Eco-designed pavements
Green chemistry & smart testings

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ESIEE Paris
2019, June 11th

French-Swedish Workshop on
Research, Innovation and Education
2019

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Key figures of French asphalt industry in 2016

- Asphalt mixture production : 33,1 millions tons
- Bitumen : 2,4 millions tons
- Bituminous binder production: 1 million tons
- Average recycling rate: 20%
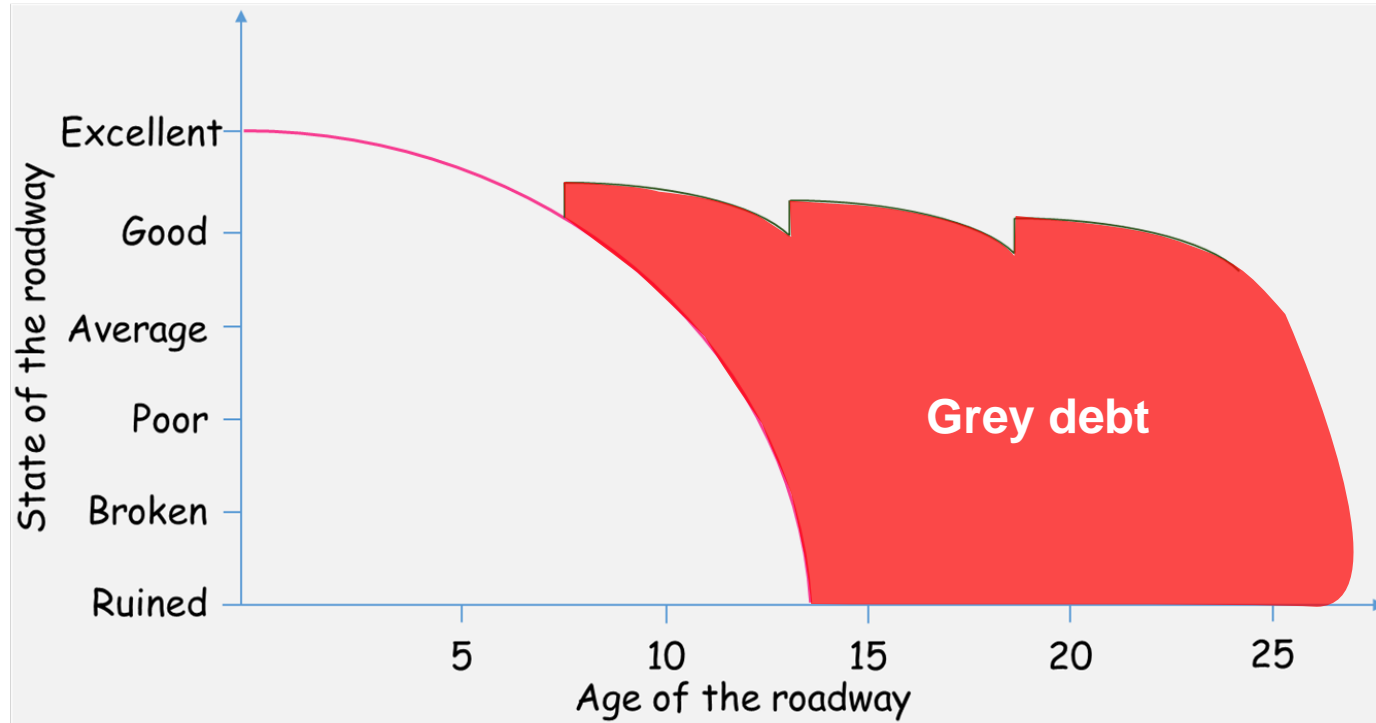
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French policy

- Voluntary Engagement Agreement (signed in 2009)
    - Recycling rate of 15% in 2017
    - 33% decrease of emissions in 2020/2009
    - Warm mix production : 30%

Sweden
Carbon neutral in 2045?

- Energy transition law
Recycling of 70% of waste from construction (2020)
Circular economy

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« Grey debt »

How pavement industry can contribute?

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Green Chemistry

Recycling

Reclaimed asphalt

Bio-based binder produced from renewable and local ressources

BioRePavation

- Infravation call
- Europe & US fundings

- Bio-Recycling
  - 3 tested solutions
  - Recycling rate up to 70%

Sylvaroad^{TM}

Biophalt$^®$

Epoxidized methyl soyate

LCA on binder

Binder	Global warming potential [t CO2 eq]
Bitumen	0.247
Biophalt	-1.52

Standard EN 15804

Biogenic carbon

Eco-designed pavement

SEVE calculation for 1 000 tons of mixture

- o Conventional mixture with 20% of reclaimed asphalt + bitumen
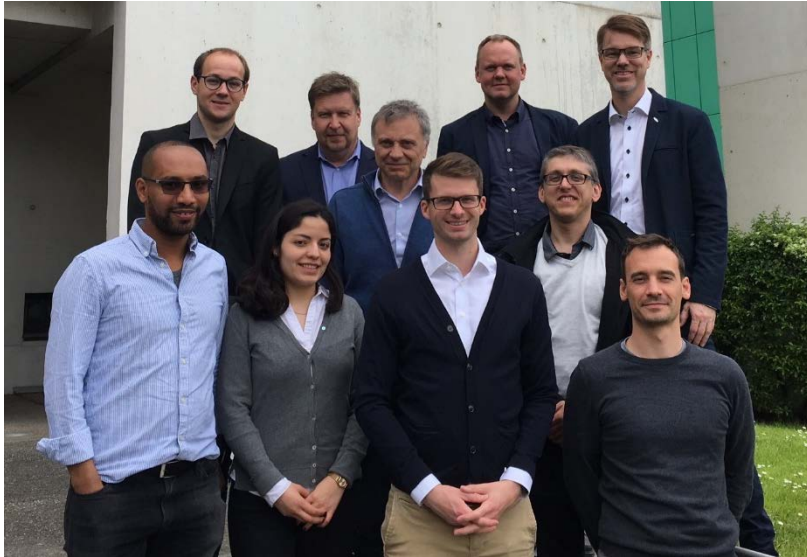- o Biophalt mixture with 60% of reclaimed asphalt

CO₂		Emissions (t CO2 eq)					
		Materials extraction	Transport	Mixture production	Paving operation	Total	Comparison / ref
Conventional mix	Route/VRD	12,0	7,2	16,7	1,5	37,4	
Biophalt mix	Route/VRD	-36,7	3,8	16,3	1,5	-15,1	-140,4 %

Smart testing

Modal analysis to characterise the complex modulus of asphalt concrete
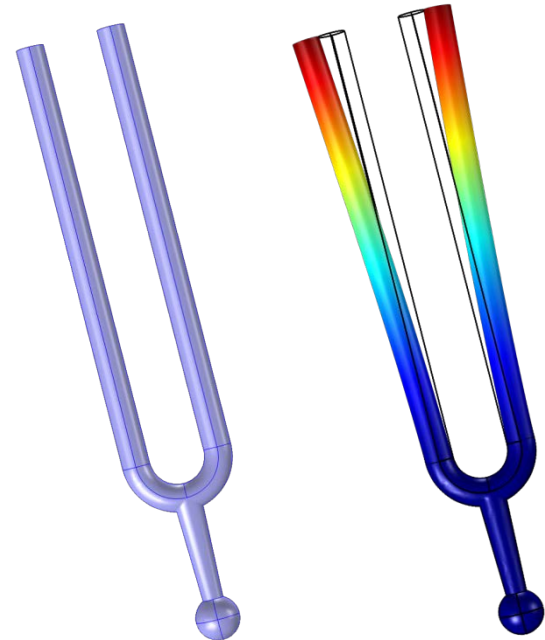
Swedish/French collaboration

Background
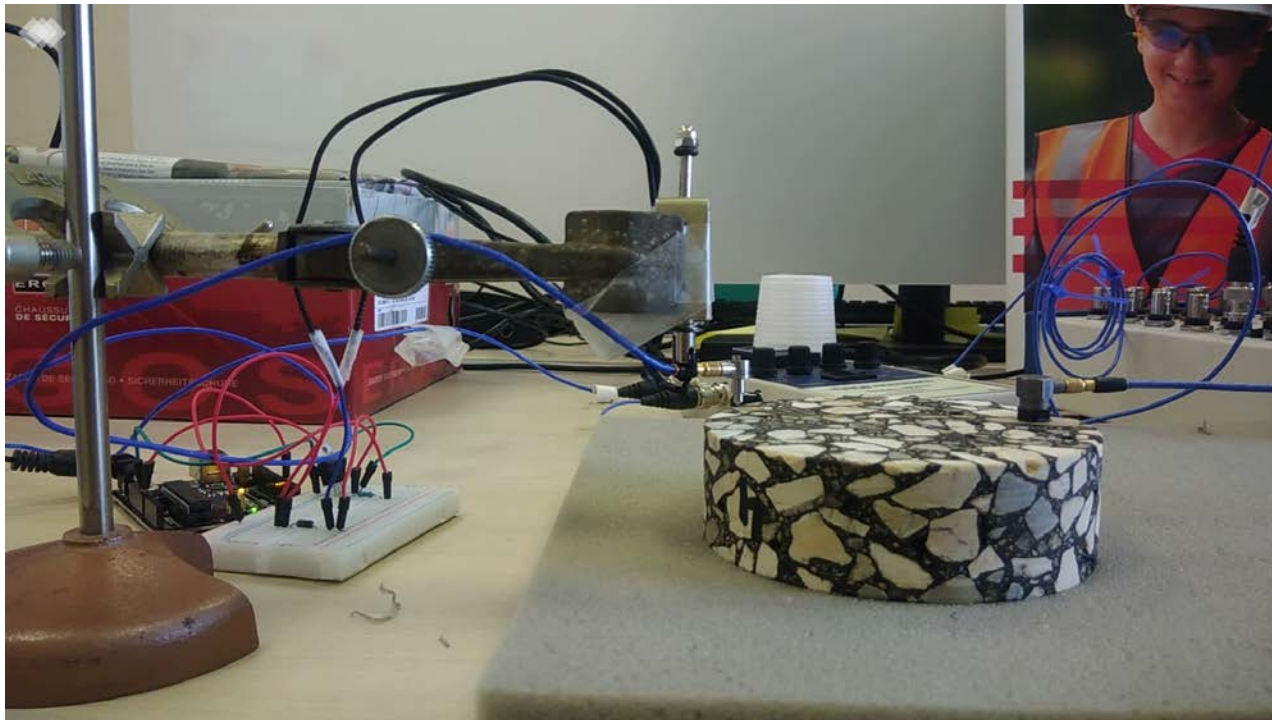
- Resonance frequencies
  - The resonance frequencies of a solid with free boundary conditions depend on:
    - **Stiffness (E)**
    - **Density (ρ)**
    - **Dimensions (l, A)**

$$f \propto \frac{1}{l^2}\sqrt{\frac{AE}{\rho}}$$

Principle

Merci de votre attention
Tack för din uppmärksamhet

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