WORKSHOP Transport and climate change- european researcher act, Paris,
Organised by ETRA and IFSTTAR,j 6th uly 2015

TRANSPORT INFRASTRUCTURE GHG ASSESSMENT AROUND THE WORLD : A WAY TOWARDS MITIGATION

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IFSTTAR

THINK GLOBAL ….PERFORM BENCHMARKING

- ***LCA 2014 3rd international conference : UC Davis, CA, USA***

17 research questions from parallel sessions **http://www.ucprc.ucdavis.edu/p-lca2014/**

- ***CFCC 2015 international conference : Paris, FRANCE***

State of the art on data, impacting processes and life cycle phases-pavements, earthworks

- ***CAPSA'2015 11th conference for asphalt pavements for southern Africa, Sun City***

"Application of the Results of the Pavement LCA 2014 (USA) Symposium to Southern Africa" :

[By Harvey, UCPRC, University of California Davis, USA
Jullien, IFSTTAR, Nantes, France
Steyn, Department of Civil Engineering, University of Pretoria, Gauteng, South Africa
Kendall, Department of Civil and Environmental Engineering, University of California, Davis, CA, USA
Jones, UCPRC, Davis, CA, USA
Saboori,UCPRC, Davis, CA, USA]

- ***SETAC, 2016, on LCA in Nantes, France : a session on transport infrastructures including roads and railways?***

Jullien, IFSTTAR, Nantes, France – discussion in progress with University of Davis and Berkeley, USA and other researchers and companies

DEFINE METHODS AND SHARE PRACTICE…

LCE4ROADS

Partners

1. **Acciona (coordinator)**
2. **BASt**
3. **CIRCE**
4. **Université de Chalmers**
5. **ERF**
6. **FEHRL**
7. **IECA**
8. **IFSTTAR *+ 3rd parties(GeM, CEREMA)***
9. **TNO**
10. **KGM**
11. **AENOR**
12. **INVESTEKO**
13. **NAPE**

Project funded by the European Community´s Programme FP7/2007

SST 2013 5-3 Innovative, cost effective, construction and maintenance for safer greener roads, under grant agreement no 605748 .

Project Overview

Main concepts

Development of a sustainability certification system for roads:

ECOLABEL will be pavements (including foundation/subgrade) focussed. Tunnels, bridges, slopes and embankments excluded.

Targets

- TENt network and similar types of roads.

➢ *Certification system*

3 certification moments for new and rehabilitated roads

M1 Before construction
M2 After construction
M3 During the operation phase. NRAs will fix periodicity.

Phases

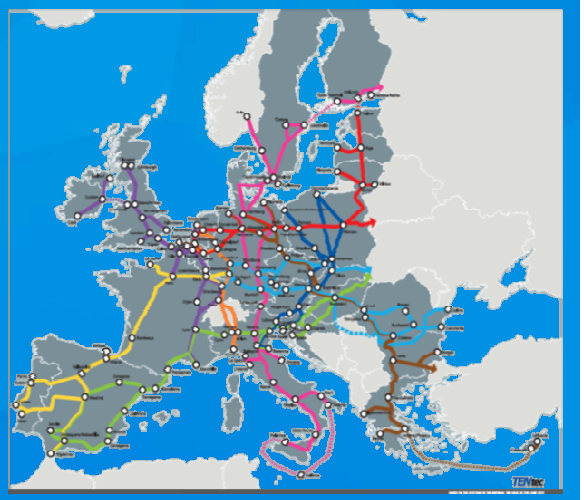
- Planning
- Design
- Construction
- Operation
- Maintenance
- EOL

Domains

- Technical
- Environmental
- Social
- Economical

Certification scope

- ✓ Certification requirements (both qualitative and quantitative) will be defined. A support software tool will be created.
- ✓ Regional peculiarities (energy mix, regulations, etc), will be considered by the ECOLABEL methodology
- ✓ Made for TENt network and similar roads
- ✓ Light certificate covering a minimum range of requirements.
- ✓ Complete certificate covering the whole range of requirements

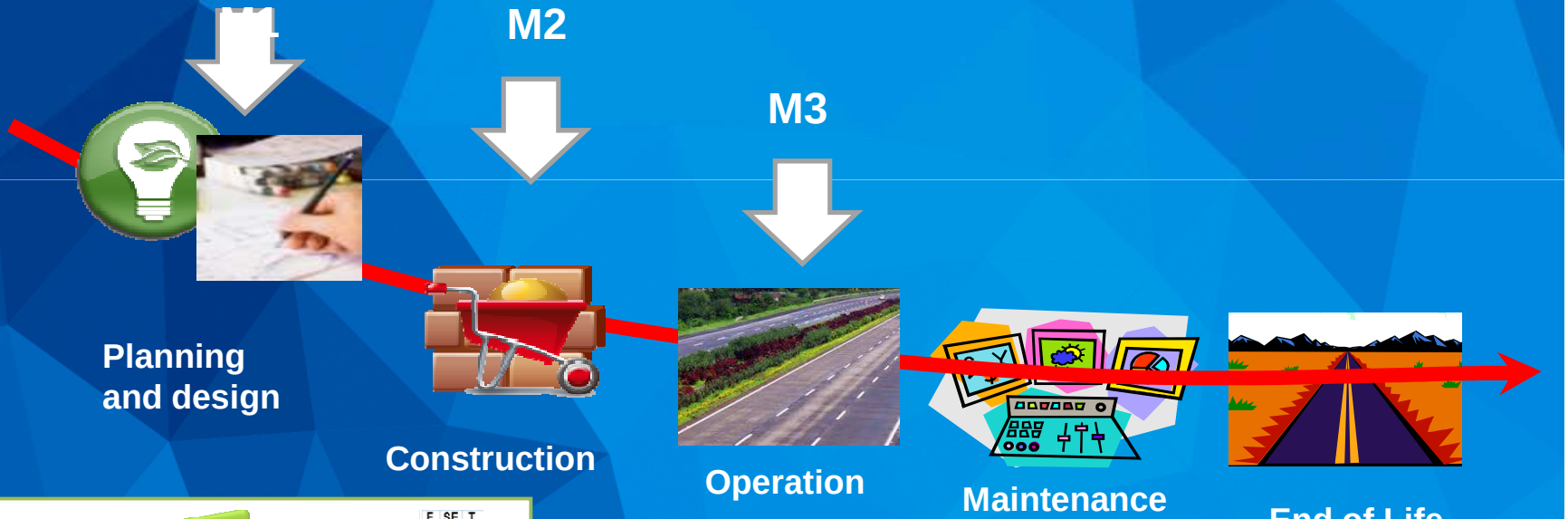


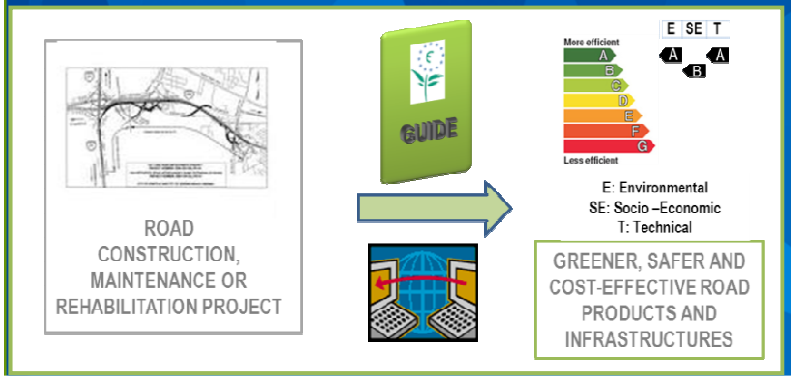
KPIs
WP1 results

Economic		
Life Cycle Costs: - Initial cost (Preliminary design cost, Start up cost, Raw materials cost,Labour cost) - user cost, work zone user cost - maintenance cost (inspection, annual maintenance, repair cost) - failure cost o		
Technical	**Environmental**	**Social**
Pavement surface characteristics - PI_F (friction) - PI_R (rut depth) - PI_T (macrotexture) - PI_E (evenness, IRI) - **Or PI_EV (evenness, NBO)** - **PI_F_Heavy_vehicle (friction)** **Climate resilience** % of budget to consider this issue	- Mass of each component (t) or % of natural resources (primary non-recycled materials) used in road construction - % of recycled materials used in road construction - % of material that could be recycled	**Noise** exposure and annoyance during works and use for habitants: - TP (Noise, den) - TP (Noise, %HSD) - TP (Noise, Night) - TP (Noise, %HA) **Noise** disturbance for wild life (Ha)
	ADP elements (kg eq. Sb) or (total tons) ADP –fossil fuels (MJ) GWP (kg eq. CO_2) POCP (kg eq. C_2H_4) AP (kg eq. SO_2) Eutrophication (kg eq.(PO_4^{3-})	**Comfort** index (IRI, macrotexture)
	And voluntary : Ecotoxicity (kg eq. 1.4 DCB) Toxicity (kg eq. 1.4 DCB)	

Certification moments

MOMENT 1: Before construction
(Planning and design of both new construction and rehabilitation projects)
MOMENT 2: After construction
MOMENT 3: During the operation phase.





Benefits for the stakeholders

Some benefits might be for example:

✓ *Benefits for public bodies such as national and regional road authorities:*

- *To increase the sustainability of the future and existing road infrastructures*
- *They will have a system to increase the protection of sensitive or protected areas (National Parks, certain ecosystems, etc. where the environmental impact of road construction/rehabilitation must be reduced).*
- *If ECOLABEL is linked to GPP and/or PPI, it might support the implementation of these type of procurement process. This might also provide alternative funding for the extension or preservation of their road network.*

*the motives of similar stakeholders might vary depending on the country.

Benefits for the stakeholders

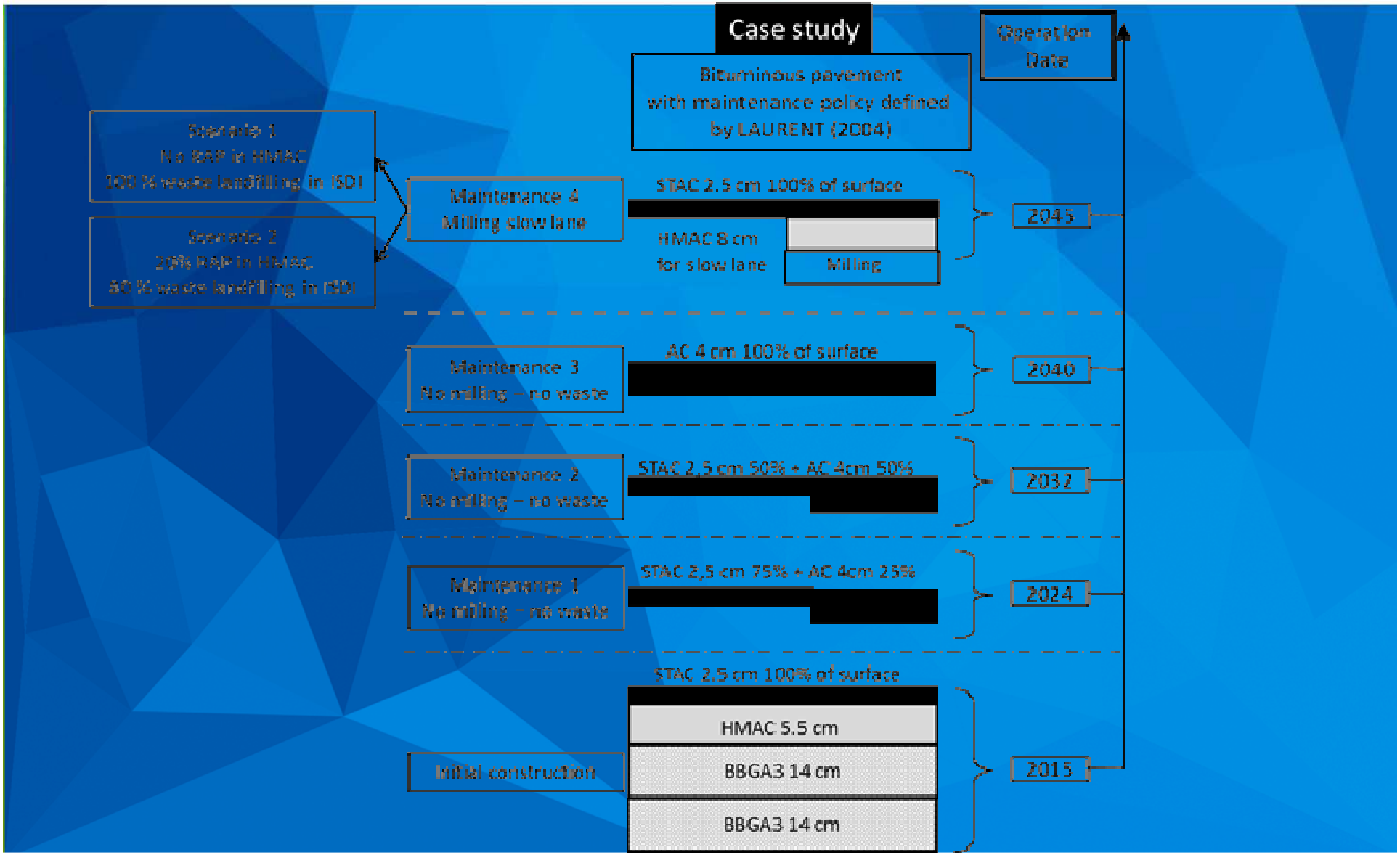
Each stakeholder have its own reason to support ECOLABEL. Some benefits might be for example:

- ✓ *Benefits for construction companies and operators:* to showcase the sustainability performance of their road infrastructure products and projects. However, investing in a certification may be only interesting if major clients (e.g. road authorities) express their interest sustainable infrastructure and ask for proof in the form of (ECOLABEL) certification.

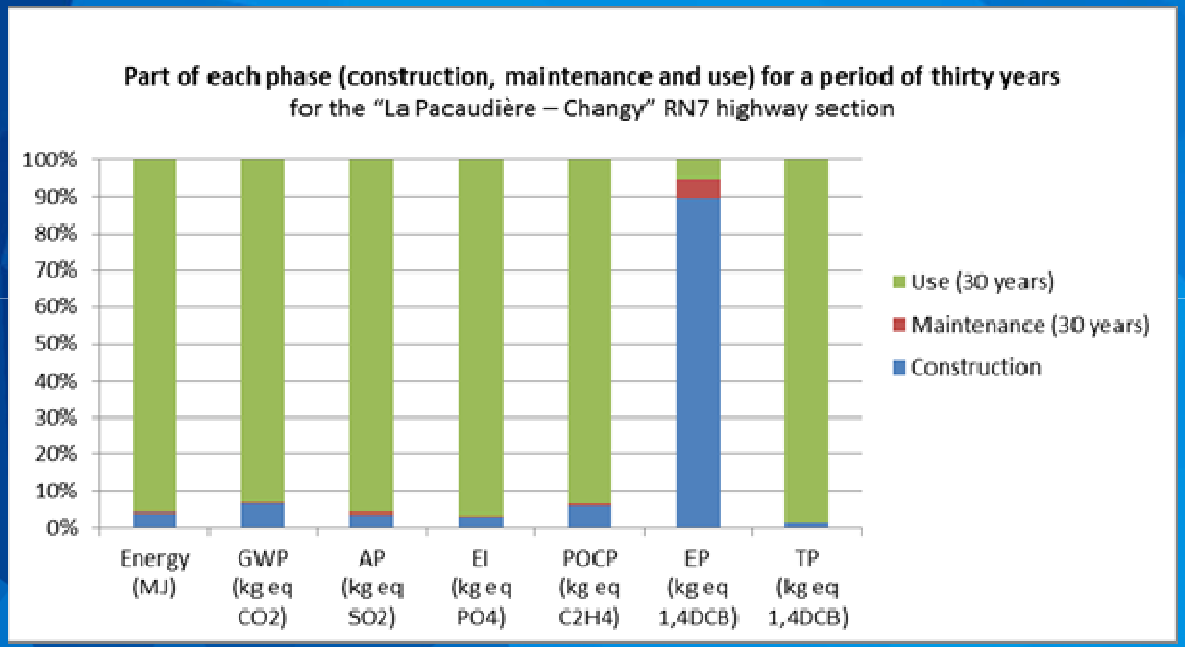
- ✓ *Benefits for certification bodies:* will only be beneficial if the revenues (payment for the assessment) outweigh the cost for being able to provide assessments (hiring assessors, education, etc.)

*Note that the motives of similar stakeholders might vary depending on the country.

Some results on a French highway case study (25 km)



Results- part of the use phase vs construction and maintenance (source for Hypotheses of calculations
Adding traffic consideration in LCE4ROADS deliverable D1.4)

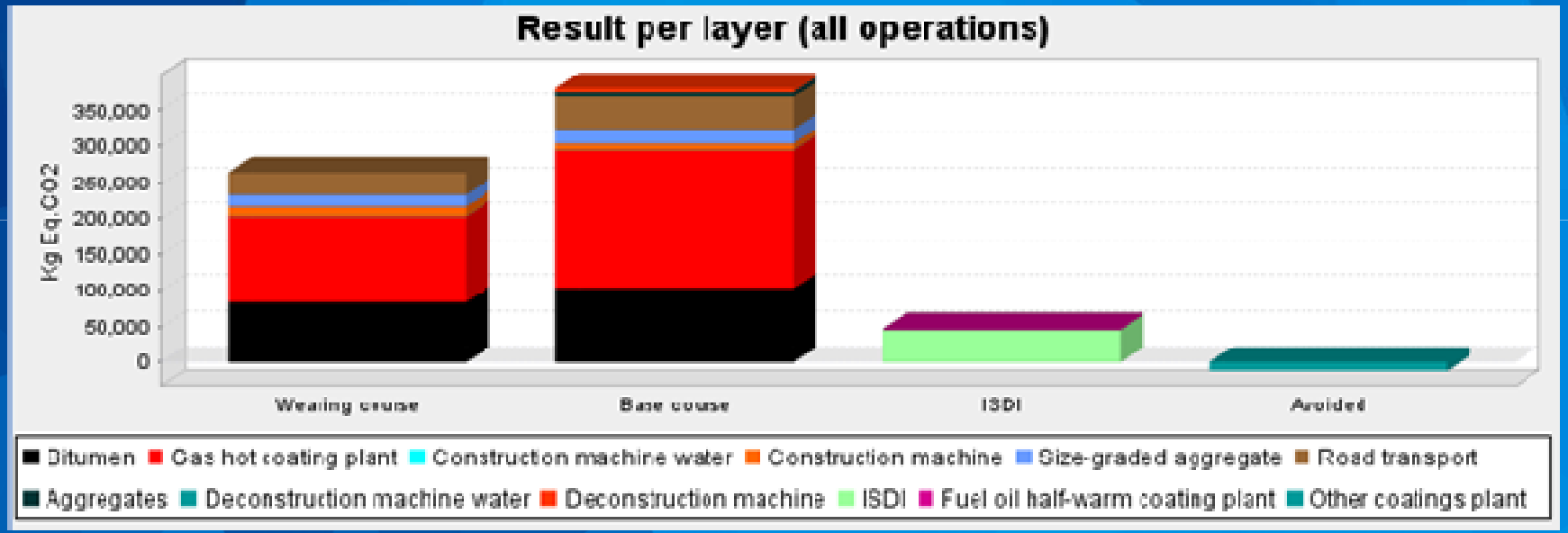


whole life cycle of RN7 comparisons of the phases

Results – infrastructure only

Identifying the most impacting processes

GWP (ECORCE output)



Ability to assess maintenance and landfilling/recycling strategy

SUP&R ITN

Sustainable Pavement & Railway Initial Training Network

www.superitn.eu

Partners

The University of Nottingham
UNITED KINGDOM · CHINA · MALAYSIA

Iarnród Éireann Irish Rail

UCD DUBLIN

REPSOL

IFSTTAR

ugr Universidad de Granada

Universidad de Huelva

URS

Sacyr

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement n. 607524

The Project

Joint

Training – through – Research

Programme with industries

Setup a multidisciplinary and multi-sectoral network in order to form a new generation of engineers versed in sustainable technologies and to provide, to both academia and industry, design procedures and sustainability assessment methodologies to certify the sustainability of the studied transport infrastructure technologies.

Research Framework

WP1 – WP2 (12 PhD students)
Characterization and Design of Transport Infrastructures Technologies

Secondary materials

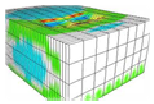
RAP

Tyre Rubber

Old ballast

biomass

Testing



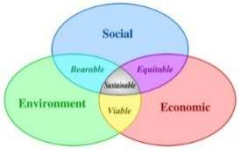
Modelling

On-site Experience

Design

Maximise recycling

Minimise impact



Greenroads™

CEEQUAL: the Civil Engineering Environmental Awards Scheme

WP3 (3 Post-Docs)
Sustainability metrics and Labelling

- Lifecycle Assessment (LCA)
- Lifecycle Cost Analysis (LCCA)

Sustainability Assessment methodology

SUPER ITN
Sustainable Pavement & Railway Initial Training Network

WP3: Sustainable Assessment

Investigators:
Tony Parry, Agnes Jullien, Davide Lo Presti

WP3 will focus on the definition of a methodology and the creation of a tool to perform a broad sustainability assessment at the design stage of the technologies in WP1 and WP2. This tool will be based on environmental Lifecycle Assessment (LCA) that will incorporate cost analysis and social sustainability metrics together with a comprehensive set of economic, social, and environmental indicators. WP3 will include the following tasks that will be carried out by *Post-Docs*:

Project 3.1 (ER1) : Definition of sustainability assessment methodology and current state-of-the-art in sustainable practices (since Jul 2014 - J.Bryce)

Project 3.2 (ER2) : Sustainability assessment of the SUP&R ITN technologies (starting mid 2015 –in, progress)

Project 3.3 (ER3) : SUP&R ITN assessment tool (starting end of 2015 –post doc offer available)

French research project *Ville10D*

www.ville10d.fr

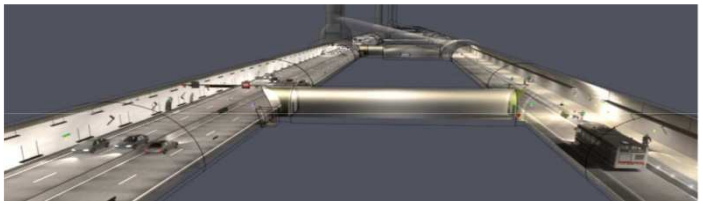
The Project

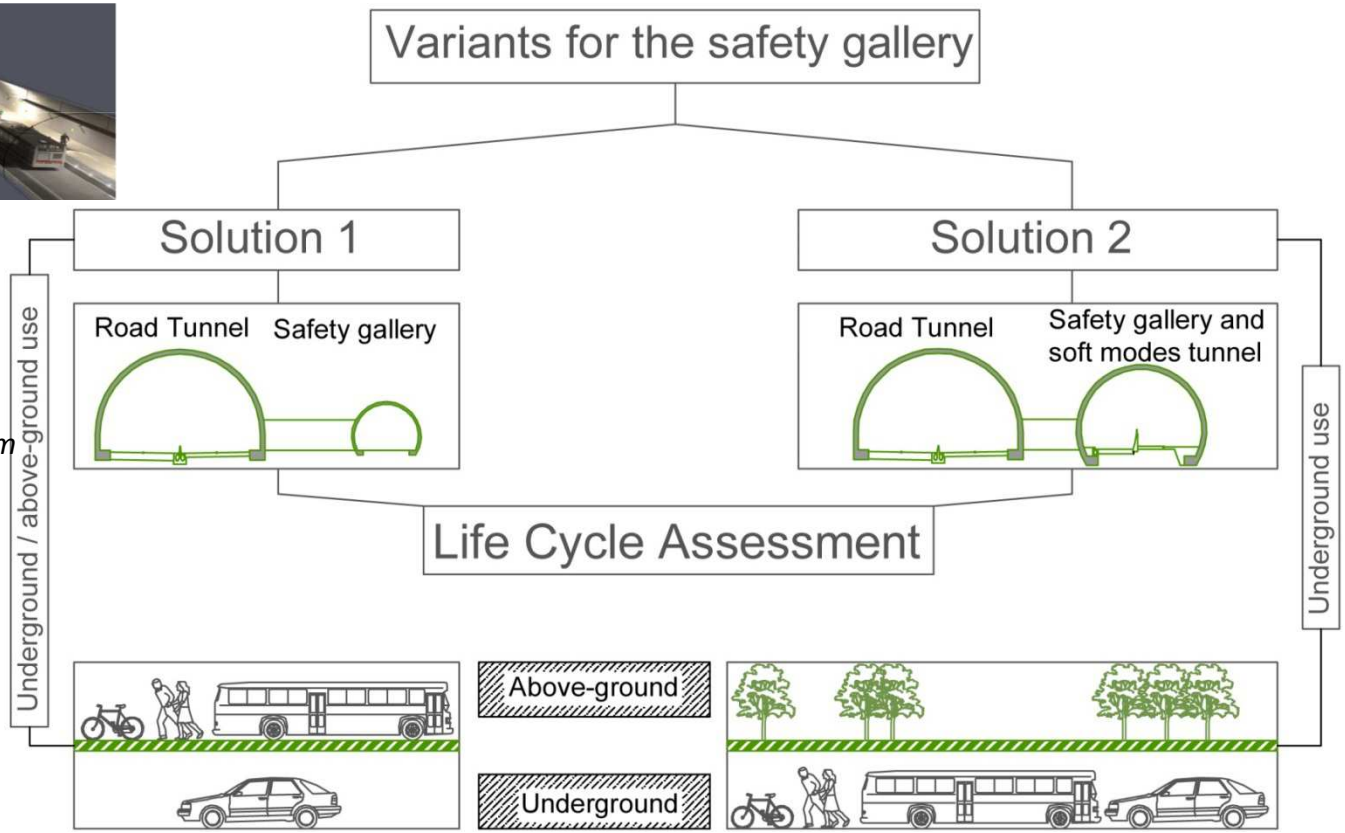
- This project aims to develop the contribution of the underground space in the sustainable urban development of the cities.
- It has four main themes : Socio-economy, environment, societal issues and visibility.

Planning and Designing Tunnels and Underground Structures

A methodology of assessment at the **district scale**

IFSTTAR CETU École des Ponts ParisTech





(source Audi Y., Jullien A., Ferraille A., Lorino T., Daloia L.
Building underground: Which benefits from a sustainable point of view ?) :

ITAWTC 2015
LACROMA VALAMAR CONGRESS CENTER
DUBROVNIK, CROATIA

Composition		
Solution 1	Safety Tunnel	Vault
		Pedestrian pavement
	Above-ground Pavements	Bus pavement
		Cycling pavement
		Pedestrian pavement
	Road tunnel	Road pavement

Solution 2	(Safety + soft-modes) Tunnel	Vault
		Bus pavement
		Cycling pavement
		Pedestrian pavement
	Road tunnel	Road pavement

Solution 2 bis	(Safety + soft-modes) Tunnel	Vault
		Bus pavement
		Cycling pavement
		Pedestrian pavement
	Road tunnel	Road pavement

Hyp 1:80%

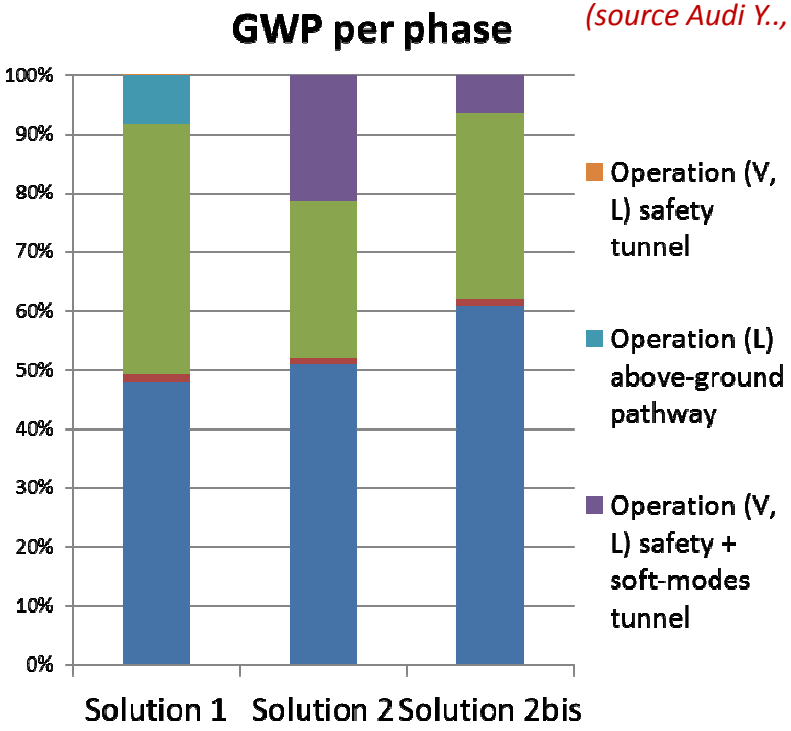
Roads tunnels exploitation (source CETU)

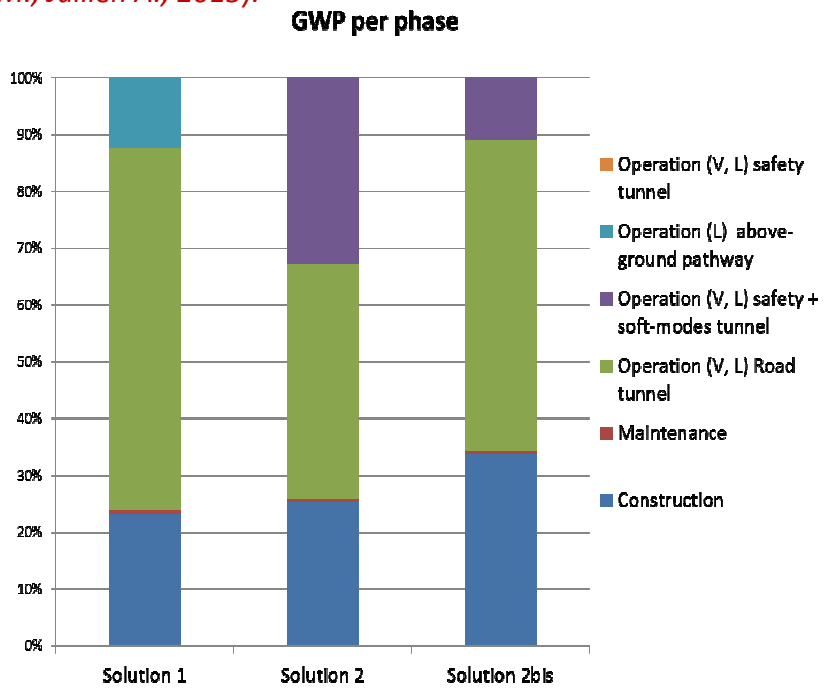
Hyp2 :20%

French energy mix:

Changing the mix :

(source Audi Y.., Dauvergne M., Jullien A., 2015).





CONCLUSIONS FOR FUTURE WORK: REFINE DATA AND BOUNDARIES, THINK OF COUNTRY AND LOCAL RESOURCES