



INTERNATIONAL  
ROAD CONGRESS

Innovation in Road Infrastructure



INTERNATIONAL ROAD FEDERATION  
FÉDÉRATION ROUTIÈRE INTERNATIONALE

# Innovating in Road Infrastructures with R5G – The 5<sup>th</sup> Generation Road

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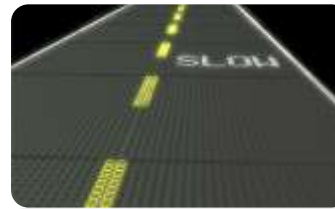


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# Need for R5G in France

- The current image of road transport
  - Bad image
  - Environmental cost too high
  - Excluded from greening politics
- Innovation in road transport
  - Numerous innovations are available in labs



- Lack of risk taking by public authorities (at least national ones)
- Technological transfer and industrialization
  - Need for full scale test beds
  - Identification of implementation tools
  - Renewal of research thematics

# Benefits of R5G

- Maintain the RAMS of road networks
  - Modal shift to guided transport
  - However, the road network must remain the same
- Reinforce industrial leaderships
  - Reduce social dumping
  - Design of new business models
- Reaching societal objectives
  - Reduction of carbon footprint of roads
  - Creation of new jobs
  - Renewal of education programs





# FOREVER OPEN ROAD

Redefining Highway Transport for the 21st Century



- Gather existing ideas and provide a solution which fulfills our future needs:
  - The adaptable road
  - The automated road
  - The climate change resilient road
- A concept which will...
  - Be adapted to future transport demand
  - Provide a low cost automated transport
  - Produce substantial benefits
- **Be Forever Open**



Winner of the 2011 Road Design and Construction prize – World Road Congress



# The Adaptable Road

Porous, low noise surfacing, light reflecting for night time driving.

Adaptable to freight transport communications, location and monitoring requirements.

Flexible, durable surface, self repairing/self-cleaning and instant crack repair.

In-built sensors for traffic monitoring/control and condition monitoring.

In-built lane control/vehicle guidance.

In-built power system for electric vehicles.

Removable/self-cleaning drainage reservoirs feeding carbon capture planting.

Adaptable/removable communication/power channels for lane control, traffic monitoring, driver information and condition monitoring.

Pre-fabricated inter-locking, sub-base with integrated drainage, services and communications channels.

Low carbon sub-base and pavement.

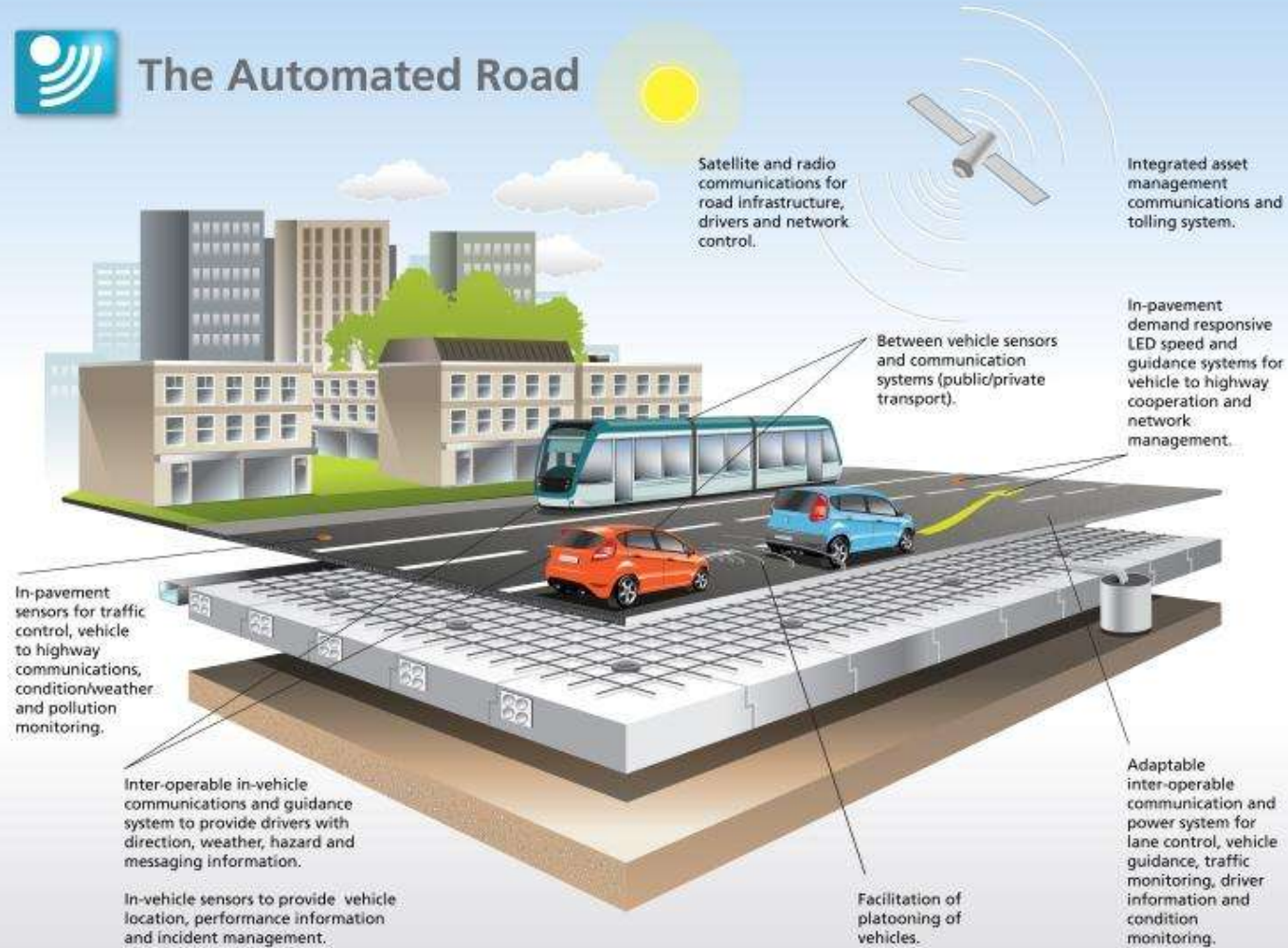
Energy harvesting grid and storage/use of solar energy to power lighting, signs and sensors.

In-built system for replacing and adding lanes/infrastructure, eg barriers, signs and sensors.





# The Automated Road





# The Resilient Road



# R5G embedded in a strong European alliance through FOR

NEW FP7-FP8  
PROJECTS!

- Already included in research programs and agendas



- Already integrated in European roadmaps



- More to come



# R5G - Design, construction and operation of full scale research demonstrators

- The French project R5G combines the three elements of the Forever Open Road following a systemic approach, in order to build full scale demonstrators so as to demonstrate the synergy among them and provide acceptable solutions.

## → The 4 elements of R5G

- The adaptable road
- The automated road
- The resilient road
- **The acceptable road**



## • R5G is already successful

- Industry claims for a R5G label
- SETRA claims for a common message between R5G program, innovations at early stages, and « Routes et rues » program, mature innovations for public procurement



# An Example: Components for an Energy-Efficient Road Transport

Construction

Recycling of Materials  
Cold mixes



Low rolling resistance pavements

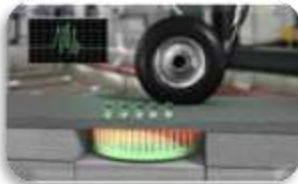


Modular urban pavement



Energy

Mechanical energy



Geothermal energy



Solar road



Mobility

Inductive charging



Eco-traffic management







Autonomous shuttles



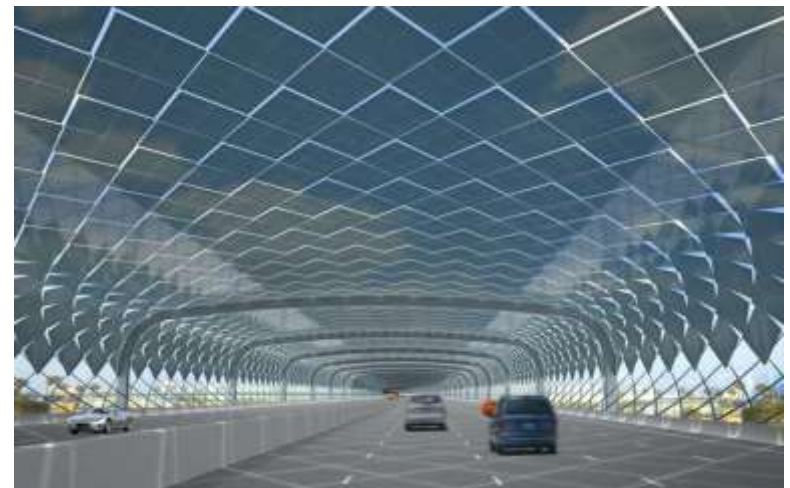


# Priorities of R5G demonstrators

	Urban networks	Periurban networks	TEN-T networks	Local networks	
Low carbon design and construction	High	High	High	High	 Adaptable road
Safe and smart operations	High	High	High	High	 Automated road
Resilience and energetic efficiency	High	High	High	High	 Resilient road
Juridical, social, individual, environmental acceptability	High	High	High	High	 Acceptable road

# Innovation Themes

- Human-centered design
- ITS Cooperative Systems
- Active traffic management
- Co-modality and intermodality
- New materials – economy of natural resources
- Business models
- Accidentology – road safety
- Road as energy provider
- Natural risks
- Environment
- Maintenance
- Modular pavements



*The solar road by Mans Tham*

# Systemic approach

Needs of road operators  
User expectations  
Societal objectives



Resilient road



Automated road

Needs of road operators  
User expectations  
Societal objectives



Adaptable road

Needs of road operators  
User expectation  
Societal objectives

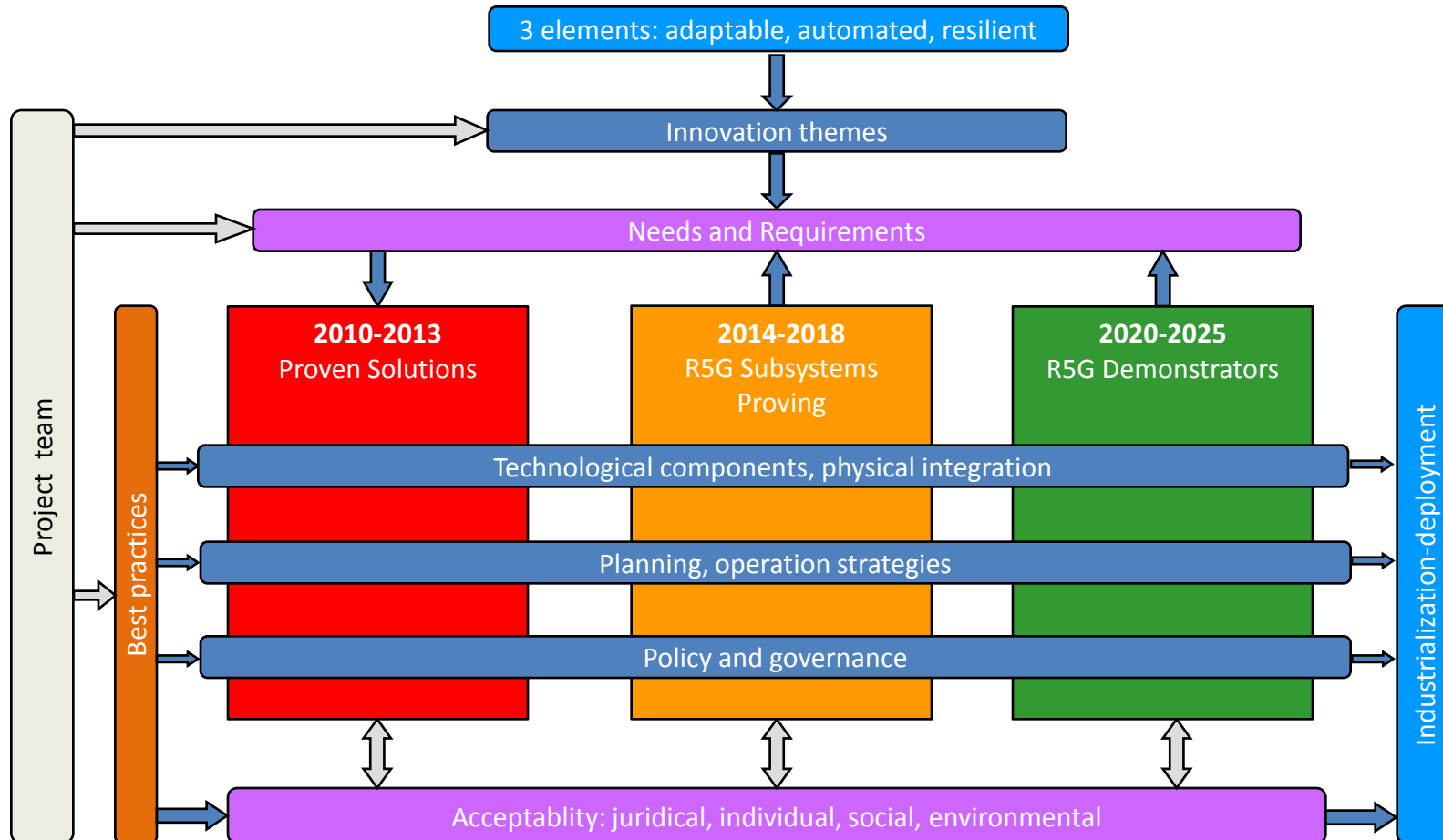




# R5G Demonstrators under Development

- Energy harvesting by the road (solar, wind, geothermal, mechanical, chemical, etc.) **together with our colleagues from BASt (Germany)**
  - Urban eco-mobility solution to be deployed in eco-neighborhoods or redesigned city hearts
  - High speed automation of motorways on dedicated lanes
  - Self-explaining and efficient secondary interurban local networks
- + 1 dedicated taskforce related to the acceptable road**

# Implementation





# Conclusion and Perspectives

- **The R5G project is building a fully integrated approach of road transport**
- **It is currently developing four full scale demonstrators which aim at proving the feasibility and the synergy among lots of innovations in terms of:**
  - Design and construction,
  - Management and operation including vehicle operations,
  - Resilience to climate change,
  - Acceptability.
- **R5G is embedded into a strong European alliance, especially the Forever Open Road program, which is the flagship program of FEHRL.**
- **Consortium under construction → New partners are welcome.**



# Questions

- R5G program managers

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- European affairs: FOR project, iMobility Forum, ERTRAC
- Coordination of the different demonstrators
- Industrial contacts related to road operation

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- Pilot of the GERI
- Industrial contacts related to road construction
- Contact with ADEME
- Pilot of the demonstrator related to road and energy

- Reference

N. Hautière, C. De La Roche. “Innovating in Road Infrastructures with R5G – The 5<sup>th</sup> Generation Road”. *IRF International Congress: Innovation in Road Infrastructure*, Moscow, Russia, November 2011