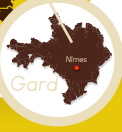
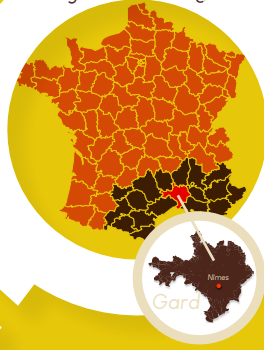


The Cadereau d'Alès river next to the Protestant cemetery.



NÎMES 1988

South of France



From a major event to the quest for resilience in built-up areas

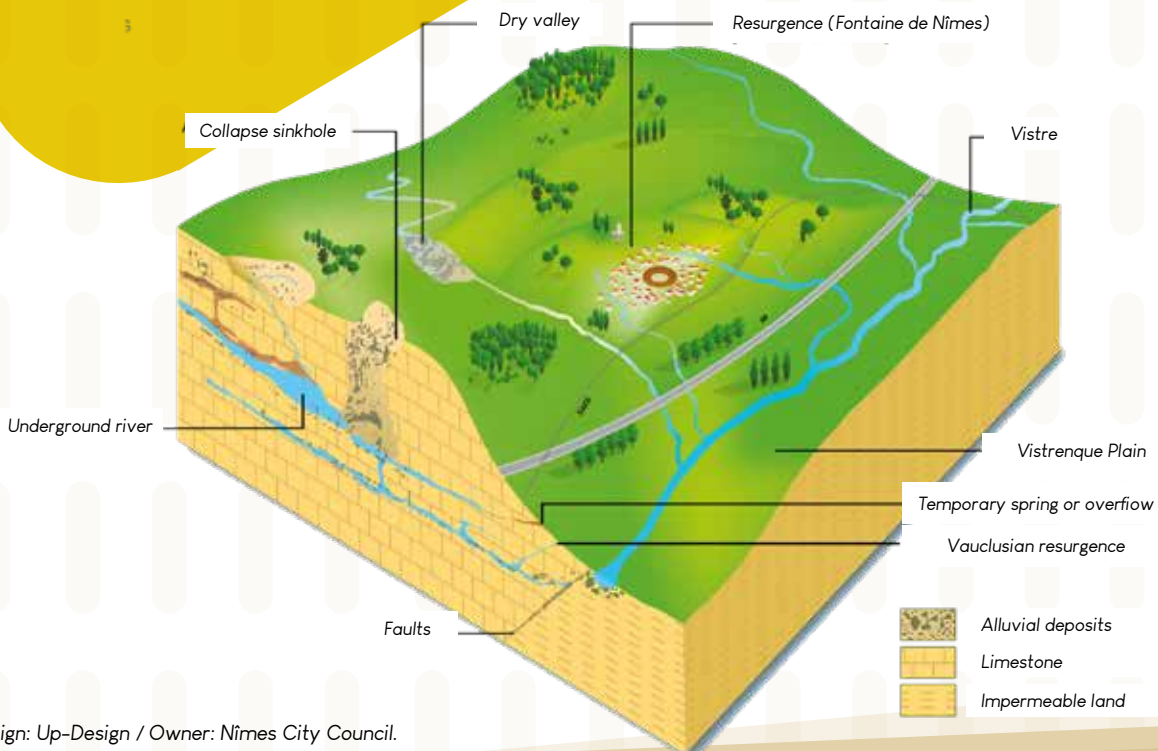
The setting: The city of Nîmes is built on the southern piedmont of a huge limestone plateau, the Plateau des Garrigues, that rises to some 200 metres above the city centre (52 metres from the Jardins de la Fontaine gardens). A system of talwegs, which are mostly dry, run down from the plateau but fill with water and overflow in heavy rain. These dry river beds are called **Cadereaux**.

Two of the biggest Cadereaux cross the city centre. To the west, is the Cadereau d'Alès and its tributary, the Cadereau de Camplanier, while to the east is the Cadereau d'Uzès. These rivers run through densely built-up areas and have been considerably remodelled by building work (encased and covered over in the 1950s).

As both river catchments are small (5 to 30 Km²) but notorious for flooding **very quickly**, leaving **little time** for the city authorities to react and **warn** the population.

The Cadereaux are sometimes be fed by temporary karst springs (called "Boulidou") that swell flood flows. After crossing the city, the Cadereaux join the **Vistre River** in a vast plain that, in turn, reaches the sea near the Grau du Roi.

Past floods and today's regions in the Mediterranean Arc





1988: Cloudburst in the city!

On the morning of 3 October 1988, an enormous cumulonimbus cloud loomed over the Nîmes. It dumped more than **420 mm of water on the city's western suburbs in 8 hours**, reaching peaks of at least 90 mm in one hour. Over the same period, 264 mm of rain fell on the east of the city.

All the Cadereaux became raging torrents and in the city centre their covered channels couldn't cope with the volume of water and flooded the roads, including Avenue Georges Pompidou and Avenue Jean Jaurès. Especially vulnerable districts such as Richelieu were soon **under 3 metres of water**. Structural obstacles like the railway embankment in the city centre, or the A9 motorway embankment on the plain made the flooding worse in some neighbourhoods.

The outcome was **devastating**:

9 deaths as a direct result of the floods and 2 others in a helicopter crash during the rescue operations,

45,000 people affected,

40,000 homes with no electricity,

2,000 homes and **6,000 vehicles** damaged,

35 km of water supply network destroyed,

15 km of roads needing rebuilt,

41 schools damaged,

50 buses rendered unusable,

1,100 shops and **650 small businesses** affected,

4,000 people temporarily laid off.

The cost of the damage was estimated at **610 million euros** (1988 figures).



Historic floods:

Nîmes' history is marked by a great many floods that have been recorded in ancient chronicles as far back as the 14th century. The biggest floods were in 1399, 1403, 1557, 1680, 1755, 1859, 1891, 1904, 1915 and 1963. Most of them occurred in late summer or autumn although some happened in June. The flood on 3 October 1988 was extremely intense, while other less extreme events followed in 2002, 2005 and 2014.



Floods on 5 and 6 November 1963.
Photos: Nîmes municipal archives,
Hervé Collignon Collection



At the corner of the Rue de l'Étoile and Rue de la Madeleine in the afternoon of 3 October.
Photo: Georges Mathon.



The same spot in 2019



Eye witness account:

"I was out in my little Renault 5 and had driven down the Rue du Cirque Romain then I turned onto the Rue de la République. The traffic was crawling as there was several centimetres of water on the road. I got to the roundabout at Avenue Jean-Jaurès and was amazed to see a bus blocking the road. The passengers and driver had all gone.

I got to the crossroads at the Route de Saint Césaire and the Route de Montpellier but the car in front of me stalled as its engine flooded. Water was rushing down the roads next to the hills.

"We kept getting frightening reports throughout the day. An independent station on the transistor radio described catastrophic scenes in the city. A school bus was reported to have been swept away in the flood waters and people sucked down drains. In the end, only 9 people died on 3 October, which is 9 too many but it could have been a lot worse when you saw the devastation."

Georges Mathon, nemausensis.com



At the corner of Rue Pépin le Bref and Rue Charles Martel

Photo: Georges Mathon.

A resilience strategy

After many months spent repairing the city, Nîmes began a massive programme to combat flooding, which is still ongoing.

Some activities are statutory obligations, while others are discretionary. The building work was conducted through successive action plans, administered by the city council, then by the Greater Nîmes Council from 2018 as part of the GEMAPI (aquatic environment and flood prevention remit). This included a PPCI from 1991-2006 (flood protection plan), the PAPI Cadereaux I from 2007-2014 (flood prevention action programme) and the PAPI Cadereaux II from 2015-2021. From 2022, there will be a new government and local authority-funded programme covering the entire Vistre river catchment (PAPI 3 Vistre). This will sustain the efforts of the last 30 years or more and complete other measures.

These flood protection procedures will happen on all fronts.

Flood mitigation: The most obvious and spectacular actions seek to reduce flood risks along the Cadereaux. This involves **3 measures**.

Flood retention dams have been built upstream to slow down the flow of water.

In the city centre, the Cadereaux running under the streets have been widened to boost their capacity to evacuate flood waters by 5 to 10-times.

Overflow basins have been built on the plain to trap all or part of the flood wave on the banks of the Cadereaux, to stop the floodwaters spreading to the Vistre River and worsening conditions downstream.

These installations are designed to protect the city from a flood like that of September 2005, which was more than twice as small compared to that of 1988. They have since proved their worth by protecting part of the city centre from flooding in 2002, 2005 and 2014.



The Oliveraie holding pond on the Cadereau d' Uzès.

The morning of Monday 3 October is rooted in the minds of the residents of Nîmes, who witnessed their city submerged by waves of water. Since then, they have been "living with" the risk by switching from a strategy of "total control over nature" in the 1990s to a resilient local community in which local authorities and citizens strive to build a less vulnerable city.

Jean-Luc Nuel, Head of Flood Prevention at Nîmes Métropole.



... **Overseeing flood events, warning people and making them safe:** As well as introducing a **statutory Municipal Safety Plan (PCS)**, the city of Nîmes also has a hydrometeorological monitoring system to plan for the Cadereaux breaching their banks. This is called an **ESPADA** system (rainfall assessment and monitoring in built-up areas to pre-empt alerts).

Town planning Nîmes' Risk Prevention Plan (PPRi) was approved in 2012 and the local authority has since relocated more than **50 highly flood-prone amenities**, with more to come.

Preventive information and fostering a culture of risk awareness: In addition to information disseminated in its **DICRIM** (Municipal Information Document on Major Risks), the city has installed more than **100 flood-level markers from the 1988 flood**. It has also created a **permanent exhibition** on flood risks and launched an extensive awareness-raising **programme in primary schools**, reaching thousands of children and their families.

Reducing vulnerability The flood resilience strategy has been supplemented with vulnerability assessments carried out with local residents and businesses. These audits can result in recommendations for building work which the government, Nîmes City Council and **Greater Nîmes Council** can fund up to 100%. To date, a quarter of homes in flood-prone areas have had free assessments, i.e. more than **4,000 households**. Almost 2,000 of these have received guidance for preventive measures and nearly 200 grant applications have been submitted to undertake remedial work.



Place de la Maison Carrée and Rue du Général Perrier in 1988 and now.
(Photo: Georges Mathon)



This publication has been produced by the Inter-regional Mediterranean Arc Flood Unit. (MIIAM) and the SUDALEA Consultants.

Design: Éric Mégou, Translation: Alexander Colvine

Acknowledgements: Jean-Luc Nuel, Luc Marragou, Georges Mathon, Nîmes Municipal Archives, Greater Nîmes Council, Nîmes City Council, DDTM Gard, Mayane.

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Published: February 2021

