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PER LE NANOTECNOLOGIE

# Emerging and «emerged» technologies in Transportation - Successful application cases in the Automotive field

## ROAD, RAILWAY AND SEA TRANSPORTATION

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## Agenda:

- Main goals for automotive industry to 2020 and related technologies
- CO<sub>2</sub> reduction: approaches
- A successful case: Fiat ECO Drive
- Seamless connected vehicles: new paradigms per safety
- Automotive applications of Near Field Communication (NFC)
- Commonalities of research interest and needs among Transportation sector

# Main goals for automotive industry to 2020 and related technologies

*“The European automotive industry is a key sector for the European economy, providing over 12 million jobs and a positive contribution to the trade balance of around € 90 billion (in 2011), which is essential for continued European prosperity”.*(\*)

A strong and competitive European industry should provide:

*“New vehicles purchased by EU consumers, which are **clean** in terms of regulated pollutants, more **fuel-efficient, quiet, safe and connected**”*

*“A sector **exporting a larger portfolio of vehicles** to third markets, characterised by high-quality and high-technology”*(\*)

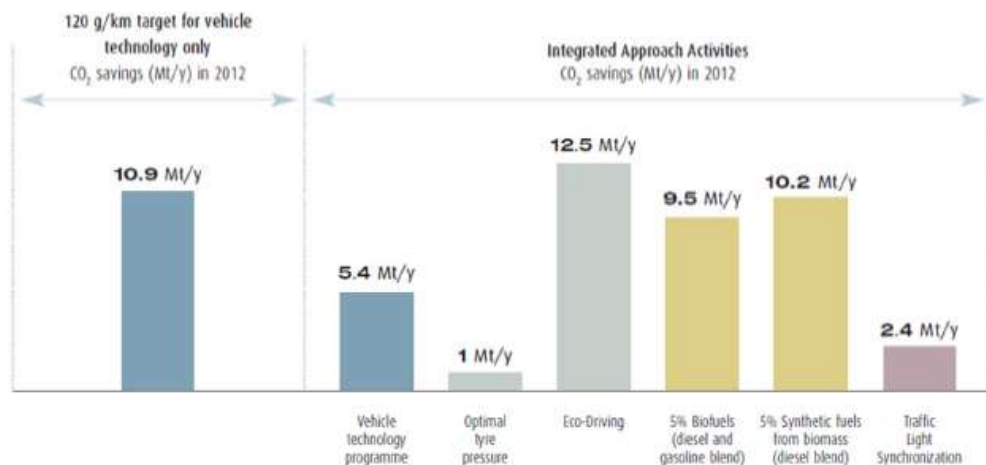
**From «CARS 21 High Level Group – Final report»** on the Competitiveness and Sustainable Growth of the Automotive Industry in the European Union - June 2012

# CO<sub>2</sub> reduction: approaches

The issue of reducing CO<sub>2</sub> emissions is probably the most important driver for automotive research over the coming years: the Regulation (EC) No 443/2009, in addition to setting the target of 130g<sub>CO2/km</sub> for new car emissions in the period 2012-2015 it also set a target of 95g<sub>CO2/km</sub> to be achieved in 2020.(\*)

Reduction of CO<sub>2</sub> emissions can results from the following three actions:

- efficiency of conversion of the energy vector used (i.e. powertrain performance);
- global carbon footprint of the energy vector used
- energy used by the vehicle during operation, including integrated approaches that involve the driver and infrastructures





# CO<sub>2</sub> reduction: approaches

Consequently, research to improve the efficiency of the vehicle should focus on:

- aerodynamic drag coefficient reduction;
- rolling resistance minimization (including friction and optimized tyre pressures)
- deeper integration of vehicle and powertrain to optimize the on board energy management (e.g. beltless engine)
- sustainable weight reduction
- recovering the kinetic energy when braking;
- waste heat re-use, including thermo-electric generators;
- reducing the distance travelled emitting fossil CO<sub>2</sub> by using low carbon content fuels;
- assisting the driver with eco-driving aids.

# A successful case: Fiat ECO Drive



[\(click to start the video\)](#)

# A successful case: Fiat ECO Drive



## ECO-DRIVING UNCOVERED

The benefits and challenges of eco-driving, based on the first study using real journey data.

### ABOUT THIS STUDY

Eco-driving can reduce CO<sub>2</sub> emissions by helping people to use less fuel. But how significant is this reduction, and how easy is it to achieve? Fiat studied thousands of journeys made by drivers using its eco:Drive tool, which helps people monitor their fuel efficiency and learn eco-driving techniques.

This was the first ever study of its kind, analysing real journeys made on real roads, by real drivers going about their everyday lives. These slides explore how easily people learned to eco-drive, the external factors influencing their efficiency – and the potential savings to be made.

428,000 journeys | 5,700 drivers | 150 days | 5 countries



# A successful case: Fiat ECO Drive

## ECO-DRIVING BRINGS SIGNIFICANT SAVINGS

Drivers save fuel and money and reduce their CO<sub>2</sub> emissions.

SAVINGS PER AVERAGE CAR LIFECYCLE	FUEL CONSUMPTION	CO <sub>2</sub> EMISSIONS	MONEY SAVED
AVERAGE ECO-DRIVER	-6%	-1,088kg	£480
TOP 10% ECO-DRIVERS	-16%	-2,895kg	£1,260

fiat.com/eco

## FOUR STEPS TO FUEL EFFICIENCY

fiat.com/eco

There are four key ways to become a good eco-driver. Some contribute more to total savings, while others are easier to achieve.



### SOME TECHNIQUES SAVE MORE THAN OTHERS...

Early gear changes and smooth acceleration contribute most to reducing fuel consumption and drivers should focus first on improving these areas.

### ...AND SOME ARE EASIER TO LEARN

After using ecoDrive, people achieved highest scores on efficient deceleration. There is still great savings potential in smooth acceleration and early gear changes, but urban traffic conditions often make it difficult to improve.



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# A successful case: Fiat ECO Drive

## Eco DRIVE Live



# A successful case: Fiat ECO Drive

In future the eco-driving approach can be extended by integrating additional eco-related information:

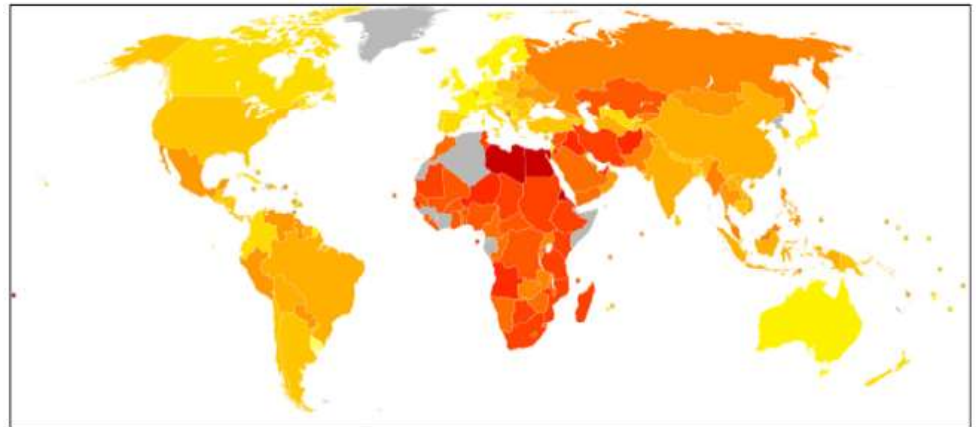
- based on the electronic horizon (geometry and attribute of upcoming road segments) and the position of the car, not excluding the possibility to move data and calculations “on the cloud”
- that may derive from sensing and exchanging information on surrounding driving conditions, with the roadside infrastructures, traffic control centers and social interaction among vehicles.

# Seamless connected vehicles: new paradigms for road safety

Road safety is a major societal issue all over the world, the rate of fatalities caused by road accidents is huge in all countries and the large majority of the **1,7 million of road fatalities** worldwide occur in low income countries.

In 2011 the European Commission established a challenging goal for road safety:

- to move close to zero fatalities in road transport by 2050. In line with this goal, the EU aims at halving road casualties by 2020.



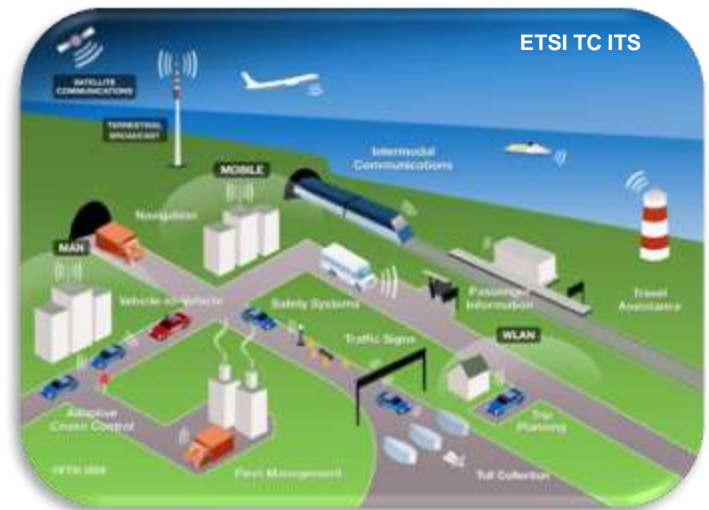
Traffic related deaths: annual number of road fatalities per 100,000 inhabitants [sources: List of OECD countries by traffic related death, World Health Organization, road traffic injuries]





# Seamless connected vehicles: new paradigms for road safety

- **Human factor studies** highlighted that the great majority of road accidents involve some form of driver error, related in particular to inattention.
- The **challenge** is to prevent such errors, or mitigate their consequences, providing drivers with information or warnings on potential hazards, or even intervening by automatic steering and/or braking.
- The **next generation of support systems** shall:
  - **integrate** key enabling technologies: advanced sensing, novel driver vehicle interfaces, vehicle connectivity and positioning.
  - **combine** safe, green and efficient driving to maximise drivers' adoption.





# Seamless connected vehicles: new paradigms for road safety

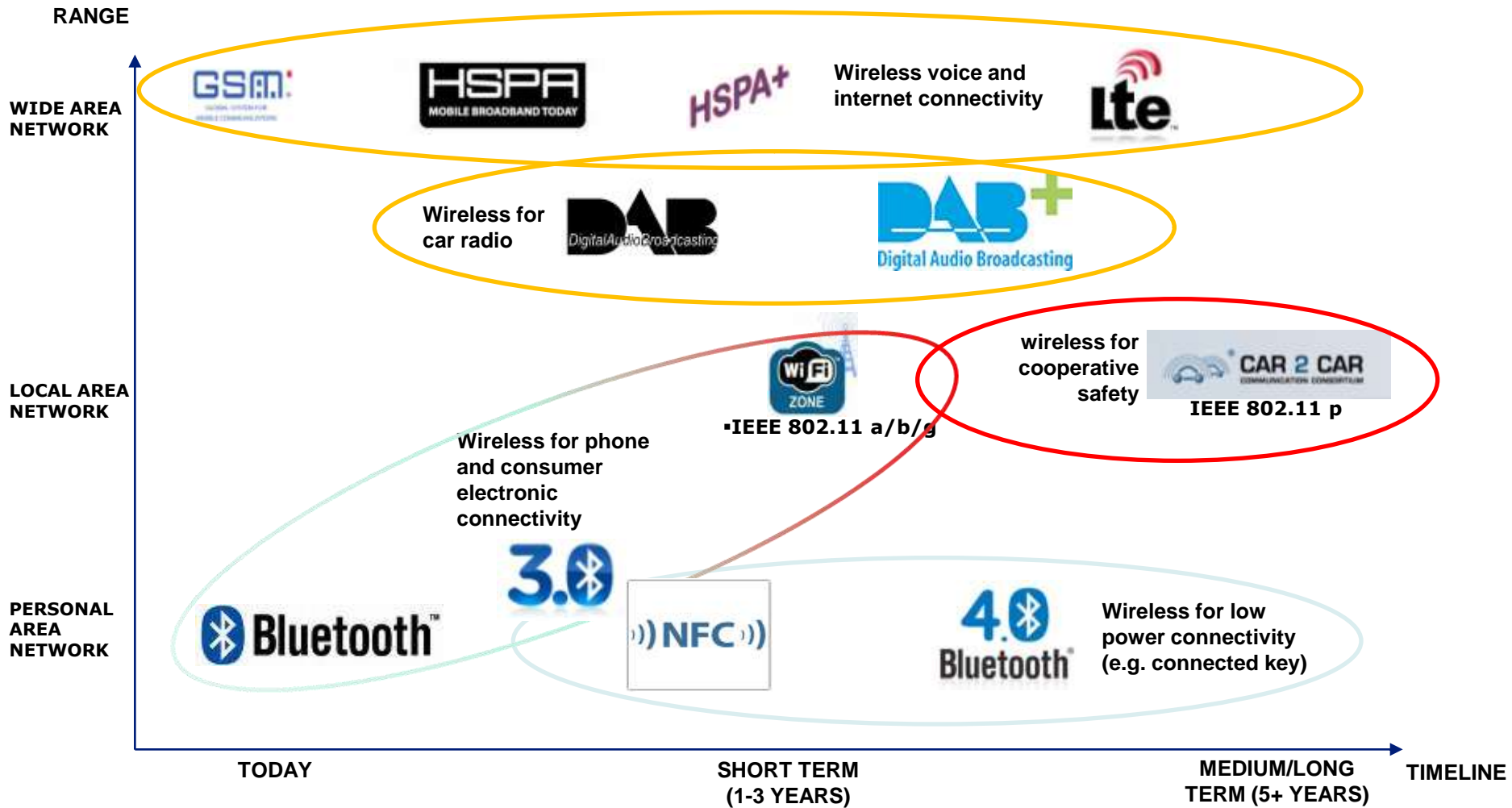
**Connected vehicles** extend drivers' and sensors' lines of sight and can see hidden dangers: cooperative systems have not the limit of the standards sensors, radars and cameras, in terms of perception: they could “see” also behind a curve, or in dense fog, all vehicles in the communication range are detected (electronic radar).

Then they have a considerable potential in terms of accident reduction.

By the way, all vehicle have to be equipped: full penetration is needed.



# Seamless connected vehicles: roadmap of wireless communication technologies

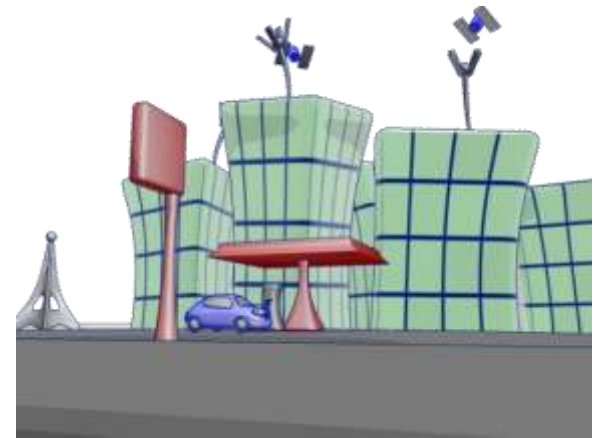


# Seamless connected vehicles: new paradigms for road safety

3G/4G, LTE cellular network (eCall in-vehicle platform)  
Short range communication (802.11.p)  
Galileo augmented vehicle positioning  
Traffic data management based on cloud computing



Dynamic electronic horizon for  
preventive safety,  
green and efficient driving



# Seamless connected vehicles: new paradigms for road safety, green and efficient driving

Connected vehicles & Future Internet IPv6 will enable the “APPs” approach for a positive cost/benefit ratio:

- Traffic jam ahead
- Emergency vehicle approaching
- Slow vehicle warning
- Post crash warning
- Obstacle warning
- Motorcycle warning
- Insurance and Financial Services
- Dealer Management
- Point of interest notification
- Fleet management
- ...



# Automotive applications of Near Field Communication (NFC)

OEMs, telecom operators and smart phone providers are the key stakeholders for NFC (Near Field Communication).

Investigations on integration of NFC technology in the automotive environment is a theme which has been developed within the cooperation between CRF and Telecom Italia

The smartphone is the main target of the NFC technology, which can be imagined as a wallet where the user “rights” are stored. Among these rights there could be the vehicle access code. In such a way the phone becomes the vehicle key.





# Automotive applications of Near Field Communication (NFC)

## Possible use cases

1. The owner of the vehicle uses his phone as the vehicle key (doors/ immobilizer).
2. The owner, by the means of a web service, can decide to enable the other user's phone for the vehicle usage.
3. The owner can decide to revoke the vehicle credentials from the phone of the user, who receives another self-installing message. The user has therefore no access to the vehicle



# Automotive applications of Near Field Communication (NFC)

Additionally, other functions can improve the offer:

- **Personal Settings** seat, steering wheel, radio stations, etc. are automatically adapted to personal configurations stored into the NFC mobile phone.
- **Car diagnosis** related information can be accessed via an NFC mobile phone.
- **Car rental:** the car user gets a time limited (software) key via an NFC mobile phone.
- .....

# Commonalities of research interest and needs among Transportation sector: Sea Transportation Technologies

- Solution&Technologies to **reduce** ships **air pollutions**
- Solution&Technologies to **improve Energy Efficiency** on ship systems
- Alternative technologies to **generate Power** on board
- New **methodologies for ship design** and **Multi-disciplinary Virtual Analysis** techniques to reduce time-to-market
- Solution&Technologies to **optimize Comfort** on board
- Technologies for **Controls** and **Security**

# Commonalities of research interest and needs among Transportation sector: Rail and Multimodal Transportation Technologies

- Solution&Technologies to improve **Energy Efficiency** on railroad systems (Green Technologies)
- Systems with high **Enviromental Sustainability**
- **Information, Security & Safety** technologies
- Architecture/system for **Safety and security** to optimize Performance, Costs & Benefits
- Improvement in **Quality and Efficiency** of processes for people and goods transportations..

# Conclusions

- Among the “emerging” technologies analyzed in 2012 AIRI report for the automotive sector, those related to **Communication** have growth of interest further in the last months
- **Communication techs** are key enablers not only for new infotelematics services on board but, at the same way, for preventive safety evolution and eco-driving
- Integration of **Communication technologies & precise positioning** (e.g. Galileo network of satellite), the future **Internet IPv6** and **cloud based computation** will enlarge the offer of automotive functionalities in the next years
- In this highly evolutionary contest, the AIRI network can offer opportunities of cross-fertilization among Sectors and the bases for joined participation to National/European funded Programme (e.g. [Cluster Tecnologici Nazionali](#))



Back –up



*Ministero dell'Università e della Ricerca Scientifica e Tecnologica*

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**LO SVILUPPO E POTENZIAMENTO DI CLUSTER TECNOLOGICI NAZIONALI**

***Cluster Tecnologici Nazionali***

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***AVVISO MIUR prot. 257/RIC del 31/05/2012***

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