

Drought 2022 – Analysis of subsidence risk in France

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According to the study *Impact of climate change on insurance by 2050*, produced by the FFA (Fédération Française de l'Assurance), the cost of climate-related claims should double over the period 2020-2050. This document consolidates analyses produced by Milliman (Paris office) using different data sources (notably: CCR's Cat' Nat' decrees, ECMWF's ERA5 data, Météo France's spring 2022 climate report, BRGM's and ESDAC's RGA data, and IGN's ADMIN-EXPRESS).

Subsidence or shrinkage and swelling of clay soils

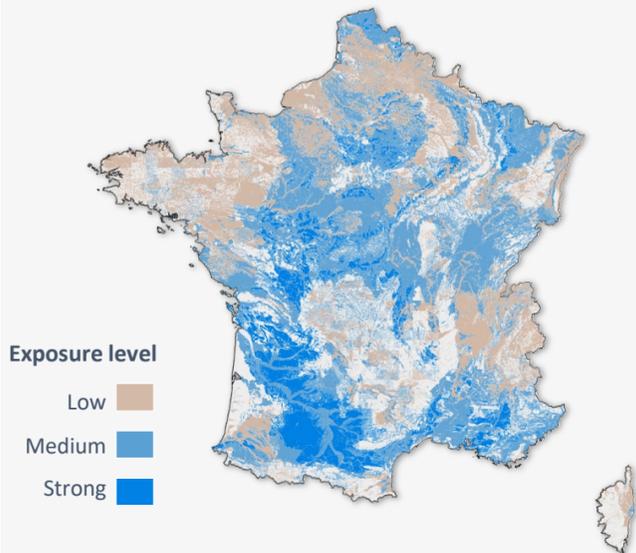
The last few years have shown a **significant increase in the cost of drought claims for French insurers**. Each year since 2017, more than 2000 municipalities have been subject to a recognition order for this peril, whereas this number had only been exceeded twice (in 2003 and 2011) since 2000.

This hazard, commonly called "drought", is the result of **"differential ground movements due to drought and soil rehydration"** (Source: CCR, Caisse Centrale de Réassurance.)

This phenomenon occurs when the **soil shrinks during hot, rainless spells and then, following heavy rainfall, becomes waterlogged and swells**. These ground movements can then cause very costly damage (cracks, pipe breaks, etc.). **On average, the Cat' Nat' scheme has been burdened with €0.5 billion over the last 30 years and nearly €2 billion for 2003**, the year most affected by the drought (FFA, MRN).

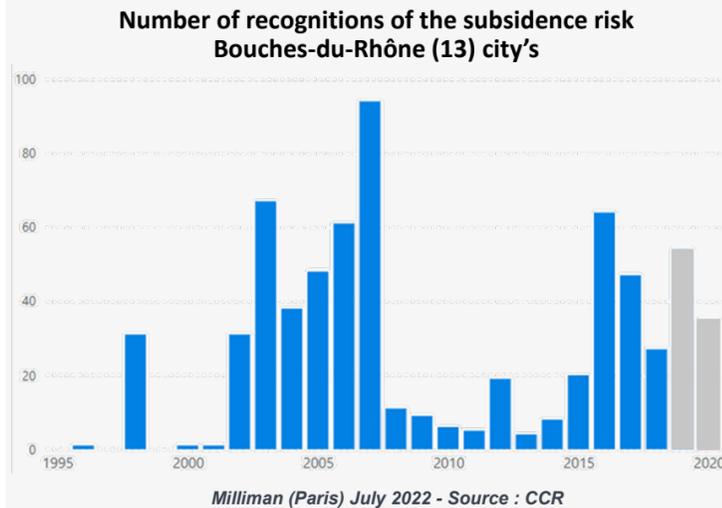
This phenomenon presents a strong geographical disparity, with the Southwest and the Bouches-du-Rhône department, concentrating on the communes most exposed to the subsidence risk (map below).

Swell-shrinkage risk exposure



Milliman (Paris) July 2022 - Sources : BRGM, Géorisques and IGN

A risk monitored temporally and geographically (with focus on the Bouches-du-Rhône, Marseille department)



950M€

Cumulated costs

8.5K€

Average cost

These are the costs compensated by insurers under the French Cat' Nat' scheme for subsidence peril over the period 1995-2018, for the Bouches-du-Rhône department. This amount is estimated from the 2018 ONRN report for drought.

Milliman (Paris) July 2022 - Source : CCR

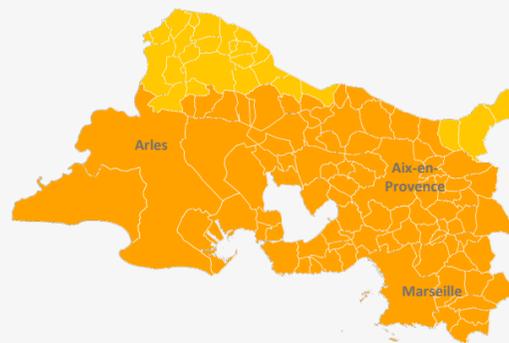
Since 1989, the Cat Nat regime covers the risk of drought and the CCR publishes different orders to inform the communes of their **recognition or not**. In the visual above the **recognitions** and the **costs** of the subsidence risk for the Bouches-du-Rhône department are represented.

1st quarter (Q1) 2022 ranking by municipality in terms of rainfall— zoom on Bouches-du-Rhône

Ranking in relation to Q1s over the last 30 years

Worst Q1

2nd worst Q1



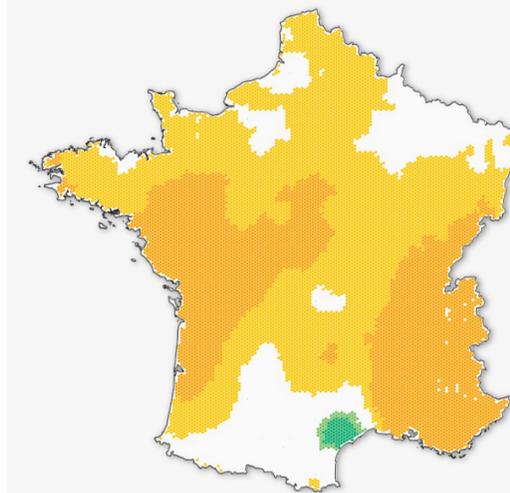
Milliman (Paris) July 2022 - Sources : ECMWF and IGN

As the map above shows, in the Bouches-du-Rhône department, **almost all the communes have never been as dry as at the beginning of the year**. The prefect then announced **water restrictions** on 7 June 2022, establishing a **state of alert for about 50 communes**, 19 of which were in a **state of crisis**, with the cessation of non-priority water withdrawals (including those for agricultural purposes).

2022 among the hottest and driest years

The beginning of the year has already been marked by **intense heat waves**, but is it particularly dry? To provide some answers, the **precipitation (mm)** and **soil temperature (°C)** that characterise this phenomenon are analysed. The maps below show the **differences in metrics between the Q1 of 1989 to 2021 and the Q1 of 2022**.

Precipitation difference between Q1 2022 and the average of Q1 1989-2021



Milliman (Paris) July 2022 - Sources : ECMWF and IGN

Precipitation difference (%)

- > 30% (heavy rainfall)
-]15%; 30]
-]-15%; 15]
-]-30%; -15]
- < -30% (very dry)

In Q1 2022, there was a **strong deficit in rainfall** throughout the country, with the South east being particularly dry (despite some **very rainy episodes in the Hérault in March**).

In general, **the average rainfall is down by 25% compared to the average of the last 30 years for the same period**.

Temperature difference (%)

(high heat) > 30%

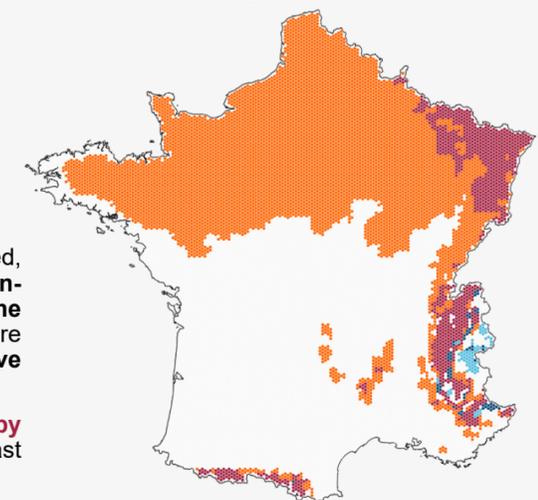
]15%; 30]

]-15%; 15]

]-30%; -15]

(low temperature) < -30%

Temperature difference between Q1 2022 and the average of Q1 1989-2021



Milliman (Paris) July 2022 - Sources : ECMWF and IGN

As far as temperatures are concerned, France is experiencing a **warmer -than-average Q1 2022 over part of the country**. The East and Pyrenees are experiencing temperatures **well above average**.

The **average temperature is up by +0.7°C** compared with the average of past Q1 periods.

Climate risk understandable through Open Data

With the development of **external data and geomatics**, climatic phenomena are more easily measured and represented.

Soil analysis data can be used to **map the exposure of water-sensitive clay formations to subsidence**. **Satellite measurements** allow the comparison of various **climatic data** at more or less fine grids. More directly, some **Cat' Nat' reports present statistics and cost estimates**.

Subsidence risk cost of €13.8 billion between 1989 and 2019, in terms of compensation by insurers and, according to a projection by the FFA, would cost **€43 billion between 2020 and 2050**. Five departments would be particularly affected: **Haute-Garonne, Gironde, Bouches-du-Rhône, Tarn, and Tarn-et-Garonne**. **Climate change would then lead to an increase of €17 billion for this peril**.

These data and analyses can be used by insurers for the **reserving of drought and more generally of climatic perils**. There is also a **stake for underwriting**: insurers who know the **different risks at fine geographical scales** can adapt their offers according to the **desired level of risk**. More generally, this **monitoring of climate risk** can take the form of decision support tools (**dashboards, reports, KPIs**) that make it possible to **understand the consequences of the peril**.

The ECMWF indices are available after three months; this study therefore uses data up to March 2022. The first quarter alone is not sufficient to determine whether the year will see many droughts and updates and **new analyses can be produced based on these tools**.

In its **spring 2022 climate report**, Météo France provided information, which tended to **confirm in Q2 the trend initiated in Q1**:

- **Spring 2022 was the third driest since 1959** on a national scale behind the springs of 2011 (drought cost estimated at €740 million) and 1976.
- It was also the **third warmest spring since 1900**. It ranks behind 2011 and 2020.

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