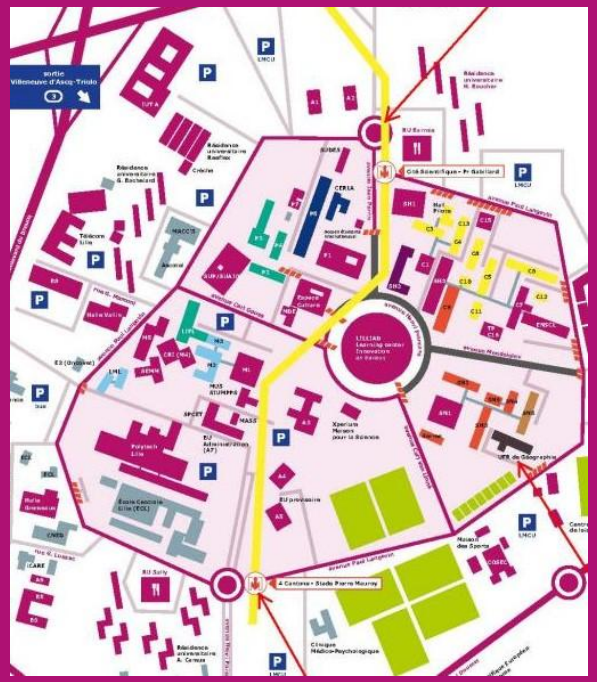
https://cumin.univ-lille.fr/



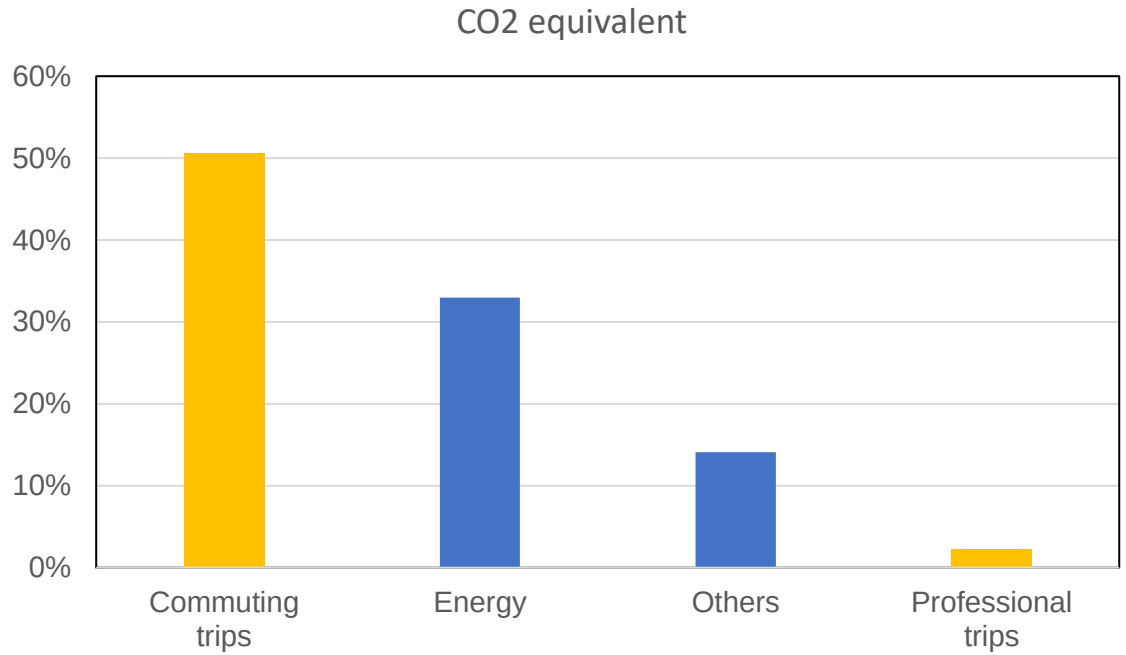
Campus of University with Mobility based on Innovation and carbon Neutrality

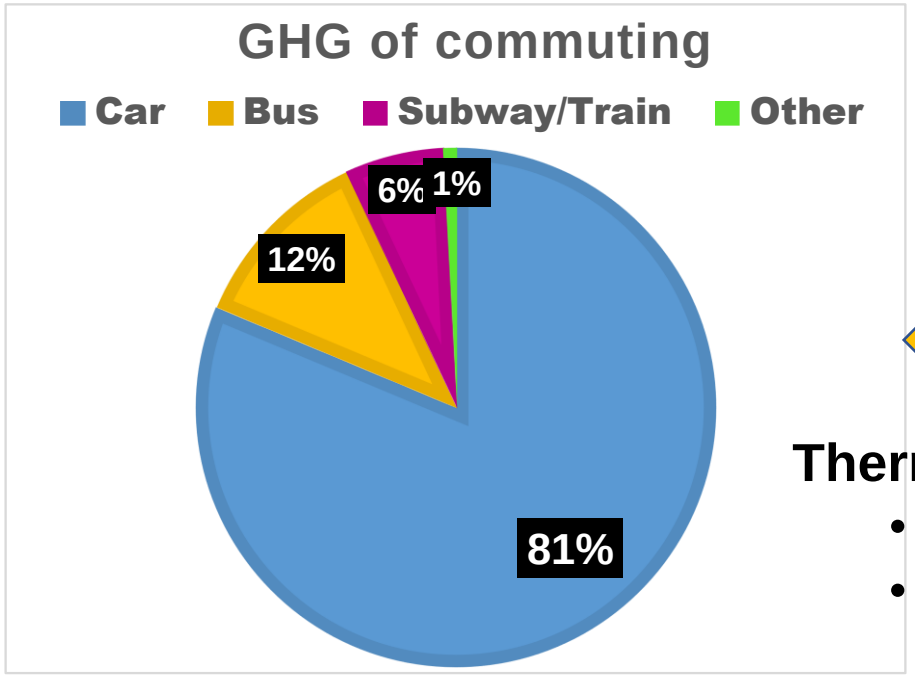
Pr. A. Bouscayrol
(ST, L2EP)

Pr. E. Castex
(SHS, TVES)

University carbon footprint

In 2020
74 000 students
7 000 staff members
Green House Gases (GHG) 52 000 tons CO2eq

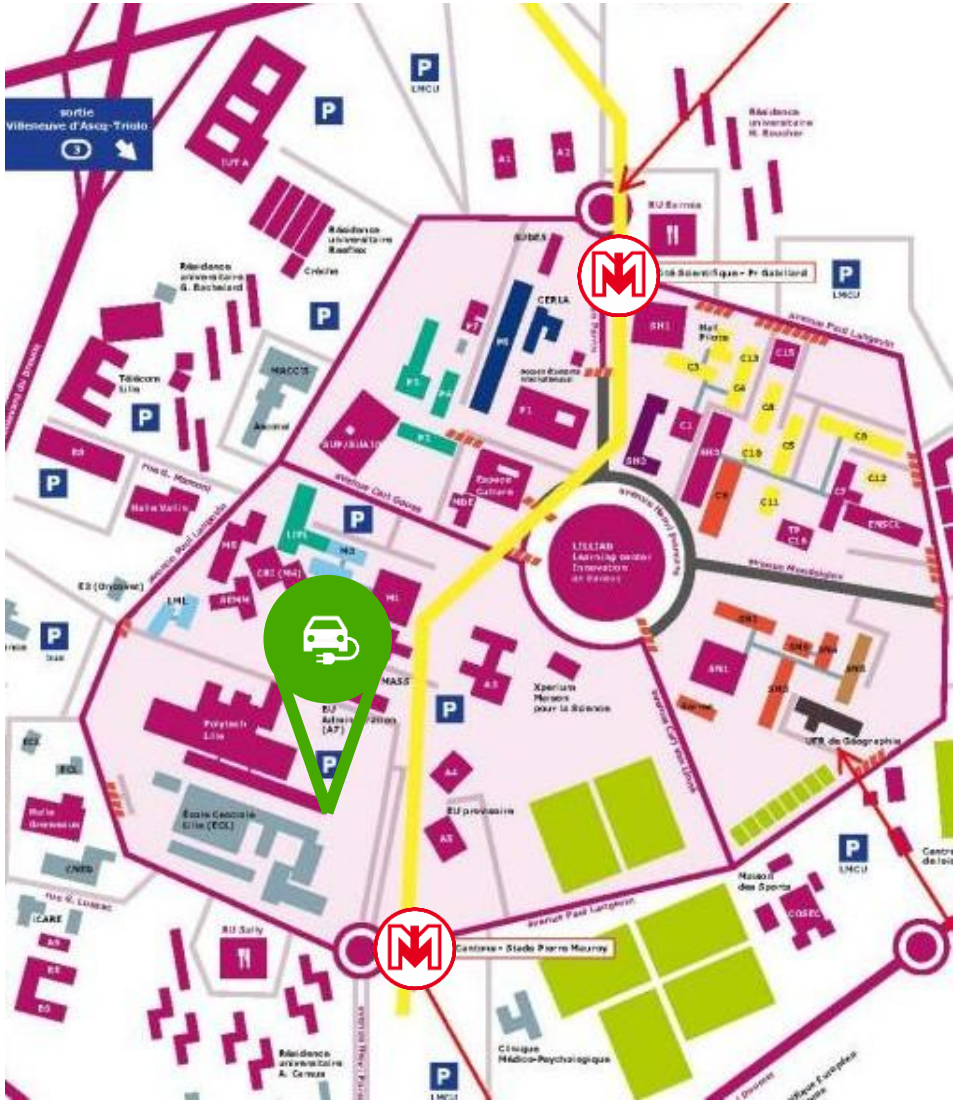




Thermal cars

- only 24% of km
- but 81% of GHG

Campus “Cité scientifique” as demonstrator (Living Lab)



20 000 students

2 000 staff

80 buildings / 110 ha

1 hub de bus

2 subway stations

5 000 thermal vehicles

Every day!!

e-mobility transition?

Thermal vehicles = 41% of the GHG of the University

How to motivate commuters with thermal vehicle to switch to low-carbon alternative?

[ADEME 2022]

	TV 1 person	TV 2 persons	EV 1 person	EV 2 persons	bus GNV*	subway	bike
kgCO2eq / km	0,22	0,11	0,1	0,05	0,12	0,03	0
GHG saving	reference	50%	55%	**77%**	45%	**86%**	**100%**

* Natural Gaz Vehicle

5 000 Thermal Vehicles (TV)

Which distribution?

Which incentives?

Which constraints?

Which cost?

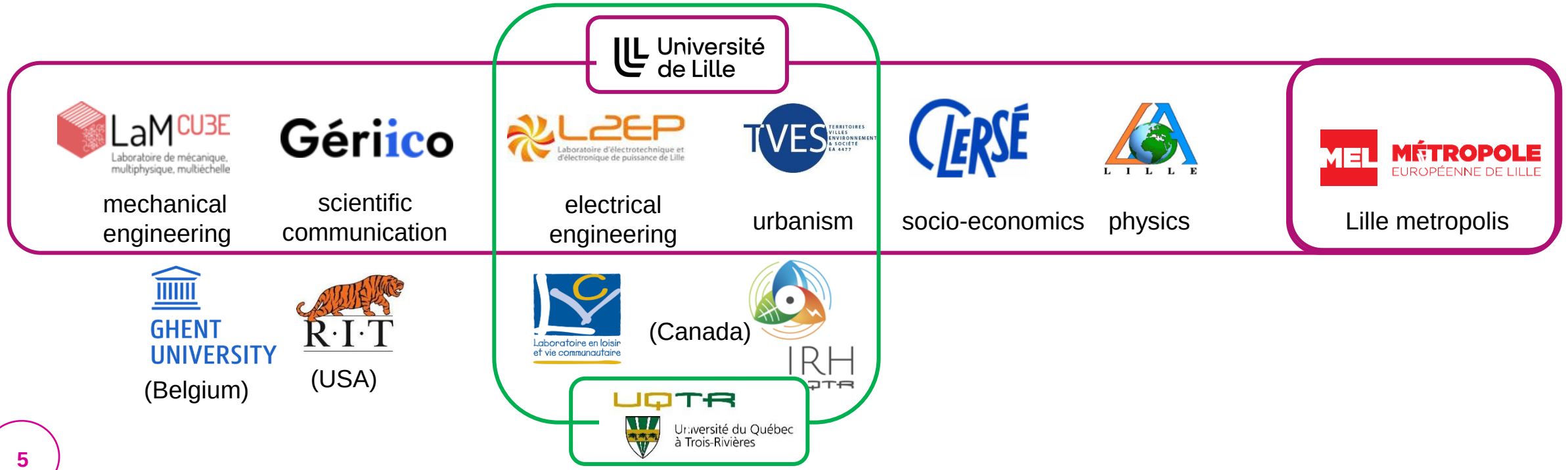
Which technologies?

Interdisciplinairy Programme

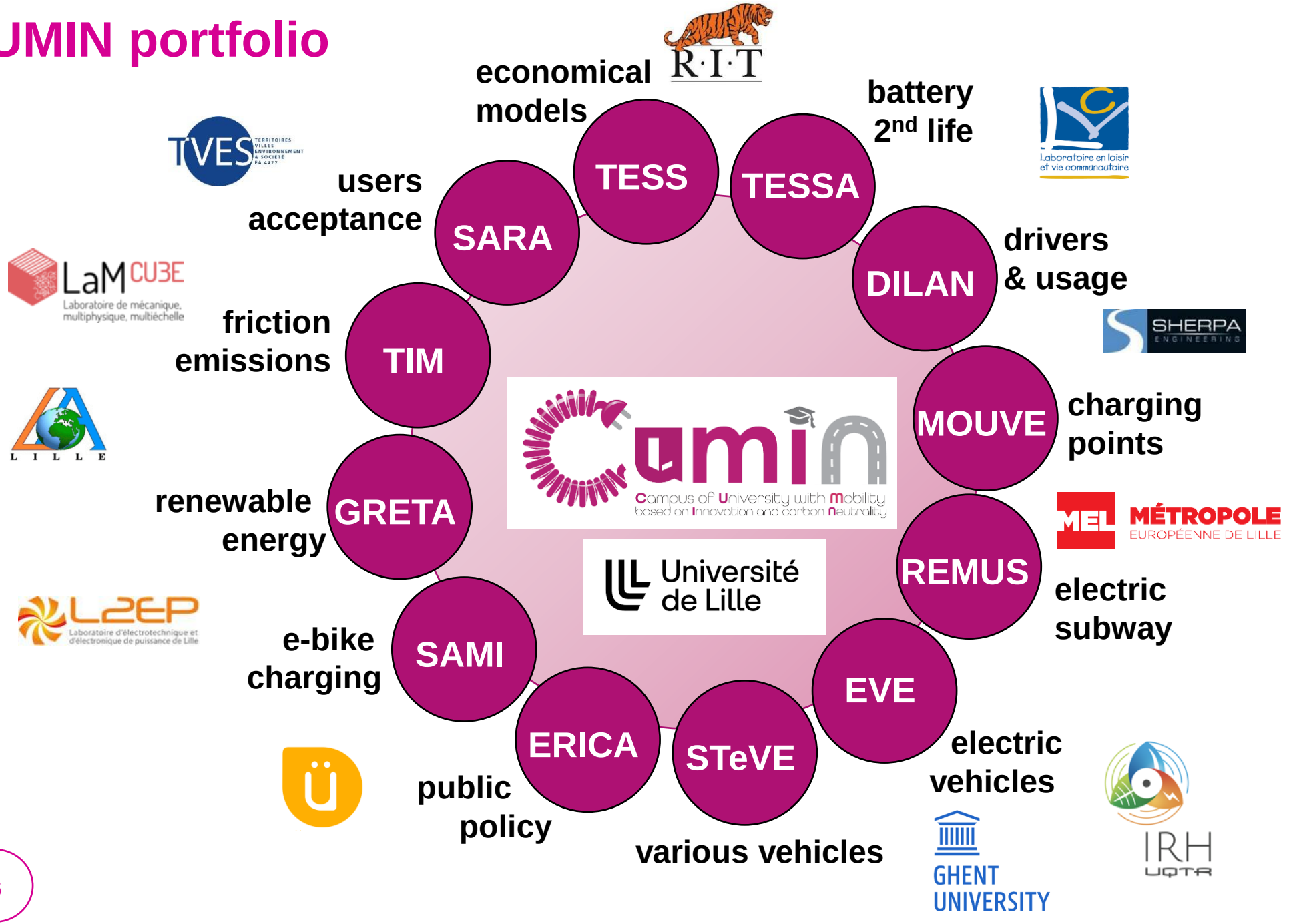
Objective: flexible methods and tools for e-mobility transition

Mean: demonstrator campus(Living Lab)

Outputs: innovative technical solutions…. to sustainable urban mobility plan



CUMIN portfolio



Funding

I-SITE UNIVERSITÉ LILLE NORD-EUROPE
Université de Lille
MESHS Lille Nord de France
MEL MÉTROPOLE EUROPÉENNE DE LILLE
Région Hauts-de-France
l'Europe s'engage en Hauts-de-France avec le FEDER
Liberté • Égalité • Fraternité RÉPUBLIQUE FRANÇAISE
bpifrance
Agence Nationale de la Recherche ANR
INVESTIR L'AVENIR
UNION EUROPEENNE

Supports

MEGEVH French network on HEVs
COMASUS Continuum de l'énergie
convertisseur d'énergie Intégré Intelligent
Panda
ELSAT2020
RITMEA Nos recherches. Vos innovations
Energie Electrique 4.0

Scientific outcomes

A unique interdisiplinary approach

from theory to experimenation

from experimentation to theory

Flexible methods and tools

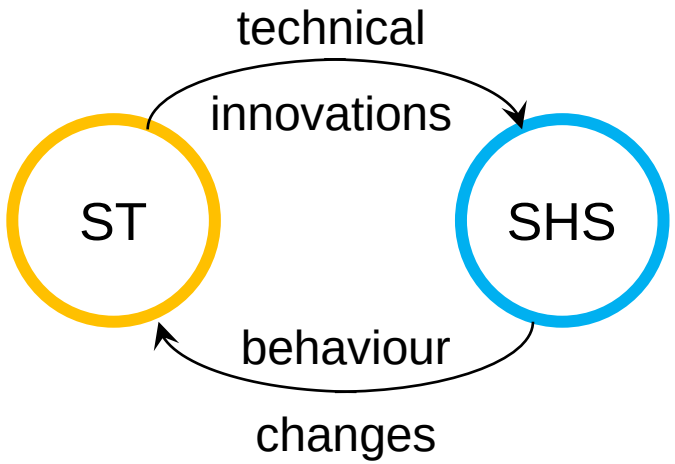
with different spatial

and temporal layers

Accurate and reliable results

with validation and

good understanding



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Accurate energy consumption for comparison of climate change impact of thermal and electric vehicles

A. Desreveaux [a,*], A. Bouscayrol [a], R. Trigui [b], E. Hittinger [c], E. Castex [d], G.M. Sirbu [e]

[a] Univ. Lille, Arts et Metiers Institute of Technology, Centrale Lille, Junia, ULR 2697-L2EP, F-59000, Lille, France
[b] Univ Eiffel, Univ Lyon, ENTPE, LICIT-ECO7, F-69675, Lyon, France
[c] Rochester Institute of Technology, Rochester, NY, 14623, USA
[d] Univ. Lille, Univ. Littoral Côte d'Opale, ULR 4477 – TVES – Territoires Villes Environnement & Société, F-59000, Lille, France
[e] Renault Technologie Roumanie SRL, 062204, Bucharest, Romania

ARTICLE INFO

Handling Editor: X. Ou

Keywords:
Electric vehicle
Conventional vehicle
Life cycle assessment
Global warming potential
Vehicle simulation

ABSTRACT

Performing a climate impact assessment of vehicles is essential for comparing different powertrain options during an entire vehicle life. Life Cycle Assessment (LCA) is used to estimate these effects over a vehicle's lifecycle, including manufacturing, usage, and end-of-life phases. LCA comprises several indicators, such as the Global Warming Potential (GWP). Generally, LCA or GWP studies use manufacturer-reported standard cycle data to estimate the energy consumption of vehicles. In this article, we develop diesel, gasoline, and electric vehicle simulation tools using the Energetic Macroscopic Representation formalism to evaluate that practice. These simulations are validated with actual, measured driving cycles. The simulations are then used to compare the calculated GWP from real, measured driving cycles relative to standard driving cycles used as industry benchmarks. The results show that standard driving cycles consistently underestimate the benefit of switching from fossil fueled vehicles to electric vehicles. Finally, a sensitivity analysis of the battery life duration is included in this work. It shows that the replacement or second life of batteries is also a key parameter in the GWP advantages of electric vehicles.

Societal outcomes

Université de Lille

Contribution of CUMIN:

- Ecologic Transition Plan of University of Lille (2023-2033)
- 3 committees on « Sustainable Development Goals » among 7
- Transition week (24-28 March) workshops & vehicle tests

Demonstrator for:

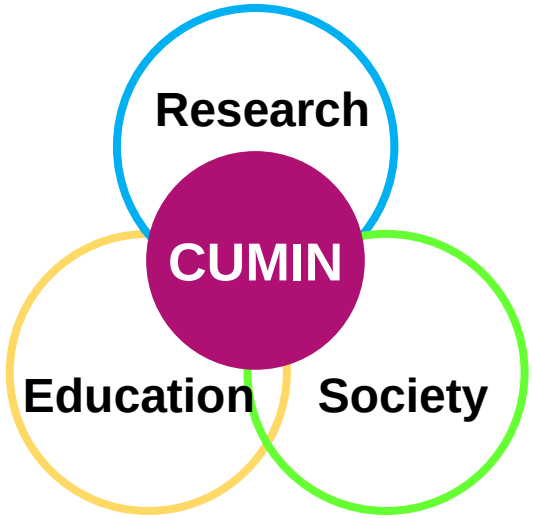
- Lille European Metropolis
- Other international campuses
- etc.

MEL MÉTROPOLE EUROPÉENNE DE LILLE

Campus Living Lab

Methods & tools ?

Education outcomes



eV platform visits
(Univ, IUT, Polytech'Lille, Centrale Lille, ENSAM)

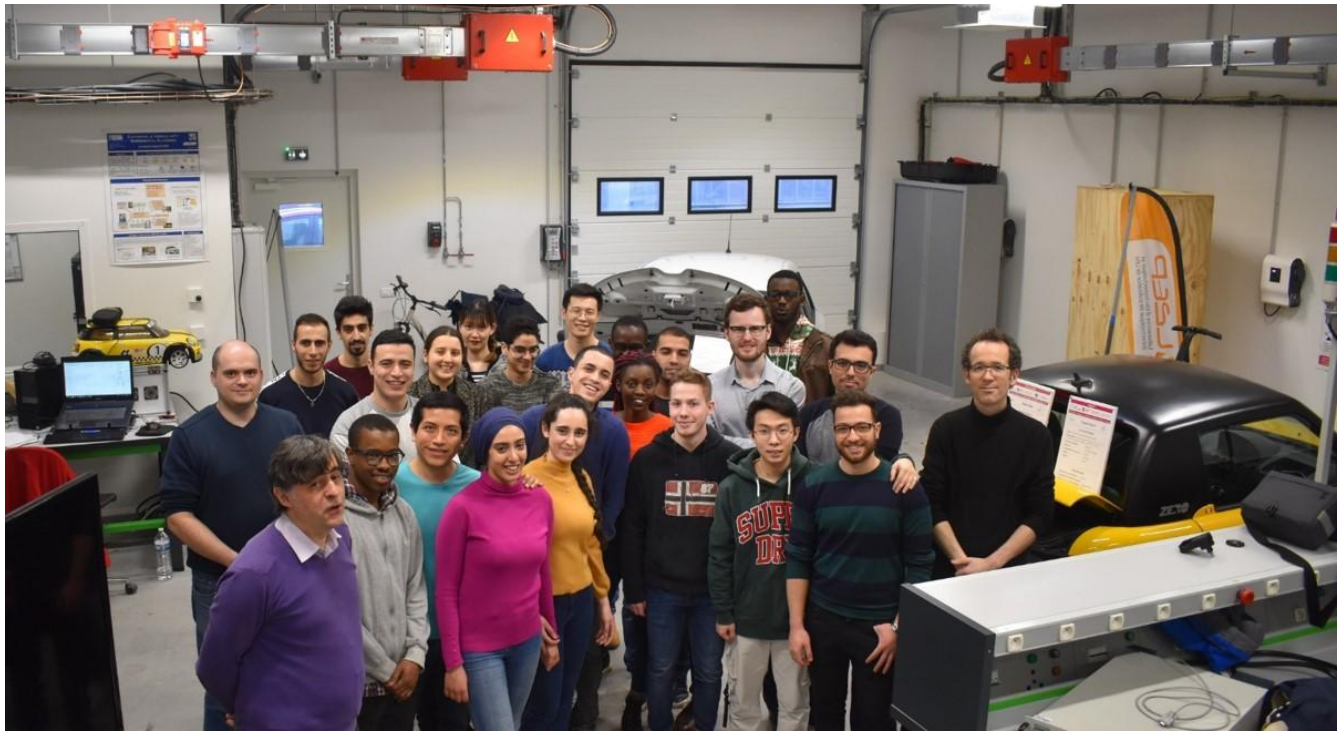
Various projects
(Bachelor, Master, ST & SHS)

Lectures & seminars
(Master ST & SHS)

A transversal doctoral unit
« Green Mobility » (ST & SHS)

Co-supervised PhD theses

- **6 defended**
- **4 on-going**



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CUMIN-SARA

(Social Acceptance of electric vehicles in Restricted Areas)

L. Junker, E. Castex,

A. Bouscayrol, C. Audouit

[Junker et al., IEEE-VPPC'24]

About SARA…..

Social

Acceptability

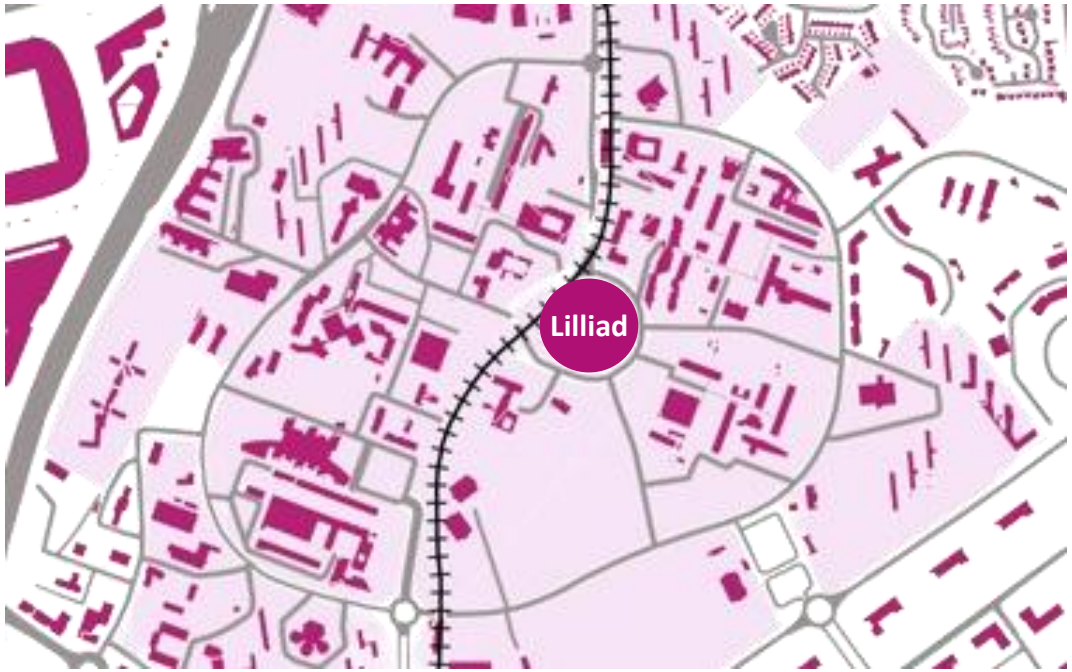
of electric vehicles in

Restricted

Areas

DEF: *Social acceptability refers to the **level of approval a project or decision gets from a population**. It is based on the collective belief that the proposed option is preferable to alternatives, including the status quo. This concept includes **legislative, economic, environmental, and social dimensions**, reflecting the **community's consensus** on the merits of the undertaking.*

In our case, the campus :



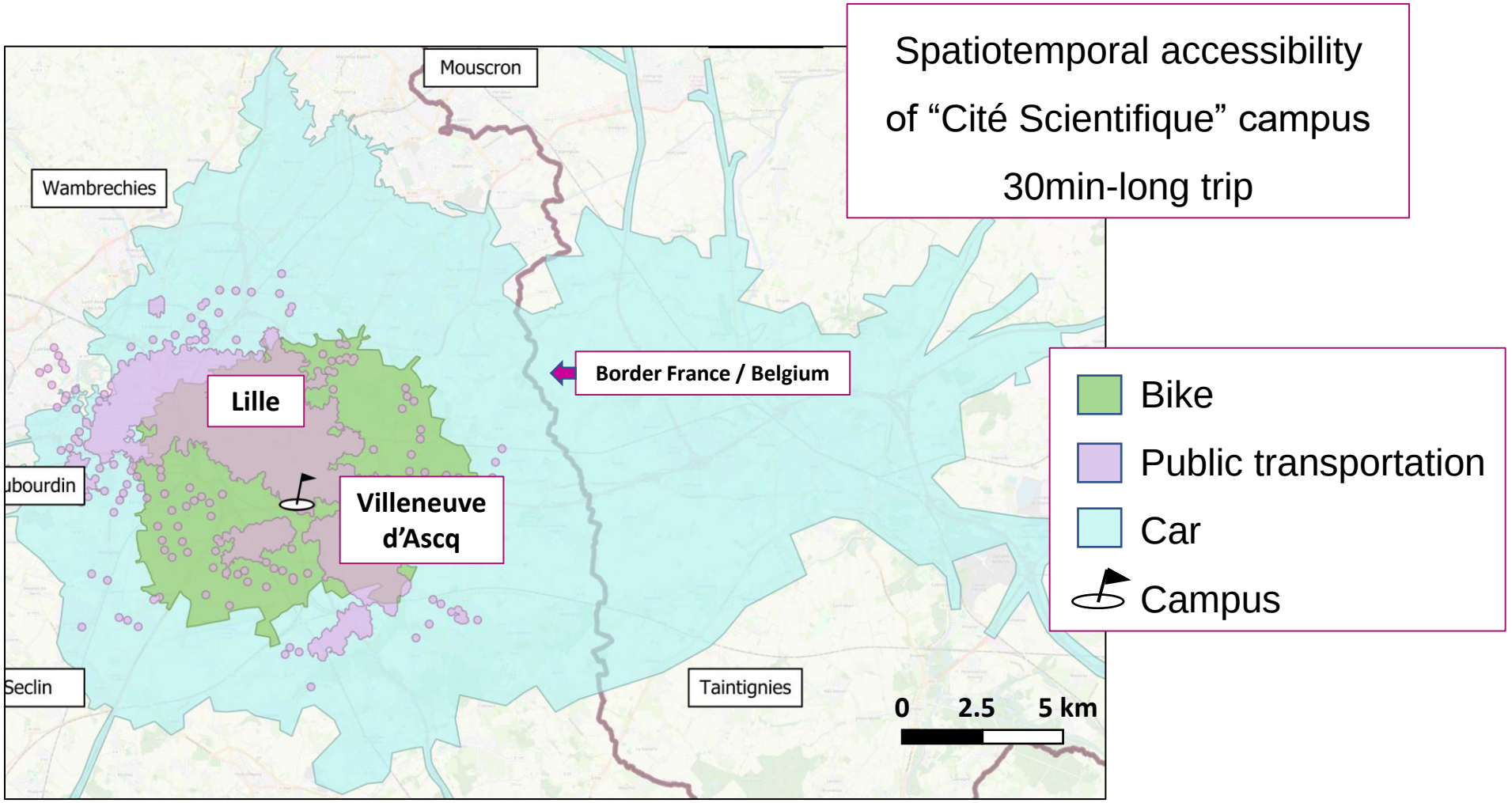
Objectives

Identify levers for action to decarbonize commuting trips

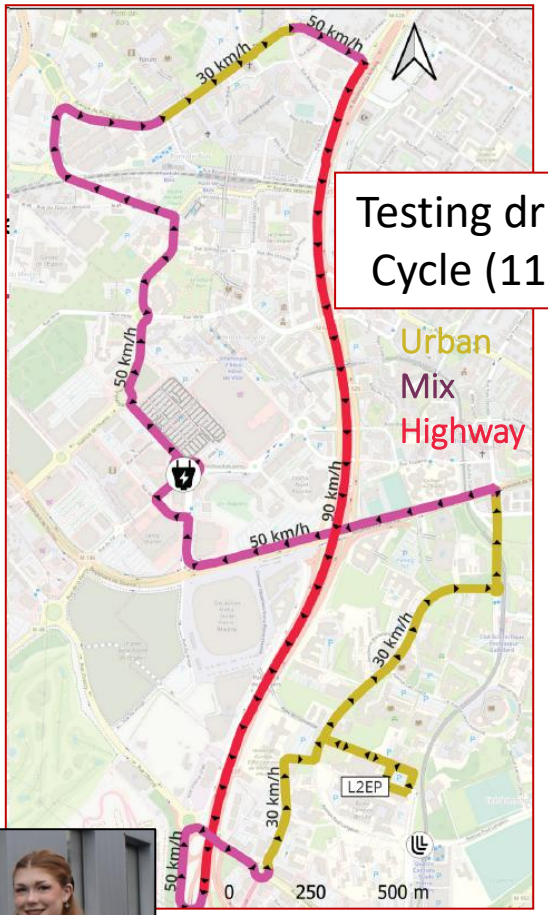
Collecting information on the mobility habits of campus users

Identify obstacles and think about planning solutions that encourage the use of sustainable mobility

Isochore maps of various transport types



CUMIN-SARA – Driving tests of an EV



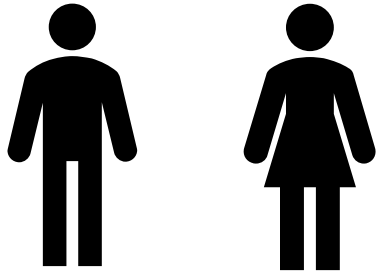
ST Engineer:

1. Instrumentation of the EV
2. Charging
3. Collection of recorded data

SHS Engineer:

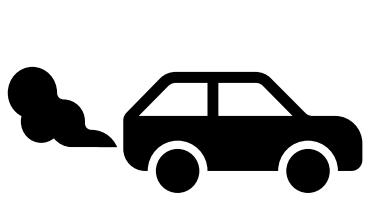
1. Survey on EV perception
2. Driving tests
3. Survey on EV perception and commuting habits

Panel (124 persons)



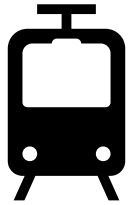
57% 43%

74% live in the European Metropolis of Lille



42%

Combustion engine car



27%

Subway and/or Tramway

8%

Walking

8%

Electric car

4%

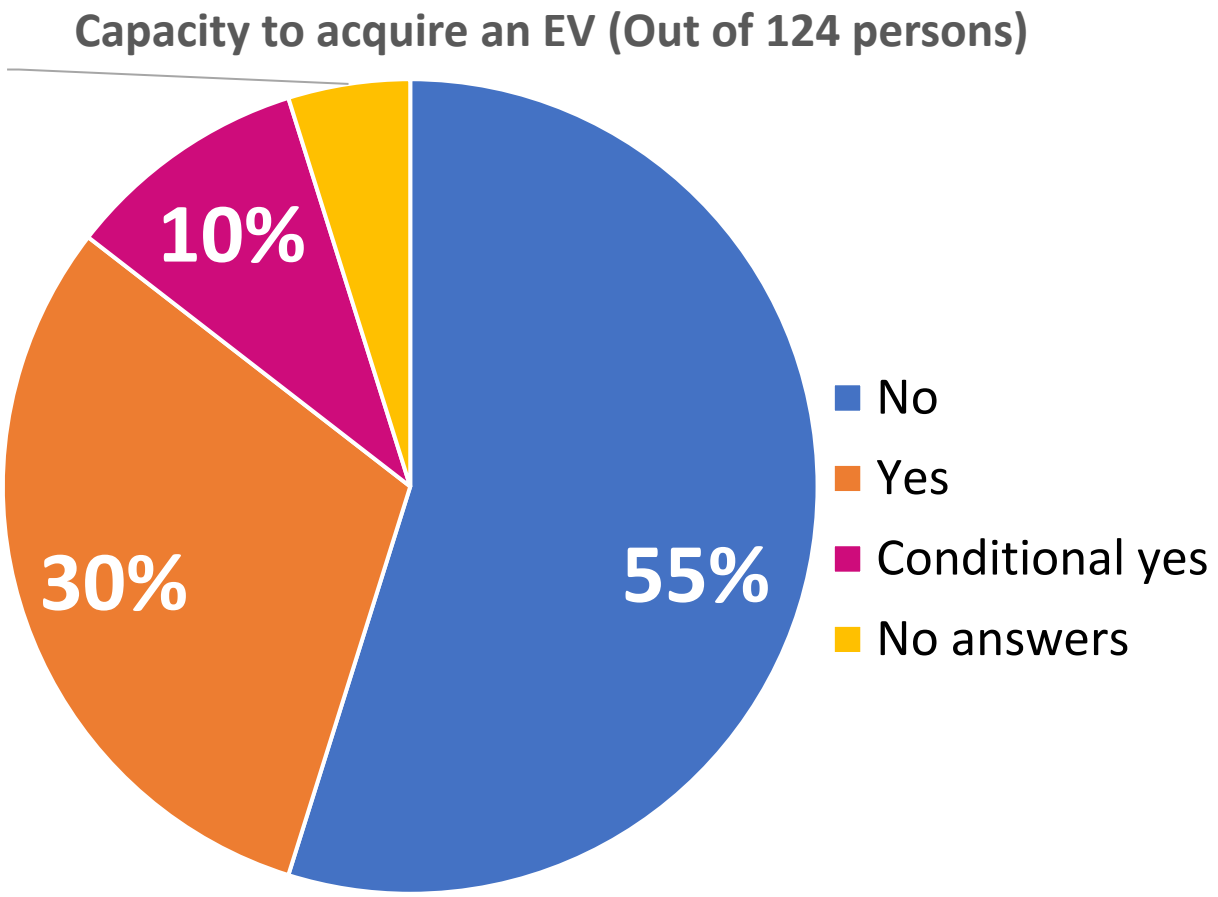
Carpooling

4%

Electric bike

their commuting

CUMIN-SARA – First results (SHS)



Socio-behavioural aspects

- 49% unaware of campus charging stations
- 82% in favor of adopting an EV

  but 55% cannot buy EV
- 51% with cost as their first issue

Connexion with CUMIN-TESS
(Technical Economical Study of Sustainable campuses)

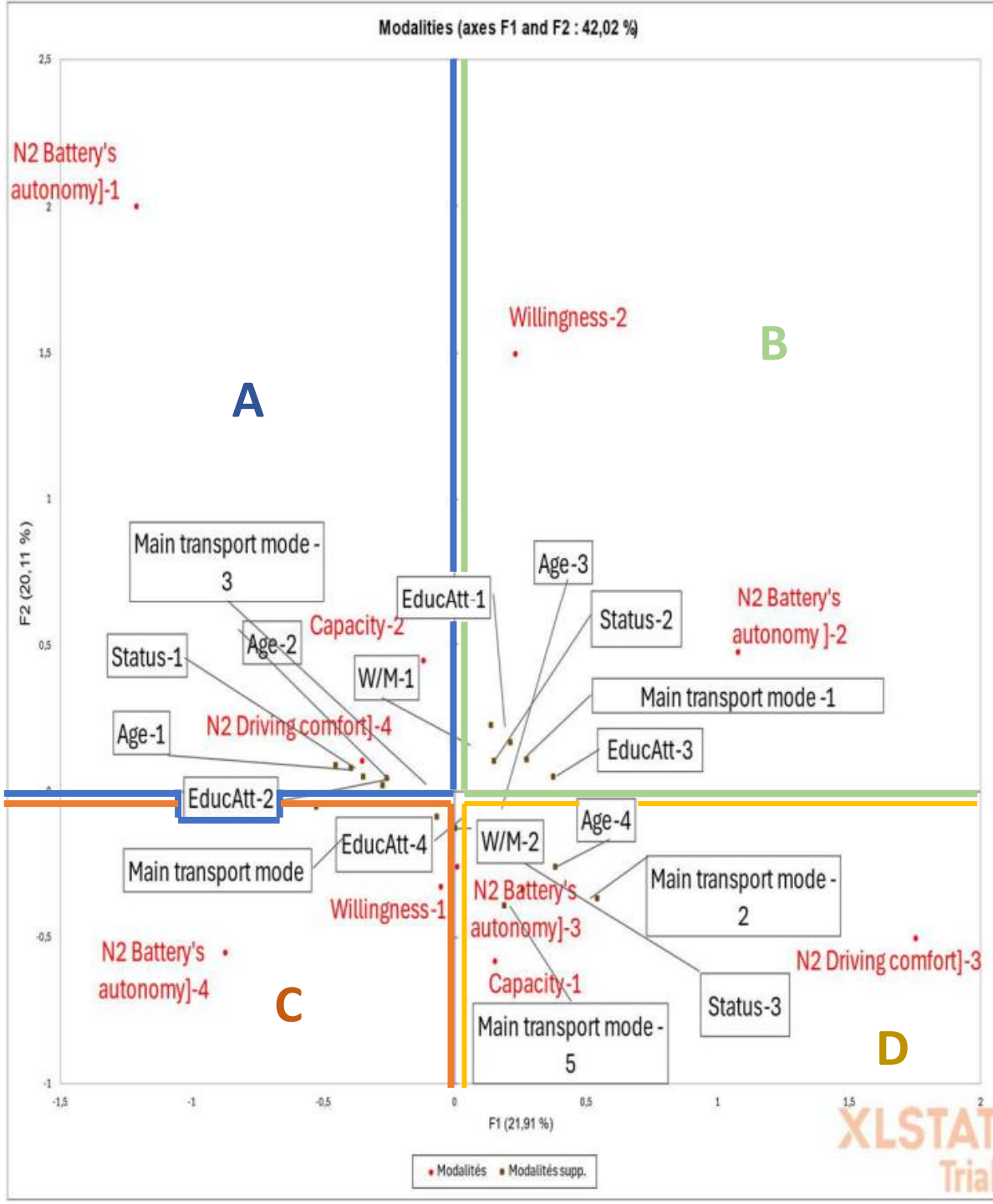
[Junker et al., IEEE-VPPC'24]

CUMIN-SARA – First results (SHS)

Multiple correspondences analysis

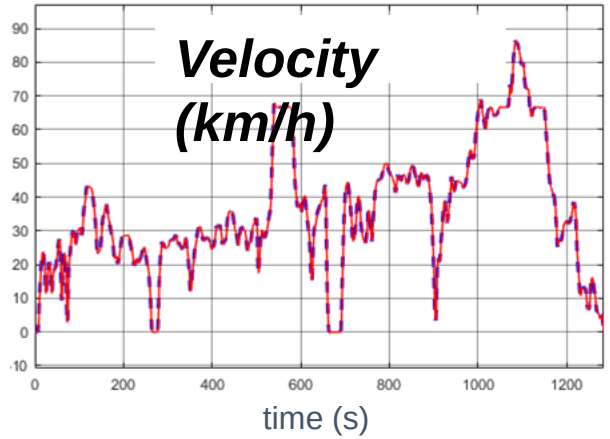
Groupe B

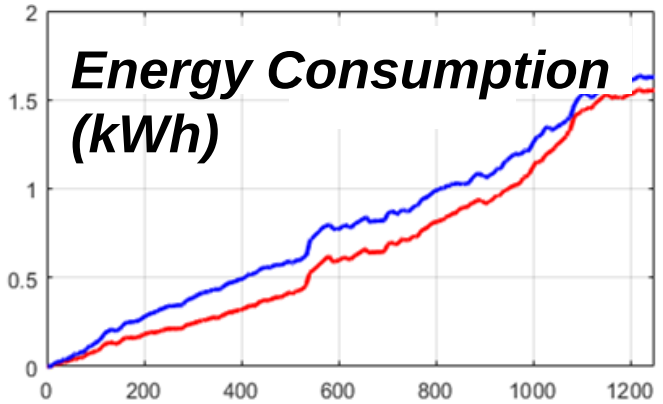
- Find the driving range unsufficient
- Liked the driving comfort
- Able to adopt and electric vehicle but not wanting to
- Between the ages of 40 and 50 year old
- Mostly commute through individual thermal cars
- Mostly administrative and technical staff



[Junker et al., IEEE-VPPC'24]

CUMIN-SARA – First results (ST)





Technical aspects

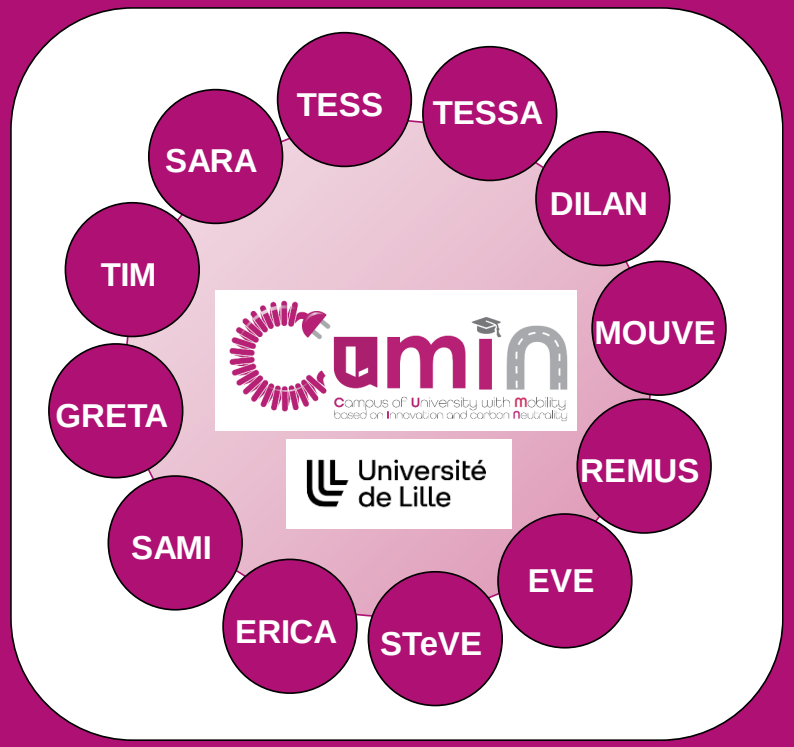
- Variation in terms of energy consumption of 21%
- Impact of traffic ?
- Impact of driver ?

Connexion with CUMIN-DILAN (Driver-In-the-Loop of transport Application for New e-mobility)

If you'd like to contribute to our research and try out an electric vehicle, you can reach out to: lucie.juncker@univ-lille.fr

(A valid driving license is mandatory)

https://cumin.univ-lille.fr/

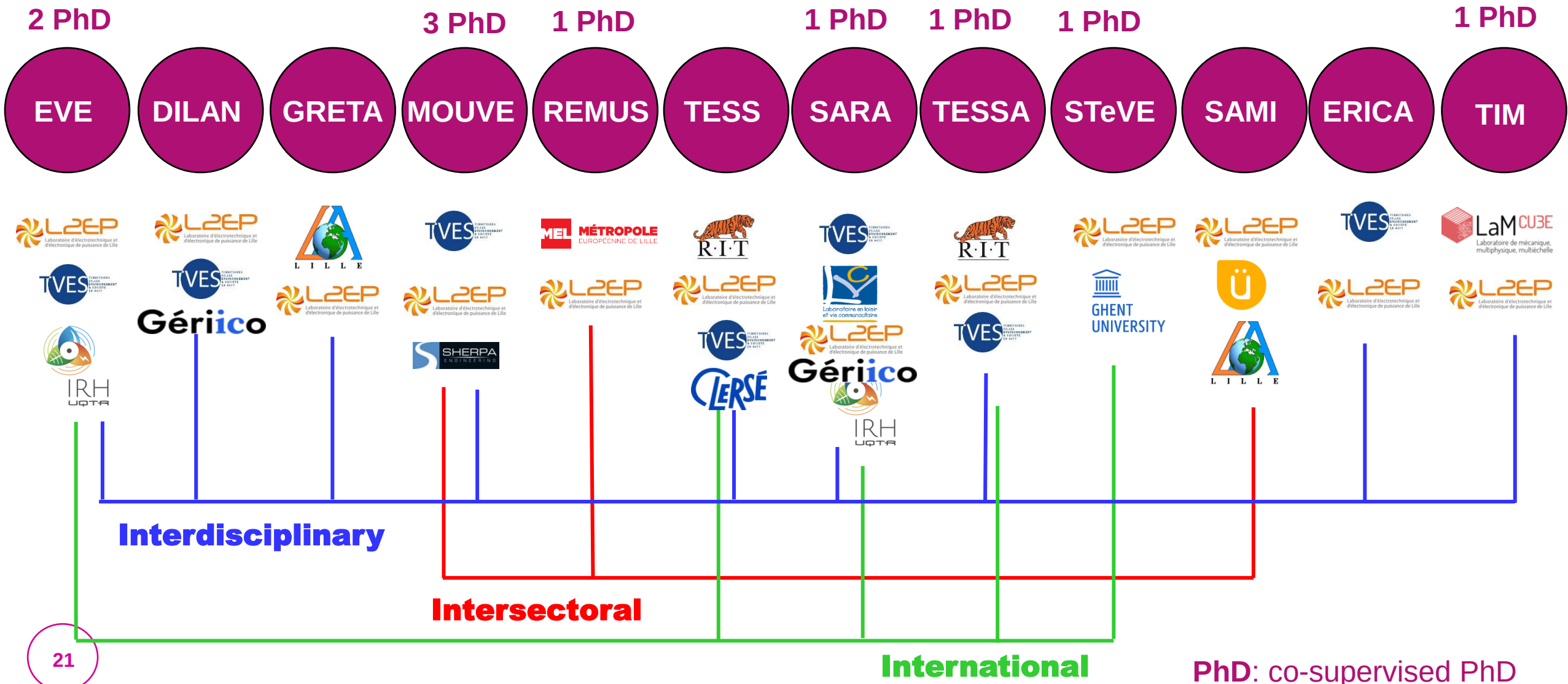


Other Interdisciplinary projects

CUMIN Project

Conditions:

1. Contribution to CUMIN with 2 CUMIN members
2. Intersectoral or Interdisciplinary or International (H2020 / Horizon Europe)

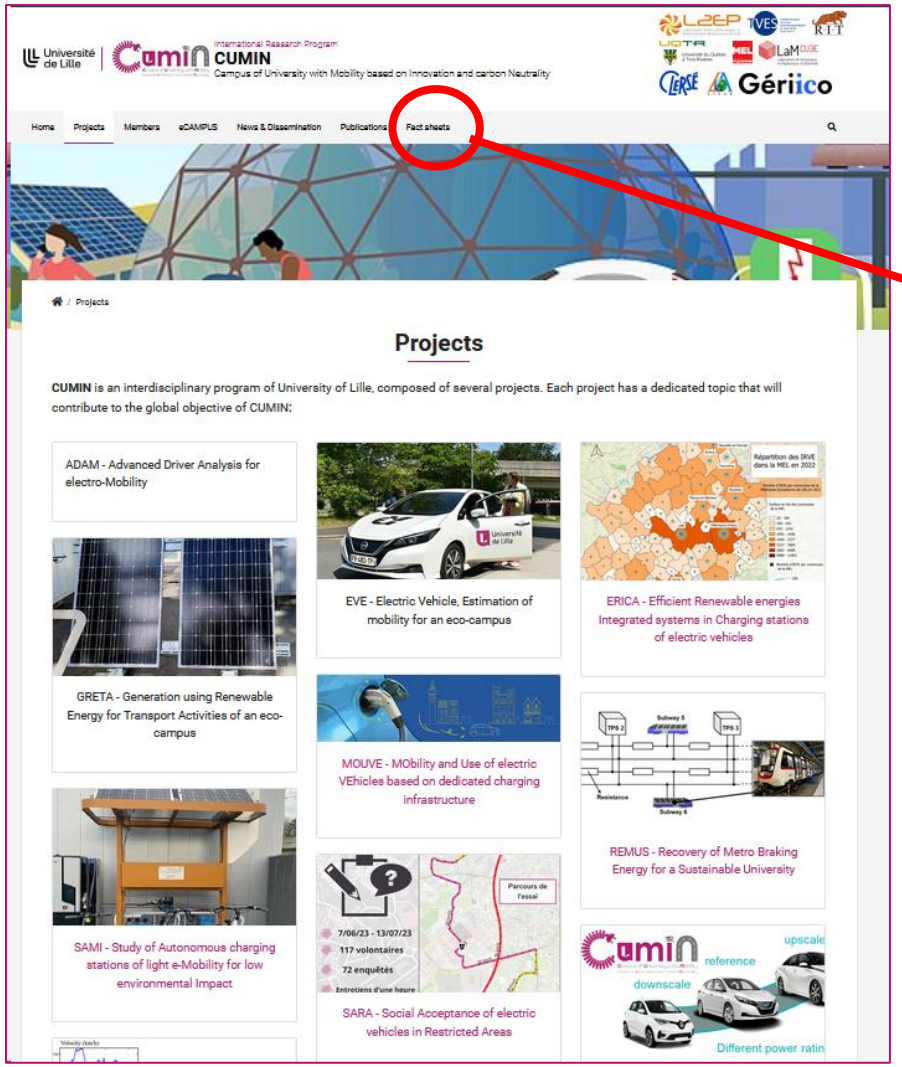


PhD: co-supervised PhD

CUMIN website

https://cumin.univ-lille.fr/

CUMIN projects description



Informative 1-page factsheets for a broad (French and English):

- GHG of University of Lille
- Life cycle impacts of electric and thermal vehicles
- Impact of teleworking
- Ecologic transition plan of University of Lille

CUMIN annual workshop 12-13 February pm

CUMIN annual workshop
12 & 13 February 2025

Université de Lille

CUMIN: Campus of University with Mobility based on Innovation and carbon Neutrality https://cumin.univ-lille.fr/

More information @ https://cumin.univ-lille.fr/

University of Lille & on-line

https://univ-lille-fr.zoom.us/my/amandinelepoutre?pwd=DOBjEX-iDY0avoAv9mxbzRWLtcIhGj0.1

	Wednesday 12 February 2025, Lilliad, Amphi B	
13:30	Welcome coffee	
14:00	CUMIN	**A. Bouscayrol, E. Castex** (L2EP/TVES, ULille)
14:30	SARA: Driving test	**L. Juncker, E. Castex, A. Bouscayrol** (TVES/L2EP, ULille)
14:45	SARA: open data platform on e-mobility	**Q. Pochet, A. Fraisse, A. Bouscayrol** (GERiiCO/L2EP, ULille)
15:00	GRETA: solar energy potential	**N. Ferlay** (LOA, ULille),
15:15	EVE: Nissan Leaf consumption	**A. K. Bensadoun, A. Djemadi, C. Plomion** (Master VIE)
15:30	**Coffee break**	
15:45	DILAN: Driving In the Loop	**F. Tournez, W. Lhomme, A. Bouscayrol** (PANDA/L2EP, ULille)
16:00	DILAN: Road Runner	**I. Boukadia, I. Jamal Eddine** (Master VIE)
16:15	STEVE: Scaling Laws/for EVs	**A. Aroua et al.** (UGhent/L2EP, ULille)
16:30	**Coffee break**	
16:45	TIM: Hybrid braking	**M. Lehut, J.-F. Brunel, W. Lhomme** (L2EP, LamCube, ULille)
17:00	TIM: Hybrid braking	**D. Belbachir, E. Hodonou, I. Seck** (Master VIE)
17:15	eCAMPUS: general presentation	**A. Groleau et al.** (LAI eCAMPUS, ULille/ Univ Trois Rivières)
17:30	eCAMPUS: Nissan leaf charging	**S. Revankar et al.** (eCAMPUS/L2EP, ULille/ IRH Univ 3 Rivières)
17:45	**End of the day**	

	Thursday 13 February 2025, ESPRIT, amphi ATRIUM	
12:30	Lunch - Barrois	
14:00	CUMIN and SDG chair	**A. Bouscayrol, B. Lemaire-Semail** (L2EP, ULille, Chaire ODD TE)
14:15	REMUS: CO2 of commuting	**C. Mayet, C. Brocart et al.** (L2EP, ULille, MEL)
14:30	REMUS: Tramway energy consumption	**I. Chbiki, F. Mamou, N. Quazil** (Master, VIE, MEL project)
14 :45	REMUS: emulation of subway carroussel	**L. Stassin, C. Mayet** (L2EP, Univ. Lille, MEL)
15 :00	EVE: Bus energy consumption	**D. Akli, C. Bathat, M. Leklou** (M2, VIE, MEL project)
15:15	**Coffee break**	
15:30	TESSA presentation	**E. Hittinger, R. German, E. Caxtex** (RIT/L2EP/TVES, ULille)
15:45	TESS: Leaf cost	**M. Lehut, A. Bouscayrol, E. Hittinger** (L2EP, ULille, RIT)
16:00	TESSA: battery charging	**A. Ndiaye, R. German et al.** (L2EP, ULille, AMPERE Univ. Lyon)
16:15	TESSA: battery ageing	**M. Chaud, R. German et al.** (L2EP, TVES, ULille, RIT)
16:30	**Coffee break**	
16h45	MOUVE: fast charging strategies	**S. Fadili et al.** (Sherpa/L2EP, ULille)
17:00	MOUVE: fast charging station	**B. Catrice, G. Houadenou, B. Makoso Pambou** (M2, VIE)
17:15	MOUVE: bidirectional charging station	**F. Djouab, T. Kadour, V. C. Nguyen** (M2, VIE)
17:30	Visit of eV Platform	
18:00	**End of the seminar**	

Supported by Univ. Lille, i-SITE ULNE, Initiative d'excellence Lilloise, Region Hauts-de-France & MEL

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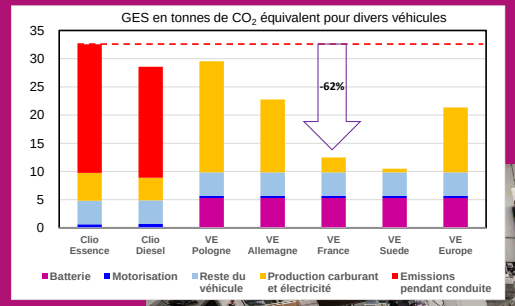

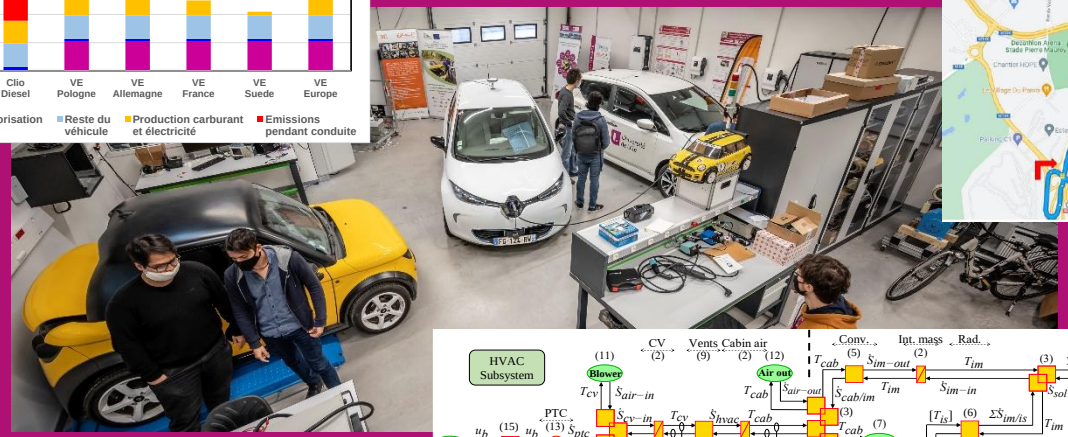

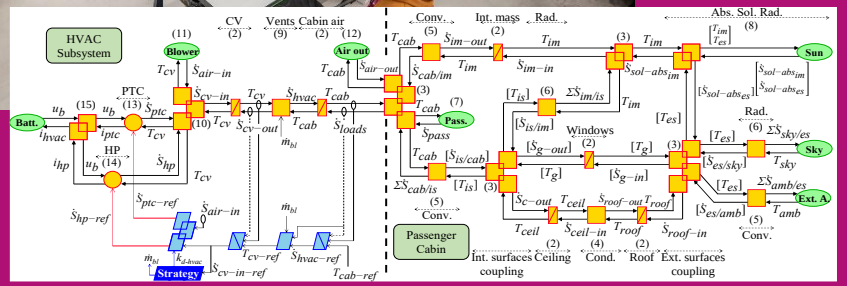

Our university as an exciting living lab towards eco-cities !