SUSTAINABLE URBAN MOBILITY CONGRESS

The role of energy carriers in sustainable mobility

Dolores Cárdenas
Mobility Advisor

20th February 2019

Repsol stand point

Repsol is an energy company committed to be part of the of the solution for a sustainable mobility while at the same time providing access to secure, affordable energy to people…

…and is actively contributing now

High quality diesel and gasoline

AutoGas

Natural gas

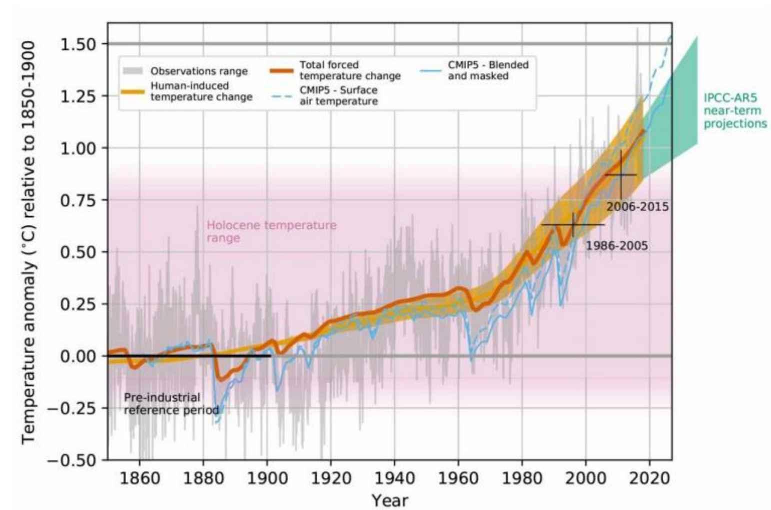
Biofuels

Electricity

Shared mobility

The environmental challenges for sustainable mobility

Air quality	Climate change [1]



Air quality

- Local issue
- Population health affected
- Focused in NO_2 and particles
- Traffic is a major contributor

Climate change

- Global issue
- World climate affected
- Focused in CO2 and other GHG
- Traffic is one of the contributors

[1] Figure extracted from Global warming of 1.5 °C. IPCC special report (2018)

How to tackle the challenges?

Based on three principles:

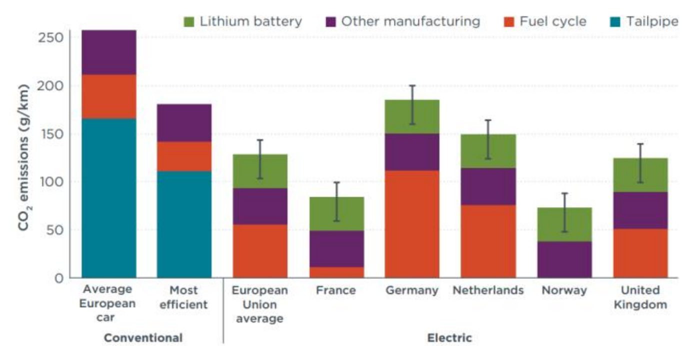
- Setting objectives, not imposing technologies (technology neutrality)
- Using adequate metrics for the objectives (local vs global)
- Updating measurements continuously because technologies evolve

Not adhering to these principles creates misleading incentives:

Non technology neutral

Modern diesel and gasoline C vehicles (Euro 6d-TEMP) have lower real world emissions than some gasoline or gas ECO vehicles (Euro 6b)

Non adequate metrics

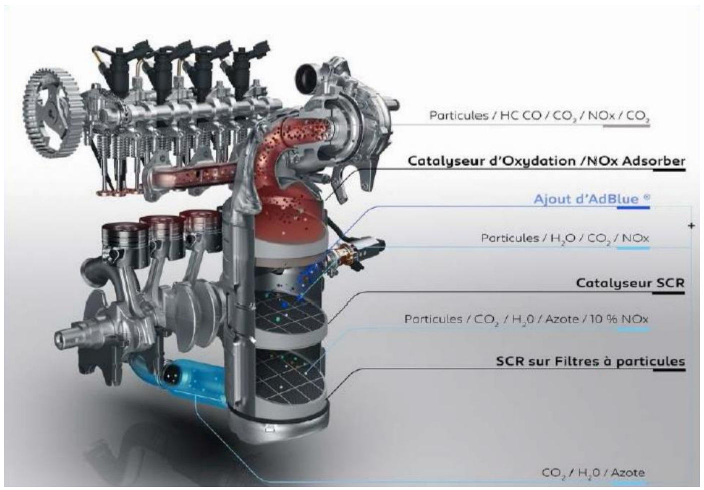


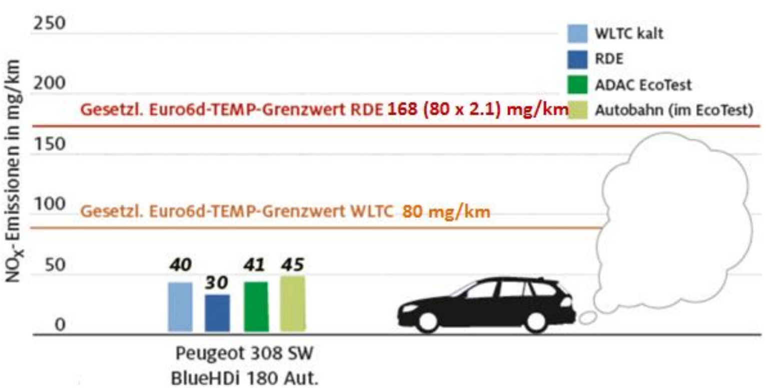
"Zero-emission" electric vehicles emit GHG during manufacturing of vehicle and battery and while producing electricity[1]

[1] Figure extracted from "Effects of battery manufacturing on electric vehicle life-cycle greenhouse gas emissions". ICCT (2018)

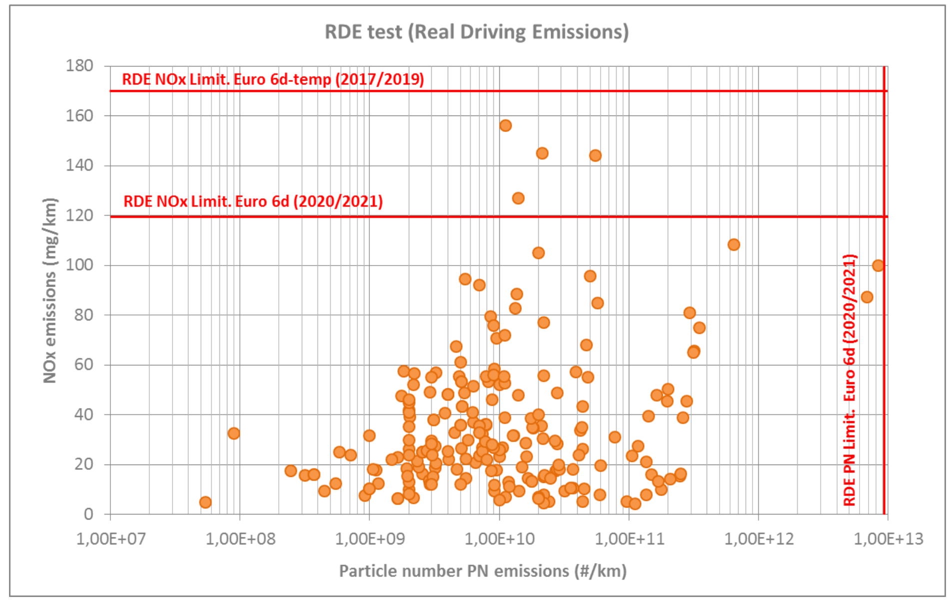
How can mobility technology contribute to air quality improvement?

NOx and particles are under control in all circumstances with the latest diesel, gasoline and gas technologies, but this fact is still not well known.





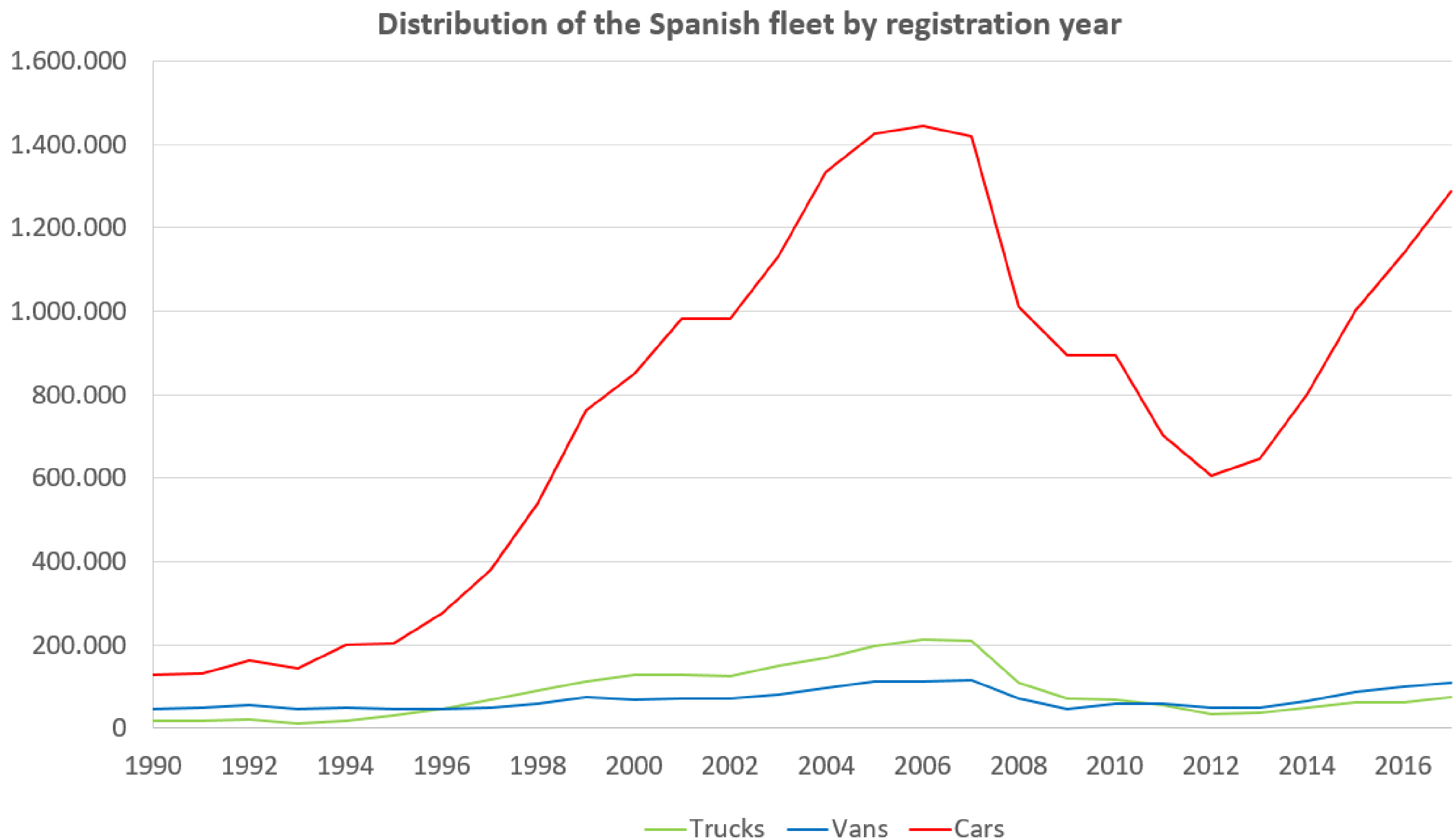
Source: ADAC (2018)



Source: ACEA (2018)

How can mobility technology contribute to air quality improvement?

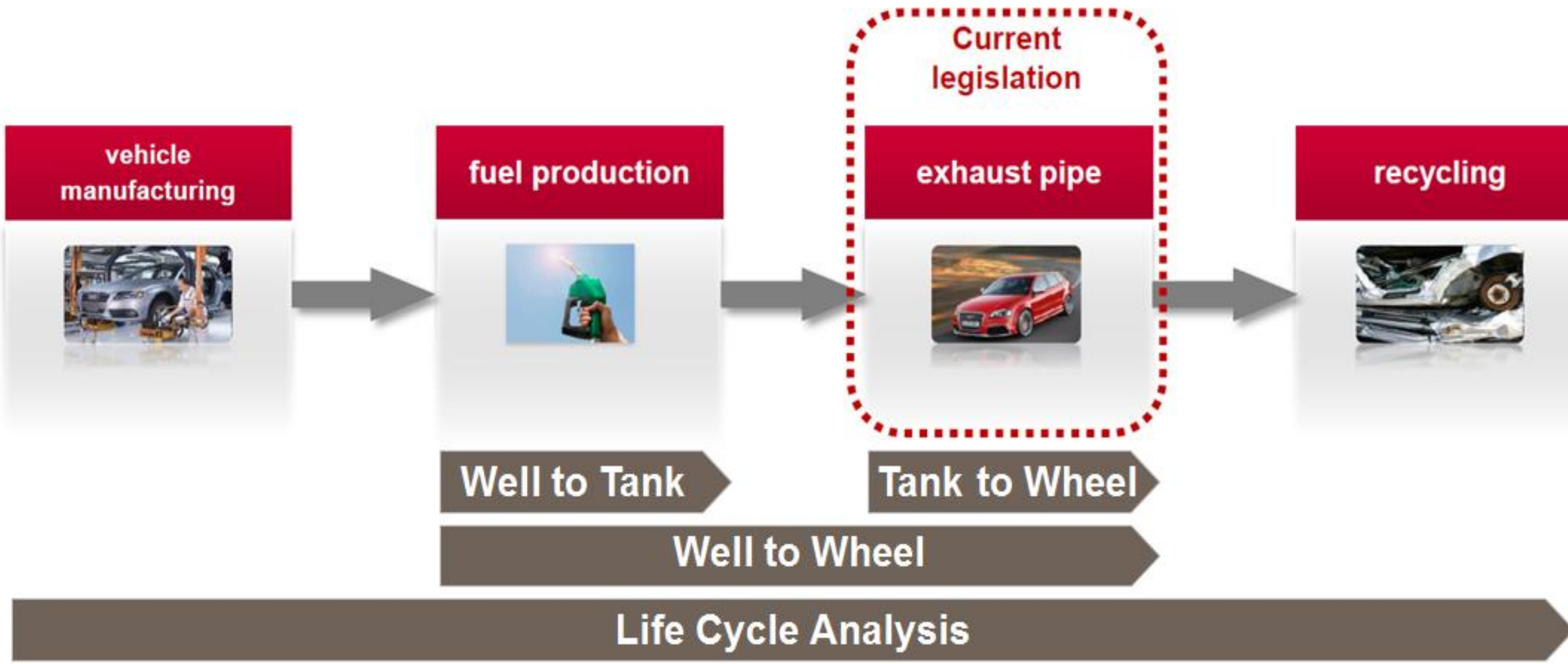
The age of the fleet is the real problem.



Source: DGT (2018)

How can mobility technology contribute to climate change mitigation?

For a global problem, such as climate change, global metrics are needed.
Life Cycle Analysis is the most adequate tool to compare different technologies.



How can mobility technology contribute to climate change mitigation?

Multilevel approaches with multiple technologies involved:

- Efficient vehicles
- Low carbon energy carriers
- CO_2 capture and use/storage

Potential CO_2 reduction for a diesel car in 2015-2030

Technology Steps	Potential CO_2 emission (gCO2/km)	Reduction (gCO2)
T1: Baseline engine 1.6l 3-cylinder in-line cooled high pressure +low pressure EGR; LNT + DPF; 6-speed manual transmission; Mass 1530 kg CD1	117	
T2: T1 with Start&Stop	114	2,6
T3: T2 with downsized engine 1.4l 3-cylinder in-line; 7-speed Dual Clutch Transmission; Mass 1397 kg	113	3,3
T4: T3 with mass reduction and aerodynamic improvements; Mass 1254 kg, CD2	93	23,7
T5: T4 with optimized friction resistance	90	26,5
T6: T5 with mild hybrid P0 system 48V 15 KW	87	30,0

26% reduction

Potential CO_2 reduction for a gasoline car in 2015-2030

Technology Steps	Potential fuel consumption (gCO2/g/km)	Reduction (gCO2)
T1: Baseline engine 1.8l Naturally Aspirated 5-speed manual transmission; CD1	169	
T2: T1 with downsized engine 1.4l Turbocharged with Start&Stop	141	27,5
T3: T2 with downsized engine 1.0l Turbocharged with 6-speed manual transmission and 10% mass reduction	129	39,7
T4: T3 with 7-speed Dual Clutch Transmission, optimized friction resistance, Variable Valve Lift and 20% mass reduction; CD2	106	63,1
T5: T4 with low pressure EGR and Miller cycle	100	68,8
T6: T5 with mild hybrid P0 system 48 V 15 kW	94	74,4

44% reduction

Source: FEV (2015)

How can mobility technology contribute to climate change mitigation?

Multilevel approaches with multiple technologies involved:

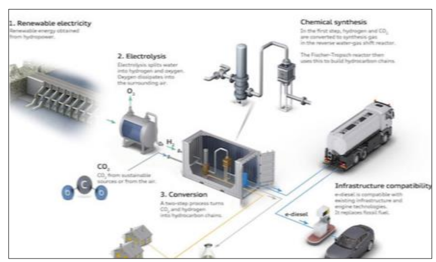
- Efficient vehicles
- Low carbon energy carriers
- CO_2 capture and use/storage

AutoGas

Biofuels

Renewable electricity

Natural gas



e-fuels from renewable electricity

Renewable hydrogen (or ammonia)

How can mobility technology contribute to climate change mitigation?

Multilevel approaches with multiple technologies involved:

- Efficient vehicles
- Low carbon energy carriers
- CO_2 capture and use/storage

Source: Aramco (2018)

Conclusions

- Two environmental challenges for mobility: **air quality** and **climate change**
- Solutions should be based on three principles:
  - **Setting objectives, not imposing technologies** (**technology neutrality**)
  - Using adequate metrics for the objectives (local vs global)
  - Updating measurements continuously because technologies evolve
- **Technologies to reduce local pollutants already in the market**, a renewal of the fleet is needed to see the results
- Technologies to tackle **climate change** should be compared with a **Life Cycle Analysis methodology**
- Multiple technologies to reduce GHG emissions on three levels:
  - **Efficient vehicles**
  - **Low carbon energy carriers**
  - **CO_2 capture and use/storage**

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#SUMBILBAO19
www.sumbilbao19.com
info@sumbilbao19.com