Innovation in road research

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Deputy Secretary General

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Forever Open Road

FEHRL

FOREVER OPEN ROAD
Redefining Road Transport for the 21st Century
FEHRL's Flagship Programme

OUTLINE

- Who is behind and what is driving us
- What is Forever Open Road
- The Adaptable Road
- The Automated Road
- The Resilient Road
- Strategies to enable the FOR
- Projects

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- Created in 1989 as the European Centre of Excellence in Road Research
- Formed as the organisation of National Road Research Centres
- Currently consists of over 40 institutes – with a public service orientation
- Platform for national technical centres

Why innovation?

In addressing the Global challenges…..

- Financial Crisis
- Globalisation
- Climate Change
- Social/Demographic Changes
- Energy and Resources security

….We need infrastructure to be more efficient:

- Much cheaper – 30% less cost
- Ensuring much more reliable traffic
- Much safer and more secure
- Minimal footprint
- Fully ICT integrated
- Enhancing new mobility concepts
- Enhancing social inclusion/accessibility
- Resilient to climate change effects

…… to be Forever Open ……

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Putting the WOW back in roads

Who & Why

FOR

Adaptable

Automated

Resilient

What now?

Projects

- Past WOW! Factors?
  - 1st generation – the bridge?
  - 2nd generation - the paved road?
  - 3rd generation - the smooth road?
  - 4th generation - the continuous road/motorways?
  - What will the 5th generation be like?
- We need to start to develop the 5th Generation Road!
  - Solves existing and future problems
  - Achievable through new technology
- Stakeholders need to be convinced that there's a workable concept!
  - Must be a long-term multi-national solution
  - Must have lots of costs savings and benefits

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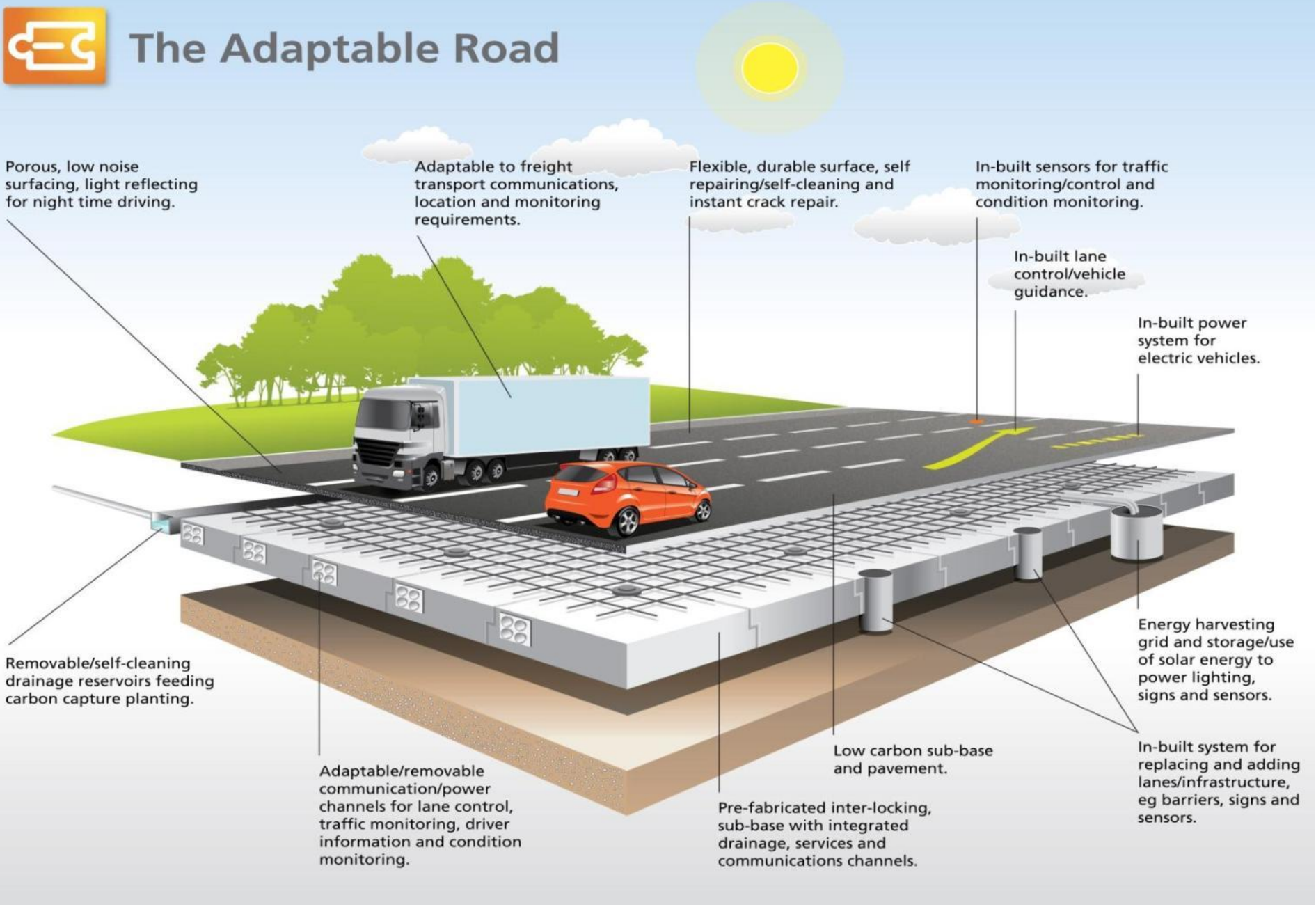
What is Forever Open Road

- A combination of national and multi-national activities implemented as of 2011
- Involving a wide range of partners from public and private sectors
- A new concept for roads that are **adaptable**, **automated** and climate change **resilient**
- A tool box with proven solutions/products from an integrated systems approach

The Adaptable Road



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The Adaptable Road

Who & Why

FOR

Adaptable

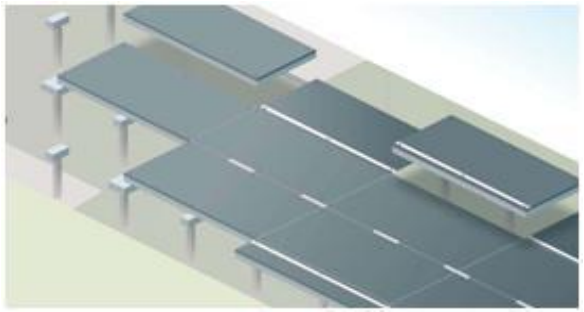
Automated

Resilient

What now?

Projects

- Fully adaptable to changes in demand
- Based on a pre-fabricated/modular system that can gradually be implemented across Europe's motorway, rural and urban road networks
- It will adapt to increasing travel volumes and to changes in demand for public transport, cycling and walking
- It will power vehicles, harvest solar energy, measure it own performance and even repair itself



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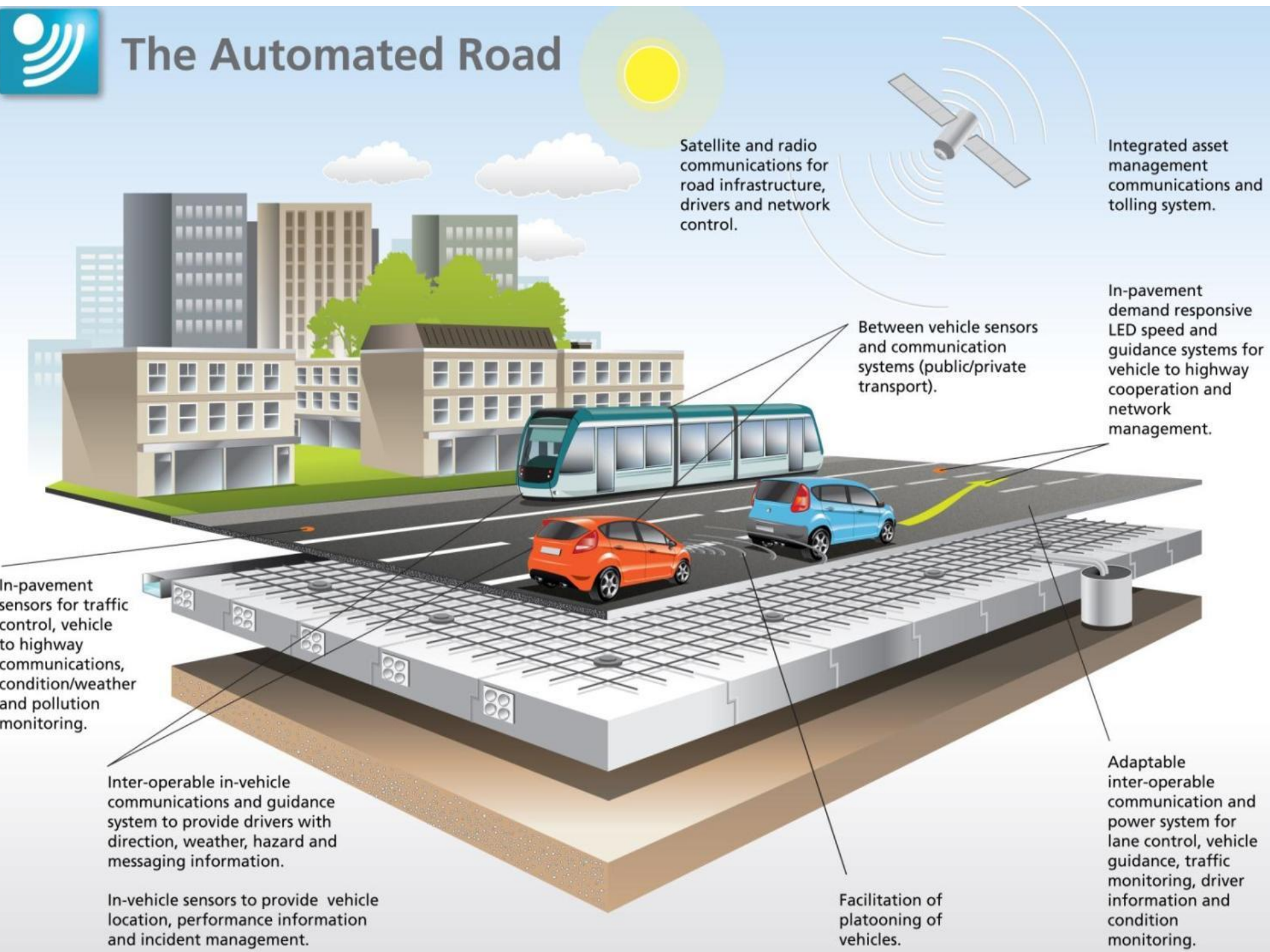
The Automated Road



Satellite and radio communications for road infrastructure, drivers and network control.

Integrated asset management communications and tolling system.

Between vehicle sensors and communication systems (public/private transport).

In-pavement demand responsive LED speed and guidance systems for vehicle to highway cooperation and network management.

In-pavement sensors for traffic control, vehicle to highway communications, condition/weather and pollution monitoring.

Inter-operable in-vehicle communications and guidance system to provide drivers with direction, weather, hazard and messaging information.

In-vehicle sensors to provide vehicle location, performance information and incident management.

Facilitation of platooning of vehicles.

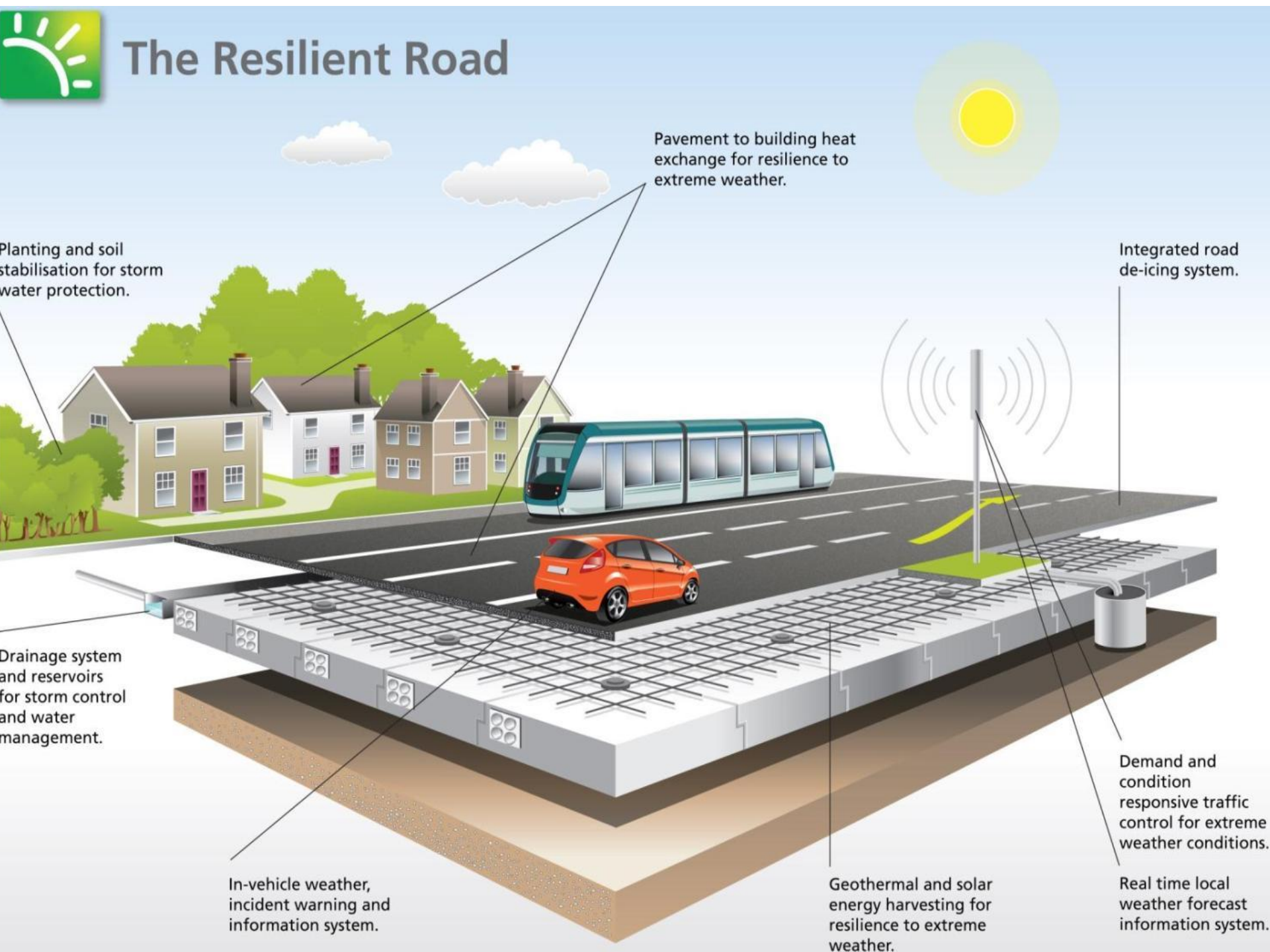
Adaptable inter-operable communication and power system for lane control, vehicle guidance, traffic monitoring, driver information and condition monitoring.

The Automated Road

Who & Why
FOR
Adaptable
Automated
Resilient
What now?
Projects

- Fully integrated with the user, vehicle, services and operations
- Will incorporate a fully integrated information, monitoring and control system
- Will support a co-cooperative vehicle-highway system that will manage travel demand and traffic movements
- Will measure, report and respond to its own condition, providing instant information on weather, incidents and travel information

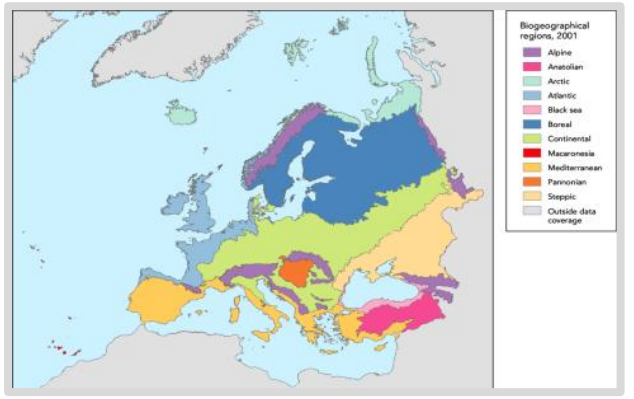
The Resilient Road



The Resilient Road

Who & Why
FOR
Adaptable
Automated
Resilient
What now?
Projects

- Fully adaptable to extreme weather conditions
- Will adapt itself to the impacts of extreme weather conditions and climate change
- Will monitor flooding, snow, ice, wind and temperature change, and mitigate their impacts through integrated storm drainage, automatic heating and cooling
- Will be linked to the integrated information system for travelers and operators



Strategies to enable FOR

Who & Why

FOR

Adaptable

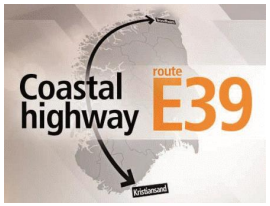
Automated

Resilient

What now?

Projects

- Building up the project portfolio
- On-going technology trials and system proving tests
- Newly funded projects (from EC, CEDR, National, …)
  - E.g. EXPECT, MIRIAM, TRIMM, INROADS
- Links to national programmes
  - R21C (DE), R5G (FR), Coast Highway Route E39 (NO), EAR (USA)



- New initiatives to pool research funds INFRAVATION
- Knowledge transfer to the sector

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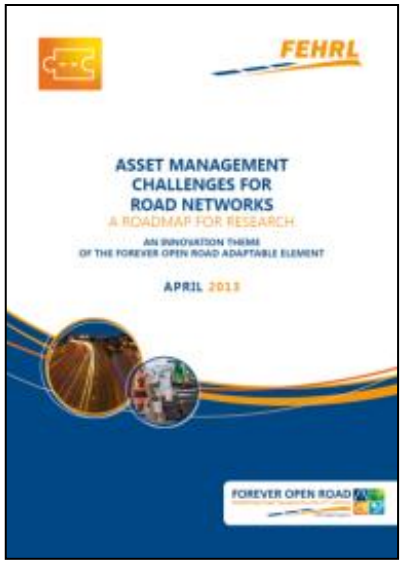
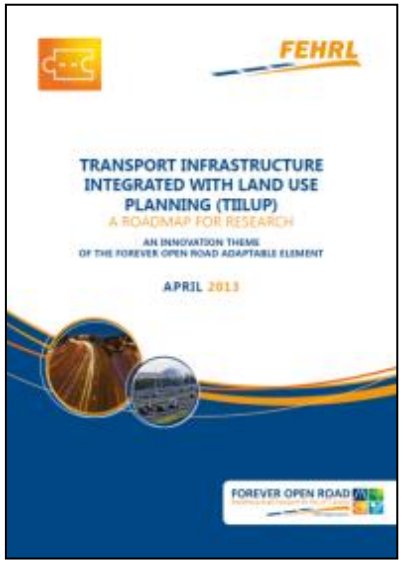
Roadmaps towards implementation

- Who & Why
- FOR
- Adaptable
- Automated
- Resilient
- What now?
- Projects





http://www.foreveropenroad.eu/

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SAMARIS, ARCHES projects

UHPFRC for rehabilitation of bridges
- a spreading technology!

SAMARIS, ARCHES projects

UHPFRC, characterised by a
- very low water/binder ratio,
- high binder content and
- an optimised fibrous reinforcement,

provide the structural engineer with a unique combination of extremely low permeability, high strength and tensile strain hardening.

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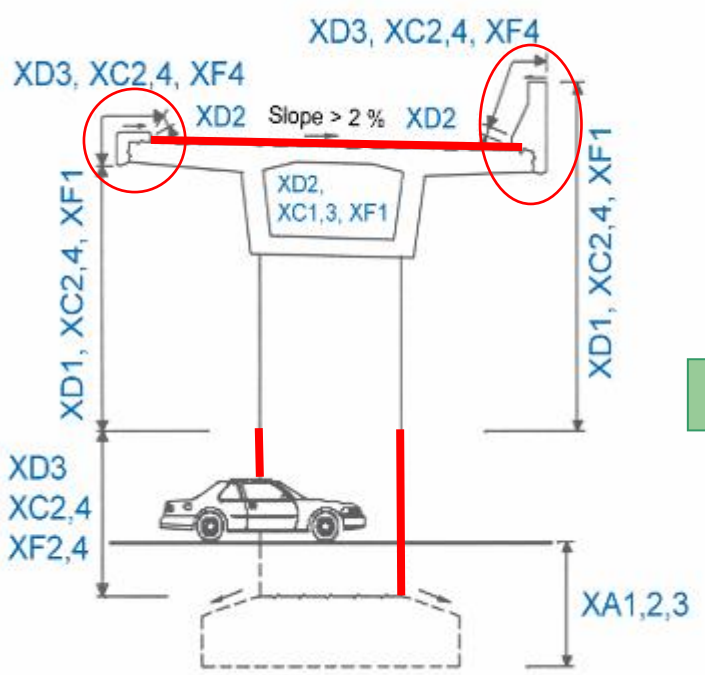
SAMARIS, ARCHES projects

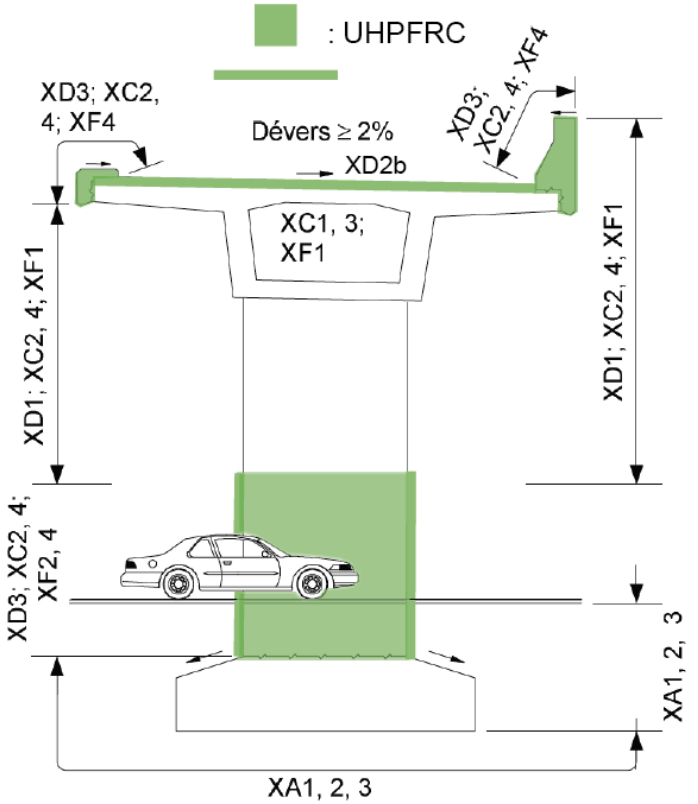
UHPFRC are perfectly suited to the rehabilitation of reinforced concrete structures in critical zones subjected to an aggressive environment and to significant mechanical stresses, to provide a long-term durability and thus avoid multiple interventions on structures during their service life.

SAMARIS, ARCHES projects



Brühwiler
1999

UHPFRC



➔Liquid water + Cl^- = XD2, XD3

➔Most aggressive for structures !

➔Apply protective watertight UHPFRC overlay

➔Improve durability and load carrying capacity

SAMARIS, ARCHES projects

- 1st validation during the SAMARIS FP5 project
- The FP6 ARCHES project showed implementation of technology with local components in Slovenia and Poland was possible and fostered the use of cost-effective (ECO) UHPFRC mixes with reduced clinker content.
- By May 2014, more than 25 applications of cast-on site UHPFRC to protect or reinforce bridges or slabs in industrial buildings, alone or combined with reinforcing bars (rebars), have been performed successfully since 2004 in Switzerland and one in Slovenia

Full scale application – SLOVENIA

Log Čezsoški bridge – Soča river, July 2009 - Owner: Municipality of Bovec

➔ Rehabilitation of the sidewalk, and deck with Slovene UHPFRC

Full scale application – SLOVENIA

Concrete plant mixer
Batches of 320 litres
Mixing time = 12 minutes
2 or 3 batches per truck

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The bridge after rehabilitation

TRIMM is supported by funding from the 7th Framework Programme Call: SST.2011.5.2-2. Theme: Advanced and cost effective road infrastructure construction, management and maintenance

TRIMM

EC FP7 project

http://trimm.fehrl.org/

TOMORROW'S ROAD INFRASTRUCTURE MONITORING & MANAGEMENT

What is the essence of TRIMM?

- A selection of very promising advanced monitoring techniques are developed and assessed
- Facilitating implementation of monitoring:
  - Identify barriers to implementation
  - Address stakeholder needs
  - Development and use of indicators – make sense of data
  - Support road infrastructure managers when designing monitoring schemes

Overall approach

- **Develop, test and validate** selected advanced monitoring technologies
- Show how the advanced monitoring methods can be implemented through **indicators**
- **Develop complimentary**, accurate and relevant **technical parameters** and **indicators** to enable utilisation of advanced monitoring data
- Investigate **added value of monitoring** and provide method for assessment

Asset management

- Task 5 – Recommendations and guidelines for advanced monitoring
  - Task 4 – Methodology and support for assessment of monitoring schemes
    - Task 3 – Reliability based societal cost – benefit method
    - Task 2 – Relate condition indicators to performance and impact
    - Task 1 – Condition indicators

Bridge monitoring

- Automated 3D visual bridge inspection
- Traffic load monitoring
- Acoustic monitoring
- Corrosion monitoring
- Monitoring of joints and bearings
- Integrated Bridge monitoring method

Road monitoring

- Monitoring road functionality in real time with data collected from vehicles.
- Monitoring of Road Inventory
- Identification of Potential Water Ponding
- Monitoring of structural condition
  - TSD – Traffic Speed Deflectometer
  - GPR – Ground Penetrating Radar
- Monitoring of surface condition
  - Ravelling
  - Cracking

European Commission

The research leading to the results has received funding from the European Community's Seventh Framework Programme (FP7/2008-2013) under grant agreement no.618109

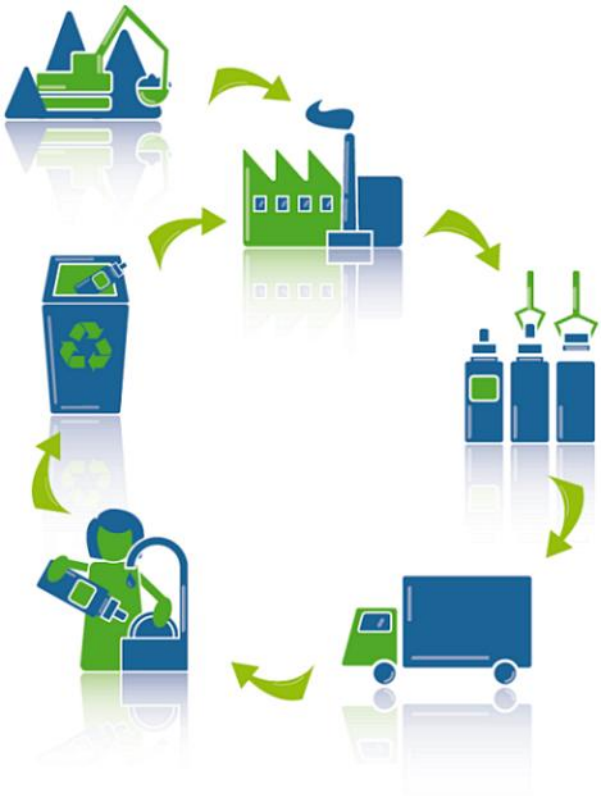
ECO LABEL

http://ecolabelproject.eu/

EU Ecolabel for materials

EU ECOLABEL is a voluntary system for environmental rating to identify and certificate products or services according to ISO 14024 provided by a third party or certifying agency

There are already more than 17000 EU Ecolabelled products on the market but no references for road products and infrastructures



Project Objective

The main objective of the project is to develop a new, green, holistic and EU-harmonised ecolabeling methodology for road products and infrastructures, integrating by a Life Cycle Engineering (LCE) approach the following aspects:

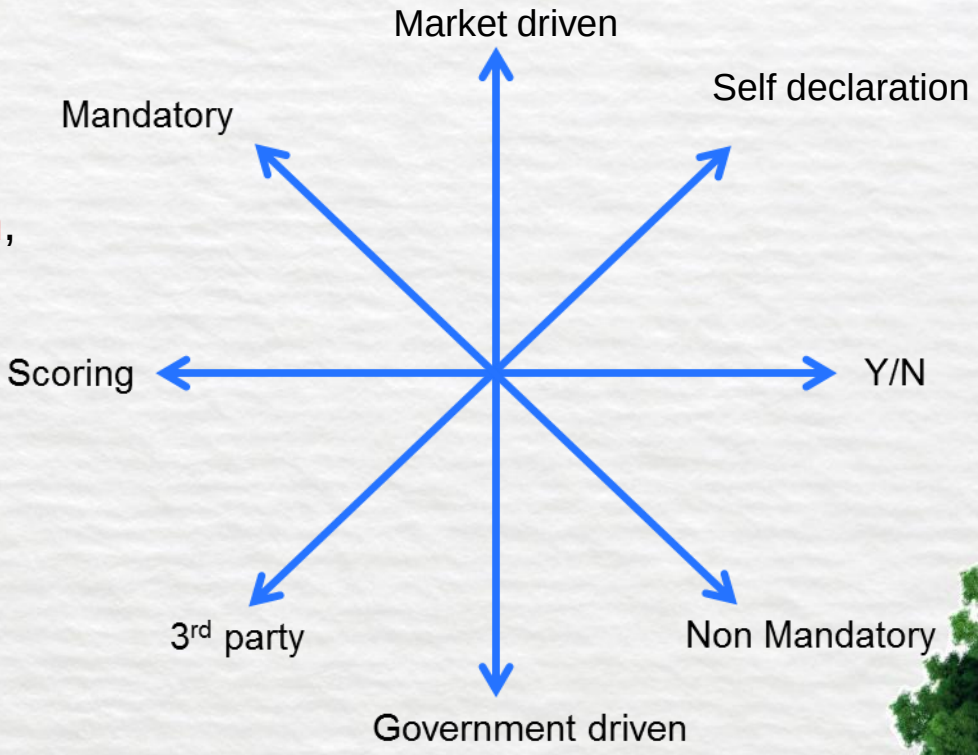
- **Environmental**
- **Economic**
- **Social**
- **Technical**

ECOLABEL Methodology

♦Boundary conditions

ECOLABEL will be focused on pavements including soilworks. Consideration will be given to new construction and maintenance and rehabilitation works.

♦ ECOLABEL will be a scoring label, mandatory and government driven, certified by 3rd parties.



Summary

- FEHRL; platform for national technical centres
- Innovation is needed to address the global challenges
- Forever Open Road; vision of future
- Forever Open Road; toolbox of solutions

Thank you for your attention!

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