Laurens Pipoz and Michel Jaboyedoff
Coalback project
Risk Group
ISTE - Institute of Earth Sciences
Université de Lausanne
August 2026

2026 Wildfires
Exploring Wood Vaulting to Reduce Their Greenhouse Gas Impact
The Case of France

1 2026: An Exceptional Year for Wildfires

Satellite images : As of 19 August 2026

96'428 ha burnt in France — **5.09MtCO2** emitted

Satellite-based estimates may underestimate total fire emissions. For the 2022 French wildfires, Vallet et al. (2025) estimated nearly twice as much CO2-eq. as satellite-based estimates. Satellite images do not capture emissions from burning belowground carbon stocks.

Sources: EFFIS, 19 August 2026
Vallet et al. (2025) *Soil smoldering in temperate forests: a neglected contributor to fire carbon emissions revealed by atmospheric mixing ratios*
HelloCarbo, "Incendies de forêt en France en 2026 : quel impact CO_2 ?" (2026)

For comparison, in **2022**, annual **direct emissions** within **Paris** amounted to

5.07 MILLION TONS OF CO2 equivalent

≈ **3 million** round-trip flights from Paris to New-York for one passenger

Sources: City of Paris (2026), "Emissions de gaz à effet de serre : où en est Paris ?"
UK Government (2025). Greenhouse gas reporting: conversion factors 2025

2 Gironde & Landes Wildfires

40'965 ha burned in **late-July wildfires** in Gironde and Landes

Région Nouvelle-Aquitaine estimates that **3.5 million cubic meters** of fire-damaged wood are left in the forests.

Equivalent to **35%** of the region's **annual production**

© Fabien Cottereau
Sud Ouest

→ Wildfires leave behind **more than CO2 emissions.** They also leave **millions of tons** of dead or **damaged biomass**.

Sources : Région Nouvelle-Aquitaine (2026), "Incendies en Gironde et dans les Landes : Les 14 mesures de la Région
Région Nouvelle-Aquitaine, "La filière forêt, bois et papier en Nouvelle-Aquitaine"

3 After the Fire: What Happens to the Wood? The Carbon Challenge

Why recover wildfire-damaged wood?

- Prevent pest outbreaks (e.g. bark beetles)
- Reduce fire and safety risks
- Recover economic value

What is the carbon challenge?

3.5 million cubic meters of wet wood sequestrate → **3.05MtCO2**

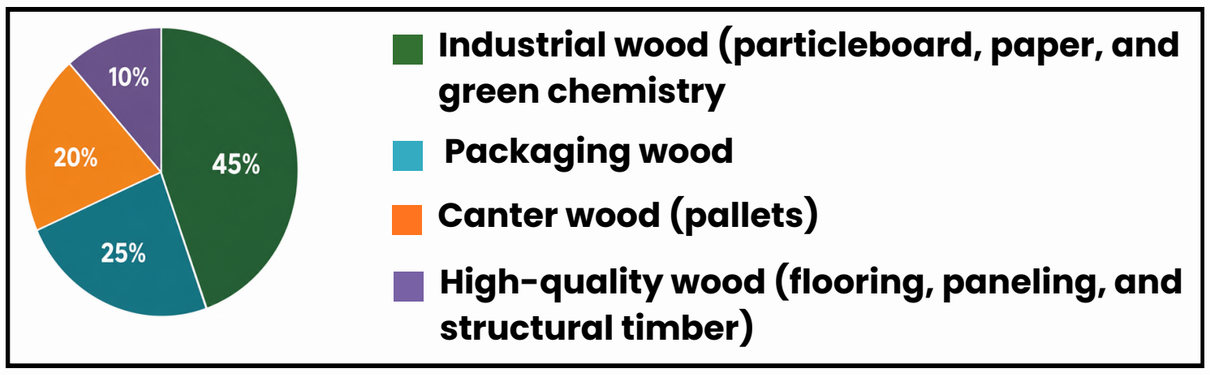
≈ 38.4% of the Gironde department's 2023 emissions

This wood would not have entered the market without the wildfires — its use can add to the fires' carbon footprint, depending on how it is managed and used

Sources: XyloDensMap (Leban et al., 2021), Fiche Pin maritime
Bert, D., & Danjon, F. (2006), Carbon concentration variations in the roots, stem and crown of mature Pinus pinaster
OREGES Nouvelle-Aquitaine / AREC Nouvelle-Aquitaine / Fiche départementale

Use of wildfire-damaged wood: The example of the Teste-de-Buch forest following the 2022 Gironde wildfires

Main uses of wildfire-damaged wood



Wood products half-lives

Wood uses	Paper with recycling	Packaging	Pallets	Panels (engineered wood)	Quality wood (construction)	Energy wood
Half-life of stored carbon	7 years	3 years	6 years	25 years	50 years	Immediate

Observation

- **Only ~10% of damaged wood is used in long-lived products, allowing for durable carbon storage (half-life ≥ 50 years)**
- **The rest will gradually release carbon into the atmosphere**
- **A massive wood surplus could disrupt the wood market**

→

Alternative

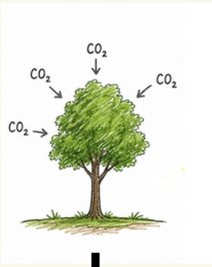
Explore alternative pathways for durable carbon storage :

Wood Vaulting for durable CO2 storage

Sources: Office National des Forêts, *La Teste-de-Buch : quatre ans après l'incendie, que devient la forêt ?*
Plan Comptable Forestier National (NFAP) de la France, Ministère de la Transition écologique (Réf : MPDOUV00264414)
Spear & Hart (2025), *Modelling Wood Product Service Lives and Residence Times for Biogenic Carbon*
Zeng (2008), Carbon sequestration via wood burial, Carbon Balance and Management.

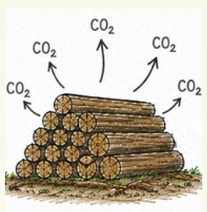
4 Wood Vaulting: Preventing Wood Decomposition

Natural cycle



Tree growth : Capture CO2 via photosynthesis

↓ Tree dies



Wood decomposes and CO2 is released back in the atmosphere

Net : carbon neutral

Wood Vaulting

- Wood is buried in anoxic conditions.
- Lack of oxygen prevents decomposition and preserves the wood.
- **Inspired by natural coal formation and archaeological wood preservation.**
- Carbon remains locked away for centuries.

Net : carbon negative

Why it matters

Global warming context :

Cutting CO2 emissions alone is not enough :

- Need to remove CO2 from the atmosphere to limit warming to 1.5°C.

100-1000GtCo2
of CO2 removal by 2100

Scaling wood vaulting could enable long-term CO2 removal.

Source: IPCC (2018), Global Warming of 1.5°C, Summary for Policymakers, Section C.3.

5 Where to Store All This Wood?
Returning to Our Case Study: The 2026 Wildfires in Gironde & Landes

Goal: durably store wildfire-damaged wood by burial, potentially preventing the release of up to 3.05 MtCO2eq of biogenic carbon

3.5Mm3 of wood (volume to store) → **Former mining sites** (offer vast available spaces) → **Arjuzanx site** (a former lignite mine in the Landes)

About Arjuzanx site

A flooded former lignite mine in the Landes, offering large, ready-to-use storage capacity.

23Mm3 — water volume of Arjuzanx main lake alone

120 km — by truck from wildfires site

26-80ktCO2eq — wood transport emissions (0.9–2.6% of potentially stored CO2)

© Syndicat Mixte de Gestion des Milieux Naturels /Réserve Naturelle Nationale d'Arjuzanx

Storage conditions

- Logs submerged at the bottom of the lake
- Logs covered with low permeability sediment to promote anoxic conditions

< 5% carbon loss
Zeng et al. (2024) found 3,775-year-old wood preserved under similar conditions, in comparison to modern wood

Monitoring

To ensure long-term wood storage, continuous monitoring with sensors:

- Oxygen
- Carbon dioxide (CO2)
- Methane

Sources: XyloDensMap (Leban et al., 2021), Fiche Pin maritime
Achigan.net, Lac d'Arjuzanx, Landes
Google Maps, route distance
FCBA, Écoconception des produits bois construction (Plan Bois IV), 2024.
Smart Freight Centre, GLEC Framework v3.2, 2025.
IFEU & SGKV, étude comparative transport route/rail-route, 2002.
Zeng & Hausmann (2022), Wood Vault: Remove Atmospheric CO_2 with Trees, Store Wood for Carbon Sequestration
Zeng et al. (2024), 3775-Year-Old Wood Burial Supports « Wood Vaulting » as a Durable Carbon Removal Method.

6 An Economic Opportunity

Wood market prices

Between **30-70€** per m3

3.5Mm3 wood ↓

105-245M€

Carbon credits

Similar credits are sold up to : **380$/tCO2**

~3MtCO2-eq ↓ Cost of 100-200$/tCO2

540-840M€

Assumes ~3 MtCO2 durably stored; actual value depends on CO2 effectively sequestrated. This is a theoretical upper bound

Wood vaulting can create economic value by making use of damaged wood and reducing pressure on timber markets

Sources : Centre National de la Propriété Forestière, Nouvelle-Aquitaine. (s. d.). Le prix des bois
CDR.fyi, 2024 Year in Review (2025)
Zeng et al. (2024), 3775-Year-Old Wood Burial Supports « Wood Vaulting » as a Durable Carbon Removal Method
XE. (2026). Currency Converter. Accessed August 26, 2026.

7 A Historic Opportunity

Durably store up to 3.05 MtCO2

Wood vaulting could enable crucial near-term carbon storage, preventing its release and reduce the carbon footprint of wildfires

Test wood vaulting at scale & develop future solutions

This opportunity created by the wildfires allows us to test wood vaulting at scale, while monitoring the wood on site and assessing logistics, emissions and costs to prepare for future deployment.

Beyond today's fires, a chance to lay the groundwork for future carbon dioxide removal

This brief was prepared as part of the Coalback project, which explores the potential for durable CO2 removal through wood burial in former mines.

Unil.

Generative AI tools were used to assist with writing and create certain visual elements.