Introduction

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HOW CAN GREEN DRIVING SOLUTIONS CONTRIBUTE TO CLEAN AIR POLICIES?

1. Introduction

Andrew Winder – ERTICO

2. Importance of topic and EC perspective

Salima Abu Jeriban – European Commission / CINEA

3. Remote sensing – City demonstration measurement campaigns

Yoann Bernard – ICCT

4. Overview of the MODALES app Ramiro Camino – LIST

5. Approach to assessment in MODALES Guillaume Saint Pierre – Cerema

6. Questions and discussion

INTRODUCTION: THE MODALES VISION

To reduce air pollution from all types of road vehicles (but especially older vehicles) by encouraging adoption of lowemission driving behaviour and proper maintenance choice

MODALES advances the understanding of the co-variability between user behaviour and vehicle emissions from powertrain, brakes and tyres, in order to modify user behaviour, via training and awareness

Retrofits

6. Diesel-saving technologies for cars & vans 7. NOxBUSTER for buses and trucks 8. Diesel particulate filter servicing



emission control systems

10. Enhanced OBD functionality as an anti-tampering measure

Periodic inspections

11. Enhanced inspection procedure to trap tampering 12. Roadside emissions testing

Driver 1. Low-emission driving style & training 2. Guidelines for regular maintenance 3. Use of adaptive cruise control & navigation to avoid congestion 4. Increased awareness of emissions 5 Real time indication of emission

Exhaust emission

(app)

CO2, CO, HC, NOX, PM, PN



Brake and tyre/road wear Fine and ultrafine particles (PM, PN)

OBJECTIVES OF MODALES

Key objectives	Targets		
Understand the nature of driving behaviour with respect to vehicle emissions	Variables for driver behaviour and their variability (e.g. speed, road condition, etc.) validated with data		
Correlate driving behaviour variability with real powertrain, brake and tyre emissions	Mathematical equations defining powertrain, brake and tyre emissions as a function of driving behaviour		
Propose and validate a real-time driver assistance smartphone app for low emission driving	App available for demonstration and testing, to be opened for further exploitation post-project		
Promote low-emission oriented driving via training courses and an awareness campaign	Courses set up for various user groups, and feedback used to assess user acceptance and awareness		
Assess the real effectiveness of on-board diagnostics (OBD) and technical inspections and investigate the legal situation of tampering in Europe	Analysis for OBD and inspections to detect high emissions due to different causes; Study report on legal aspects of vehicle tampering		
Assessment of the potential impact of diesel retrofits	Diesel retrofit to a van and emissions tests. Monitoring and data analysis for retrofitted HDVs and review of technologies/performance for car retrofits		

EMISSION MONITORING (POWERTRAIN, BRAKES, TYRES)



DRIVING BEHAVIOUR FACTORS

Driving behaviour KPIs for exhaust emissions	Ranking (1: most important)
Aggressiveness (% of time in acceleration $> 0.9 \text{ m/s}^{2)}$	1
Average acceleration	2
% of time in speed interval of 20~50 km/h	3
Average speed	4
Average driving speed without stops	5
% of time in deceleration interval of -0.9 \sim 0 m/s ²	6
Average deceleration	7
% of time in acceleration	8
% of distance in acceleration	9
% of time in deceleration	10
% of distance in deceleration	11
% of distance in speed interval 50~70 km/h	12
Gear upshift speed	13
Gear downshift speed	14

Powertrain

Driving behaviour KPIs for brake emissions	Unit	Ranking (1: most important)
Deceleration rate of braking	m s ⁻²	1
Average deceleration rate of braking	m s ⁻²	2
Braking distance	m	3
Braking time	S	4
Initial speed when braking	km/h	5
Average initial speed when braking	km/h	6

Brakes

Tyres

Driving behaviour KPIs for	Wear amount	Wear mass	Ranking
tyre emissions	(m ³ /rev)	(g/rev)	(1: most important)
Deceleration rate when right braking	5.43E-10	6.30E-04	1
Acceleration rate when right accelerating	4.13E-10	4.80E-04	2
Initial speed when right braking	3.14E-10	3.64E-04	3
Initial speed when right accelerating	2.82E-10	3.27E-04	4
Deceleration rate when straight braking	2.51E-10	2.91E-04	5
Acceleration rate when straight accelerating	1.78E-10	2.07E-04	6
Initial speed when straight braking	1.49E-10	1.73E-04	7
Initial speed when right cruising	1.27E-10	1.47E-04	8
Initial speed when straight accelerating	1.07E-10	1.24E-04	9
Driving speed when straight cruising	4.73E-11	5.49E-05	10
Deceleration rate when left braking	4.14E-11	4.80E-05	11
Acceleration rate when left accelerating	3.79E-11	4.40E-05	12
Initial speed when left braking	2.65E-11	3.07E-05	13
Driving speed when left cruising	2.59E-11	3.00E-05	14

DEMONSTRATION OF APP, TRAINING AND AWARENESS

Low-emission driving support app, creates two types of recommendations:

- Active recommendations (when the user is driving)
- Passive recommendations (after a trip)

Training videos developed by MODALES cover:

- Pre-trip checks and planning
- Driving
- Maintenance

For private cars, LDVs/taxis and HDVs

App and training being tested

• ~200 volunteer drivers in 7 countries







Cette application est en cours de développement. Elle peut donc être instable.
 Cette application est disponible pour votre appareil



Installer





Supported by a multilingual awareness campaign supported by automobile clubs on social media

• See <u>https://modales-project.eu/campaign</u>

MODALES OVERVIEW

Dates: EC H2020 Call: Consortium: 1 Sep 2019 to 31 Aug 2022 (expected extension to 28 Feb 2023)
MG-1.1: "Reduction of transport impact on air quality"
16 EU-funded partners (coordinated by ERTICO) + 2 International partners in China



Legal experts





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Smart and Sustainable Mobility for all.



EUROPEAN CONGRESS TOULOUSE 30 May - 1 June 2022



modales

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Smart and Sustainable Mobility for all.



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DISCUSSION POINTS

- Role of Low-Emission driving with respect to clean air zones or low emission zones in cities?
- Role of emission monitoring / PEMS / remote sensing in cities?
- Role of on-board fuel consumption monitoring / OBD in terms of measuring how much PHEVs drive on electric vs. ICE motor?
- How can the use of low-emission driving tools (apps, training, behaviour) be encouraged? What are the incentives for private motorists?