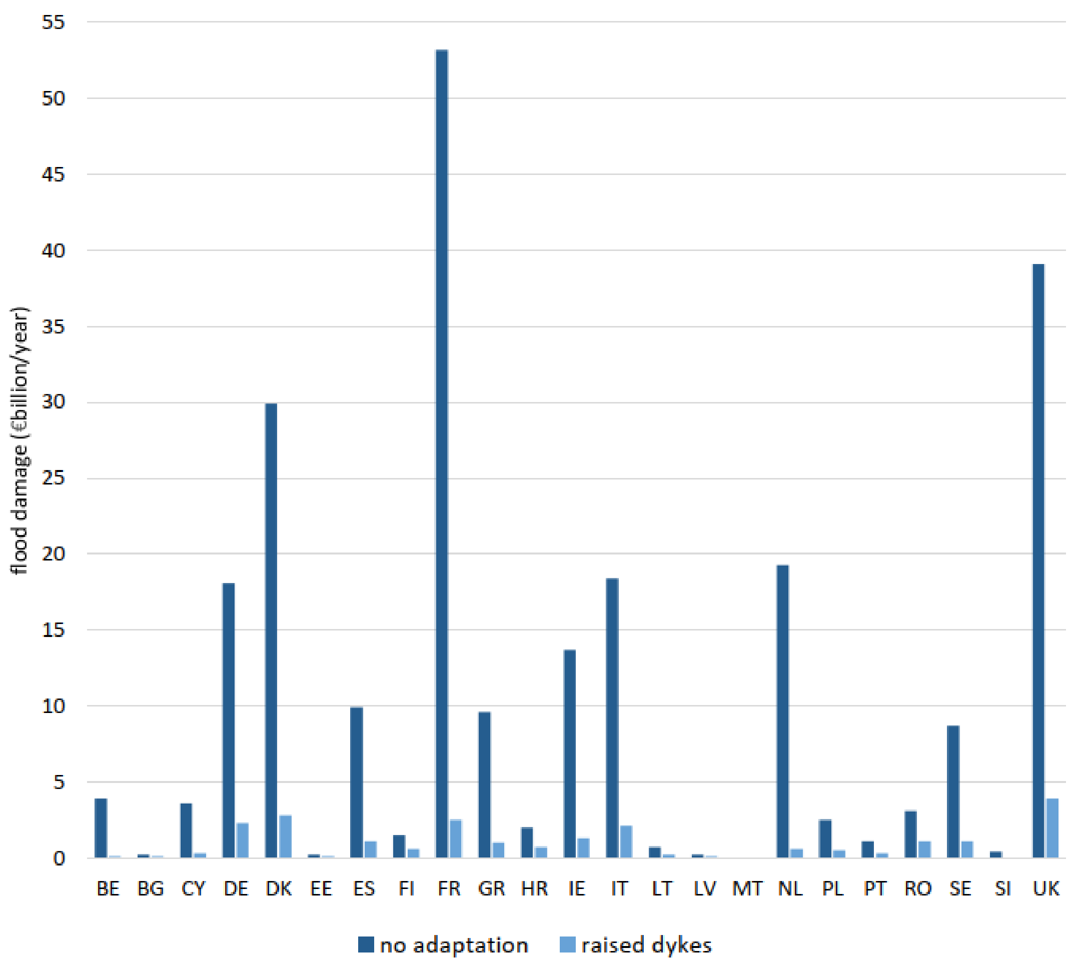


Figure 6: National annual damages with and without adaptation measures (high emissions scenario 2100) (Source: Vousdoukas et al. 2020).

Materiality for insurance sector in Europe

5.18. Most Member States consider the materiality of coastal flood for their insurance sector to be "low", with three exceptions. BE and EE assess the materiality to be "medium" for their industry and IE as being "high".

5.19. BE clarified that coastal flood was included in the mandatory cover of Nat Cat risk under fire property insurance. EE mentioned that coastal flood risk was covered by the companies and that some companies used coastal flood exposures in their OSN calculations because there was no capital requirement set in the Solvency II SF for the Baltic countries. EE further explained that Nat Cat flood risk modelling was used also for assessment of sufficient reinsurance capacity. IE mentioned that coastal flood was typically included in standard household and commercial property insurance and that there is a concentration of insured risk in coastal areas as most of Ireland's cities are coastal. IE further clarified that insurance firms could choose to exclude properties which do not meet their underwriting standards and that this might include firms in areas more prone to coastal flood, thus leading to a protection gap for such firms. According to IE coastal flooding is expected to become more common because of sea level rise and climate change, in that case the protection gap may rise over time.

5.20. The reasons mentioned by Member States that consider the materiality of coastal flood to be low for their insurance sector include e.g., a low insurance penetration, the coverage by public schemes and appropriate adaptation measures, such as dikes.

5.21. In most Member States coastal flood would be included in property insurance. However, in Denmark flooding from storm surge is covered by the Danish Natural Hazards Council, a national insurance scheme covering all buildings where the property or contents are insured against fire.

How to potentially include coastal flood in the SF

5.22. Coastal flood should only be included in the SF if it is a material risk for the insurance sector in a Member State. Currently, coastal flood is only considered for the UK in the windstorm peril.

5.23. The following options to potentially include coastal flood in the SF could be considered:

i) The consideration of coastal flood in the Nat Cat risk module under the perils windstorm or flood

ii) The inclusion of coastal flood as a separate peril under the Nat Cat risk module

5.24. On the question as to how coastal flood could be integrated in the SF, the views received in the public consultation were split, ranging from including coastal flood in the flood peril, as a new peril or – similar to the UK approach - within the windstorm risk. Supervisors indicated that coastal floods could for example be added under the flood risk module. Therefore, it is proposed to further discuss and assess the topic in the future.

Droughts

5.25. Agricultural drought – understood as crop yield reductions or failures induced by low soil moisture - is currently not included in the Nat Cat SF. However, this risk is rising and may prove sufficiently material for the insurance sector in the future. This justifies monitoring this peril and consider ways in which it might be included in the SF in future recalibration exercises.

Risk materiality

5.26. Based on a first assessments provided by the NCAs, the risk of agricultural drought was considered as relatively low: 52% of respondents perceived the risk as “low”, 41% as “medium”, 7% as “high” (two NCAs: Spain and Poland).

Climate change view

5.27. Agricultural drought is driven by elevated temperature and low precipitations, which affect soil moisture (Figure 7). The relative risk of droughts is expected to increase in frequency and intensity in southern and western parts of Europe, in line with the expected increase in temperature. Conversely, drought conditions will become less extreme in northern and north-eastern Europe (Figure 8).

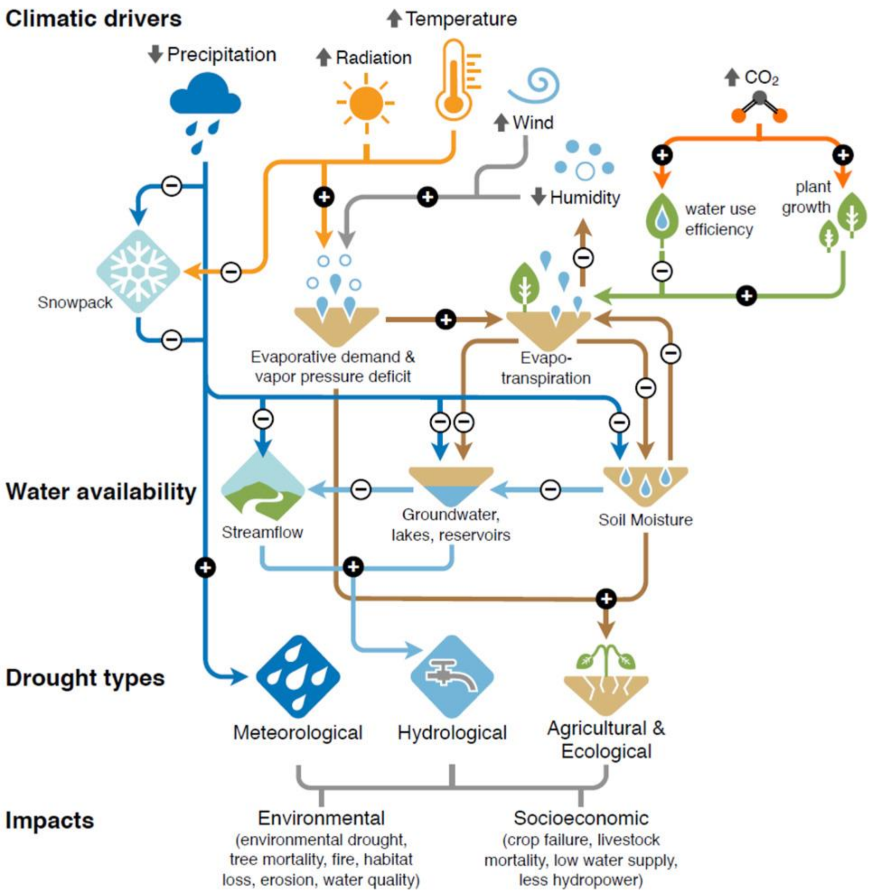


Figure 7 – Climatic drivers of droughts, *inc*. agricultural droughts (Source: IPCC, 2021).

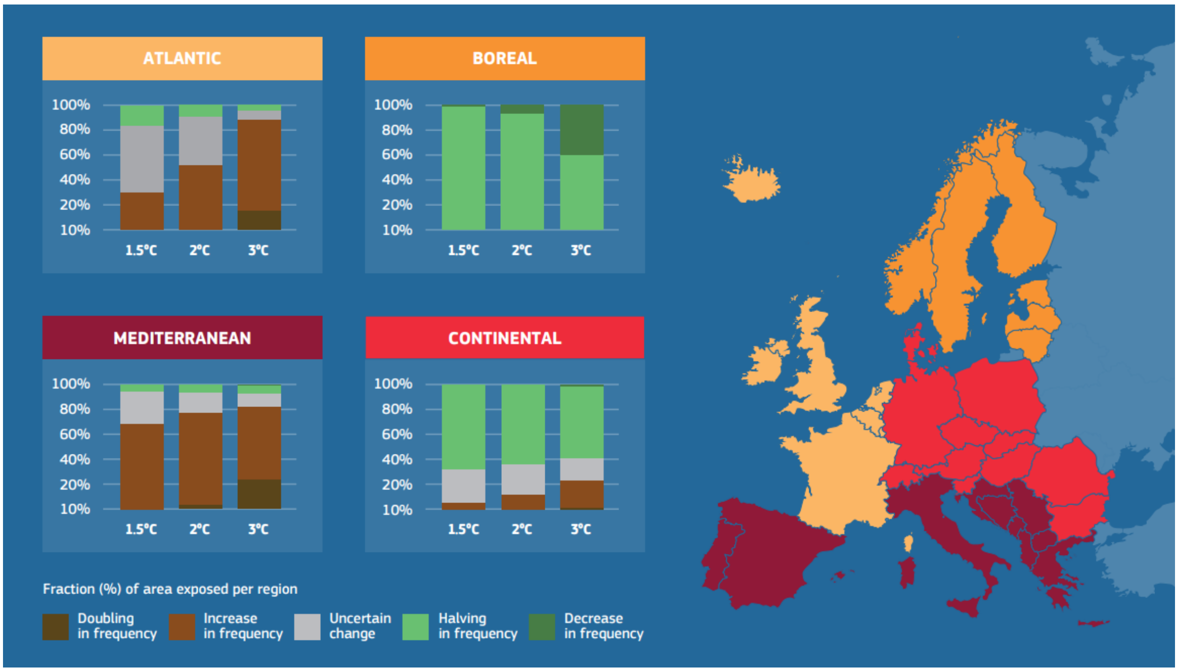


Figure 8 - Fraction of area exposed to changes in drought occurrence compared to present (1981-2010) for European sub-regions (Source: JRC PESETA IV project, 2020).

Materiality for insurance sector in Europe

5.28. In addition to climate considerations already exposed, the effect of public support on compensation claims and insurance penetration results in a high variability of crop insurance materiality across countries. Public schemes can take the form of private-public partnership, direct ex post government funding, or crop insurance premium subsidies. This illustrates the specific attention given by governments to food security across Europe. Overall, agricultural drought risk for the insurance sector was considered as low by the NCAs: 84% of respondents assessed the materiality risk as “low”, 12% as “medium” and only one NCA (Spain) assessed the materiality to be “high”. The initial primary insurance risk is estimated as high for Spain but thanks to the combined agricultural insurance (SAC) the materiality for the undertakings will be low[55].

5.29. Still, risk is increasing and so are economic losses. In a 3°C global warming scenario, drought-related losses in 2100 could be five times higher compared to 2020 (see JRC PESETA IV project, 2020). This

[55] The SAC is an essential tool for agricultural risk management in Spain, as it provides a system that ensures that all LoBs linked to agricultural risk in Spain are protected. The SAC is a private-public system based on the principles of risk compensation, solidarity and coverage unity; it consists of a co-insurance pool, reinforced by the mitigating mechanism of mandatory reinsurance provided by the CCS, which offers stability to the system.

could significantly increase materiality for the insurance sector, not even considering changes in insurance penetration, to make specific Nat Cat parameters relevant in the future.

How to include the risk in the SF

5.30. Several options can be considered to include agricultural drought in the SF:

iii) assess agricultural drought in a separate Nat Cat submodule, with sum insured information coming from current lines of business 7 and 19, adapted to only keep crop insurance business;
iv) assess agricultural drought alongside other perils typically included in multi-peril crop insurance contracts, in a separate Nat Cat submodule that would include all the perils most frequently insured in the context of crop insurance (e.g., drought, flood and frost);
v) rather than in the Nat Cat module, integrate this change of risk in a non-life premium and reserve risk module reassessment;
vi) keep the existing Nat Cat segmentation and reshape subsidence risk as a broader drought risk;

5.31. Most of the supervisors indicated that droughts should be added in a separate module.

6. IMPACT ASSESSMENT

6.1. The non-life catastrophe risk sub-module is one of the most complex sub-modules in the SCR SF, due to the high granularity of the technical specifications and calculations. The non-life catastrophe risk sub-module consists altogether of thirteen sub-modules, five of which form the natural catastrophe risk sub-module. Three of the natural catastrophe submodules are further defined by means of two separate scenarios.

6.2. The (re)assessment/(re)calibration is aimed to improve the risk sensitivity and therefore to provide benefits for policyholders, industry and supervisors, avoiding the underestimation or overestimation of the capital requirements.

6.3. Using the data reported via the annual QRTs, it is possible to derive an approximate impact of the changes in parameters proposed in this paper. The impact on the level of SCR depends on the peril/region considered.

6.4. EIOPA has analyzed the impact of a change in the following country factors:

- Windstorm risk: new factors for Iceland, St-Martin, Martinique and Guadeloupe
- Flood risk: new factors for Romania, Belgium, Czechia, Ireland, Luxembourg, Norway, Finland, the Netherlands, Denmark and Sweden
- Hail: new factors for Belgium, France, Germany, Luxembourg, the Netherlands and Poland

- Earthquake risk: new factor for Romania
- Subsidence risk: new factors for France and Belgium.

6.5. The annual QRTs (S.27) provide the results of intermediary calculations at country level. There is insufficient information to perform an impact assessment at zonal level, i.e. at the level where undertakings performed calculations. Because of this limitation, assumptions and approximations are needed. However, EIOPA recomputed the Nat Cat SCR (also per peril) starting from exposure data at country level.

6.6. In addition, as new peril/regions are added to the SF, EIOPA did not have associated country level exposure data. The exposure for windstorm was used to run the Impact Assessment where no exposure data was available (i.e., for all new perils/regions) as the data for windstorm cover the largest number of countries. Assuming that the subsidence sum insured is equal to the windstorm sum insured for the new countries for example is a very conservative assumption. In addition, as the QRT data are available at country level, aggregated for all LoBs, the changes in the motor factor cannot be accounted for. However, an analysis performed to see what would be the overall impact of the changes in the motor factor compared to the changes for the country factor indicate that the changes from the motor factor would not have a significant weight as overall the sum insured for fire and property LoB is significantly higher than the exposure from motor for hail.

- Another important assumption relates to the effect of reinsurance. Natural catastrophe events create significant claims against which insurance undertakings seek to protect themselves by entering into reinsurance arrangement contracts. Because of the nature of the events, non-proportional reinsurance covers are typically used. In its impact assessment, EIOPA has considered no change in the effect of reinsurance (in absolute terms). Also, for newly added perils, no additional reinsurance was assumed. Again, this results in a very conservative view of the changes.

6.7. All SF Solo companies were considered in the analysis. The results are shown at two levels:

- One at EU level, which means that all exposure data have been sum up and the calculation of the SCR for the different perils and SCR Nat Cat has been performed;
- One where the calculation has been performed at company level but outcomes are shown at member state level.

Analysis at EU level

6.8. Considering all EU exposure aggregated together, the overall change at SCR level is less than 1%. The Nat Cat SCR (net of reinsurance) is expected to increase by ~10% at aggregated level. It is important to note that the impact on the Nat Cat SCR is strongly mitigated by the use of reinsurance, the overall impact on the Solvency Ratio is also minimised thanks to the aggregation with other SCR values (from market risk, life, health…). The changes at peril SCR level (aggregated at EU level) can be observed for which, as expected, hail, flood and subsidence show the largest changes (+44%,

+10% and +40% respectively). Aggregating at Nat Cat SCR level, these changes become less material because of the diversification effect when aggregating all perils together (windstorm is the largest peril in the SF[56] and hail and subsidence have in comparison only a small weight – see Figure 9). Many parameters for windstorm were also updated in the 2017/2018 exercise and therefore there was no clear evidence of the need to modify these parameters in the 2023/2024 exercise.

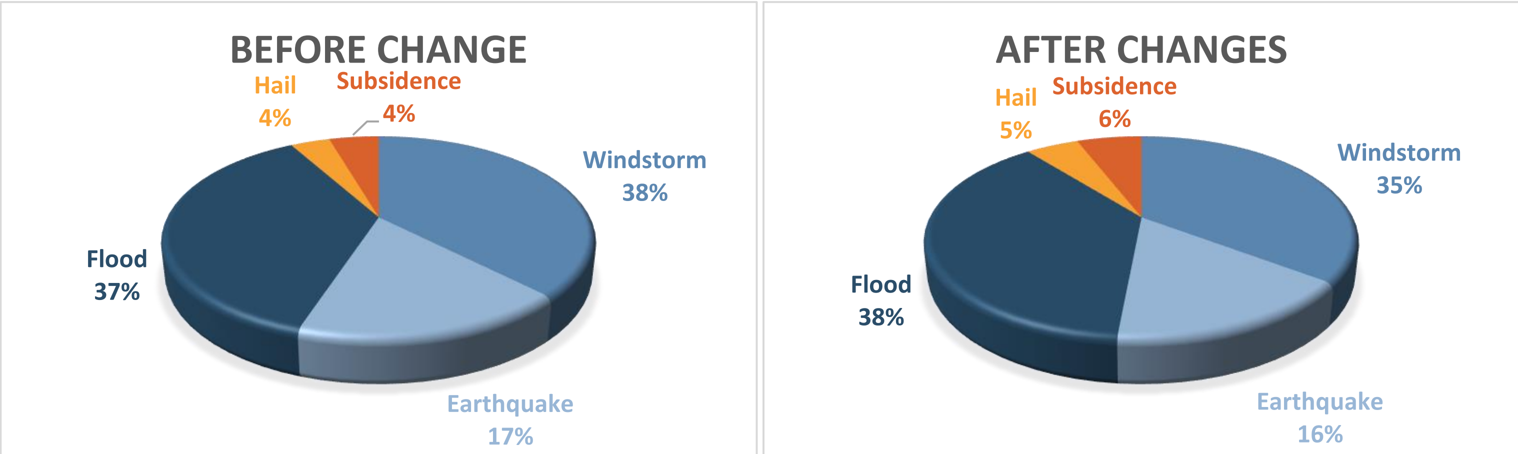


Figure 9: Split of the SCR per peril before and after the changes in the country factors.

Impact on solvency positions by member state

6.9. As the factors are country specific, not all EU exposure is impacted by the changes which also explains why at EU level the changes are very limited. However, the impact will differ significantly by Member State[57] (and obviously by undertaking).

6.10. Figure 10 shows the % of changes between the subsidence, hail, flood, earthquake and windstorm SCR and total SCR with and without changes per Member State whereas Figure 11 shows the split between the subsidence, hail, flood, earthquake and windstorm SCR with the changes per Member State.

6.11. For subsidence, only one country was present in the SF before and now two countries are present as Belgium has been added. To calculate the corresponding changes, the assumption was made that if the undertaking under a specific Member State had Belgium windstorm exposure, this exposure was applied to the subsidence module (as no data were available for subsidence for Belgium). This is the reason many Member States see a significant change (in % comparing the subsidence SCR with and without the changes) for subsidence as the corresponding undertaking had windstorm exposure in Belgium as well as subsidence exposure in France (see Figure 9) and the changes for the module itself is significant (doubling the number of countries considered). However, in comparison

[56] This is consistent with the fact that windstorm has the largest insurance penetration in Europe.

[57] This analysis considers the impact on solvency of the undertakings that are supervised in each member state - this can result from exposure outside of the specific member states (e.g., through FOS).

with other perils, the subsidence SCR is much lower (as shown in Figure 9 and Figure 11). The ultimate weight of subsidence is therefore very low in the overall SCR.

6.12. The two other perils where significant SCR changes are observed are for flood and hail as expected as these are perils where many factors have been modified. For flood, the Nordic countries show significant changes as they were not considered in the SF for flood before (also here the assumption made was to use the corresponding windstorm exposure which can be seen as conservative). The significant changes are therefore observed in term of % as previously the flood module was very small for the Nordic/NL countries and now much more significant with the new countries added (also cross-border business has an impact as Nordic undertakings are likely to have exposure in other neighbouring countries).

6.13. For Hail, some countries see a significant increase in terms of % changes (but in term of absolute values the changes are not significant. The overall hail weight for the SCR is similarly less than other perils such as windstorms and floods (see Figure 9).

6.14. For Earthquake, there are no changes or negative changes as the factor for Romania was decreased. This can also impact other countries because of cross-border businesses.

6.15. For Windstorm, one country has relevant changes from the % changes point of view but from an absolute perspective this does not has a significant impact.

6.16. However, for the total SCR, similar to the analysis made at EU level, the overall changes observed by Member State are significantly smaller than the changes observed by peril SCR. This is again linked with the fact that the impact of the changes are lowered due to the aggregation with the other SCR modules (Figure 10)[58] .

[58] It is however important to note that at more granular level, per undertaking the changes can vary significantly.

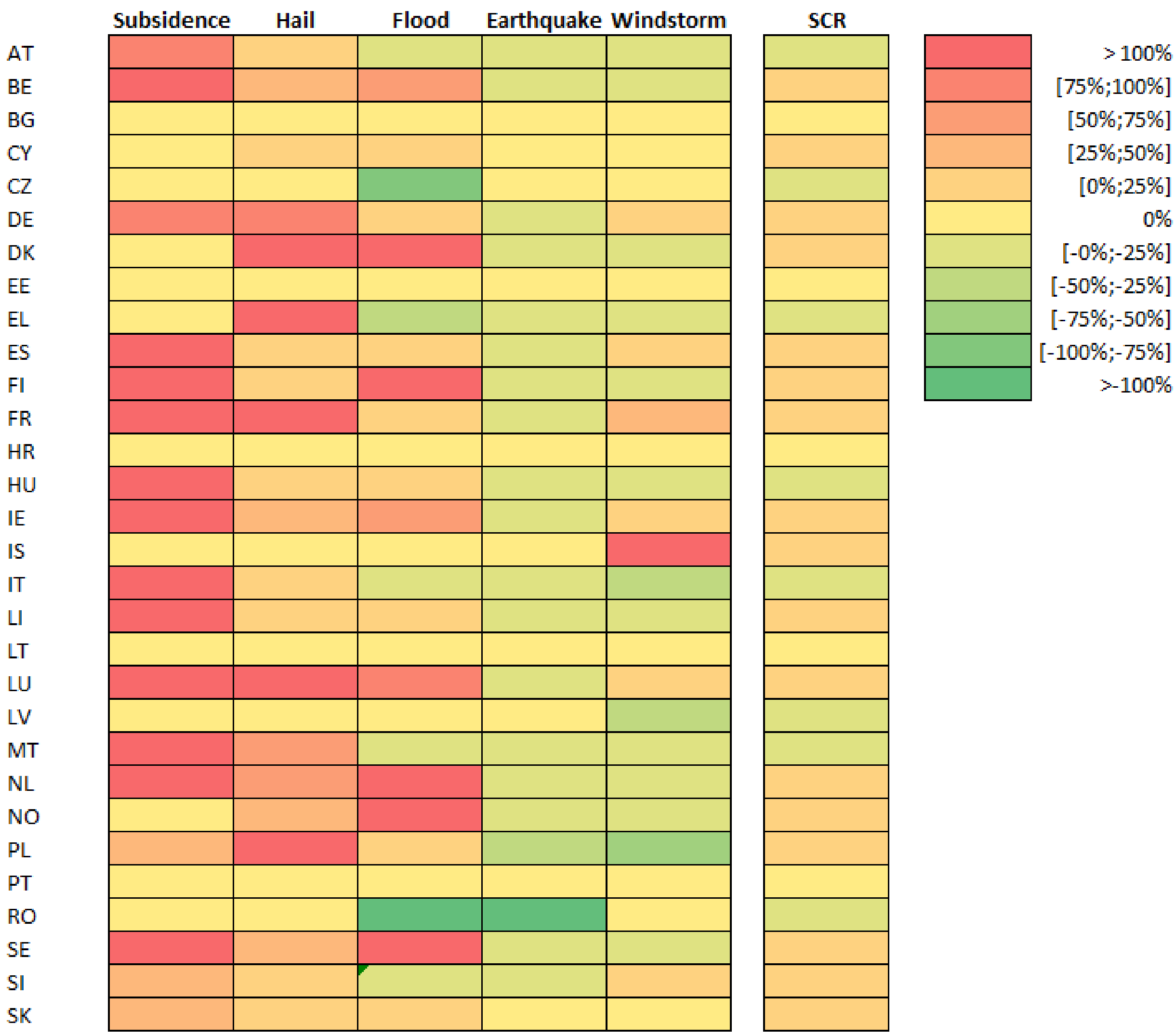


Figure 10: % of changes between the new SCR values with the changes for subsidence, hail, flood, earthquake, windstorm and total SCR with the SCR values without changes per Member State (% change = (new $SCR_{with\ changes}$ /old $SCR_{without\ changes}$ -1)*100).[59]

[59] This analysis considers the impact on solvency of the undertakings that are supervised in each member state – the impact seen by supervised member state can result from exposure outside of the specific member states (e.g., through FOS).

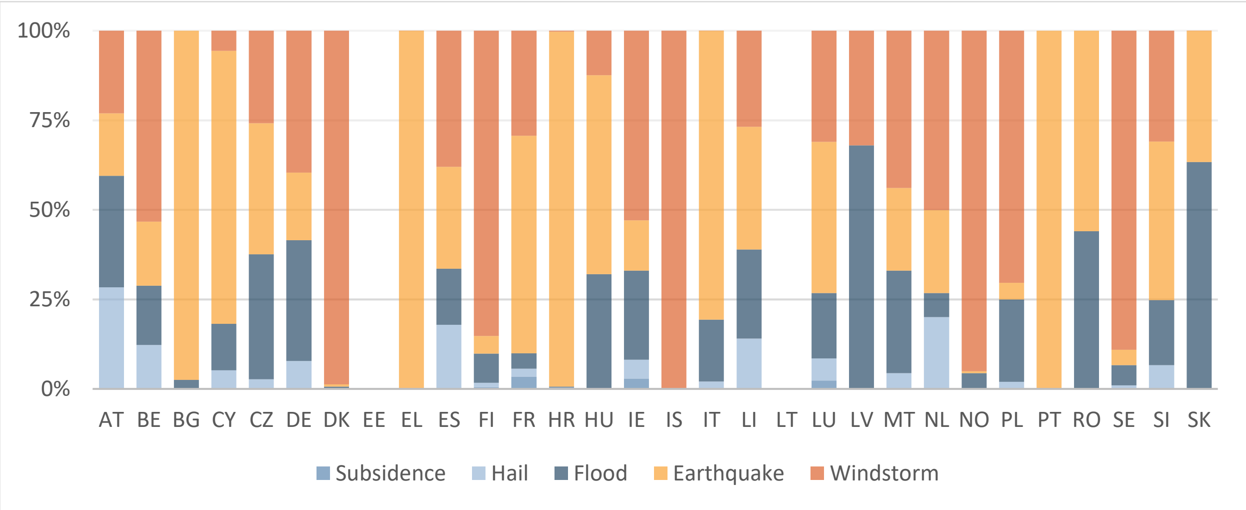


Figure 11: Split of the SCR per peril before the changes in the country factors per member state.[60]

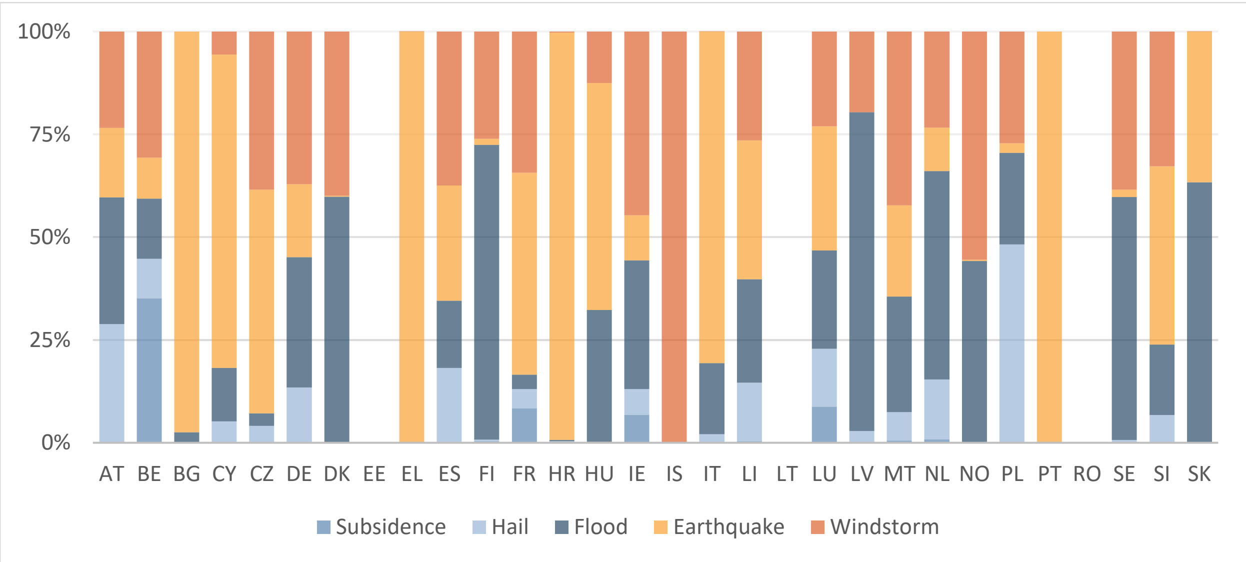


Figure 12: Split of the SCR per peril after the changes in the country factors per member state.[61]

[60] This analysis considers the impact on solvency of the undertakings that are supervised in each member state – the impact seen by supervised member state can result from exposure outside of the specific member states (e.g., through FOS).

[61] This analysis considers the impact on solvency of the undertakings that are supervised in each member state – the impact seen by supervised member state can result from exposure outside of the specific member states (e.g., through FOS). Also note that main assumptions used when running the calculations with the changes is that where the peril/region is new then the windstorm sum insured was used and not additional reinsurance was assumed.

7. ORGANISATIONS WHICH ARE MEMBERS OF THE TECHNICAL EXPERT NETWORK ON CATASTROPHE RISKS

7.1. Please see below the list of organisations with whom the members of the Technical Expert Network on Catastrophe Risks are affiliated. The inputs provided in the discussion paper is based on each individual members' expertise and contribution.

Achmea

AON

AVIVA

CMCC

Consorcio de Compensacion de Seguros

CoreLogic

Deloitte

EEA (European Environment Agency)

Gallagher Re

Generali

Guy Carpenter

Hannover Re

HDI

Impact Forecasting

JBA

Liberty Mutual

MSK Meyerthole Siems Kohlruss

Munich Re

ORTEC

PERILS

RMS

Siriuspoint

SwissRe

Verisk

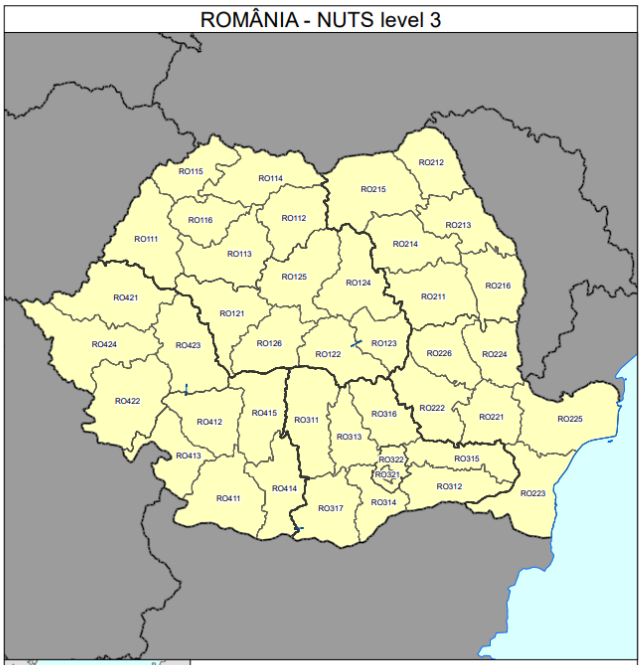
8. LIST OF ACRONYMS

CCR:	Caisse Centrale de Reassurance
CCS:	Consorcio de Compensación de Seguros
CRESTA:	Catastrophe Risk Evaluation and Standardizing Target Accumulations
EEA:	European Economic Area
EGU:	European Geophysical Union
GDP:	Gross Domestic Product
IED:	Industry Exposure Database
Nat Cat:	Natural Catastrophe
NCA:	National Competent Authorities
NNP:	Norwegian Natural Perils Pool
NUTS:	Nomenclature des unités territoriales statistiques
PAID:	Natural Disaster Insurance Pool
QRT:	Quantitative Reporting Templates
RPL:	Return Period Loss
SCR:	Solvency Capital Requirement
SCS:	Severe Convective Storms
SF:	Standard Formula
SII:	Solvency II
TIV:	Total Insured Value

9. ANNEX 1: RISK ZONES DEFINITION

Romania

In the SF, Romania's risk zones for flood and earthquake are currently based on NUTS3 regions (41 regions - Judet).



NUTS3 map for Romania (Source: Eurostat)

The high resolution CRESTA zones has 47 zones in Romania (2-Digit Postcode Area (Example: ROU_01)). The main difference between CRESTA and NUTS3 is that in the CRESTA zones Bucuresti is divided in multiple zones whereas it is just one zone in the NUTS3 zones.

10. ANNEX 2: CORRELATION COEFFICIENT FOR REGIONS

Hail

Hail Correlations for Regions

	AT	BE	CZ	FR	DE	IT	LU	NL	CH	SI	ES	PL
AT	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
BE	0%	100%	0%	0%	0%	0%	25%	25%	0%	0%	0%	0%
CZ	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
FR	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%
DE	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%
IT	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
LU	0%	25%	0%	0%	0%	0%	100%	25%	0%	0%	0%	0%
NL	0%	25%	0%	0%	0%	0%	25%	100%	0%	0%	0%	0%
CH	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
SI	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%
ES	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%
PL	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%

Flood

Flood Correlations for Regions

	AT	BE	BG	CH	CZ	DE	FR	HU	IT	PL	RO	SI	SK	UK	LU	IE	NL	NO	SE	FI	DK
AT	100%	0%	25%	25%	50%	75%	0%	50%	0%	25%	25%	0%	50%	0%	0%	0%	0%	0%	0%	0%	0%
BE	0%	100%	0%	0%	0%	25%	25%	0%	0%	0%	0%	0%	0%	0%	25%	0%	25%	0%	0%	0%	0%
BG	25%	0%	100%	0%	0%	0%	0%	25%	0%	0%	50%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
CH	25%	0%	0%	100%	0%	25%	25%	0%	25%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
CZ	50%	0%	0%	0%	100%	50%	0%	25%	0%	75%	25%	0%	75%	0%	0%	0%	0%	0%	0%	0%	0%
DE	75%	25%	0%	25%	50%	100%	25%	25%	0%	75%	25%	0%	25%	0%	25%	0%	25%	0%	0%	0%	0%
FR	0%	25%	0%	25%	0%	25%	100%	0%	0%	0%	0%	0%	0%	0%	25%	0%	0%	0%	0%	0%	0%
HU	50%	0%	25%	0%	25%	25%	0%	100%	0%	25%	50%	0%	25%	0%	0%	0%	0%	0%	0%	0%	0%
IT	0%	0%	0%	25%	0%	0%	0%	0%	100%	0%	0%	25%	0%	0%	0%	0%	0%	0%	0%	0%	0%
PL	25%	0%	0%	0%	75%	75%	0%	25%	0%	100%	25%	0%	25%	0%	0%	0%	0%	0%	0%	0%	0%
RO	25%	0%	50%	0%	25%	25%	0%	50%	0%	25%	100%	0%	25%	0%	0%	0%	0%	0%	0%	0%	0%
SI	0%	0%	0%	0%	0%	0%	0%	0%	25%	0%	0%	100%	25%	0%	0%	0%	0%	0%	0%	0%	0%
SK	50%	0%	0%	0%	75%	25%	0%	25%	0%	25%	25%	25%	100%	0%	0%	0%	0%	0%	0%	0%	0%
UK	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	25%	0%	0%	0%	0%	0%
LU	0%	25%	0%	0%	0%	25%	25%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
IE	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	25%	0%	100%	0%	0%	0%	0%	0%
NL	0%	25%	0%	0%	0%	25%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%
NO	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
SE	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%
FI	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%
DK	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%

Subsidence

Subsidence Correlations for Regions

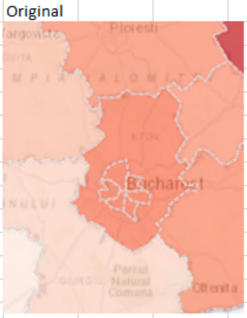
	FR	BE
FR	100%	0%
BE	0%	100%

11. ANNEX 3: RISK ZONE WEIGHTS

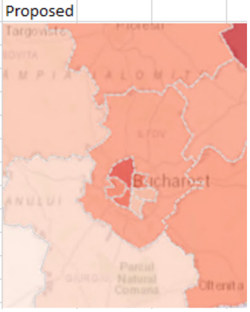
Romania Earthquake

		Zonal Weights					
ORIG SII ZONE	PC2 ZONE	Original	Proposed	ORIG SII ZONE	PC2 ZONE	Original	Proposed
41	1	2.5	3.4	32	44	0.2	0.2
	2	2.5	2.7	31	45	0	0
	3	2.5	1.6	9	50	0.2	0.2
	4	2.5	1.4	1	51	0	0
	5	2.5	2.9	15	52	1.5	1.5
	6	2.5	2.5	21	53	0	0
	7	2.5	2.1	27	54	0	0
19	8	0.9	0.9	33	55	0.1	0.1
30	10	2.1	2.1	4	60	2	2
3	11	0.8	0.8	28	61	0.5	0.5
10	12	4	4	40	62	5.2	5.2
16	13	1.3	1.3	24	70	0.3	0.3
35	14	0.4	0.4	7	71	0	0
17	20	0.2	0.2	34	72	0	0
20	21	0.3	0.3	38	73	1	1
26	22	0.3	0.3	18	80	1.3	1.3
29	23	0.4	0.4	8	81	0.9	0.9
39	24	0.6	0.6	37	82	0.1	0.1
36	30	0.2	0.2	14	90	0	0
2	31	0.1	0.1	12	91	2.2	2.2
11	32	0.1	0.1	23	92	2	2
22	33	0	0				
13	40	0	0				
5	41	0	0				
6	42	0	0				
25	43	0.1	0.1				

Original



Proposed

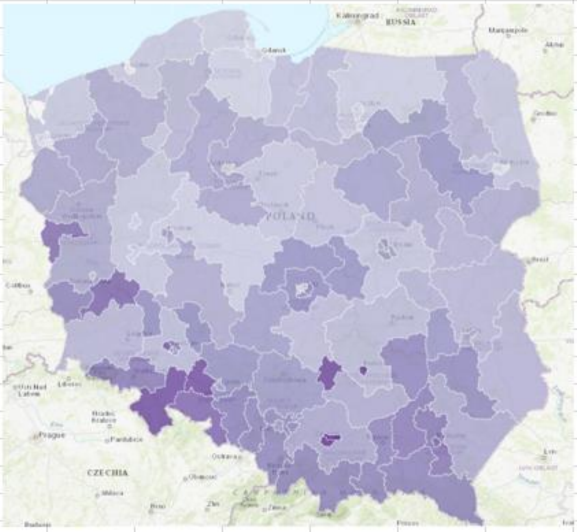


Romania Flood

ORIG SII ZONE	PC2 ZONE	Zonal Weights	ORIG SII ZONE	PC2 ZONE	Zonal Weights
41	01	0.2	5	41	3.6
	02	0.1	6	42	4.9
	03	0.1	25	43	1.4
	04	0.2	32	44	1.3
	05	0.1	31	45	0.4
	06	0.1	9	50	0.2
	07	0.2	1	51	1.6
19	08	8.9	15	52	0.4
30	10	0.6	21	53	2.1
3	11	0.5	27	54	0.8
10	12	1.2	33	55	0.4
16	13	0.3	4	60	0.7
35	14	1.2	28	61	0.6
17	20	1.9	40	62	0.6
20	21	0.4	24	70	1.5
26	22	3.3	7	71	0.5
29	23	0.3	34	72	0.8
39	24	0.4	38	73	0.8
36	30	0.1	18	80	1.6
2	31	4.8	8	81	1.1
11	32	1.3	37	82	2.6
22	33	1.3	14	90	1.1
13	40	2.1	12	91	1.2
			23	92	4.2

Poland Hail

Risk zone	Weight	Risk zone	Weight	Risk zone	Weight	Risk zone	Weight
PL-00	1.6	PL-31	3.0	PL-62	1.1	PL-94	1.2
PL-01	1.6	PL-32	1.6	PL-63	1.5	PL-95	1.9
PL-02	1.7	PL-33	2.0	PL-64	1.2	PL-96	1.9
PL-03	1.8	PL-34	2.1	PL-65	1.1	PL-97	1.3
PL-04	1.7	PL-35	2.3	PL-66	1.6	PL-98	1.7
PL-05	1.2	PL-36	2.2	PL-67	2.3	PL-99	1.9
PL-06	1.7	PL-37	1.6	PL-68	2.1		
PL-07	1.5	PL-38	2.1	PL-69	2.3		
PL-08	1.4	PL-39	2.1	PL-70	0.7		
PL-09	1.2	PL-40	1.7	PL-71	0.9		
PL-10	0.9	PL-41	1.9	PL-72	1.2		
PL-11	1.1	PL-42	1.8	PL-73	1.6		
PL-12	1.7	PL-43	2.0	PL-74	1.7		
PL-13	1.5	PL-44	2.0	PL-75	0.4		
PL-14	1.3	PL-45	1.6	PL-76	1.2		
PL-15	0.8	PL-46	1.9	PL-77	1.4		
PL-16	1.2	PL-47	2.1	PL-78	1.6		
PL-17	1.5	PL-48	2.3	PL-80	0.9		
PL-18	1.9	PL-49	2.6	PL-81	0.9		
PL-19	1.4	PL-50	2.0	PL-82	1.3		
PL-20	1.5	PL-51	2.1	PL-83	1.0		
PL-21	1.4	PL-52	2.1	PL-84	1.1		
PL-22	1.4	PL-53	1.8	PL-85	1.0		
PL-23	2.0	PL-54	2.5	PL-86	1.6		
PL-24	1.8	PL-55	1.3	PL-87	1.2		
PL-25	2.6	PL-56	2.0	PL-88	1.6		
PL-26	1.3	PL-57	2.6	PL-89	1.6		
PL-27	2.0	PL-58	2.1	PL-90	0.3		
PL-28	1.5	PL-59	1.4	PL-91	1.0		
PL-29	2.7	PL-60	1.7	PL-92	2.1		
PL-30	2.8	PL-61	1.6	PL-93	1.9		

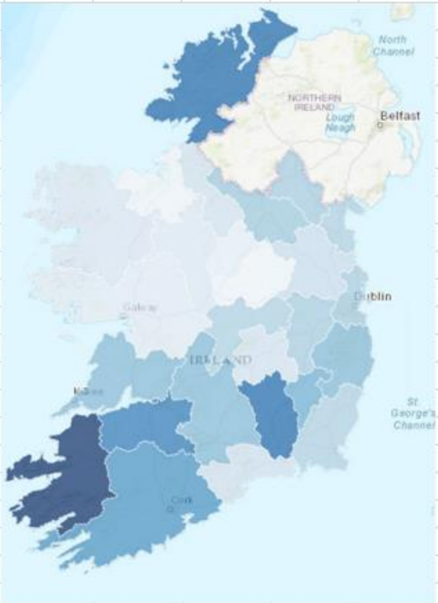


[Record Number]
EIOPA REGULAR USE
EIOPA-YY/XXX

Ireland flood

IE FL

ZONE	Zonal Weights
IE-01-CE	1.9
IE-02-CK	2.6
IE-03-CN	1.5
IE-04-CW	2.1
IE-05-DL	3.2
IE-06-DN	1.4
IE-07-GY	0.5
IE-08-KE	1.5
IE-09-KK	3.2
IE-10-KY	4.1
IE-11-LD	0.4
IE-12-LH	1.3
IE-13-LK	2.9
IE-14-LM	0.8
IE-15-LS	0.8
IE-16-MH	1.0
IE-17-MN	1.5
IE-18-MO	0.7
IE-19-OY	1.4
IE-20-RN	0.6
IE-21-SO	0.2
IE-22-TY	1.9
IE-23-WD	0.9
IE-24-WH	0.2
IE-25-WW	1.9
IE-26-WX	1.3



12. ANNEX 4: EXAMPLES OF IMPORTANT HISTORICAL EVENTS

Earthquake

Source	**Country**	**Regions**	**Date**	**Magnitude**
EMDAT	Italy	Avezzano, Campotosto, Montereale, Capitignano, Ortolano di Campotosto, Mopolino (L'Aquila); Castel Castagna, Castiglione Messer Raimondo, Prati di Tivo (Teramo); Abruzzo (Pescara), Lazio (Rieti), Marche (Ascoli Piceno, Macerata, Fermo, Ancona) regions	18/01/2017	5.7
EMDAT	Italy	Casamicciola Terme, Lacco Ameno (Ischia Isl.), near Flegrea coast of Campania (Naples province)	23/08/2017	4.2

Flood

Source	**Country**	**Regions**	**Date**	**Pluvial flood or fluvial flood**
EMDAT	Germany	Berchtesgaden (Bavaria); Heilbronn (Baden-Württemberg); Saxony, Saxony-Anhalt; Ahrweiler, Euskirchen, Rhein-Sieg, Heinsberg, Köln (Rheinland-Pfalz); Märkischer Kreis, Düsseldorf, Solingen, Unna, Rhein-Erf (Nordrhein-Westfalen); Hessen, Thüringen,	2021	Pluvial flood
EMDAT	France	Ile-de-France	2018	

EMDAT	France	Carcasonne, Conques sur Orbiel, Aragon, Berriac, Trbes, Flore, Villegaihenc, Villemoustaussou, Villalier	2018	
EMDAT	France	Var, Alpes-Maritimes, Bouches-du-Rhone, Alpes-de-Haute-Provence (Provence-Alpes-Côte d'Azur Region)	2019	
EMDAT	France	Hérault, Gard, Pyrénées-Orientales	2019	
EMDAT	France	Ajaccio (Corsica); Salines, Cannes, Pietralba	2020	
EMDAT	France	Valleraugue (Gard department); Lozère and Herault departments	2020	
EMDAT	France	Gironde, Landes Departments, Ile de France Region	2020	

EMDAT	France	Natural La Marne, La Meuse, La Moselle Departments; Châtel de Houx, Le Field (Jura); Plainfaing (Vosges); Villers la Chèvre, Errouville, Longuyon, Villette (Meurthe en Moselle); Bras-sur-Meuse (Meuse)	2021	
EMDAT	France	Nouvelle-Aquitaine; Occitanie; Landes; Pyrénées-Atlantiques	2021	
EMDAT	France	Beauvais, Tillé, Auneuil Municipalities (Oise Department); Marne, Somme	2021	
EMDAT	France	Gard Department	2021	
EMDAT	France	Charente-Maritime Department, Lot-et-Garonne Department, Gironde Department	2021	
EMDAT	France	Nord, Pas-de-Calais, Hauts-de-France Region	2021	

EMDAT	Czechia	Stedoeský, Plzeský, Karlovarský, Ústecký, Prague, Liberecký, Decín	2021	
EMDAT	Ireland	Kildare, Waterford, Wicklow counties; Dunboyne, Clonee Blackwater, Gorey (towns), Blanchardstown, Mulhuddart (suburbs of Dublin city)	2002	
EMDAT	Ireland	Cork, Galway, Tipperary, Kilkenny, Carlow, Kerry, Leitrim, Clare, Sligo, Waterford (counties)	2009	
EMDAT	Ireland	Dublin city, Kilbride village (Wicklow County)	2011	
EMDAT	Ireland	Mountmellick (Laois)	2017	
EMDAT	Luxembou rg	Mamer, Vianden, Bettemburg, Echternach, Rosport, Mersch, Beringen, and Rolleng (Laois)	2021	

EMDAT	Belgium	Tubize and Rebecq cities (Brabant wallon district), Eupen, Pepinster, Theux cities (Liege district), Rochefort, Dinant, Couvin cities (Namur district), Arlon city (Luxembourg district) (Region wallonne province)	2011	Fluvial flood
EMDAT	Belgium	Harsin area (Nassogne commune, Luxembourg district, Region wallonne province)	2016	
EMDAT	Belgium	Liège, Namur, Luxembourg, Limbourg, Brabant Wallon, Hainaut	2021	
EMDAT	Italy	Emilia Romagna, Lentigione village, Brescello, Tuscany	2017	Fluvial
EMDAT	Italy	Cagliari, Nuoro, Sassari, Oristano	2020	Pluvial flood
EMDAT	Italy	Crotone and Cosenza provinces	2020	

NatCatService MunichRe as of June 2018 (Methodological paper on potential inclusion of climate change in the Nat Cat SF)	Denmark	Copenhagen, Capital region	2011	Pluvial flood
EMDAT and submitted by NCA	Sweden	Gävleborg, Dalarna counties	2021	Pluvial flood
Submitted by NCA	Finland	Around all southern Finland	1899	Summer Fluvial
Submitted by NCA	Finland	Southeast Finland	1924	Summer Fluvial
Submitted by NCA	Finland	Southern Finland	1966	Snow melt Fluvial
Submitted by NCA	Finland	Center of Pori	2007	Pluvial
EMDAT	Portugal	Funchal district (Ilha Da Madera province)		
EMDAT	Portugal	Faro province	2015	
EMDAT	Netherlands	Valkenburg; LImburg	2021	
Submitted by NCA	Portugal	Lisbon	2022	

Windstorm

Source	**Country**	**Regions**	**Date**	
EMDAT	Portugal	Coimbra, Leiria districts	2018	Tropical cyclone
EMDAT	Saint-Martin		2017	Tropical cyclone
EMDAT	Guadeloupe	La Desirade Island	2017	Tropical cyclone
EMDAT	Martinique	Le Morne-rouge, Le Carbet (St Pierre), Le Marigot, Gros-Morne (La Trinité), Northern coast, Fort-de-France, Schoelcher (Fort de France)	2017	Tropical cyclone

Hail

Source	**Country**	**Regions**	**Date**	
EMDAT	Hail	Germany	Harburg District in Niedersachsen, Sachsen-Anhalt, Brandenburg, Sachsen	2017
EMDAT	Severe storm	Italy	Tramontina (Pordenone & Udine-Frioul region); Marziai (Belluno-Dolomites), Cortina d'Ampezzo (Belluno), Alto Adige, Lago di Garda (Verona), Adige Valley	2017
EMDAT	Severe storm	Germany	Passau district, Freyung-Grafenau (Niederbayern), Altötting (Oberbayern)	2017

EMDAT	Severe storm	France	Alps, Morillon (Haute Savoie), Corse, Savoie, Isère, Cambrai (Nord), Paris region (Ile-de-France), Seine Maritime, Pas de Calais, Haute Marne, Manche, Bretagne, Lucenay-Lévêque (Saône et Loire)	2018
EMDAT	Severe storm	France	Var, Alpes Maritimes, Puy de Dome departments	2019
EMDAT	Severe storm	Italy	Massa, Carrara Province (Tuscany Region); Varese Province (Lombardy Region) Ancona Province (Marche Region); Trentino-South Tyrol Region	2020
EMDAT	Czechia	Hodonin, Mikulcice, Moravska Nova Ves, Hrusky, Breclav, Tvrdonice, Luzice (South Moravian Region)	2021	Severe storm
EMDAT	Poland	Chojnice district (Suszek, Konarzyny), Pomorskie Voivodeship, Wielkopolskie, Torun, Gniezna, Wrzesnia, Nakla	2017	Derecho

13. ANNEX 5: DEFINITION OF PERILS

SF Peril name	**Type of disaster**	**SF**
Earthquake	Geophysical	Includes ground movement, but neither tsunami nor fire following.
Flood	Hydrological	Includes riverine (or fluvial) floods and floods that result from rainfall (pluvial, or surface water, floods). Storm surge is not included. Flash floods, which

		can be part fluvial and part pluvial, are included.
Windstorm	Meteorological	Includes cyclonic storms (both extra-tropical and tropical cyclones). Storm surge is not a separate peril, but – where material - combined with windstorm due to the inherently coupled nature. Convective storms are not part of the windstorm peril.
Hail	Meteorological	The SF includes in particular hail as the dominant sub-peril, but also other sub-perils of severe convective storms, such as tornadoes and lightning,
Subsidence	Geophysical	Subsidence is part of the SF in France and refers to a swelling or shrinking of clay soils.

14. ANNEX 6: REFERENCES

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