Energy Transition for a Smart and Sustainable Mobility in Port cities

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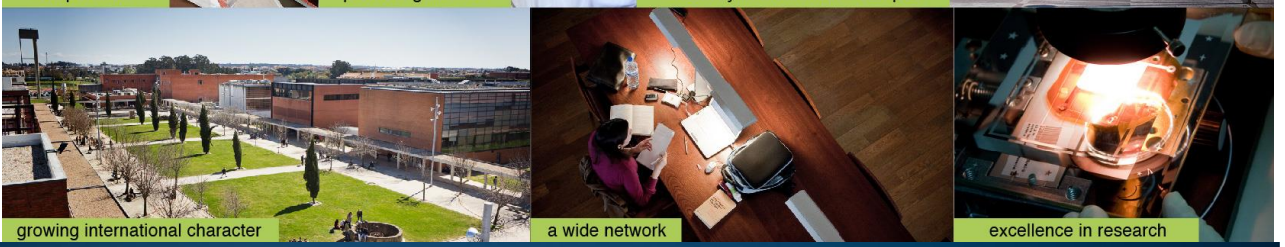
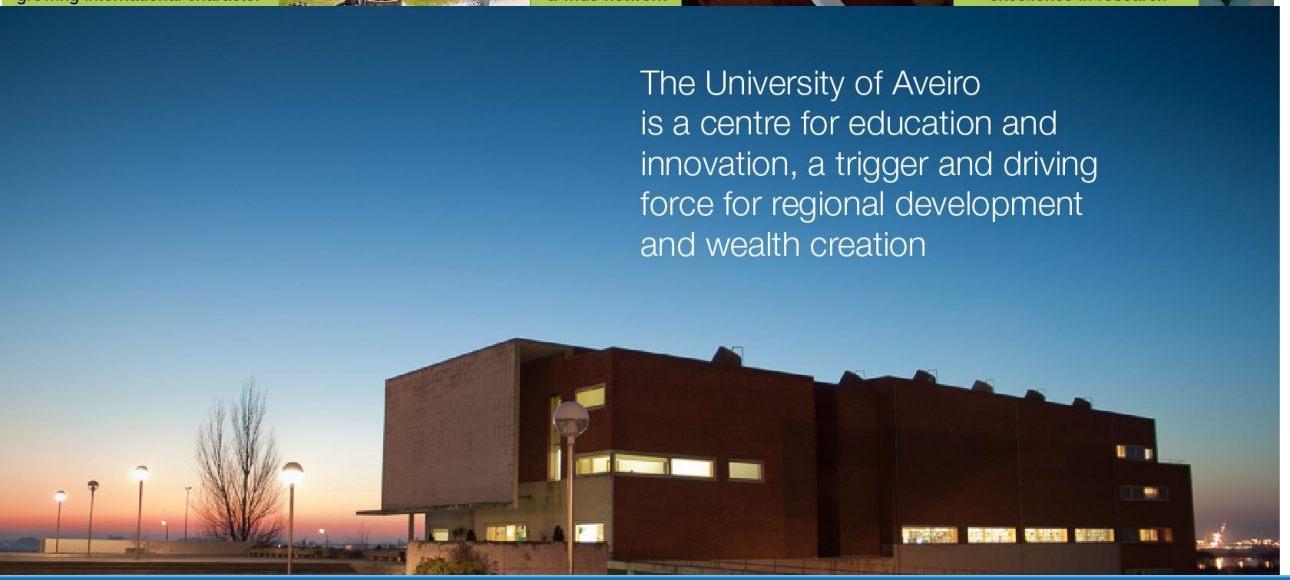
a campus with ideas
portugal





Research @ Mech. Eng. Dept.

1. Impacts of transportation systems
2. Automated mobility
3. MaaS – Mobility-as-a-service
4. LCA of alternative energy vectors for transport
5. Active modes

Teaching: MSc on Smart Mobility

NEW

Motivation

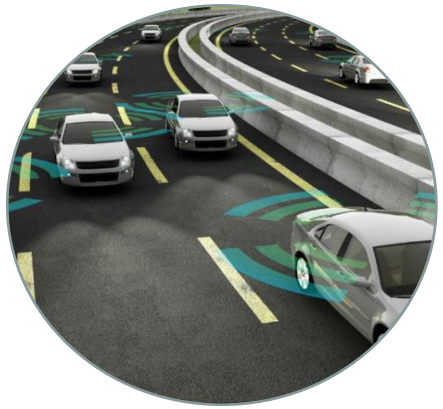
Sustainable and Smart Mobility Strategy (EC, 2020):

- **Objective**: 90% cut in emissions by 2050, delivered by a smart, competitive, safe, accessible and affordable transport system.
- Air and **waterborne** transport have > decarbonisation challenges in the next decades
- Some **key areas**:

- Boosting the uptake of "zero-emission" vehicles & vessels
- Creating "zero-emission" ports
- Healthy and sustainable interurban and urban mobility
- Greening freight transport

To tackle a smart and sustainable mobility in Port cities

Alternative fuels and propulsion modes

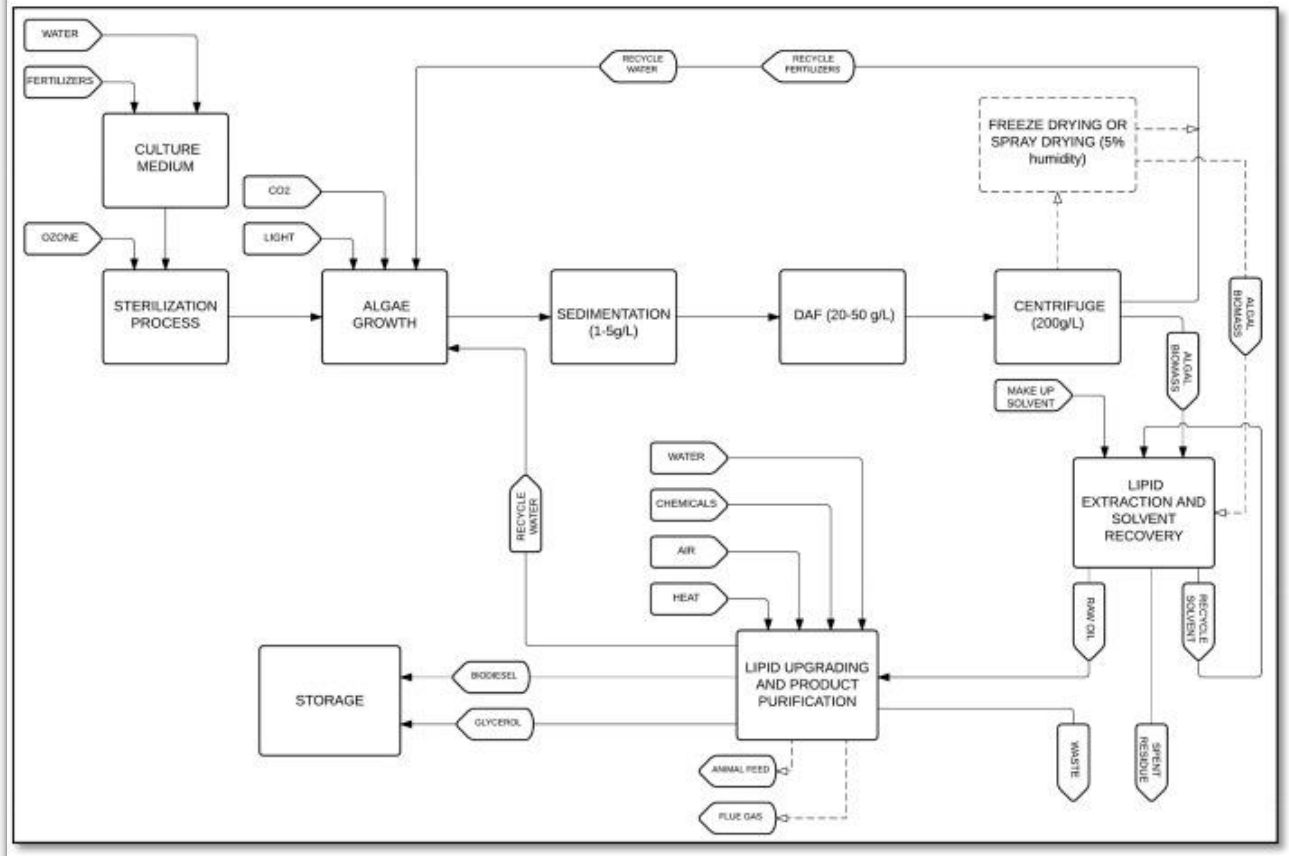


Automated mobility

ITS, Digitalization & MaaS

Sources of figures: Toyota, Insurance Information Institute, SafeSmart.City .

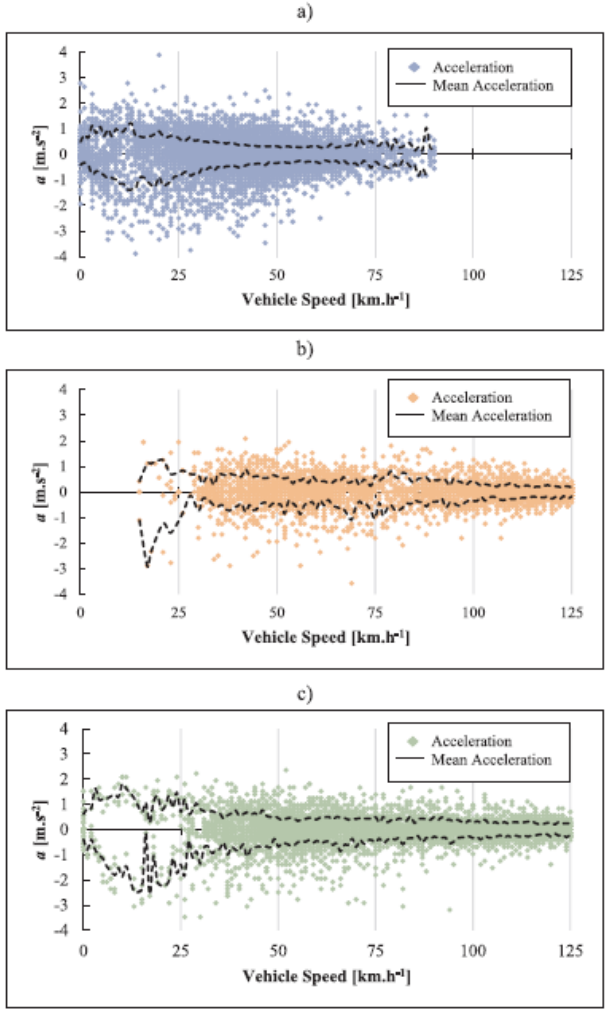
The power of biofuels

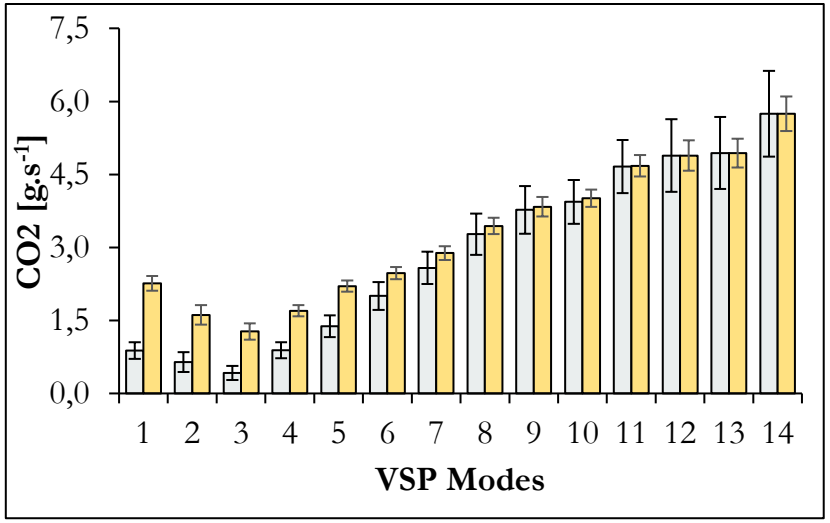


- Sustainability of microalgae-derived biofuel production with comparison of conversion pathways
- Life-cycle assessment and economic feasibility analysis aimed at large-scale application
- Lipid extraction process contributes significantly to GHGs emissions and energy consumption

S. Dutta, F. Neto, M.C. Coelho (2016) Microalgae biofuels: A comparative study on techno-economic analysis & life-cycle assessment, **Algal Research**, Vol. 20, December 2016, pp. 44-52.

Looking microscopically to the energy and emissions performance of conventional & alternative vehicles

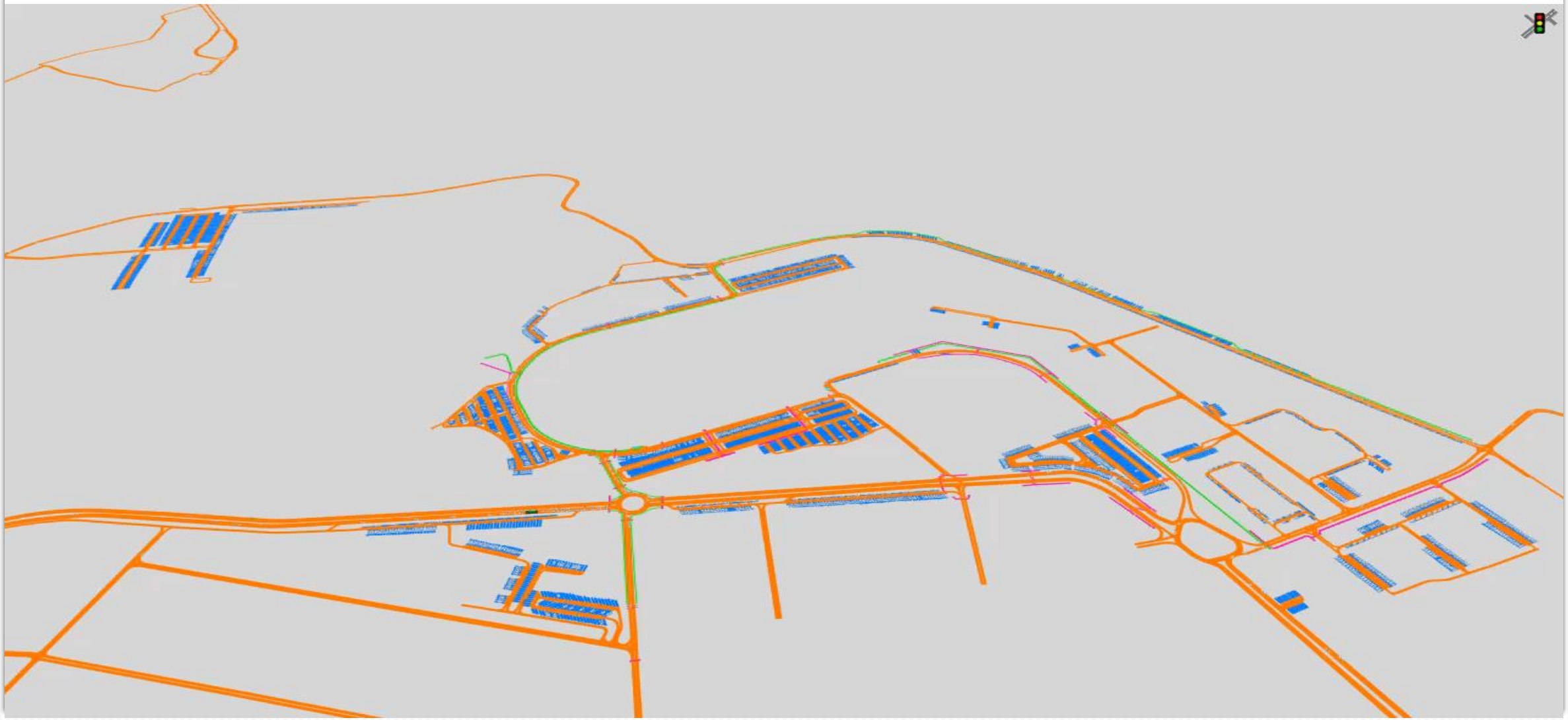




E. Ferreira, P. Fernandes, B. Bahmankhah, M.C. Coelho (2021) Micro-analysis of a single vehicle driving volatility and impacts on safety and emissions for intercity corridors, **Journal of Sustainable Transportation**, in press.

P. Fernandes, R. Tomás, E. Ferreira, B. Bahmankhah, M.C. Coelho. Driving aggressiveness in hybrid electric vehicles: Assessing the impact of driving volatility on emission rates. **Applied Energy**, Volume 284, 15 February 2021, 116250

The effect of Automated & **E-mobility** on emissions



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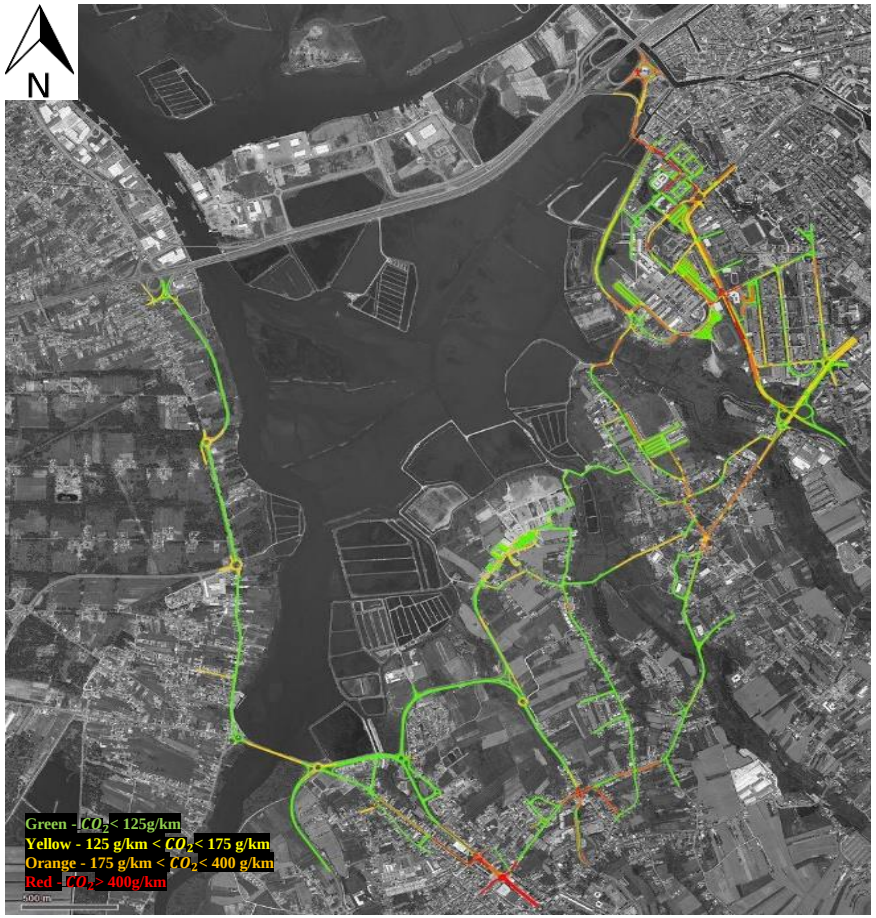


Scenario	CO_2 (g/km)	NO_X (g/km)
Baseline	369.87	0.629
10% AV electric	-10%	-14%
20% AV electric	-19%	-24%
30% AV electric	-31%	-36%
50% AV electric	-49%	-56%

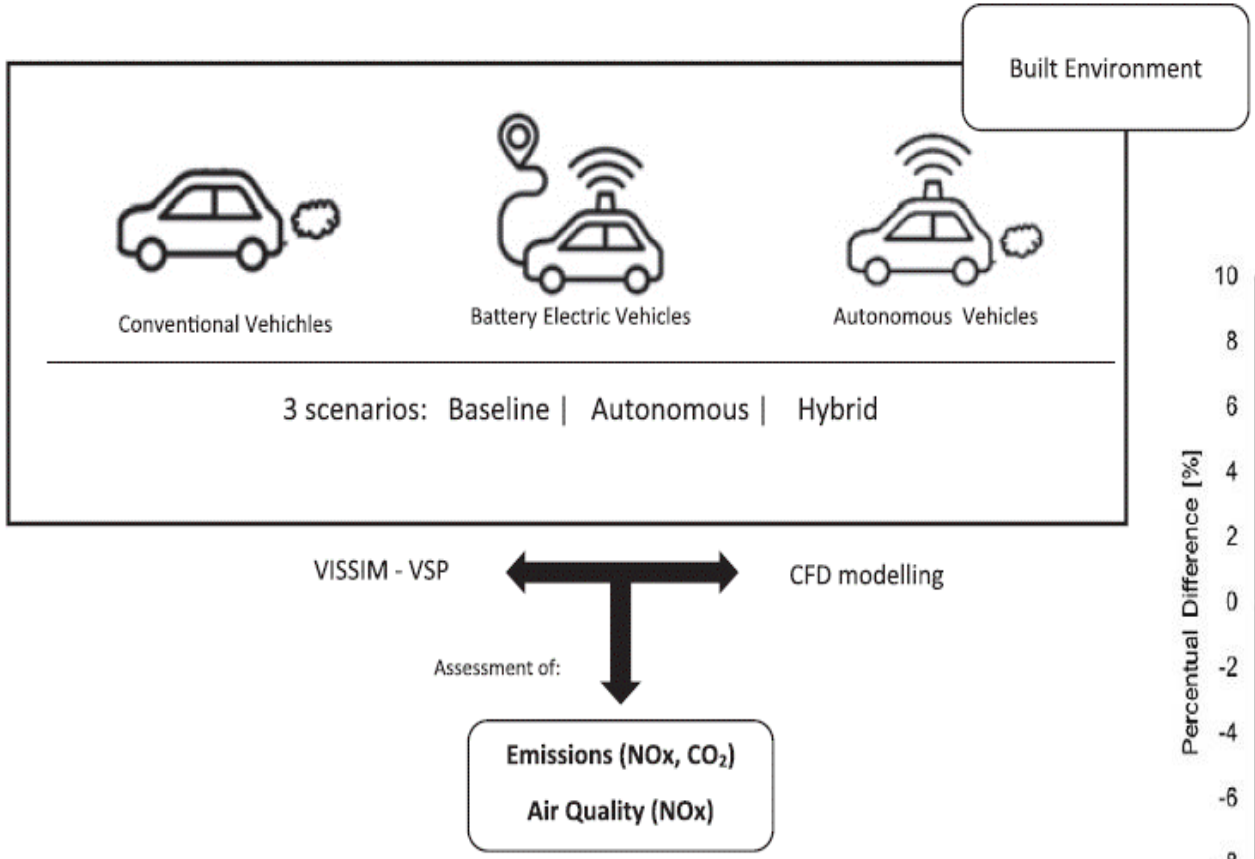
Morning peak period

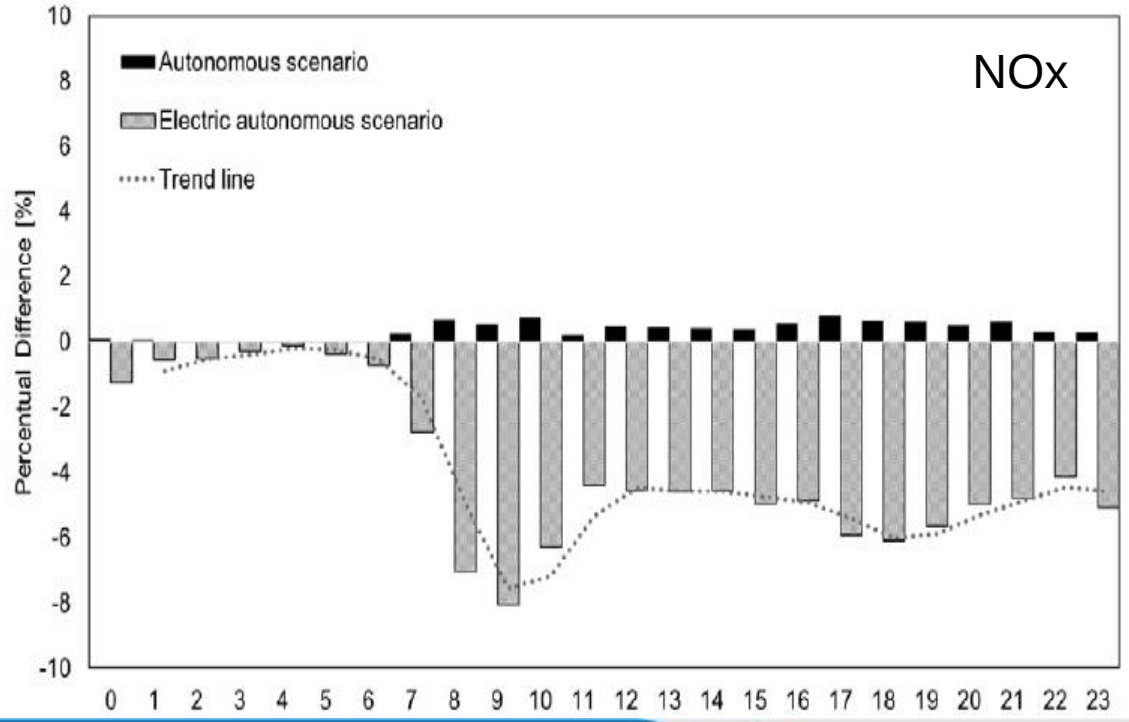
Afternoon peak period

Scenario	CO_2 (g/km)	NO_X (g/km)
Baseline	212.26	0.523
10% AV electric	-9%	-13%
20% AV electric	-17%	-23%
30% AV electric	-26%	-32%
50% AV electric	-43%	-51%

D. Marques, J. Bandeira, M.C. Coelho (2021) *Emission and safety impacts of automated vehicle penetration in a university campus*, **7th International IEEE Conference on Models and Technologies for Intelligent Transportation Systems (MT-ITS 2021)**.

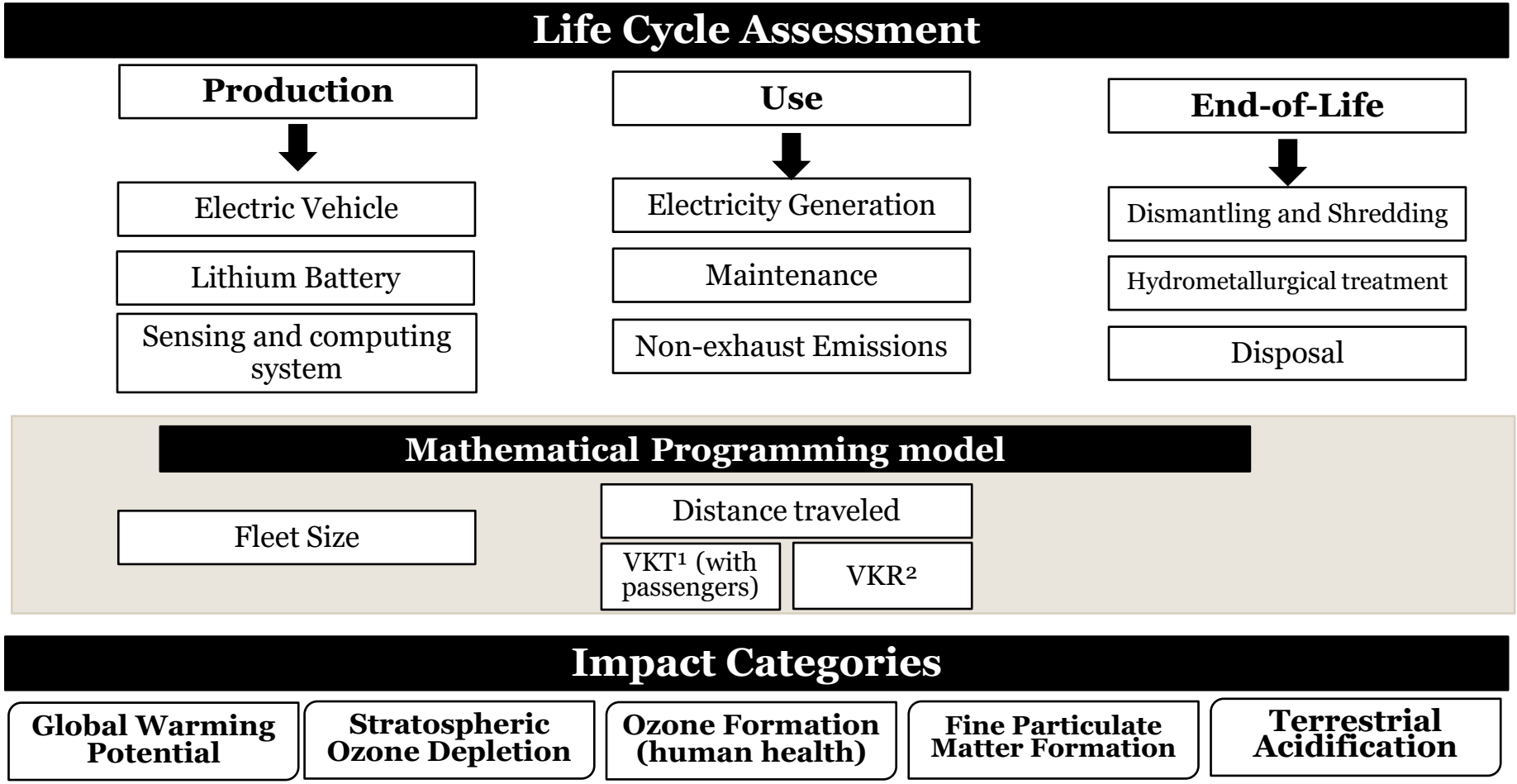
The effect of Automated & **E-mobility** on air quality





S. Rafael, L.P. Correia, D. Lopes, J. Bandeira, M.C. Coelho, M. Andrade, C. Borrego, A.I. Miranda (2020) Autonomous vehicles opportunities for cities air quality, **Science of the Total Environment**, 712 (2020) 136546.

Impacts of SAEVs ⇒ The relevance of a Life-cycle Approach



M. Vilaça, G. Santos, M.S.A. Oliveira, G.H.A. Correia, M.C. Coelho (2021) *A Life Cycle Assessment of a Shared, Autonomous and Electric Vehicle Fleet in a Regional Scale,* **100th Transportation Research Board Annual Meeting**, January 2021.

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The Power of Digital Transformation in a Port City

MOBINOV :: Automotive Cluster
PORTUGAL

CISMOB
Interreg Europe

Cooperative information platform for low carbon and sustainable mobility

PriMaaS
Interreg Europe

PriMaaS: Optimizing accessibility of citizens by Low Carbon Mobility Services

Smart and Sustainable Mobility @ Port cities
3 “Take-Home” Messages

1. **Multidisciplinarity** & **Working together** (Ports, Municipalities, Regions, Universities, Companies)

2. **Data as the Next Fuel**

3. **A synergy** between **≠ energy transition options, technology and individual behavior** is essential

Thank you!

More research at: http://transportes-tema.web.ua.pt

MSc. Degree on Smart Mobility: https://www.ua.pt/en/curso/472

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