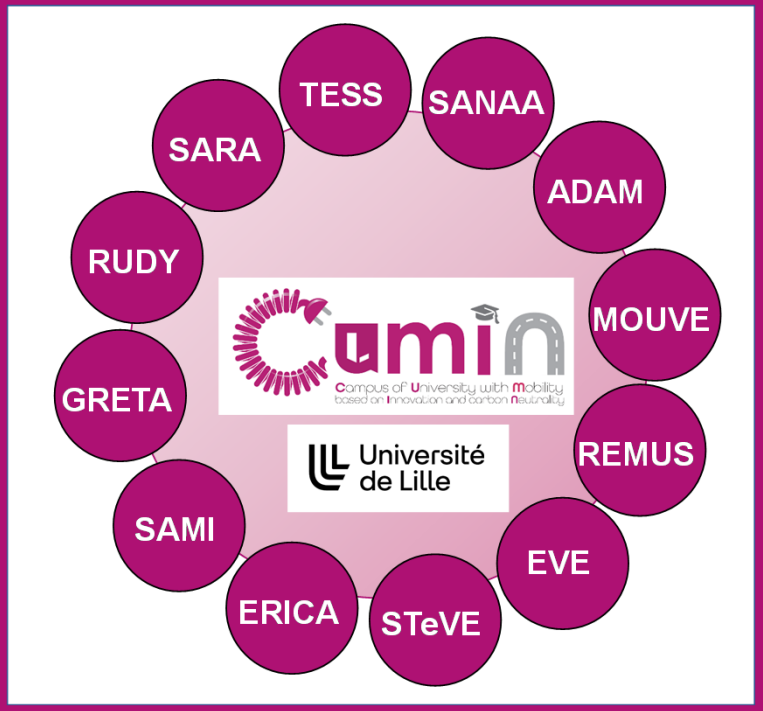
https://cumin.univ-lille.fr/



C ampus of

U niversity with

M obility based on

I nnovation and

N eutral in carbon

Evolution of the CUMIN programme

Coordination:
Prof. Alain Bouscayrol
(L2EP, Univ. Lille, France)

Outline

1. CUMIN context & objective
2. CUMIN project
3. CUMIN new organization

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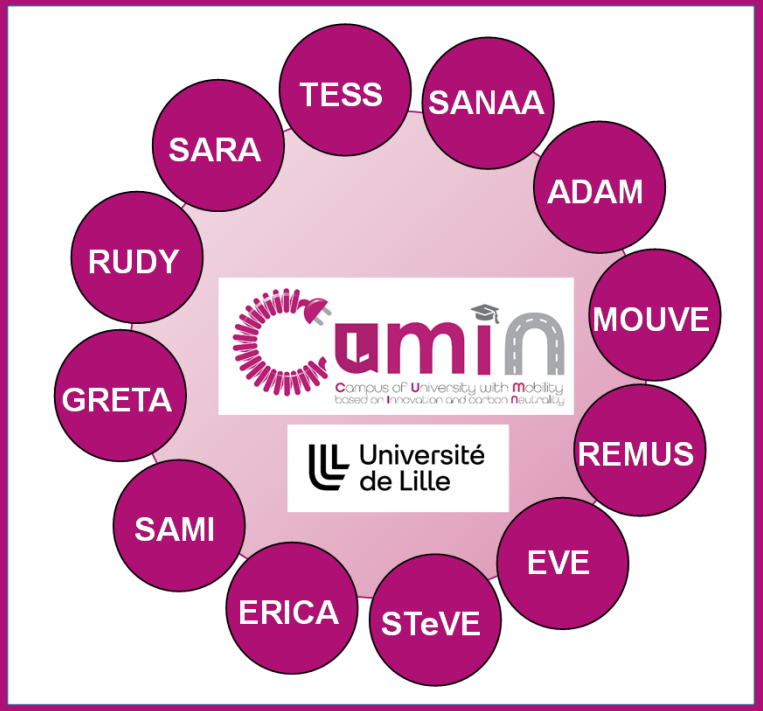
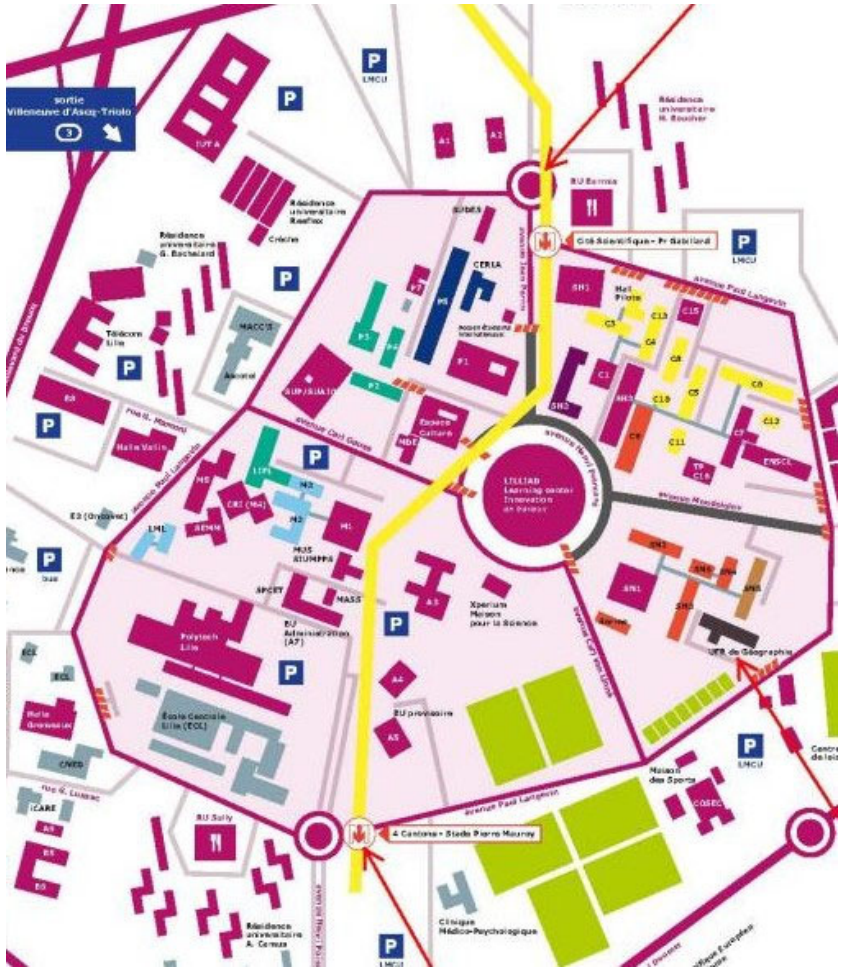


CUMIN context

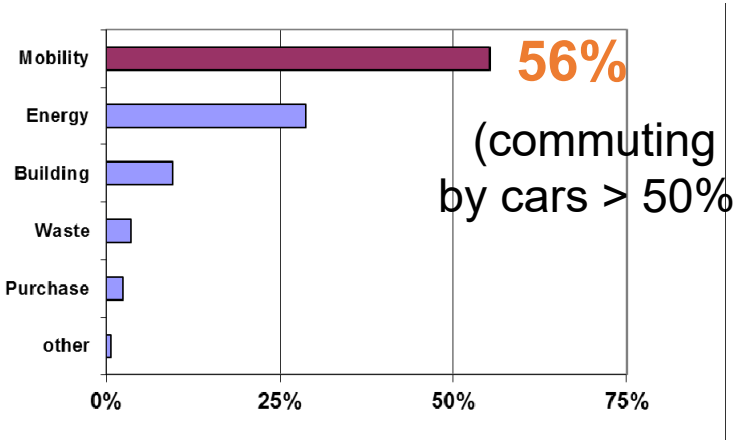
CUMIN Context



Campus “Cité Scientifique” of University of Lille

22 000 users / 80 buildings / 110 ha

Greenhouse Gases



[Bilan Carbone, Lille1, COMUE 2015]

mobility km

- thermal cars 27%
- bus 7%
- subway / trains 63%
- other 3%

mobility GHG

- **thermal cars 78%**
- bus 13%
- subway / trains 4%
- other 4%

2016

CUMIN Campus of University with Mobility based on Innovation and carbon Neutrality

L2EP Laboratoire d'électrotechnique et d'électronique de puissance de Lille

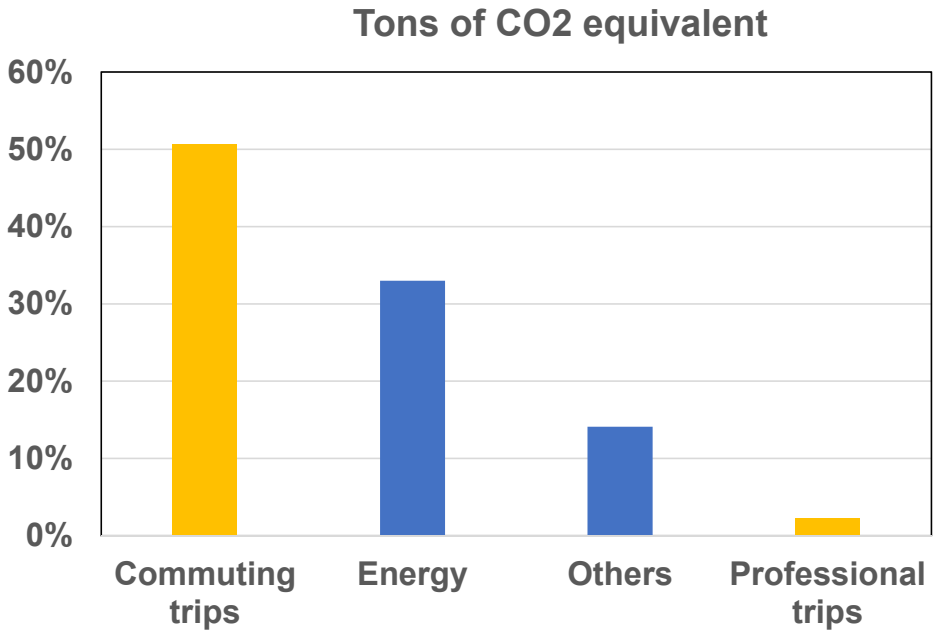
TVES Territoires Villes Environnement & Société EA 4477

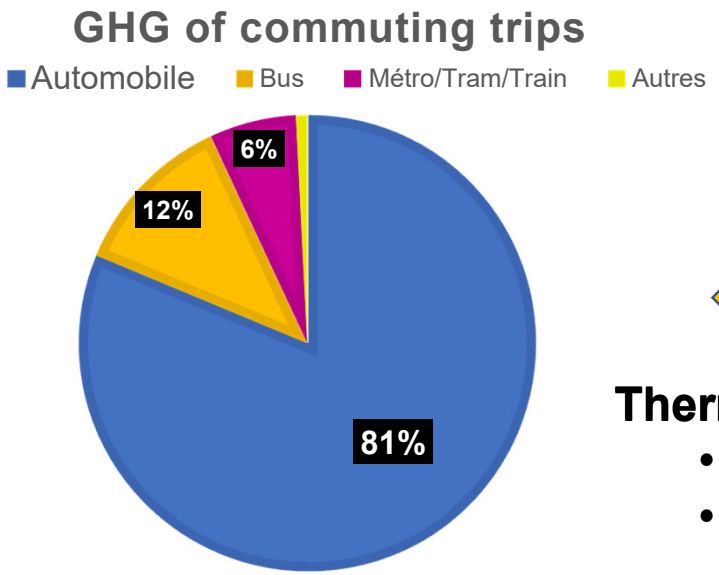
CRIStAL Centre de Recherche en Informatique, Signal et Automatique de Lille

CUMIN carbon footprint update

Université de Lille

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





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

Campus
“Cité Scientifique”
5 000 thermal vehicles
Every day

CUMIN & reduction of commuting GHG

Université de Lille

Thermal vehicles = 41% of the GHG of the University

Alternatives?

e-bus or H2-bus?
but infrastructures

	TV 1 person	TV 2 persones	EV 1 person	EV 2 persons	bus GNV*	subway	bike
gCO2eq / km	0,22	0,11	0,1	0,05	0,12	0,03	0
gain in GHG	reference	50%	55%	**77%**	45%	**86%**	**100%**

* Gaz Naturel pour Vehicule

good solution
when > 10 km

great solution
but infrastructures

best solution
but difficult
when > 10 km

Vehicle GHG divided by 2:
-20% of University GHG

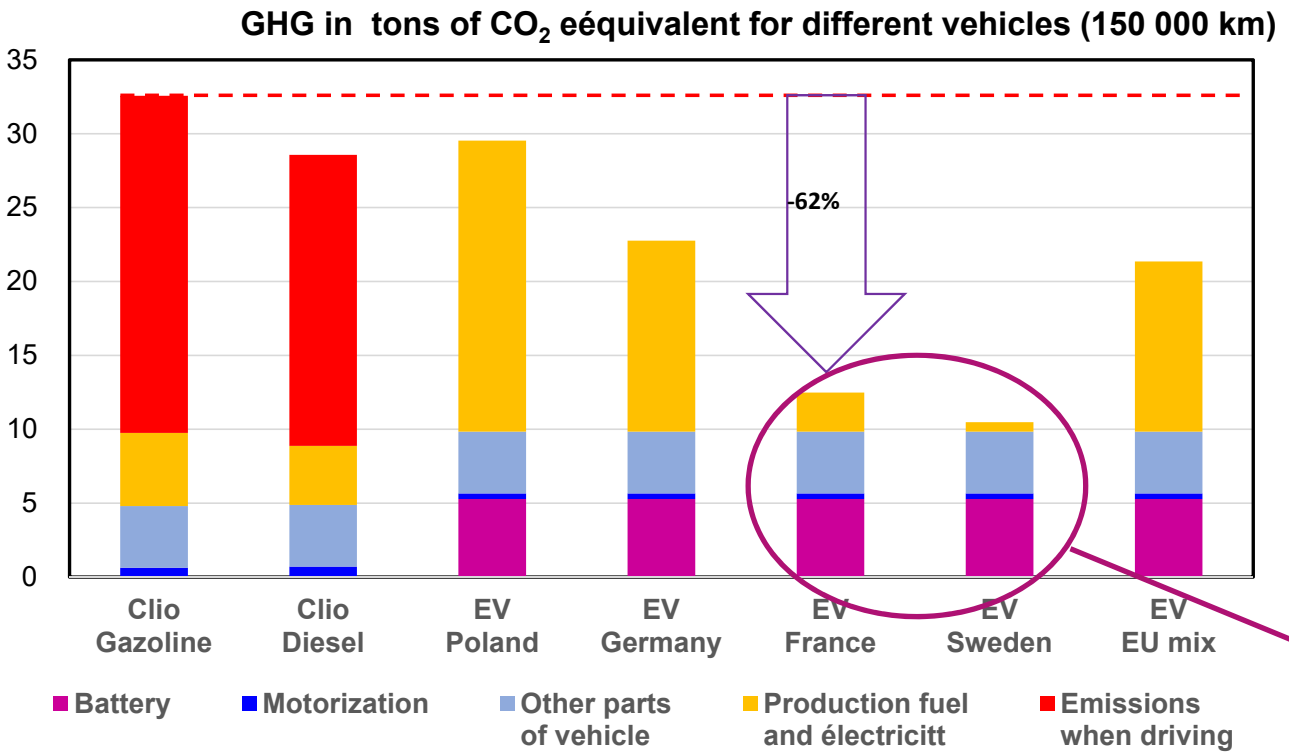
e-bike?

Indicators:

https://agirpourlatransition.ademe.fr/particuliers/bureau/deplacements/calculer-emissions-carbone-trajets

CUMIN & vehicle LCA

Life Cycle Assessment (LCA): manufacturing + usage + end-of-life



Electricity production* (2018-2022):

- Poland: 70% coal
- Germany: 31% coal
- France: 70% nuclear
- Sweden: 80% renewable

Interest of charging with renewable energy

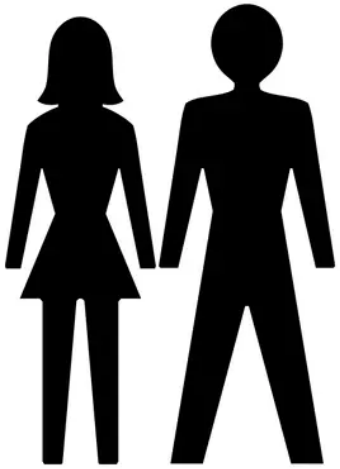
[Desreveaux 2023]

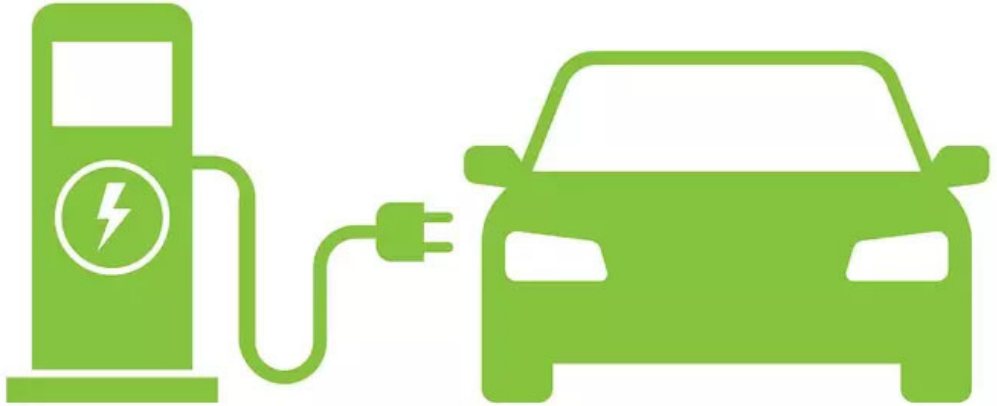
CUMIN & e-mobility challenges

Green Energy

infrastructures

Cost





Emissions

acceptability

Charging time

Driving range

CUMIN & Objective

Development of flexible tools for fast, reliable and efficient transition to e-mobility

- Validation on the campus “cite scientifique” reference case
- Help of decision making for the university transition
- Extension to other study cases

Example: March 2023
Task force on e-mobility for
2023-2033 Univ. plan on ecological transition

Approaches

- Interdisciplinary / intersectoral / international projects
- A campus as demonstrator of small scale city
- Living lab (involvement of the campus users in the research activities)
- Experimental platform with unique set-ups

Example:
instrumented
Hydrogen Car
(unique in France,
iSITE ULNE
funding,
CUMIN-SARA)

Example: March 2023
Commuting trips with users
0. Call for volunteers (TVES)
1. Socio-behavioural questionnaire (TVES)
2. Driving Nissan—Leaf (L2EP)
3. Feedback questionnaire (TVES)
4. Technical analyses (L2EP)
5. Perception analyses (TVES)

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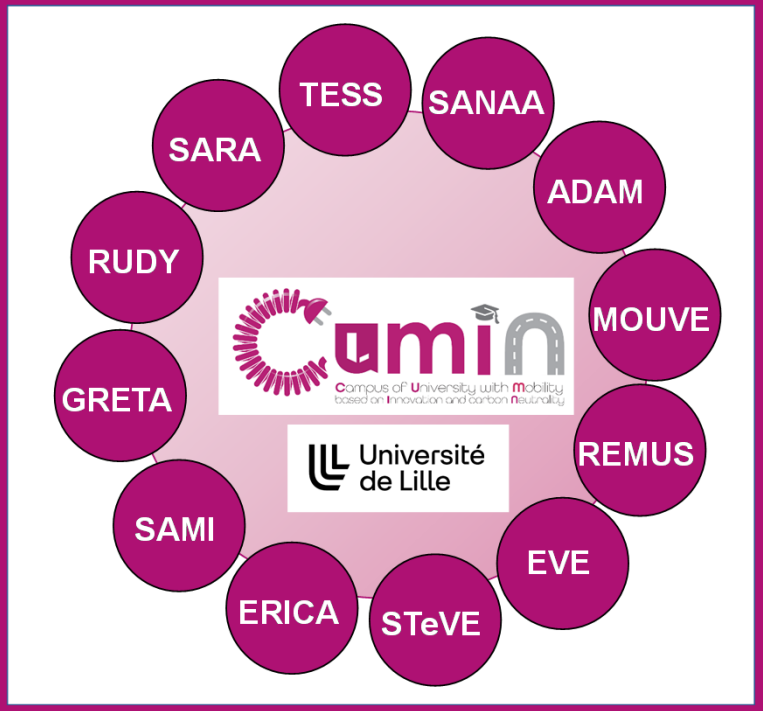
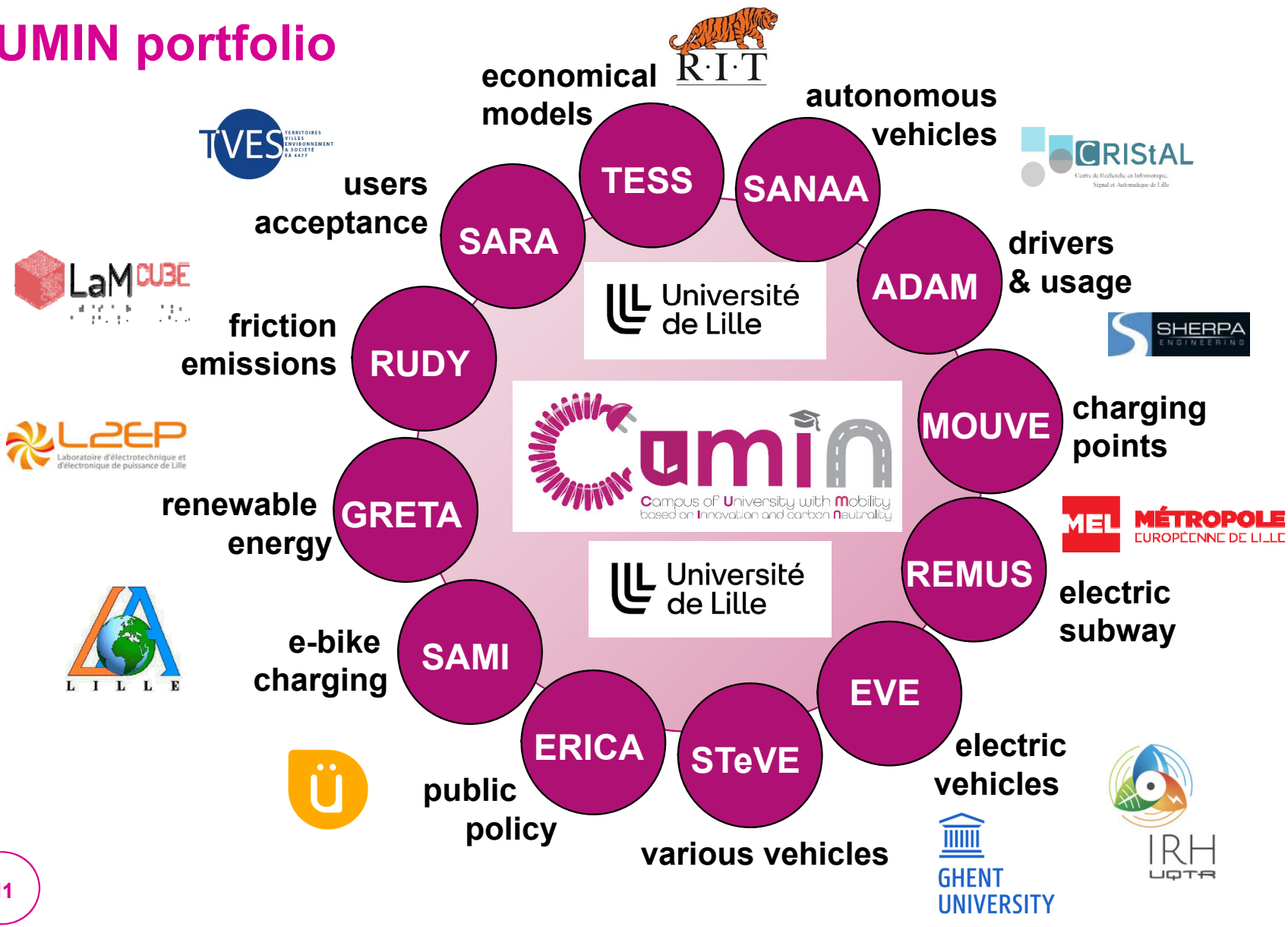


CUMIN projects

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 Européenne

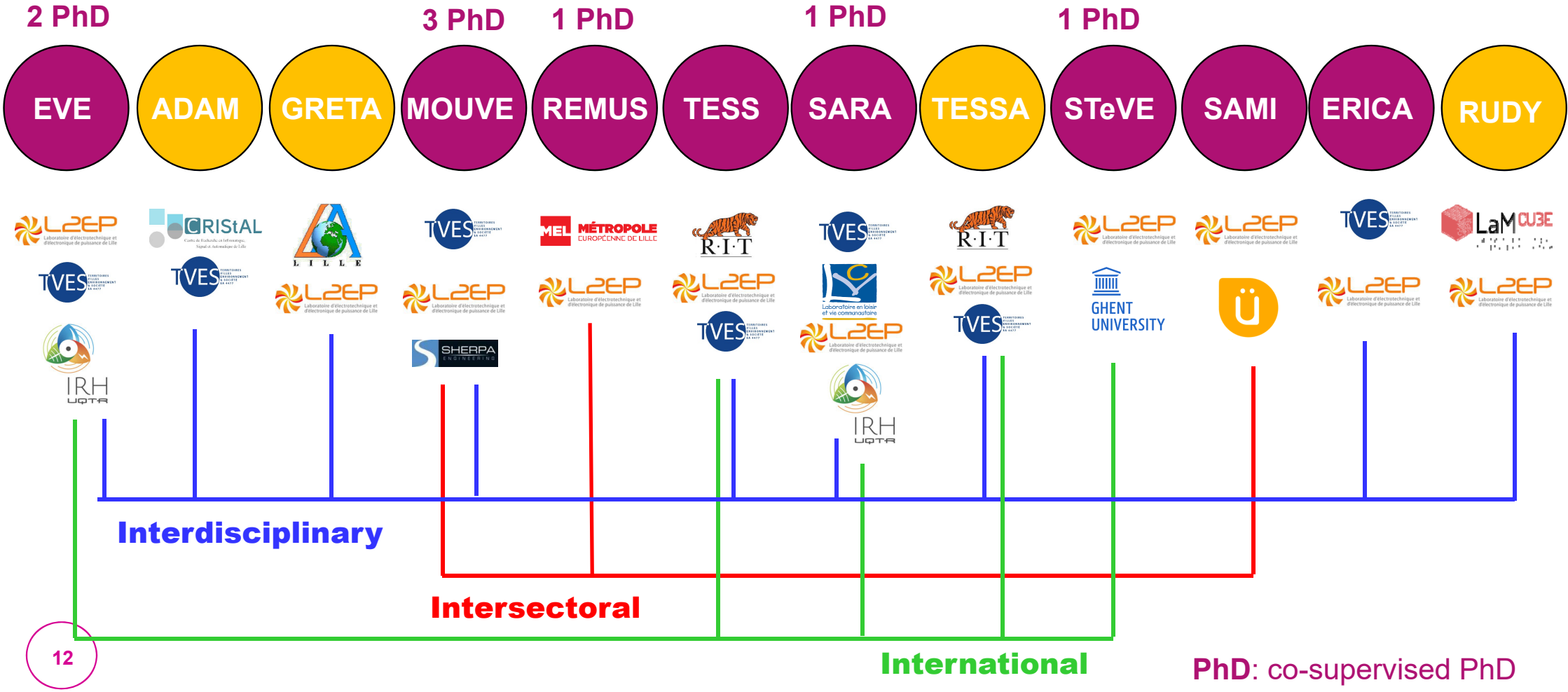
Supports

MEGEVH French network on HEVs
COMASUS Continuum de l'énergie
Panda
ce2i convertisseur d'énergie Intégré Intelligent
ELSAT2020

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 Interdisciplinary team

International associated Lab

social & human sciences

Inst. Research on Hydrogen

(Canada)

Lille European Metropole
(transport & mobility divisions)

mechanical engineering

electrical engineering

urbanism & social sciences

Optics & Atmosphere

Rochester Inst. Tec. **(USA)**
(economics & public policies)

mechanical engineering **(Belgium)**

Example of international collaboration

RIA H2020 (2018-2022) Coord. ULille

11 partners
5 countries

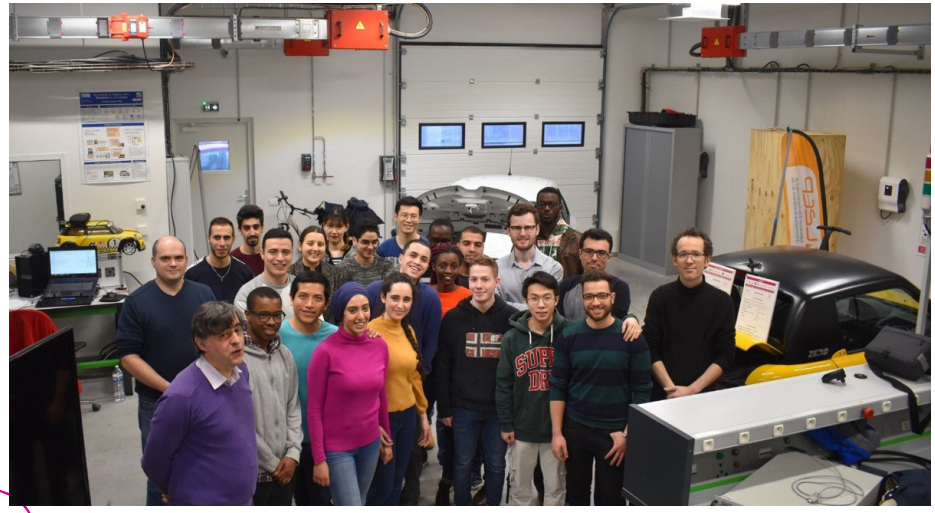
CUMIN & education

Co-supervised defended PhD

- Anatole Desreveaux, EV consumption, 2020 (CUMIN-EVE)
- **Julia Fottey**, charging station & public policies, 2021 (CUMIN-MOUVE)
- David Ramsey, EV and climate condition, 2021 (eCAMPUS ULille / UQTR Canada)

Co-supervised on-going PhD

- **Eugénie Masclef**, campus mobility usages, (eCAMPUS ULille, UQTR Canada)
- Alla Ndiaye, EV charging strategies (CUMIN-MOUVE, MEGEVH)
- Ayoub Aroua, electrified car, trucks and buses (CUMIN-STeVE, ULille, UGhent, Belgium)
- Ryan O'Berriel, braking energy of subway for EV charging (CUMIN-REMUS, MEL)
- **Salma Fadili,** EV charging structures (CUMIN-MOUVE, ANRT Sherpa Eng.)



CUMIN Master students in 2019-2020

Master theses

10 to 20 per year on sciences & technology, social & human sciences, economics sciences…

ACES'2018 EV driving test

CUMIN Seminars in Master (since 2016)

- M2 Véhicules Electriques Intelligents
- M2 Electrical Eng. for Sustainable Develop
- M2 Projet urbain et ville durable

CUMIN "Green Mobility" unit

(Doctoral schools since 2019)

- 7 seminars of 2h
- Lectures in English
- Speakers from CUMIN (ULille+USA+Canada)
- various aspects of e-mobility: technical, societal, economical,…)
- 12 PhD students in average

Summer Schools

- Annual **EMR** summer schools (Lille even year, abroad odd year)
- **ACES** summer school every 2 years

CUMIN & outputs

Co-authored international journals
- 6 papers (**4 Q1**, total citation 34)
- 2 in revision (Q1) / 3 in submission (Q1)

Keynotes and tutorials
- 1 Keynote in national conference (SGE'23)
- 3 Keynotes in international conferences (**IEEE-VPPC'18**, Sielmen'21, **TS'21**)
- 2 Tutorials in international conferences (IEEE-VPPC'20 & 21)

International Summer schools with CUMIN session
- EMR'18 (Vietnam), EMR'19 & 20 & 23 (Lille), EMR'22 (Switzerland) **EMR'24 (India)**
- ACES'18, ACES21, ACES'22 (Lille)

Projects from selective calls
- 1 STARTAIR + 1 STIMULE (Region, SAMI & REMUS) / 1 ANR (EVITA)
- **1 H2020 (PANDA)**
- submission: 1 ANR (MARSHAL) / 1 CEFIPRA (INDIRA) / 1 Horizon Europe (eCAT)

Budget 2016-2022 (only CUMIN projects)
- 2,8 M€ (470 k€/year)
- 31 % Univ. / 41% Regional / 16% National / 13% International

Book

« Les territoires des mobilités électriques : approches croisées en sciences sociales et sciences de l'ingénieur »

J. Frottey, E. Castex, A. Bouscayrol

Peter Lang Ed.
Deadline April 2023

Chapter (coordinators)
- CUMIN (L2EP)
- eCAMPUS (UQTR)
- CUMIN-EVE (L2EP)
- CUMIN-TESS (RIT)
- CUMIN-MOUVE (TVES)
- CUMIN-SARA (TVES)
- CUMIN-REMUS (MEL)
- Univ. G Effel
- CEREMA

PETER LANG

CUMIN & New projects

TESSA (Techno-Economical Study of **Second life batteries** for Affordable e-mobility campus)

- Chaire WILL (initiative d'Excellence de Lille, France 2030)
- E. Hittinger (RIT) R. German (L2EP), E. Castex (TVES)
- 2023-2026, 500 k€, 1 PhD, 1 Post-doc
- E. Hittinger 4 months / year @ ULille

TIM (Traction and braking Integration in a Modular way for optimization of consumption and emission)

- CEPR RITMEA
- J. F. Brunel (LaMcube) W. Lhomme (L2EP) et al.
- 2023-2025 / 250 k€ / 1 Eng. + 2 Post-doc

In submission INDIRA (INtegrated Design of energy management for Innovative e-mobility scheme based on Renewable energy in urban Area)

- CEFIPRA (Indo-French Centre for the Promotion of Advanced Research)
- B. Moulik (Amity Univ, **India**) A. Bouscayrol (L2EP) et LOA?
- 2023-2024, 100 k€, 1 Post-doc

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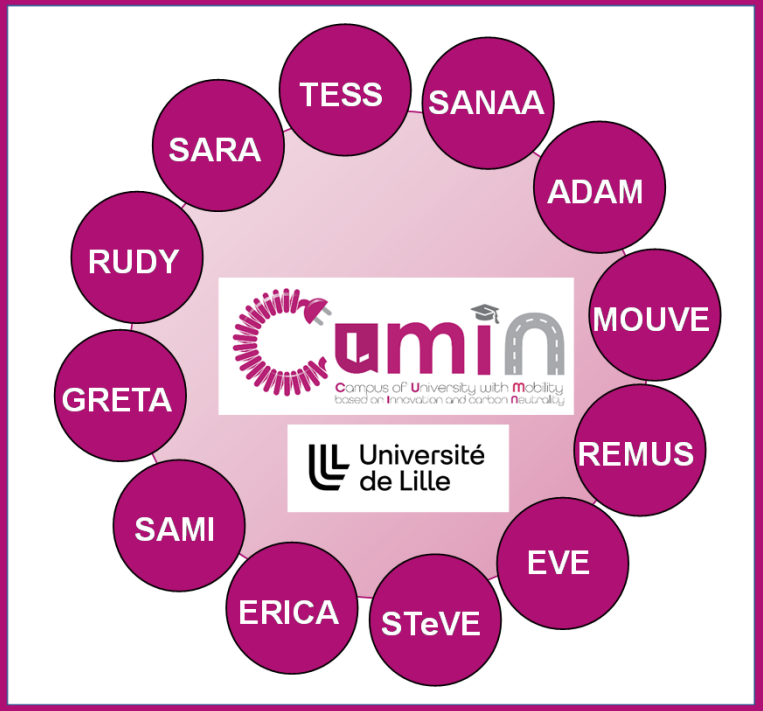
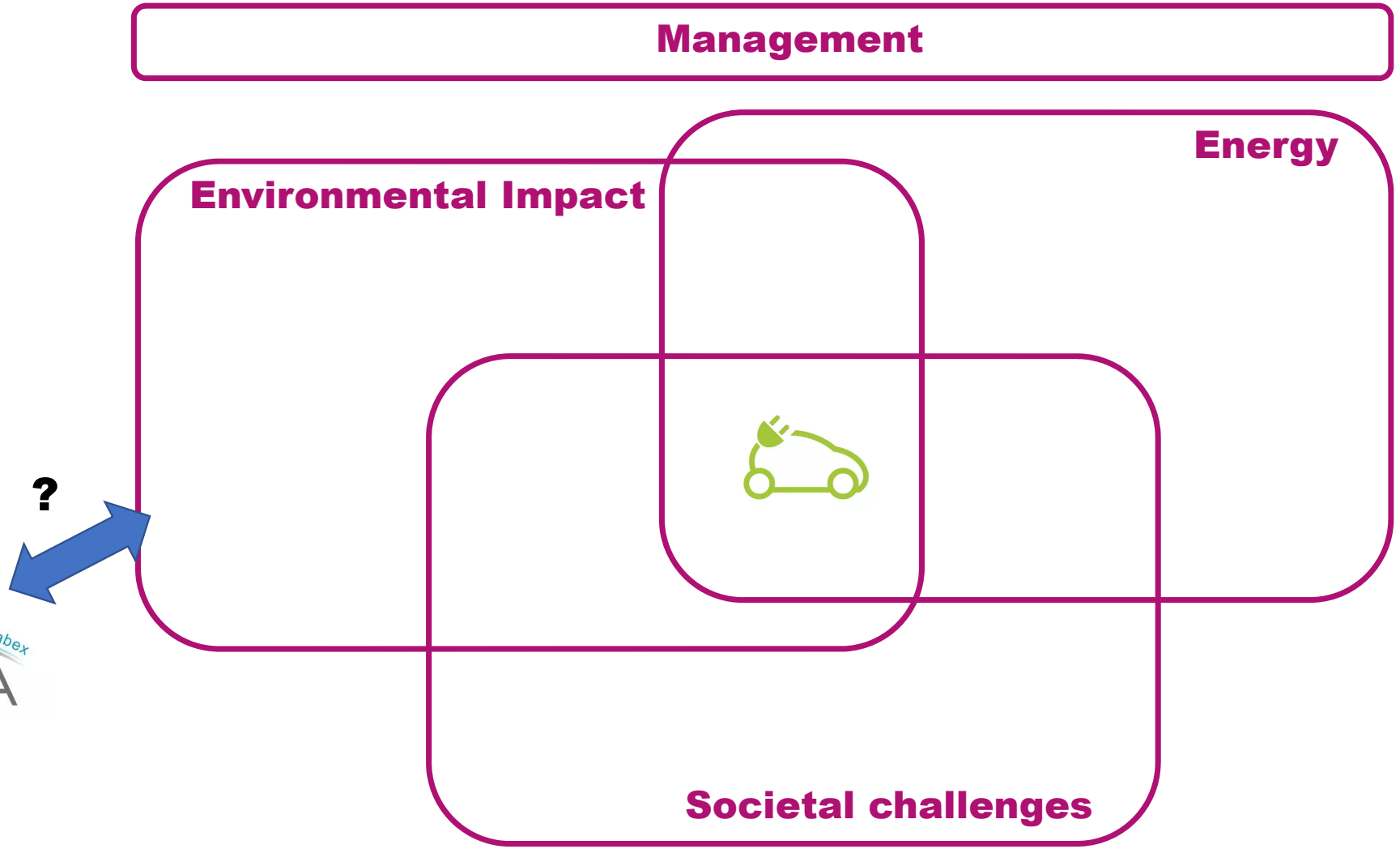
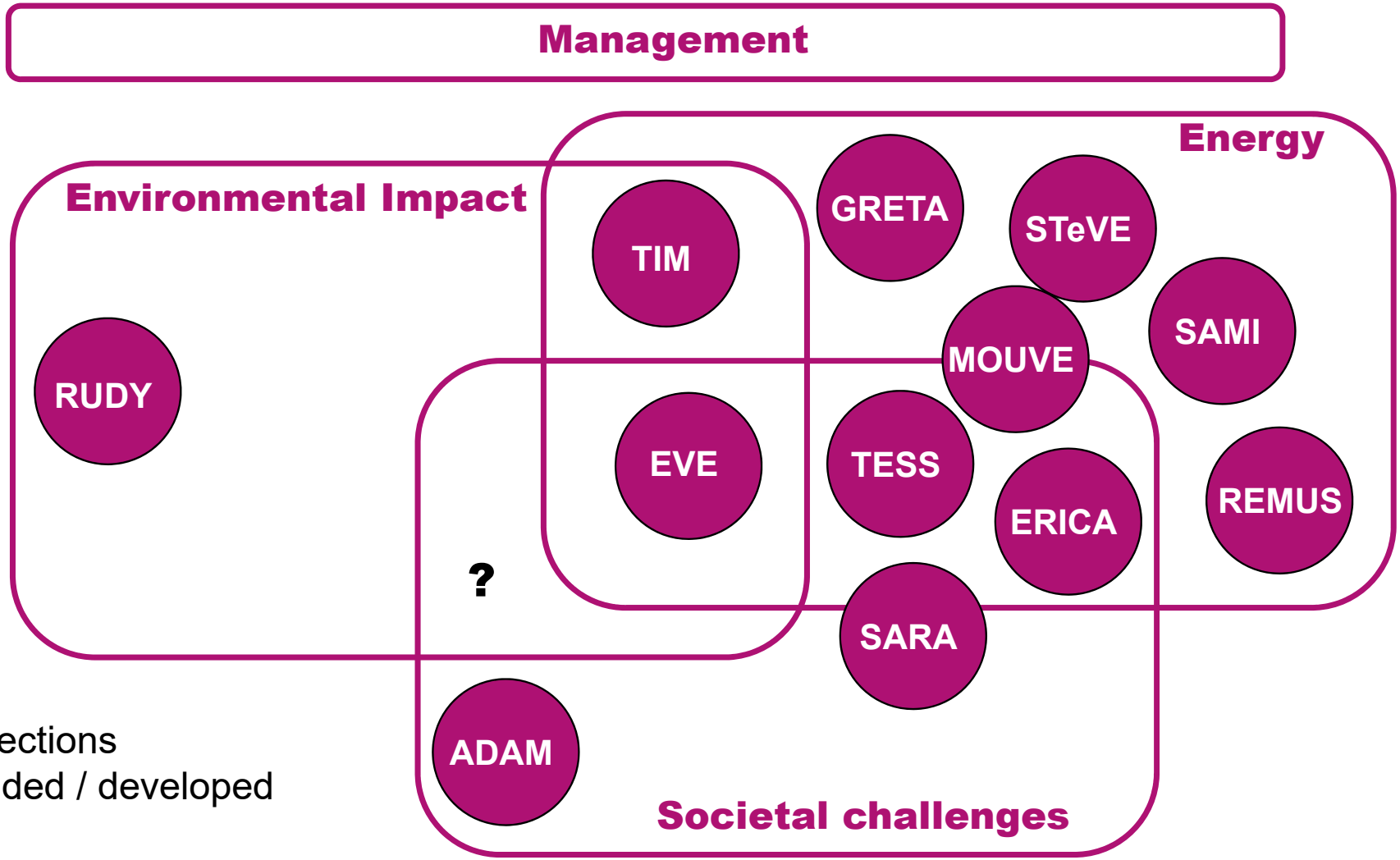


CUMIN new organisation

CUMIN new axes



CUMIN axes & projects



Some intersections
to be extended / developed

CUMIN & Université de Lille

Fortes demandes sur la transition énergétique

FST – Groupe de Travail Interdisciplinaires

- surtout pour affichage FST et dialogue de gestion
- plusieurs GTi dont “Transition Energétique & Société”
  - Plusieurs fiches action dont « Transition vers l’électro-mobilité » pilotée par CUMIN

Plan de transition énergétique 2023-2033 de l’Université

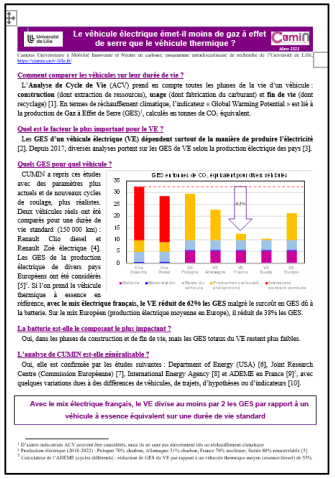
- Dont GT « mobilité (A. Bouscayrol impliqué)
- Fin travail GT mi-avril, vote plan en juin
- Mis en place « **Task Force e-mobility** » CUMIN
  pour faire des **fiches « scientifiques »**
- Possibilités « démonstrateurs » à inclure ?

Groupe Formation Energie à la demande du Président
Polytech / FST / IUT -> pilotage B. Semail (CoMaSys) / A. Bouscayrol impliqué

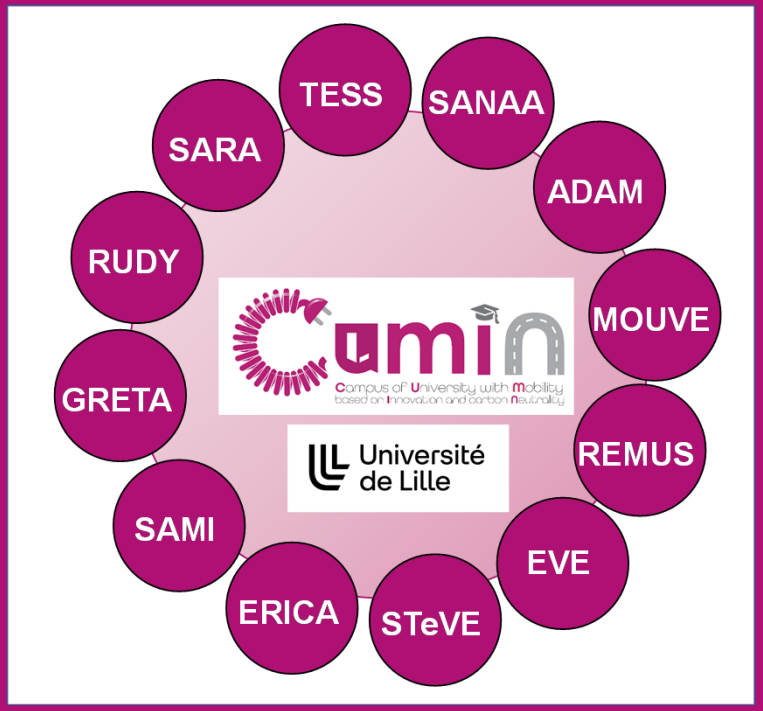
- électromobilité et énergie nucléaire, demande préfecture
- réunion Présidence le 17 mars

Force de proposition !

Reconnaissance FST et Université


Le véhicule électrique émet-il moins de gaz à effet de serre que le véhicule thermique ?

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



CUMIN programme

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