



# General Commission for Sustainable Development

## Climatic risks: six out of ten people in France are already exposed

JANUARY 2020

The mortality rate in France associated with major climate-related natural hazards is modest. Nevertheless, within the context of climate change, the number of natural events with the potential to cause harm to the population and the environment and damage to property is likely to increase. In 2016, six in ten people in France were potentially exposed to climate risk. The vulnerability of each territory also depends on the exposure of the various sectors of the local economy, with large discrepancies in exposure from one territory to the next.

Various natural hazards<sup>1</sup> expose French territories and populations to potentially dangerous or disaster events<sup>1</sup>, such as flooding or coastal flooding, storms or cyclones, ground movement, coastal erosion, forest fires, avalanches, earthquakes and volcanic eruptions. With the exception of the last two telluric hazards<sup>1</sup> *stricto sensu*, all of these can be understood to be so-called climate hazards. The exposure of the French territories is the result of the country's widely varying climate and geomorphology, from the Atlantic regions subject to coastal flooding, to the clayey soils prone to shrinking and swelling of the *Sud-Ouest* and *Centre* regions, to the tropical cyclones of the Antilles, etc.

These climate hazards can cause major disasters<sup>1</sup>, affecting large numbers of victims or causing considerable damage to property and the environment, depending on the degree of vulnerability<sup>1</sup> of the stakes<sup>1</sup> in the territory in question (e.g. population, industry, trade and heritage).

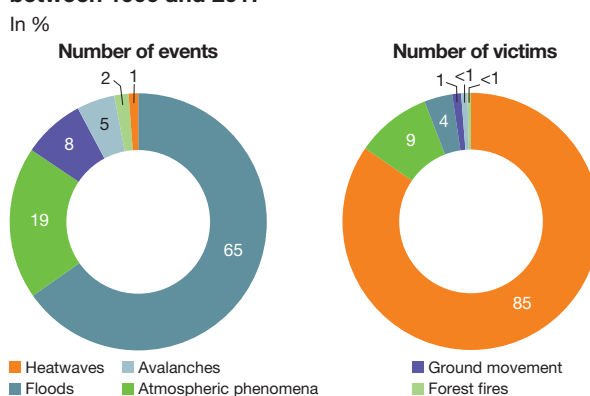
According to the Intergovernmental Panel on Climate Change (IPCC), climate change can cause certain extreme weather events to occur more frequently, more extensively or more intensely (IPCC, 2014e). The IPCC also believes that the nature and severity of the impact of such phenomena correlate with the vulnerability or susceptibility of populations and with their capacity to adapt (IPCC SR1.5, 2018).

### CLIMATE-RELATED EVENTS AMOUNT TO MORE THAN 100 SINCE 1982

Between 1900 and 2017, France was hit by 180 harmful natural events. Nine out of ten events were associated with climate conditions.

Around two thirds of climate-related phenomena consisted of flooding and one fifth of atmospheric phenomena (cyclones, hurricanes and storms). Nevertheless, the majority of victims (85%) were exposed to heatwaves, with the intense heat of the summer of 2003 being particularly devastating in mainland France, causing 15,000 deaths (*graph 1*).

**Graph 1: Harmful climate-related events and victims, between 1900 and 2017**



Scope: All French territories, 167 events.

Sources: Ministry for the Ecological and Inclusive Transition (MTES)/General directorate for risks prevention (DGRP)/Natural and hydraulic risk department (SPNH) and Bureau for Analysis of Industrial Risks and Pollutions (BARPI), GASPARD database, latest decrees taken into account, published in the Official Gazette on 24 September 2017; AFP; CCR; French federation of insurance companies (FFSA)/Mutual-fund insurance company group (GEMA); Météo-France. Processing: SDES, 2018

<sup>1</sup> See the definitions in the methodological note "The susceptibility of municipalities to climate risks: a method of calculation and typological classification".

Of all harmful natural events (including telluric events), more than two thirds were said to be "very severe" because they caused at least ten deaths or more than €30 million in material

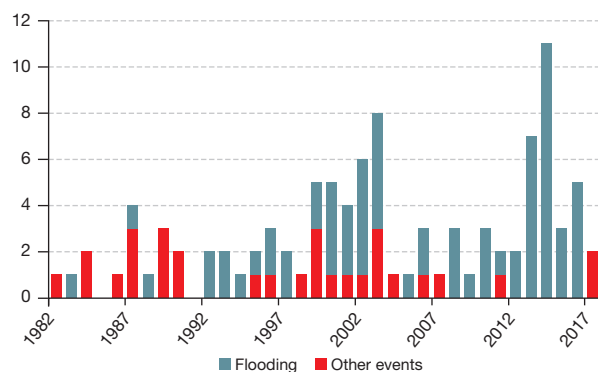
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damage (see the methodology note, Figure 2). The annual frequency of such “accidents” termed “very severe” has almost quadrupled over the past two decades, compared with the previous four decades. It has grown from one event per year between 1950 and 1996, to 3.6 over the period between 1997 and 2017.

Since 1982 – the year France first introduced natural disaster status – the incidence of very severe flooding-related events has eclipsed that of other events (Graph 2). This increased incidence can be explained by the increase in urbanisation on floodplains and, *de facto*, socioeconomic factors likely to be affected by an event. With more than 23,000 municipalities declared by prefects to be at risk of flooding, more than half of France’s surface area is therefore susceptible to this hazard. With regard to coastal areas, pressure from tourism (demography and land take) increases the susceptibility of these regions to coastal flooding and erosion.

**Graph 2: Occurrence of very severe natural events between 1982 and 2017**

According to the number of events



Scope: All French territories, 101 very severe events.

Sources: MTES/DGPR/SRNH et BARPI, GASPARD database, latest decrees taken into account, published in the Official Gazette on 24 September 2017; AFP; CCR; FFSA/GEMA; Météo-France. Processing: SDES, 2018

### SIX OUT OF TEN PEOPLE IN FRANCE LIVE IN MUNICIPALITIES EXPOSED TO CLIMATE RISK

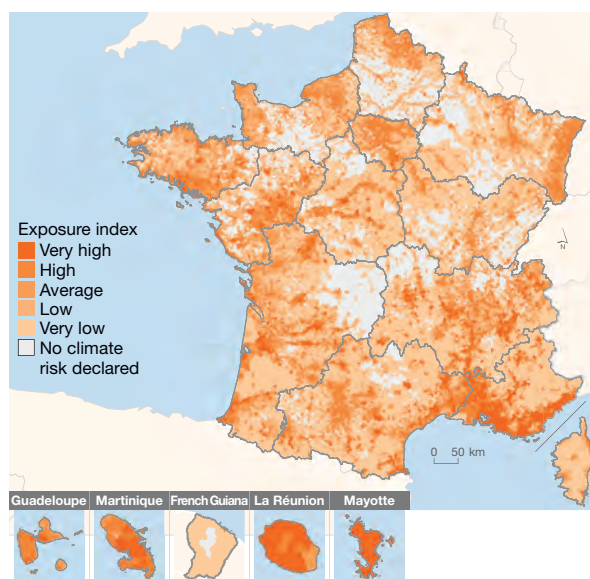
In 2016, four out of five of the French municipalities (28,657 municipalities) were exposed to at least one climate-related natural hazard (excluding heatwave). An analysis according to hazard shows the predominance of flooding and ground movement, affecting 64% and 55% of French municipalities, respectively, followed by forest fires (19%) and avalanches (2%). Moreover, many municipalities suffer from a number of these hazards in their territories, with 36% of municipalities experiencing two, 10% experiencing three and 1% experiencing four.

There are considerable differences in the population exposure level – defined as being higher as population density and the number of climate risks identified per municipality are high – from one territory to the next (map 1).

According to this criterion, 3% of French municipalities are at very high risk, 12.5% at high risk, 11.5% at moderate risk, 20% at low risk and 33% at very low risk. One in five municipalities are not currently exposed to climate risk (see the methodology note).

Reductions in the population exposure index are as follows, according to the same categories of severity: very high (15% of the population), high (47%), moderate (6.5%), low (20%), very low (6%) and none (5.5%). More than six in ten people in France are exposed to climate risk. This population is distributed across approximately 15% of France’s surface area or 15% of its municipalities. The distribution of populations in at-risk territories can be explained primarily by the historical settlement of towns along waterways used as transport routes, which have since grown. The same is true for coastal territories, which are facing ever-intensifying urbanisation, in response to the pressure from tourism.

**Map 1: Population exposure to climate risks in 2016**



Sources: MTES, GASPARD, 2017; National Institute of Statistics and Economic Studies (INSEE), RP, 2014; © IGN, Carto® database, 2016. Processing: SDES, 2019

### COMPARISON OF EXPOSURE, ACCORDING TO TERRITORY

The 28,657 municipalities exposed to climate-related natural hazards can be classified into six territorial categories (map 2), comparable in terms of exposure to climate risk (see the methodology note).

#### Susceptibility to flooding and ground movement

This category represents two thirds of the French population (i.e. 44 million inhabitants) and almost half of all French municipalities (i.e. 17,527). All are exposed to the risk of

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flooding and, what is more, 61% are subject to ground movement. These territories flood due to over-bank flow of waterways - namely the five major French rivers (Garonne, Loire, Rhin, Rhône and Seine) - and their tributaries, or due to flooding of the coastlines of Charente-Maritime or Hauts-de-France. They include seven municipalities of French Guiana, intersected in the east, west, south and in the Amazonian park by major rivers.

There are a disproportionately high number of urban and suburban municipalities, as well as rural ones close to towns, in this category. These territories are home to around 1.3 times more inhabitants and areas lost to land take than the national average. On the other hand, there are a disproportionately low number of second homes there.

Generally speaking, on average these territories hold a larger proportion of the population, homes, educational or healthcare facilities (1.4 times more), sporting facilities or detached houses (1.2 times more). Detached houses are particularly susceptible to the shrink-swell of clay, especially on the plains of Scarpe-Escaut in the north and the clayey formations of the south-west.

The number of inhabitants in all of these territories is also on the rise due to positive natural increase, amounting to 1.5 times the French average. The vitality of these regions can reinforce their susceptibility to flooding or weaken their resilience against extreme natural events. The proportion of the population found in areas prone to flooding (waterways bursting their banks or coastal flooding) living in these territories is 1.5 times higher than the national average. The same is true for buildings, especially single-storey buildings, but to a lesser extent. This reveals the vulnerability of populations who cannot take refuge on higher floors during severe flooding.

### Vulnerability to ground movement and forest fires

This category accounts for approximately 6% of the population and 16% of French municipalities located in rural areas, characterised by negative natural increase and net migration. Predominantly susceptible to ground movement, a quarter of municipalities are also susceptible to forest fires. Land take in these territories is two times lower than average, and the population is also 2.6 times lower. These municipalities contain two to four times less property (homes, industry, and sporting, educational or healthcare facilities) than the national average.

### Susceptibility to forest fires, flooding and ground movement

This group represents 13 million inhabitants (i.e. 18% of the population) and 14% of French municipalities. These municipalities, susceptible to both fires and flooding, are located primarily in the large forests of the south-east (the Languedoc coastlines, from the eastern Pyrenees to the Cévennes, Corsica, Vercors, Lubéron, Dauphiné, and the Esterel and Maures mountain ranges) and in northern French Guiana. The forests of the south-west (the foothills of the Pyrenees, Landes and Périgord) and north-west (Paimpont

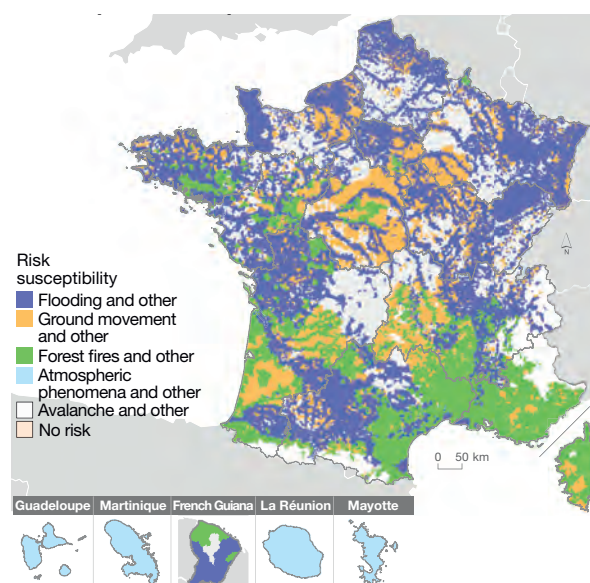
and Sologne) are also more extensively affected. Almost three quarters of municipalities in this group are also affected by ground movement.

With four times more terrain consisting of shrubby and/or herbaceous vegetation and double the forest areas compared with the French average, the disproportionately large number of forests in these territories constitutes a *de facto* vulnerability to forest fires. Similarly, the higher-than-average number of buildings, population and employer organisations in floodplains increases the susceptibility of these municipalities to flooding. Single-storey buildings occupy 1.7 and 2.3 times more area than the national average in areas prone to severe flooding caused by waterways bursting their banks or coastal flooding, respectively. Areas subject to flooding caused by waterways bursting their banks also have almost two times more employer organisations and 1.6 times more inhabitants.

The population of these territories is dropping due to negative natural increase and, to a lesser extent, negative net migration. However, these rural territories, whose economies rely on tourism, contain 2.7 times more second homes and 1.4 times more sporting facilities than the national average. Facilities related to the service sector, healthcare and tourism are also more numerous there.

The disproportionately high number of municipalities declared at technological risk exposes a significant proportion of them to technological risks in case of extreme climate events, such as dam failure (22% of municipalities) and industrial risk (7%).

### Map 2: Typology of the susceptibility of municipalities to climate risks



Note: due to the ubiquitous nature of storms on the French mainland, the 'atmospheric phenomena (and others)' category only takes into account the municipalities of overseas territories (i.e. 107 municipalities).

Sources: MTEs, GASPARE, 2017; © IGN, Carto® database, 2016.  
Processing: SDES, 2019

## Susceptibility to avalanches

This category comprises 611 high mountain municipalities subject to avalanches, representing 2% of municipalities. More than 90% are also susceptible to either flooding or ground movement and 75% to forest fires.

Given that three quarters of municipalities are located in rural areas, far from service industries (e.g. in the Alps or Pyrenees), there are two times fewer jobs in agriculture than average. Since their economies rely on tourism, they also account for 6.7 times more second homes and 2.7 times more tourist facilities than the average in mainland France.

The over-representation of forests in these areas explains the predisposition of this category to forest fires, with ten times more terrain containing shrubby and/or herbaceous vegetation and 3.3 times more forestland. Twenty-one per cent of municipalities are also at risk of "dam failure", compared with 13% in France.

## Susceptibility to hurricanes

Entire overseas territories (except French Guiana) are affected by hurricanes (tropical cyclones). In September 2017, the winds of hurricane Irma (category 5 on the Saffir-Simpson scale), exceeding 300 km/hr, left 11 people dead, 450 injured and material damage in the French West Indies. The municipalities in this category are also susceptible to ground movement, flooding and, to a lesser extent, forest fires.

Although this group represents less than 3% of the population, they are characterised by large centres of growth driven by positive natural increase. On average, land take is seven times higher and the number of inhabitants and homes ten times higher than the national average in these municipalities.

Coastal flooding threatens the coastal territories of this group. The area occupied by all or single-storey buildings and the population living in these flood-prone areas are 14, 17 and 20 times the French average, respectively.

## Low-susceptibility territories

This group represents 3.6 million inhabitants and a fifth of all French municipalities. Located in rural areas, with a waning population due to negative net migration, the number of homes and facilities in these places are systematically lower. These municipalities possess almost four times fewer inhabitants than average, while the number of houses and the proportion of land take are 2.5 times lower.

Their low susceptibility to flooding - an almost ever-present risk on French territory - stems from the disproportionately low rate of hazards in the regions subject to flooding. The population in areas prone to flooding due to waterways bursting their banks is almost nine times lower, on average, and the area occupied by buildings is five times lower. Moreover, the low proportion of forest land (1.4 to 4.5 times less, depending on the type) in these areas accounts for their low susceptibility to forest fires.

In conclusion, the vulnerability of these areas and what is at stake is dependent on the choices made in terms of planning and development, particularly at local level, as regards the vulnerability of these areas and the hazards to which they are exposed (e.g. population, industry, trade and heritage).

## FIND OUT MORE

- *The susceptibility of municipalities at climate risk: methodological note for calculations and typological classification*, CGDD/SDDES, January 2020, 32 p.
- French climate change observatory (ONERC): [www.ecologique-solidaire.gouv.fr/observatoire-national-sur-effets-du-rechauffement-climatique-onerc](http://www.ecologique-solidaire.gouv.fr/observatoire-national-sur-effets-du-rechauffement-climatique-onerc)

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