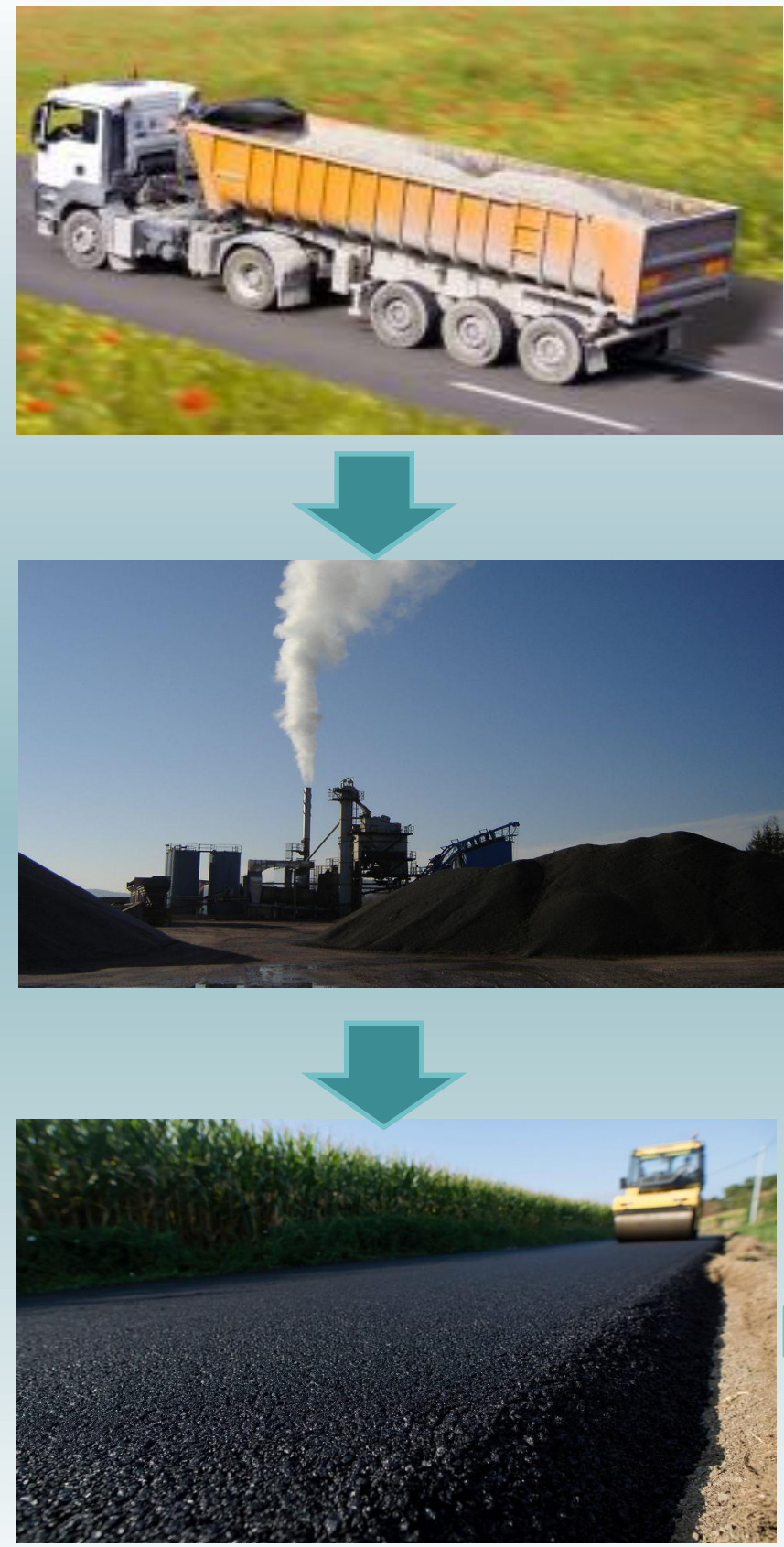


Use of recycled materials in bituminous mixes: mechanical and geotechnical design and characterization

Ali MOUKAHAL¹, Mathilde MORVAN¹, Evelyne TOUSSAINT¹

¹ Université Clermont Auvergne, Institut Pascal BP 10448, F-63000 Clermont-Ferrand

Problem statement



the reuse of asphalt aggregates helps to limit the depletion of natural resources, reduces energy consumption and waste storage costs [1].

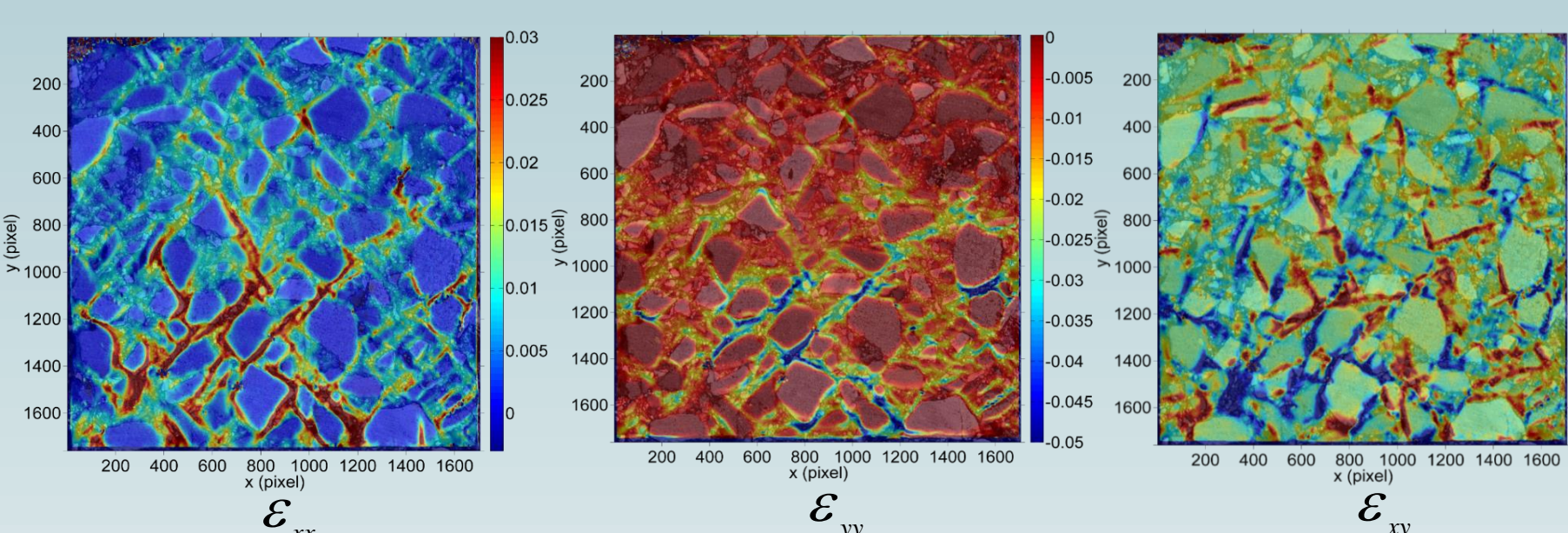
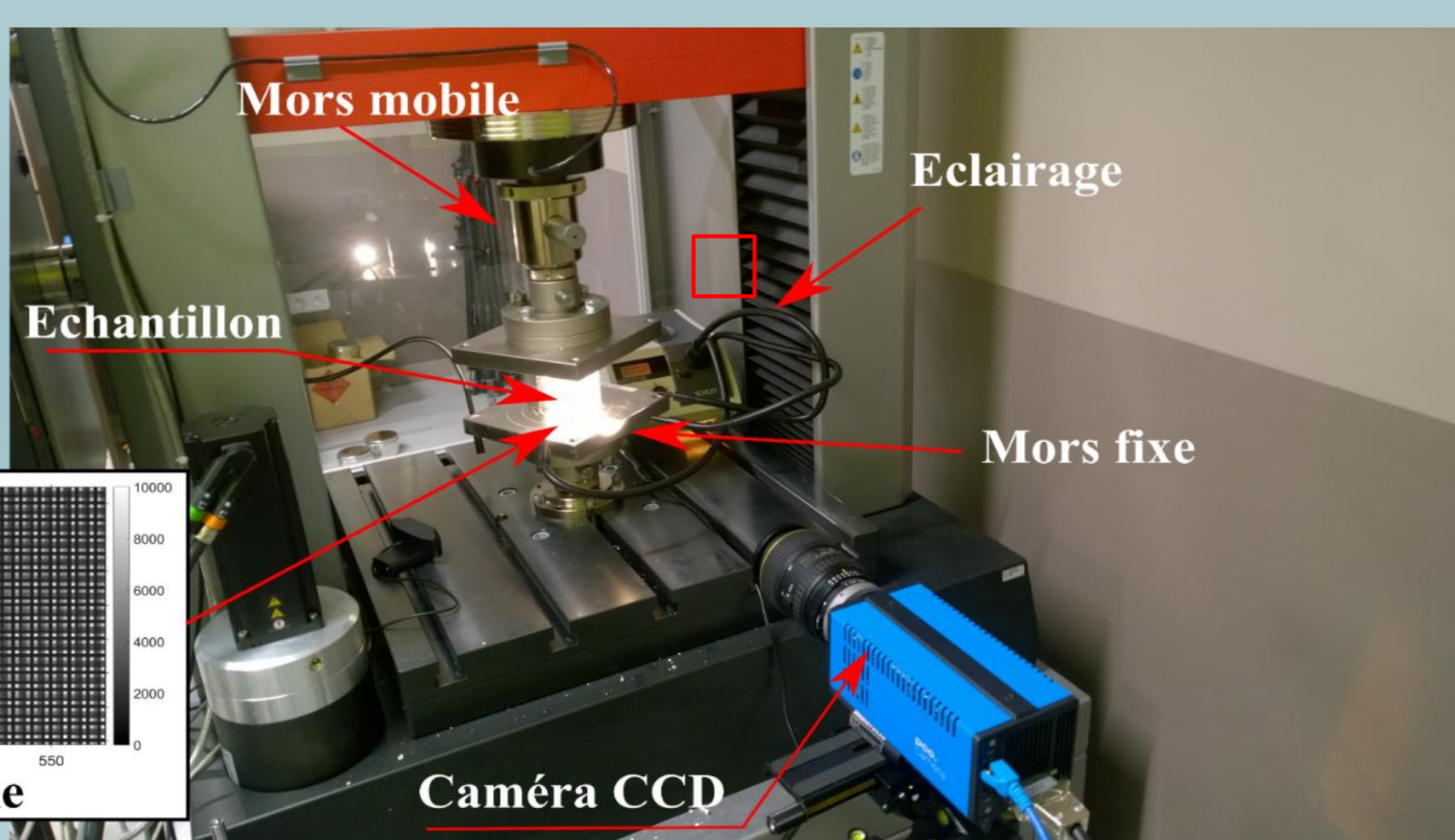
Materials and methods



Demolition and construction waste as well as industrial waste can replace virgin aggregate and bituminous binder, at different percentages, in the manufacture of roads based on recycled materials [2].



The addition of these wastes has beneficial effects on the mechanical properties of asphalt. To understand how these recycled materials work at micro-scale, a full-field measurement method was developed by the laboratory (Grid Method) and will be used during this thesis.



- Strain maps provided by the grid method help to understand the local mechanical behavior of different mixtures [3].
- The strain localization in the binder bands can be distinguished.

Objectives

General objectives :

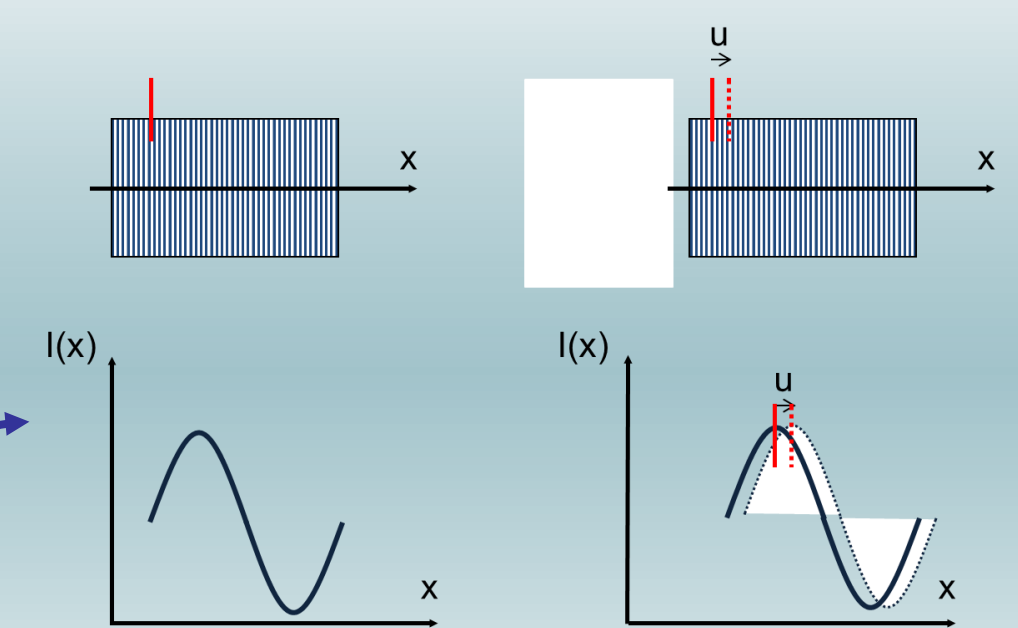
- Save non-renewable natural resources.
- Introduce waste in asphalt mixtures at an optimum rate.

Specific objectives :

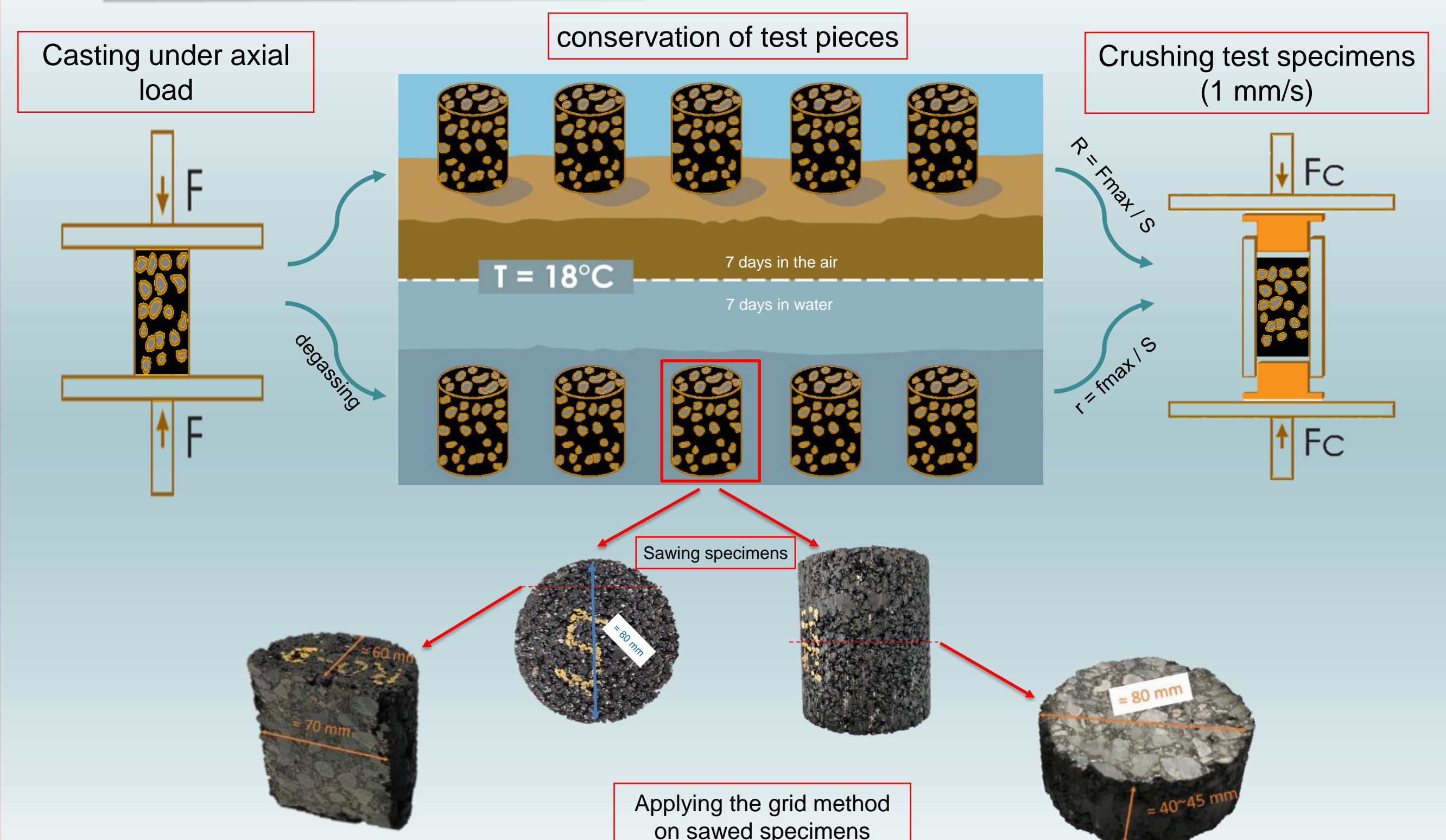
- Study local behavior of asphalt mixtures containing waste materials.
- Evaluate the mechanical behavior of these mixtures.

Grid method

- The grid method is a technique suitable for measuring in-plane displacement and strain maps in experimental mechanics.
- The displacement field is proportional to the phase change between current and reference grid images.



methodology



Expected results

- To evaluate the water sensitivity of bituminous mixes containing recycled asphalt aggregates at different recycling rates (0%, 10%, 20%, 30%, 40% and 50%).
- To obtain accurate information at micro-scale of compression behavior of samples containing recycled asphalt aggregates.
- To improve the performance of asphalt mixtures by introducing waste materials in it.
- To identify the mechanical parameters of different types of Recycled Asphalt Pavement using inverse method.
- To validate the experimental results using finite element method.

Bibliography

[1] Martins Zaumanis, Rajib B Mallick, and Robert Frank. 100% hot mix asphalt recycling : challenges and benefits. *Transportation research procedia*, 14 :3493–3502, 2016.

[2] Arabani, Mahyar, Seyed Amid Tahami, and Mohammad Taghipoor. "Laboratory investigation of hot mix asphalt containing waste materials." *Road Materials and Pavement Design* 18.3 (2017): 713-729.

[3] TEGUEDI, Mohamed Cheikh. *Comportement local des enrobés recyclés: apport des mesures de champs cinématiques*. 2017. Thèse de doctorat. Clermont Auvergne.