

# National project on Emulsion-based Asphalt mixes



Xavier GUYOT

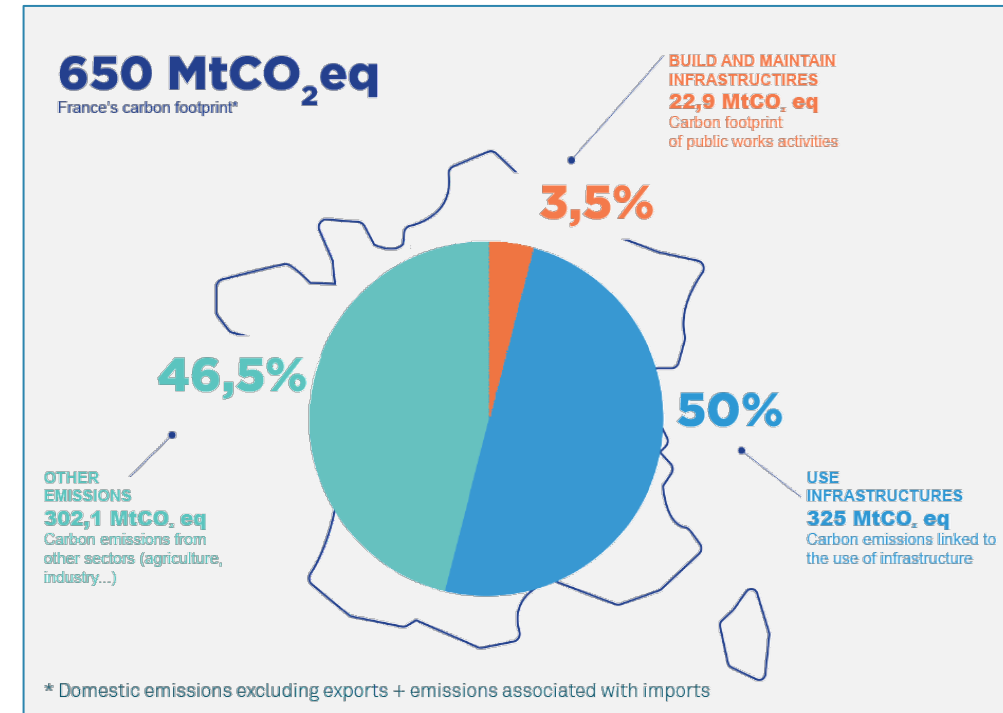
ROUTES DE FRANCE - COLAS



# Global approach to decarbonizing road construction and maintenance

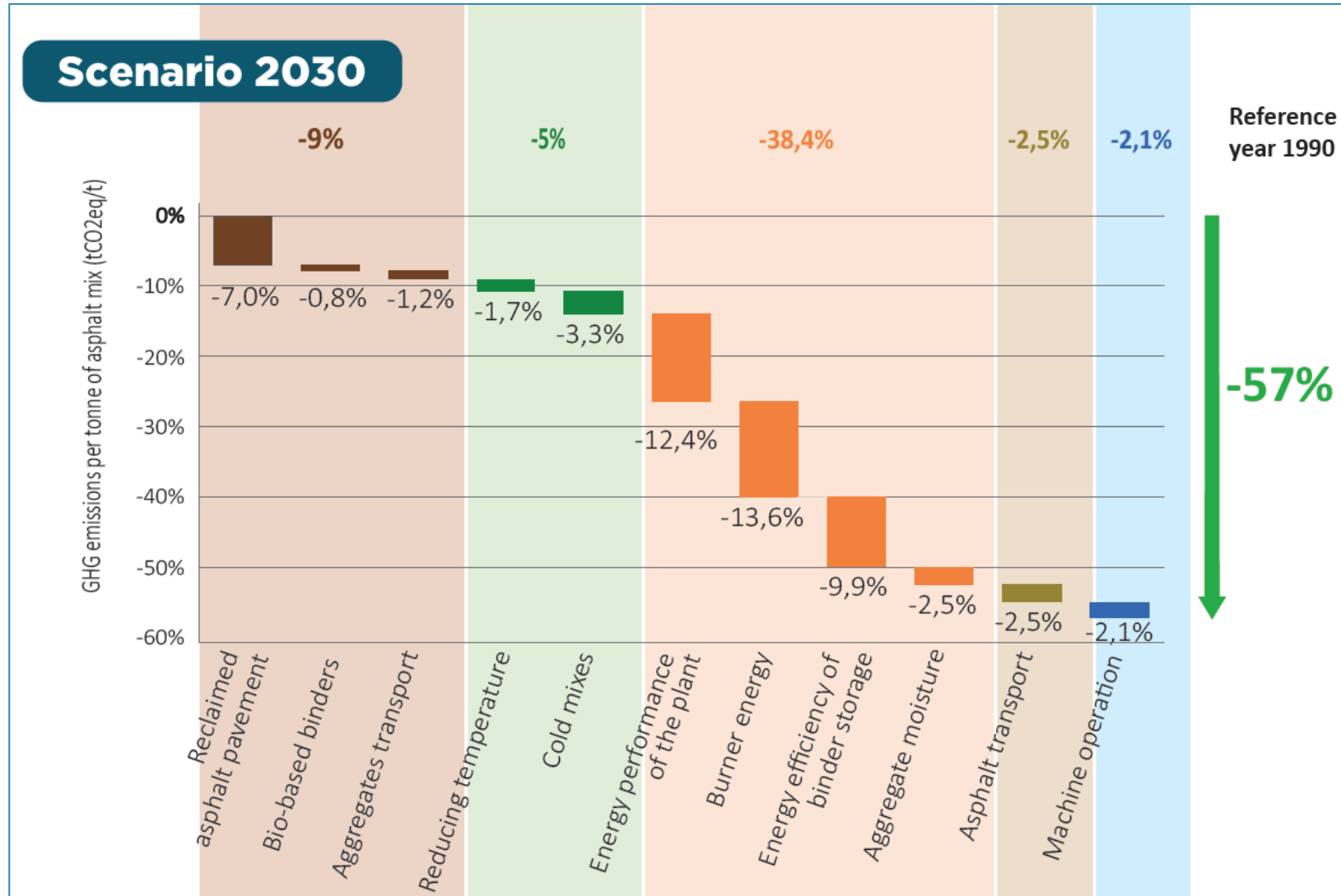
## Global approach to reducing France's carbon footprint:

- Half of France's greenhouse gas emissions come from infrastructure use
- The construction of this infrastructure accounts for 3.5% of the country's GHG emissions.
- While these figures clearly show the need to rethink our transport methods, the road transport industry has committed to reducing its CO<sub>2</sub> emissions by **a third** by 2030 compared with 2019.



# Asphalt mixes – Levers for decarbonization

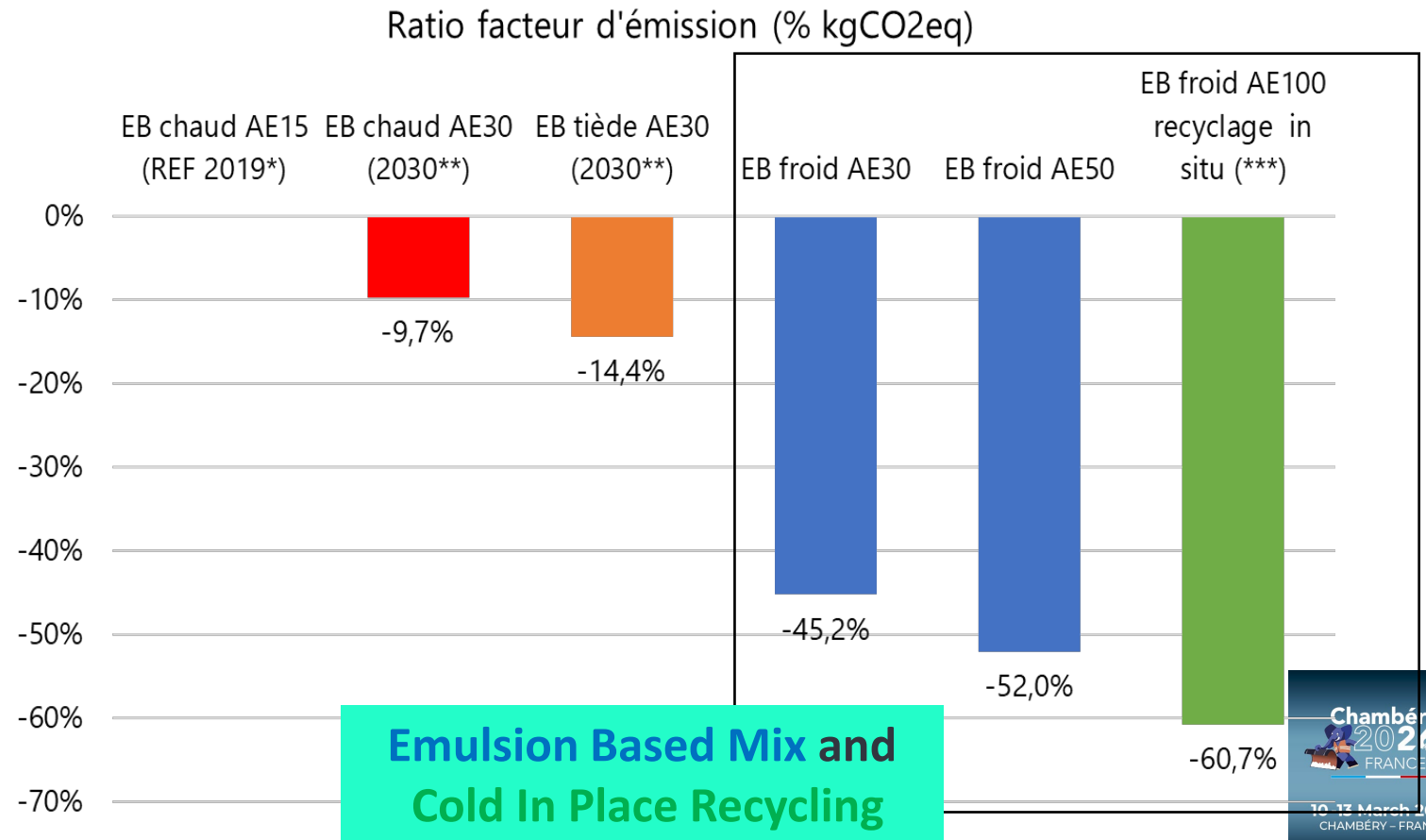
## Road Map for decarbonization



# Environmental footprints of different products

## Current techniques available

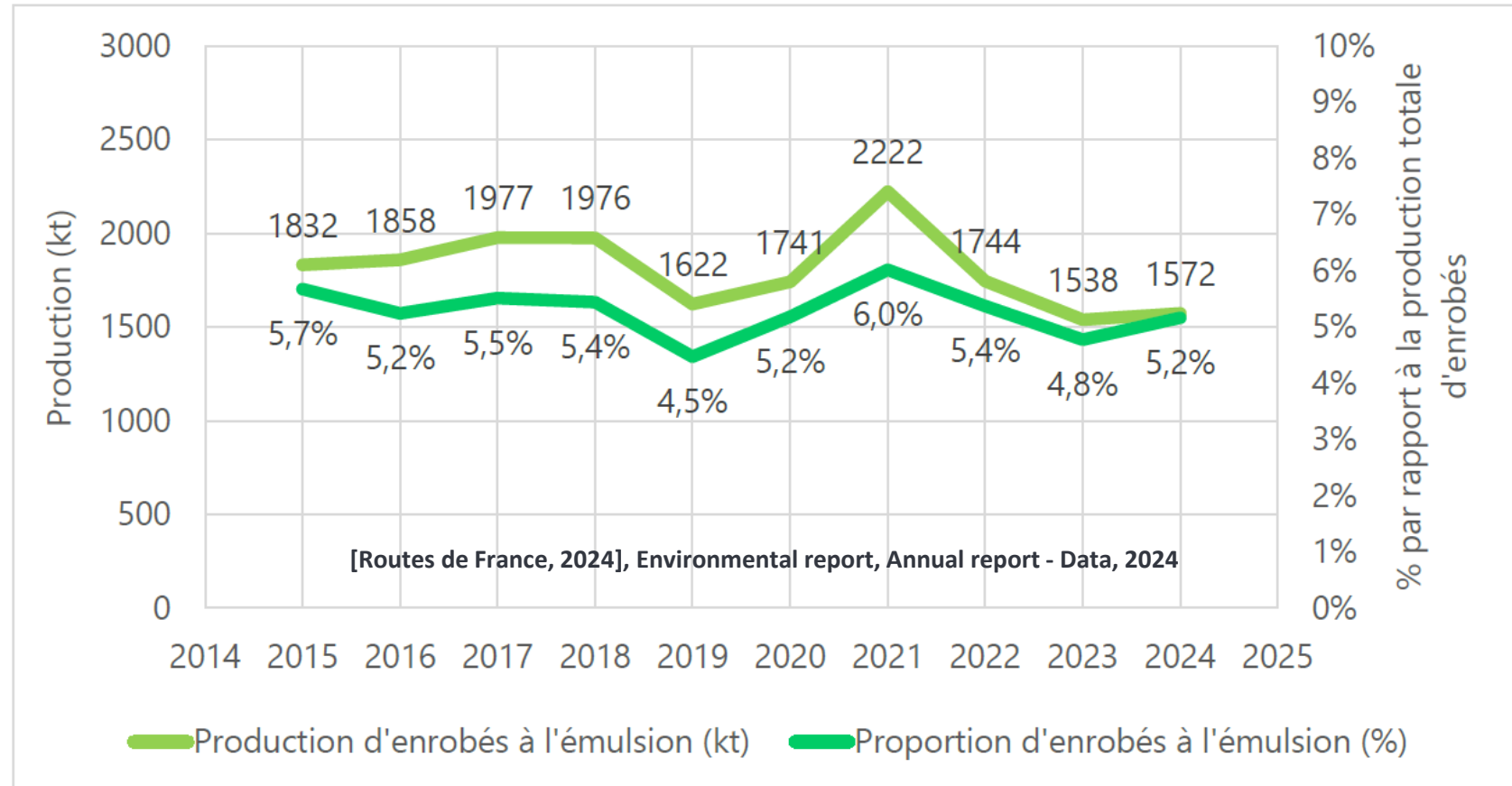
- Cradle-to-factory data used for calculations
- AEXX: % reclaimed asphalt
- \* Fuel mix: 80% NG / 20% HFO
- \*\* fuel mix: 100% NG
- \*\*\* : including wearing course + correction to take account of the absence of aggregate transport



# Products still not widely used

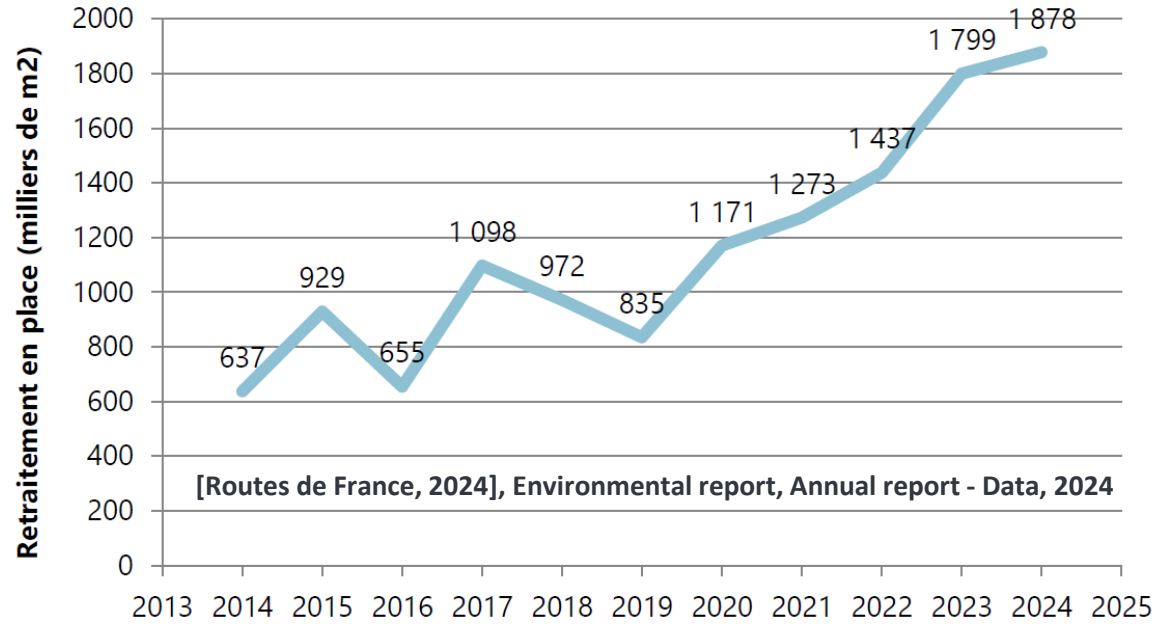


## Emulsion Based Asphalt Mix Annual production in France



**Stable production over the past 10 years**

# Products still not widely used

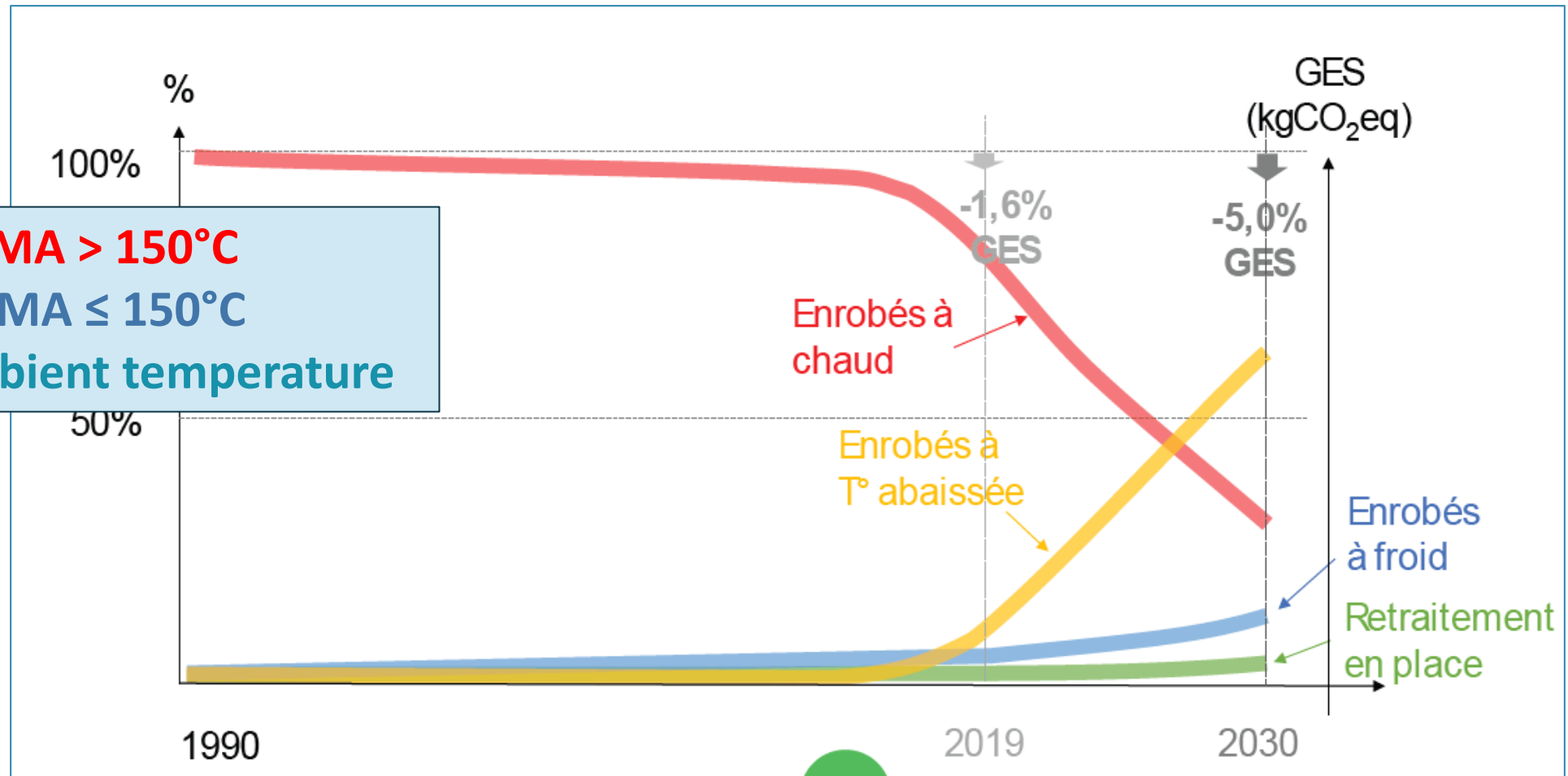


**Emulsion**  
**Cold In Place Recycling**



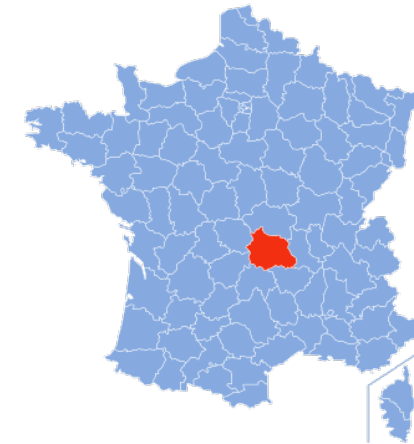
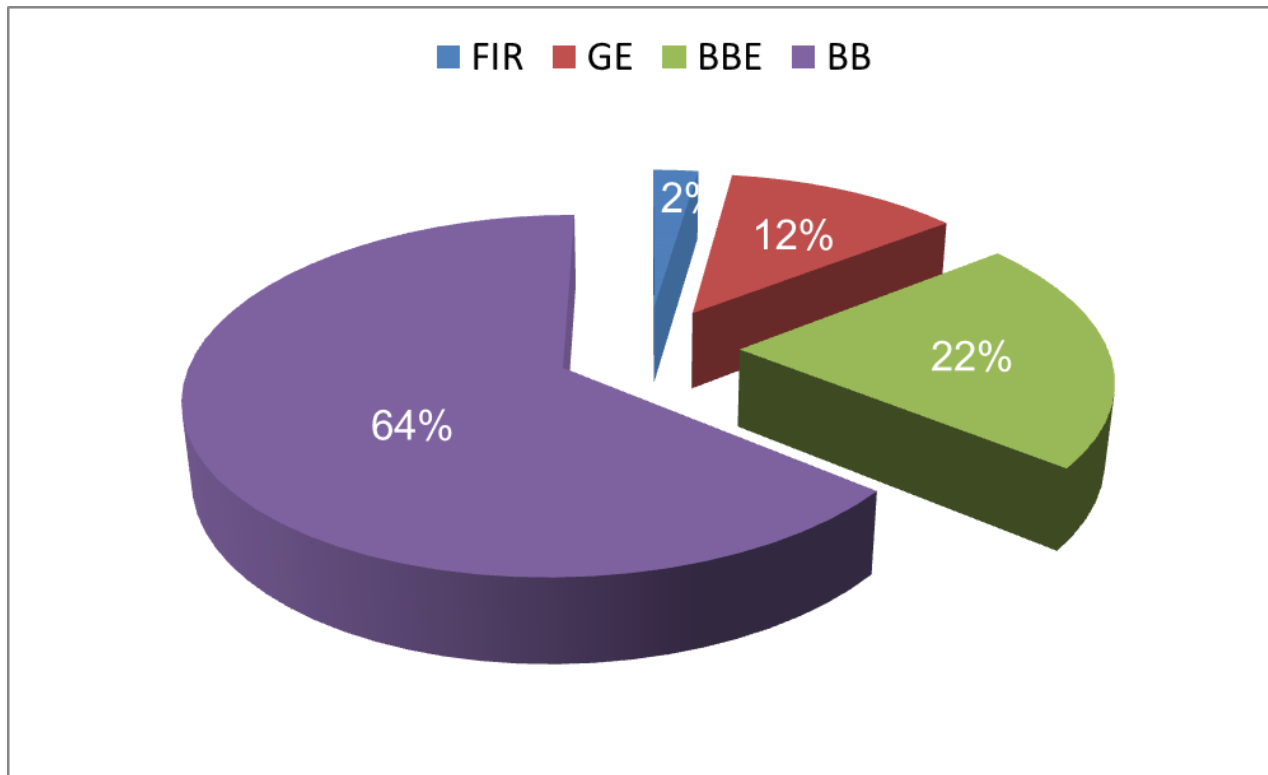
# How are practices changing ?

Scenario of Distribution evolution between HMA/WMA/CMA by 2030 (Source: Routes de France)



# Findings : and yet the approach has already been validated

## Asphalt mix tonnage distribution on the roads of the CD 63 (Puy-de-Dôme)



In 2022, 37,000 tons of emulsion-based bituminous materials, representing **36% of the quantities used** on the departmental road network (medium to low traffic).

# Findings : abundant technical literature



The collage features several technical documents and journal covers:

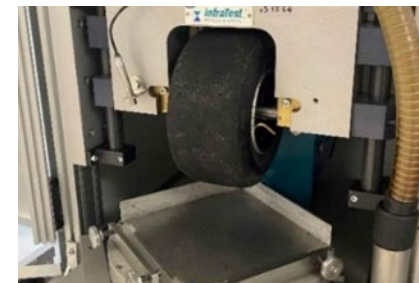
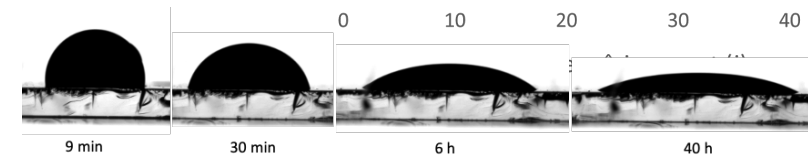
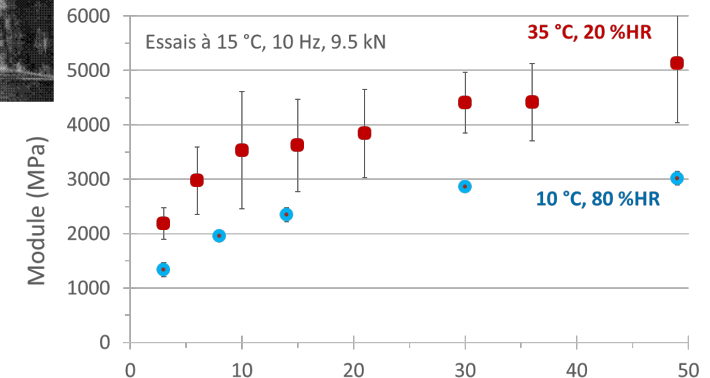
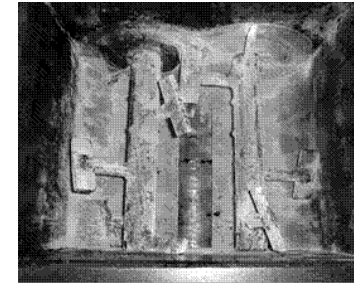
- Norme française NF P 98-121** (3 Octobre 2014): "Assises de chaussées — Grave-émulsion — Définition — Classification — Caractéristiques — Fabrication — Mise en œuvre". Issued by Cerema and IDRRIM.
- Norme française NF P 98-139** (Janvier 1994): "Enrobés hydrocarbonés Couches de roulement : bétons bitumineux à froid". Issued by Cerema and IDRRIM.
- Revue générale des routes et de l'aménagement** (RGRA):
  - June 2012 issue: "ENROBÉS À L'ÉMULSION".
  - Special issue: "N° Spécial: Coopération Public/privé".
- Setra** document: "Retraitement en place à froid des anciennes chaussées".
- 16th IRF World Meeting** (Sharing the road): ERA No. 18 • RGRA, Spring 2010.
- Idrirm/cerema 2017** and **Idrirm/cerema 2020** documents.

Blue callout boxes highlight: "Nombreux articles RGRA", "N° Spécial: Coopération Public/privé", "Idrirm/cerema 2017", "En cours de réécriture", and "Idrirm/cerema 2020".

Technological and scientific obstacles remain to be overcome

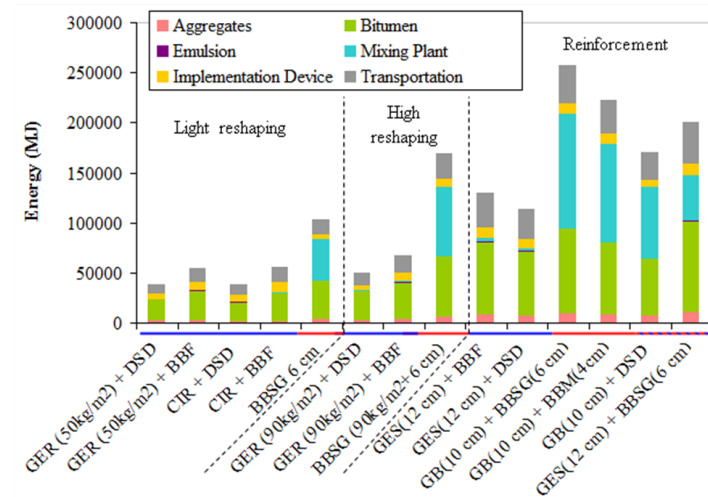
# “IDEE” Project objectives

1. Optimize the **formulation of mixes** by developing appropriate tests and taking better account of the **incorporation of recycled materials**
2. To gain a better understanding of the **behaviour** of emulsion mixes **at a young age**, in order to improve their resistance **during cohesion and curing**.
3. Identification of **damage mechanisms** and the **dynamics of deterioration** required for better pavement design



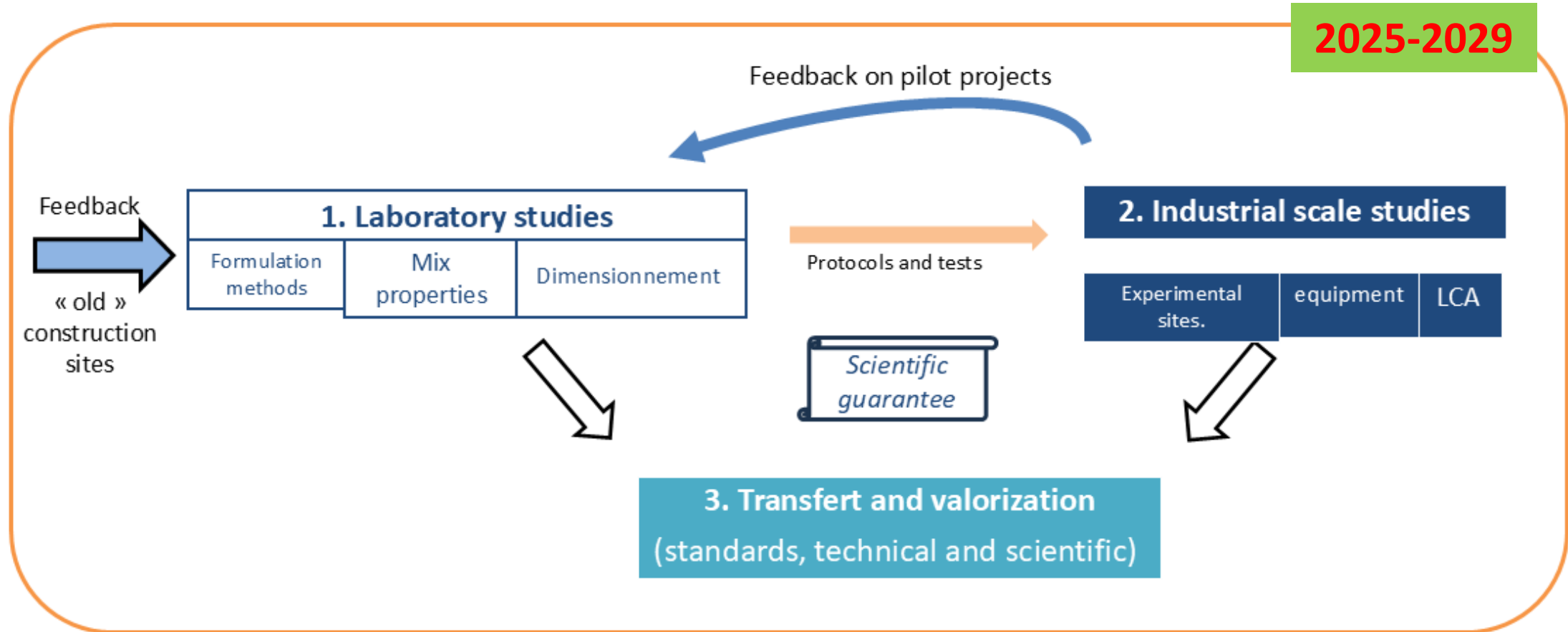
# “IDEE” Project objectives

- 4. Adapting **manufacturing processes** and the use of blends to support the increase in production
- 5. Make significant progress by producing **life cycle inventories** for families of materials with impact indicators.



S. Goyer, M. Dauvergne, L. Wendling, J.C. Fabre, C De la Roche, V. Gaudefroy, *Environmental evaluation of cold emulsion mixes*, Proceedings of Life cycle assessment and construction international congress, Nantes, France, July 2012.

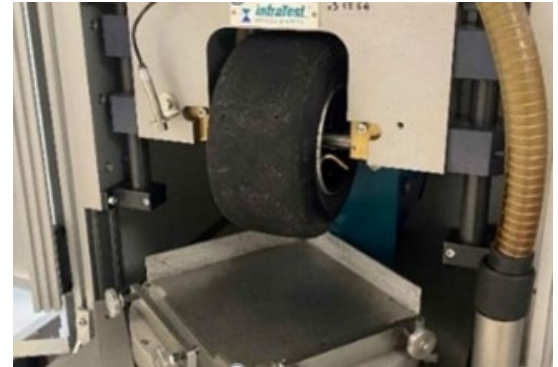
# “IDEE” Project organization



# Focus on WP1 – Formulation methods

## Behaviour of emulsion mixes at a young age

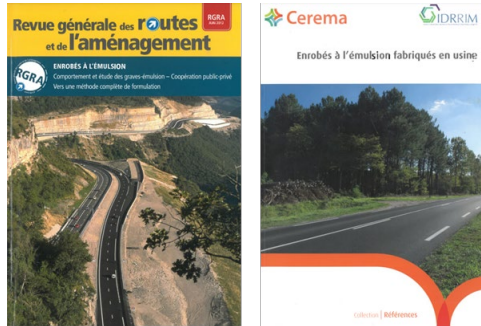
- Diametral compression crushing tests
- Pull-off tests using the Darmstadt Scuffing Device
- Shear strength test using the modified WTAT test
- Development of an innovative approach based on non-destructive testing



Darmstadt Scuffing Device (DSD)

# Focus on WP1 – Pavement design

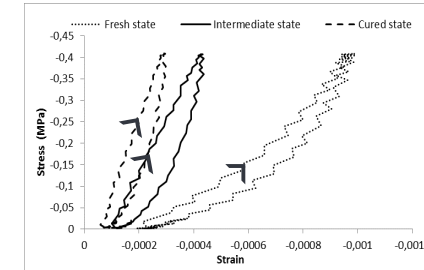
Highlight best practices



Monitoring of previous construction sites (damage, deflection, core drilling, other tests)

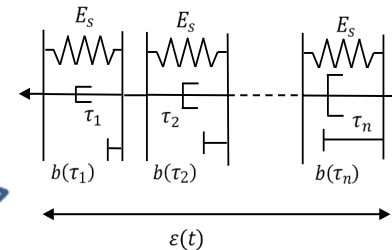
Experimental approach

- Reversible behavior: evolving modulus
- Irreversible behavior: failure criteria (cracking, rutting, water resistance)
- Aging: mixtures and binders



Numerical approach

- Maturation variable
- Behavior laws



Development of a design method (calculation of  $\sigma$ ,  $\epsilon$  under traffic)

# “IDEE” Project objectives

## High expectations in terms of :

- **Removing the obstacles** to the wider deployment of emulsion asphalt mixes
- Helping to **decarbonize** the construction sector
- **Scientific and technical documents update**: pavement design, application and maintenance, test protocols and methodologies



**IDEE**  
Infrastructures Décarbonées  
aux Enrobés à l'Emulsion

# A collaborative project



Contractors  
Project owners  
Project managers  
Laboratories

→ Collaborative project  
(4,9 M€)

<https://www.pn-idee.fr/>

Thank you for your attention

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Routes de France  
Colas

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17<sup>e</sup> CONGRÈS MONDIAL DE LA VIABILITÉ HIVERNALE,  
DE LA RÉSILIENCE ET DE LA DÉCARBONATION  
DE LA ROUTE  
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