

France 2020 : a year of climate records



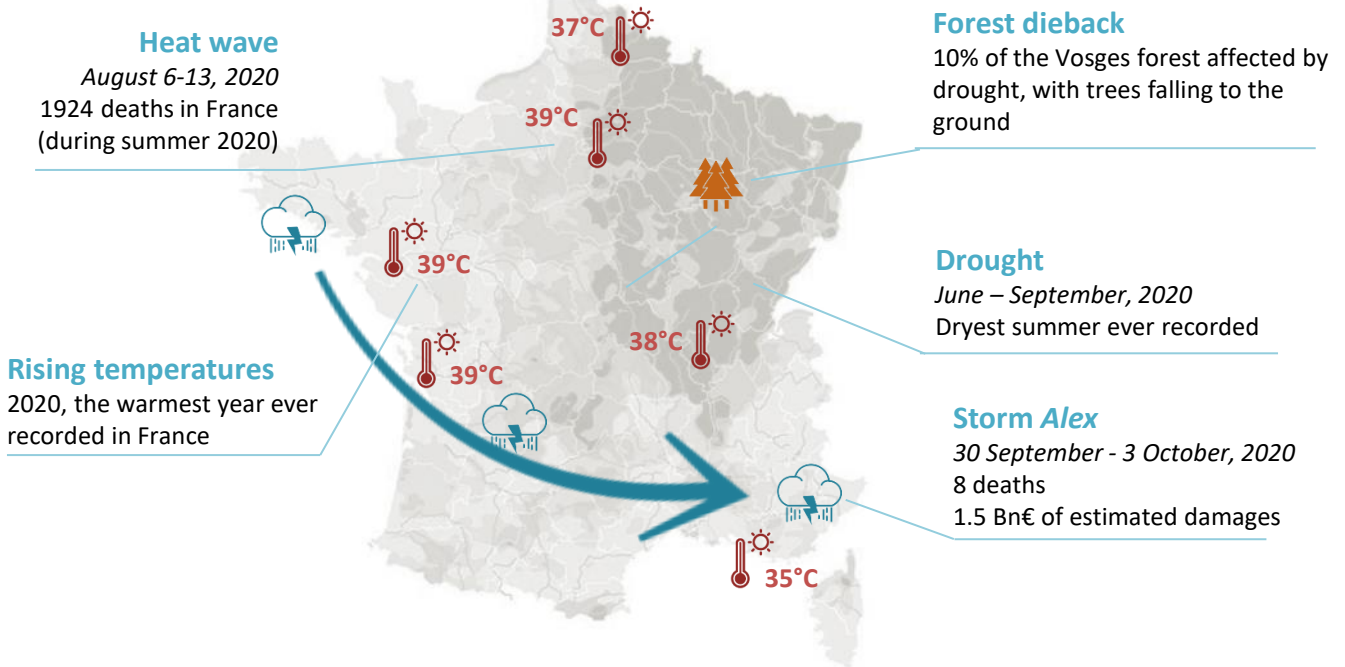
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5 years after the Paris Agreement, global warming continues its quest for disastrous records. The latest to date? 2020 is the warmest year ever recorded in France since 1900. Certainly, 2020 will remain marked by Covid-19, which has had a direct impact on our daily lives for several months; but in the face of this pandemic, which is as sudden as it is devastating, climate disruption is continuing, slowly but surely.

Today's environment is now 1°C warmer than in the pre-industrial period: on the long-term scale, this is already a remarkable phenomenon, worrying in its scale and speed. The physical consequences of the global warming are real: only in 2020, we have seen devastating forest fires in Australia, an unprecedented heat wave lasting several months in Siberia, a series of devastating typhoons (Amphan, Molave, Goni) in Southeast Asia, an Arctic ice pack that has reached its historic minimum (5.685 million km²) ... The list is long, and getting longer as the years go by.

Nevertheless, these events may seem remote and complicated to grasp for the population of France. At the beginning of 2021, we therefore wanted to review some of the climate events that have marked the French territory in 2020, in order to illustrate the extent to which major changes are already underway, here and now, and not just "over there".

By Alessia Vittorangeli and Léo Genin, January 2021



Preamble: each individual weather event cannot be directly attributed to climate change. Climate change is observed over a period of at least 30 years, based on long series of meteorological data. However, it is possible to attribute to climate change the increase in frequency and intensity of certain phenomena... an increase that we are already seeing today and that will accelerate in the future.

The year 2020 will be remembered as an unprecedented event in our modern history. The health crisis caused by the Covid-19 pandemic has affected millions of people around the world: in France, more than 60,000 people died in 2020 because of the pandemic virus, and the economic and social consequences, which are difficult to quantify, will have a lasting impact on our society. In the meantime, **the "new climate regime"** (to use Bruno Latour's words), **continues its slow and inexorable establishment.** According to a study by the French Ministry of Ecological Transition [1], six out of ten French people already feel concerned about climate risks.

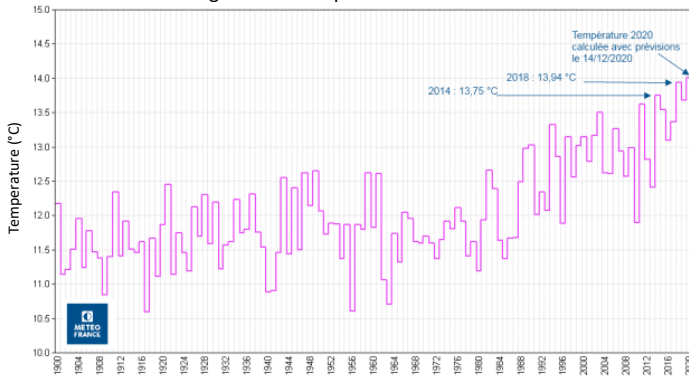
Indeed, contrary to popular belief, **France, with its overseas territories, is a territory highly exposed to the impacts of climate change.** Ranked 15th among the countries most affected by extreme weather events between 1999 and 2018 according to Germanwatch [2], the country has a heavy human and economic toll, with an average of 1,121 deaths per year over this period and US\$2.2 billion in economic losses due to climate disasters. According to a study by the Caisse Centrale de Réassurance (CCR), the cost of natural disasters could jump by 50% by 2050 [3].

Climate change is affecting the entire country; cities are becoming more and more difficult to live in during summer heat waves; shorelines are being eroded by rising sea levels and storms; mountains are covered with thinner and thinner layers of snow; and the countryside and forests are threatened by worsening droughts. These consequences have very concrete repercussions on our entire economic and social structure, calling into question the sustainability of our lifestyles. **The year 2020 has sadly beaten the record for the hottest year ever recorded in France.** Episodes of heat waves and heavy rains, floods and prolonged droughts have weakened both the population and the economy, which were already struggling with a health crisis. We present below a summary of some of the key events.



What happened?

The average annual temperature in France since 1900



January – December 2020, France



According to Météo-France [4], the year 2020 was the warmest year ever observed in France. With an average temperature of 14°C, the year 2020 ranks first, ahead of 2018 (13.9°C) and 2014 (13.8°C).



Among the 10 warmest years ever recorded, 9 belong to the 21st century; 7 of them belong to the last decade.

Rising temperatures: What is it all about?

Talk about climate:

at least **30 y.** of observations

Since 1850, the average global temperature has increased by about **+1°C** compared to the pre-industrial period [5]. This variation is in addition to natural climate variability.



In France, this rise increases to **+1,4°C** since 1900 [6].

What is the link with climate change?

↑ concentration of **GHG =** ↑ of **Temp**

This warming is anthropogenic in origin. Human activity, in particular the massive use of fossil fuels, intensive agriculture and deforestation, has led to an increase of greenhouse gas (GHG) concentrations (carbon dioxide, methane, etc.) naturally present in the atmosphere.

Concentration of CO2 in the atmosphere [7]:

284 ppm in 1850 → **407 ppm** in 2018
+143%



By the end of the **21st century** [8]:



+4,3°C in average

Pessimistic scenario (RCP8.5)

+1,6°C in average

Optimistic scenario (RCP2.6)



Projections prepared for the 5th IPCC report in 2013. Projections for the 6th report (2021) will most likely be more pessimistic.

What are the consequences?

The consequences of global warming are already visible in France, and will become even more evident in the future:



x 3

of **heat waves** in the last 30 years compared to the previous 42 years [9]



50%

metropolitan forests subject to a **high fire risk** from 2050 onwards [10]



-40 cm

of **snowfall** in 30 years at the Porte mountain pass [10]



+15 cm

sea-level rise during the 20th century [11]




30km2


of French **territory lost** in 50 years due to coastal erosion [12]


What happened?

 **September 30 – October 3, 2020**
Bretagne, Alpes-Maritimes



 Storm Alex first hit the coast of Brittany, with maximum gusts of 186 km/h recorded at Belle-Île-en-Mer. It then continued southeastward, causing an exceptional "Mediterranean episode" in the Alpes-Maritimes [13].

 On October 3, the Saint-Martin-Vésubie sector received 500.2 mm of rain in 24 hours: a new record for the department [13].

 The result is heavy: at least 9 deaths, 9 missing people, 1.5bn€ of damage (preliminary estimate).

The "Mediterranean episodes": what is it about?

Episode with more than **200 mm** (l/m2) of rain

The "**Mediterranean episodes**" in the Alpes-Maritimes are particularly violent thundery meteorological phenomena, where warm air masses, which come from the Mediterranean, collide with cold air from the Alps, then condense and form heavy rains.



The most exposed areas in France are the Mediterranean coasts (especially the Aude, Gard, Var and Hérault) and the Alpes-Maritimes [14].

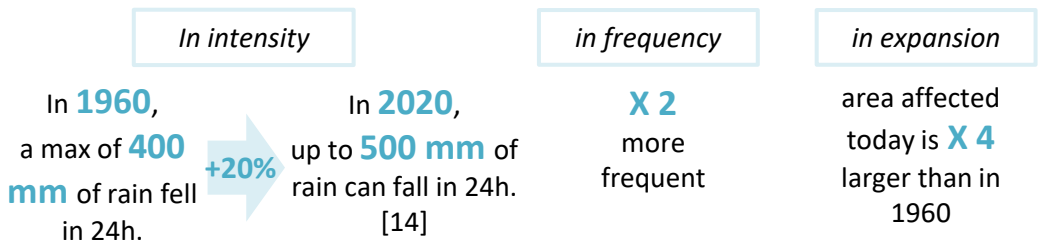
What is the link with climate change?

+1°C → +7%
of humidity

If the phenomenon and its pattern is known for a long time, **the intensity and frequency of the episode can be attributed to climate disruption**. The reason? The atmosphere, which is getting warmer, contains more humidity.



Rainy events have increased over the time:



These trends will become **more significant in the future**.

What are the consequences?

Floods: **1st hazard** in France in terms of damage: **7.3bn€** since 1982 (**60%** of the compensations related to natural disasters) [15]

This heavy rainfall often causes **flooding**, whether by river overflow, rising water levels, marine submersion or runoff (worsened by the artificialization of soils). **Floods can in turn lead to the risk of landslides and mudslides.**

Floods cause significant damage to the environment: [15]



Public health



Infrastructure (roads, bridges, railroads)



Networks (electricity, telecommunication)



Construction



Agriculture



What happened?



August 6-13, 2020
France



After two heat waves in June & July, France experienced an 8-day heat wave in August 2020. In Paris the highest temperature was recorded on August 9 (39.1°C). Although this peak is well behind the 2019 record (42.6°C), it is the duration of this heat wave episode that determines its exceptional characteristics. [16]



For Paris this heat wave was one of the most exhausting of all time, just behind those of 1911 (9 days) and 2003 (10 days).



1,924 additional deaths were recorded in France during the summer of 2020 (18% excess mortality). [17]

Heat waves : what is it about?

Heat wave:
Hot weather during the night & day

It is called a heat wave when it is very hot, day and night, for at least 3 days and 3 nights. The heatwave alert threshold is defined by Météo-France on the basis of thirty years of daily mortality data. This threshold therefore differs from one department to another. [18]



In Paris, the thresholds for declaring a heat wave are 31°C during the day and 21°C at night. [18]

What is the link with climate change?

2020: 8 days
or **T > 35°=**
over the decade
1990-1999
(9 days)

Global warming is leading to an increase in the intensity and frequency of extreme events, including heat waves and extreme heat waves. Cities are particularly exposed to these hazards due to the urban heat island (UHI) effect. Human heat-emitting activities (e.g. transportation), urban materials, and the low presence of vegetation all contribute to increasing temperatures in urban centers, which can be several degrees higher than those in surrounding areas.



Evolution of heat waves in France [19]:

3x more

of heat waves in the last 30 years compared to the previous 42 years

By 2050

the heat waves will be **twice** as numerous compared to 1981-2010

By 2100:

Optimistic scenario (RCP2.6)

Pessimistic scenario (RCP8.5)

Frequency = in **2050**

5x more frequent compared to 1981-2010

What are the consequences?



Low groundwater level



Agricultural yields threatened by droughts



Houses that crack (due to shrinkage and swelling of the clays)



Pollution peaks that are dangerous to health



An increased risk of forest dieback and fires



Slower train speed due to rail expansion



What happened?



June 21 – September 20, 2020
France



The summer of 2020 was the driest since 1959, when rainfall measurements began in France [20]. This decrease in precipitation (meteorological drought), combined with high temperatures, led to a significant soil dryness, especially in the northeast of the country.



This is the **third consecutive year** that rainfall across France has reached levels never seen before.



The economic impact of droughts can be severe. The 2003 drought is one of the most costly extreme events in France, with more than 1.83bn EUR in insured damages [21].

Droughts: what is it about?

Limitations on water use by **prefectoral decree** according to 4 thresholds (watch, alert, reinforced alert and crisis)

There are 3 different types of droughts. **Meteorological drought** occurs when there is a prolonged lack of rainfall. **Soil drought** corresponds to a water deficit in the surface soil (1-2 m deep): it is therefore dependent on rainfall, but also on plant evapotranspiration (e.g. in summer plants take more water from the soil, and the soil dries out more quickly). **Hydrological drought** occurs when rivers, lakes and water tables are low [22].



The French regions most affected by drought are concentrated in the **northeast of France**.

What is the link with climate change?

Climate change, due to the variation in rainfall patterns and the increase in evaporation associated with rising temperatures, is increasing the intensity and duration of soil droughts. According to the ClimSec project of Météo-France, which studied the impact of climate change on droughts in France [21]:



Evolution of soil droughts in France:

21st century: **12 / 17** years exceeded the average area affected by drought over the reference period (1961-1990)

By 2100

A situation described as **extreme drought** before 1990 could become **the norm**

What are the consequences? [23]



Agricultural production threatened by the decline or loss of harvests



Water restrictions for irrigation, domestic and industrial uses (including **nuclear power generation**)



Trees drying out and dying, more vulnerable to cold and forest fires



Disturbed ecosystems, with animals forced to migrate for food and water



Soils less capable of absorbing rainfall, and an increased risk of **flooding and mudslides**



Constructions threatened by increased shrinkage and swelling of the clays



Climate change is now a **reality** that we must learn to live with. This selection of exceptional meteorological events that have marked France in 2020 is far from complete, but it does provide an overview of the changes that are already taking place in our current environment, and that will become more significant in the future.

All stakeholders - public and local authorities, businesses and investors - are affected by these changes, and **everyone has a role to play in improving France's resilience to climate challenges**. While the public sector has been working for the past 20 years or so to structure and implement an adaptation strategy on a national scale, notably through the National Climate Change Adaptation Plans (PNACC I and II) and the Local Climate Air Energy Plans (PCAET) at the local level, the mobilization of the private sector around these issues is more recent.

Nevertheless, in recent years we have seen a rise in the solicitude of physical climate risks for investors and companies, motivated both by growing pressure from regulators and by the increasingly **obvious impact of climate change on economic sectors**. The recommendations of the Task-force on Climate-Related Financial Disclosures (TCFD), French article 173 of the Law on Energy Transition for Green Growth (LTECV), or the Standard NF EN ISO 14090 "Adaptation to climate change - Principles, requirements and guidelines" encourage economic actors to provide clear and transparent information on the threats and opportunities related to climate risks.

Whether it is a company or a territory, it is now **risky** to avoid having an adaptation to climate change strategy, especially since the future of our climate is already more or less written until the middle of the century. It is nevertheless important to remember that "**every tenth of a degree gained counts**": the magnitude of future climate change will be strongly determined by future mitigation actions. It is therefore necessary to think about adaptation and mitigation at the same time.

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