

Drought 2022 – Analysis of subsidence risk in France

Antoine Rainaud, Remi Bellina, Gabriel Fauchet, Loup Ortiz



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

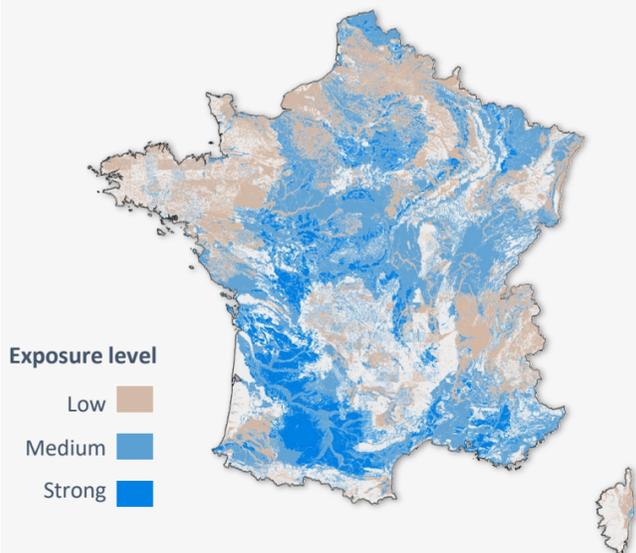
The last few years have shown a **significant increase in the cost of drought claims for French insurers**. Each year since 2017, more than 2000 municipalities have been subject to a recognition order for this peril, whereas this number had only been exceeded twice (in 2003 and 2011) since 2000.

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).

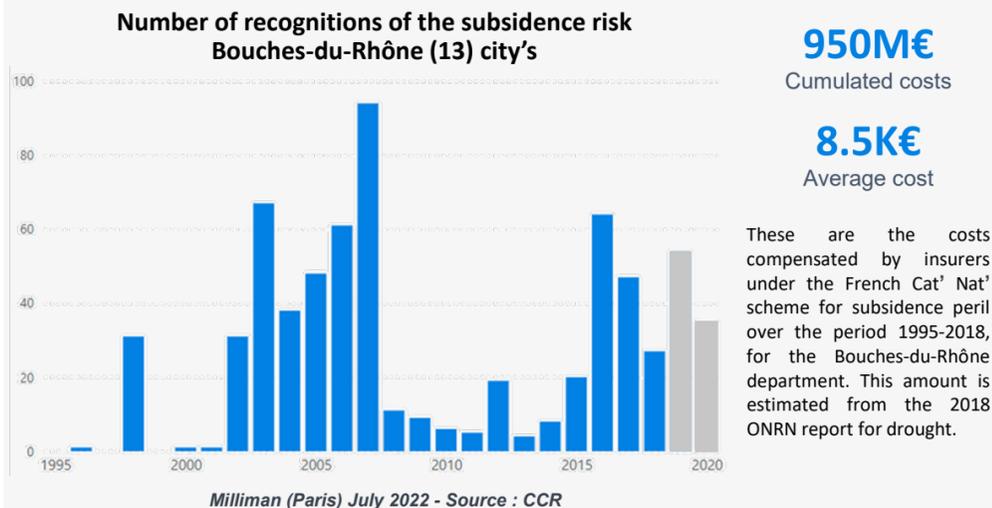
This phenomenon presents a strong geographical disparity, with the Southwest and the Bouches-du-Rhône department, concentrating on the communes most exposed to the subsidence risk (map below).

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)

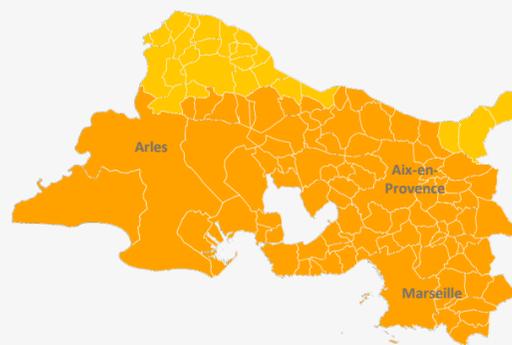


Since 1989, the Cat Nat regime covers the risk of drought and the CCR publishes different orders to inform the communes of their **recognition or not**. In the visual above the **recognitions** and the **costs** of the subsidence risk for the Bouches-du-Rhône department are represented.

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 ■



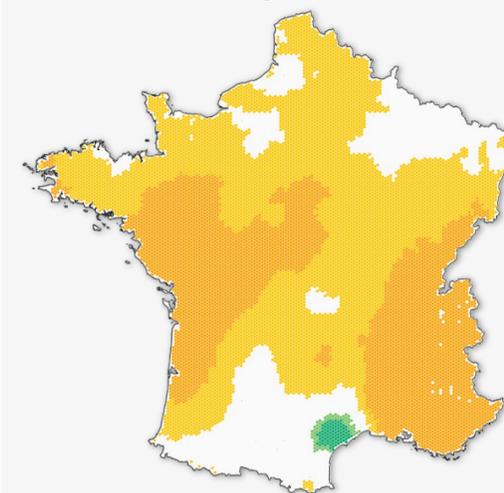
Milliman (Paris) July 2022 - Sources : ECMWF and IGN

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**.

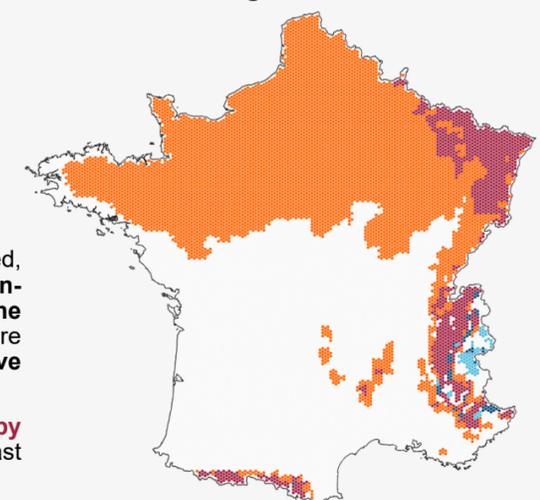
Temperature difference (%)

- (high heat) > 30% ■
-]15%; 30%] ■
-]-15%; 15%] ■
-]-30%; -15%] ■
- (low temperature) < -30% ■

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.

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



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

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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