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REDUCING EMBODIED CARBON IN NEW BUILDINGS: RE2020 IN FRANCE

KEY TAKE-AWAYS

From 2022 onwards, the buildings sector in France is required to **reduce the amount of greenhouse gas** (GHG) **emitted for the construction, and eventually demolition** of **new buildings.** The aim is to lower overall GHG emissions in the buildings sector, targeting **embodied carbon in construction materials throughout the value chain.** For the first time, new build requirements go beyond further reducing and decarbonising energy use over the building's lifetime. For the buildings sector, this is an important step towards the implementation of the national low-carbon strategy (SNBC), which aims to achieve the decarbonisation of all sectors by 2050.[1]

RE2020, the new 'environmental regulation', covers the **entire life cycle of the building.** Total **emissions caps** for new buildings will be **gradually tightened over time.** A phase-in period is planned to collect additional data and familiarise actors with the new regulation, including the calculation methods and tools.

RE2020 is the result of **regular exchange and discussion between stakeholders** in recent years as well as prior **voluntary schemes.** Lessons drawn were used to define the life-cycle analysis, calculation methods and additional data collection needs. **Capacity building schemes** were deployed **prior to implementation** and are still **ongoing.**

Concurrently, the government has designed **financial support schemes for innovative construction material solutions.** Some **national standards and norms** are under **review.**

Accounting for embodied carbon in construction materials in addition to energy use implies **new management practices for the building stock.** A **holistic and regional approach** to urban planning for **both new and existing buildings** will also be necessary, based on actual needs.

1 Ministère de la Transition écologique et solidaire, 2020a

OVERVIEW

In France, the **buildings sector** accounts for almost **25 percent of national GHG emissions** and represents **44 percent of energy consumption.** In the case of new energy-efficient buildings, **60 percent to 90 percent of emissions come from the construction and demolition phases, based on the entire life cycle of the building.**[2]

By targeting the **total embedded emissions in construction materials** over the entire **life cycle of the building,** RE2020 is expected to trigger a **progressive transformation** towards the production and use of **low-carbon construction materials.**

RE2020 builds on its predecessor, RT2012 (the "Thermal Regulation"), and requires new builds to meet more stringent standards for energy performance and summer thermal comfort without air conditioning. RT2012 also represented a first paradigm shift given its novel focus on outcomes rather than means. It significantly increased energy efficiency in new builds while also fostering cooperation between different construction-sector stakeholders.

2 Ministère de la Transition écologique et solidaire, 2021a

Expected co-benefits:

→ **Lower energy bills,** with new detached homes expected to see annual savings of 200 euros on average.[3]

→ **Improved comfort in summer without air conditioning.**

→ Improved air quality given the progressive phase-out of fossil fuels for heating in new builds by 2025.

3 Figures from the French government, calculations made prior to the energy and security crisis. See Ministère de la Transition écologique et solidaire, 2021a

AIMS & TARGETS

The new regulation aims to **reduce the carbon footprint** of new buildings over their lifetime, **from initial construction, use, to final demolition.** It seeks to further reduce and decarbonise energy use, ensure better summer heat protection through improved building design and lower carbon emissions from construction materials. The regulation includes a **gradual phase-out of fossil-gas heating** in new buildings, to be completed by 2025.[4]

The regulation sets **maximum emission thresholds, reduced over time** and expressed in kg of CO_2 per square metre per year, over a 50-year building lifetime. It includes a phase-in period with easy-to-reach targets to familiarise all actors with this new approach to emissions accounting and to incentivise the use of low-carbon materials. From 2025, thresholds will be tightened every 3 years (2025, 2028, 2031). The aim is to reduce emissions by at least 30 percent and up to 40 percent by 2030 compared to 2013 levels for construction and renovation (industry & transport, scope 3). There is no overall 2030 target for energy savings and use in the legislation (scopes 1 and 2) as yet.

The regulation also seeks to **transform construction materials and techniques** and **create a market** for construction materials with lower carbon content.

At the same time, the government is supporting the development of a **skilled workforce** for these construction materials and techniques.

The government has also set up financial schemes to foster the development of innovative low-carbon construction materials.

The French government is seeking to further harmonise the life-cycle analysis methodology developed in the context of RE2020, at both the national and European levels.[5]

4 Ministère de la Transition écologique et solidaire, 2021a

5 Ministère de la Transition écologique et solidaire, 2021a

POLICY INSTRUMENTS

The **French 2020 National Strategy for Decarbonisation** (*Stratégie Nationale Bas-Carbone,* or SNBC) requires the buildings sector to further accelerate its GHG emissions reductions. Buildings sector emissions stood at 88 Mt of CO_2eq in 2015; the targets for 2030 and 2050 are 45 Mt (– 49 percent) and 5 Mt, respectively (scopes 1, 2 and 3).[6]

6 Ministère de la Transition écologique et solidaire, 2021a

- → All energy used is to become carbon-free, and heat pumps, biomass and district heating are to be promoted for all buildings.
- → The energy efficiency of buildings systems is to be further improved and energy savings via behavioural change is to be encouraged.
- → Air quality, resource use, biodiversity, waste and landscape impacts are to be evaluated.
- → For new builds, energy use and GHG emissions are to be further reduced via life-cycle analysis, improved insulation, increased reliance on renewable energy, built-in design that avoids need for air conditioning, materials with low embodied carbon content, and carbon sinks in construction through use of high carbon-storing materials.

The **2018 legislation on housing development** (see **ELAN**[7]) included a revision of the regulation on new buildings in 2020. RE2020 aims to further encourage energy efficiency and GHG emission reductions. The regulation specifically targets:

- → Improvements in insulation, independent of heating technology.
- → Building design improvements, to increase comfort in summer, given more frequent and intense heat waves.
- → The carbon footprint of new construction over its lifetime (50 years) with a life-cycle analysis.

The regulation sets a **maximum threshold for GHG emissions from energy consumption** starting in 2022:

- → 4 kg CO_2/m²/year for new single-family homes. Fossil fuels are to be completely phased out by 2025.
- → 14 kg CO_2/m²/year for apartment buildings, to be reduced to 6.5 kg CO_2/m²/year in 2025; hybrid solutions (such as heat pumps that use gas in the event of extreme cold) are permitted.
- → 8 kg CO_2/m²/year for apartment buildings already connected to district heating, to be reduced to 6.5 kg CO_2/m²/year from 2028 onward.[8]
- → Tertiary buildings have until 2026 to transition to no fossil fuel use.
- → Renewables-based heating is favoured (e.g. over electric radiators, to avoid excessive peaks in electricity demand in winter).

In terms of **embodied carbon in buildings,** the methodology chosen for the life-cycle analysis (LCA) seeks to make the use of wood and bio-sourced materials common by 2030, including for the frame of new detached homes (which currently accounts for 10 percent of the market share) and small apartment buildings. At the same time, the government plans to encourage domestic wood production for construction purposes.[9]

The **LCA methodology** has the following implications:

- → Carbon emitted today carries more weight than carbon emitted later in time ("partially dynamic LCA").
- → Bio-sourced materials such as wood are favoured by virtue of their carbon-storing function.
- → Earth-based materials such as stones and clay are incentivised based on their low-carbon and circular properties.
- → Materials emitting the most carbon during production are disincentivised.
- → Innovation in terms of the materials mix or low-carbon materials is incentivised.
- → Carbon caps are modulated based on local climatic conditions (especially in areas close to the Mediterranean that are prone to heat waves) in order to ensure similar cost levels for similar thermal comfort levels.
- → Carbon thresholds leave relatively open the means for meeting gradually more stringent requirements and focus on outcomes.

7 Ministère de la cohésion des territoires et des relations avec les collectivités territoriales, 2018

8 Ministère de la Transition écologique et solidaire, 2021a

9 See also: French Government (2021b)

→ In addition, and for informational purposes only, an indicator for the amount of stored carbon in biomass is required.

Regarding **construction-related emissions** (scope 3), the **threshold** drops from 640 kg CO_2/m^2/year in 2022 to 530 in 2025, 475 in 2028 and 415 in 2031 for single-family homes. For apartment buildings, the cap drops from 740 kg CO_2/m^2/year in 2022 to 650 in 2025, 580 in 2028 and 490 in 2031. This represents a 30 percent reduction compared to current levels.[10]

Accompanying instruments focus on training, information sharing and innovation.

→ Several **programmes, running up to 2025, aim to support the sector in developing the** necessary **skills** to adapt **to changes in production methods and markets.** They include **upskilling the workforce in using the LCA method with digital tools, integrating energy savings as a service and encouraging the use of bio-based products.**

→ Other schemes provide general support such as **financial schemes,** the creation of a **national best practice platform,** and public funded **innovative concepts** based on organised competitive games among start-ups or researchers.

In addition, **state labels** will be developed to acknowledge the efforts of actors willing to anticipate and pioneer solutions ahead of the RE2020 requirements, aiming at a boosting effect on the whole sector.

10 Ministère de la Transition écologique et solidaire, 2021a

ACHIEVEMENTS & LESSONS LEARNED

Storing carbon with bio-based materials:
The LCA method, as developed for the RE2020 regulation, places an **emphasis on bio-based materials that** temporally **sequester carbon,** such as **wood.** The methodology chosen differs in some aspects (e.g. carbon weighting over time) from the European efforts at standardisation with the LEVEL(S)[11] framework. Incentives to innovate and improve the circularity of other materials such as concrete remain essential.

Procedures revision to facilitate innovation:

→ Procedures for taking innovations into account in the new RE2020 calculation method will be simplified and their duration shortened.

→ The administrative procedures related to the submission of building permits and certificates will be reviewed following a consultation.[12]

Heat-resistant building design: RE2020 provides a new metric for summer thermal comfort together with a minimum requirement. This threshold may be strengthened in the future, based on experience gathered during the first years of implementation.[13]

Paradigm change for urban-planning management: Taking into account the embodied carbon in construction materials over the lifetime of a building requires managing the entire building

11 https://ec.europa.eu/environment/topics/circular-economy/levels_en

12 Ministère de la Transition écologique et solidaire, 2021a

13 Ministère de la Transition écologique et solidaire, 2021a

stocks, old *and* new, at *regional level,* in light of climate mitigation and adaptation goals as well as social needs. Stakeholders' close collaboration and coordination as well as area delimitations will be critical to optimise the use of renovation, reuse, high-quality recycling and new build.

From an EU perspective, research[14] shows the **importance of data gathering and common frameworks at national and EU levels** to ensure climate neutrality goals are achieved for buildings.

14 Le Den et al. 2022

GHG EMISSIONS REDUCTIONS & COSTS

With the entry into force of RE2020 in January 2022, the French government expects energy consumption in new single-family homes to emit less than 0.5 tonnes of GHG per year (that is, 1/10 of the average house heated with gas).[15]

Emissions from construction are expected to be reduced by around 7 Mt CO_2/year nationwide for detached homes and apartment buildings by 2031.[16]

Construction companies warn the new regulation will make constructing new homes 10 – 15 percent more expensive, while the French Building Federation is concerned that sustainable housing will increase pressures on the affordable housing segment. Based on past experience, however, the French government expects the **rise in construction costs to be 3 – 4 percent at the start of implementation.** Additional construction costs of around 10 percent by 2031 are expected to be mostly offset by learning effects, energy savings, and GHG emissions avoided. This analysis is based on the lessons learned from the implementation of the previous RT2012 regulation; while a 10 to 15 percent rise in costs was anticipated, this ultimately did not occur, thanks to pilot schemes and learning effects.[17]

15 Ministère de la Transition écologique et solidaire, 2021a
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