



**IRF WORLD ROAD
MEETING 2017**

/ 14-17 NOVEMBER / DELHI / INDIA /

**FOX and USE-IT: Harmonised
and Interoperable
Transport Infrastructure
Across All Transport Modes**

Thierry Goger, Migle Pallukaite
and Caroline Evans

- 1st generation – the bridge
- 2nd generation - the paved road
- 3rd generation - the smooth road
- 4th generation - the continuous road/motorways



In **Canada**,
they use special stickers to slow the cars.



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FEHRL



ROUGH ROADS

RU



In Europe a

PRO

SEN

FEHRL – the Forum of Europe's National Road Research Centers

Focus on Road Infrastructure

FEHRL Members and Associates

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	 BRR		 ANAS with UNIFI		 ZAG
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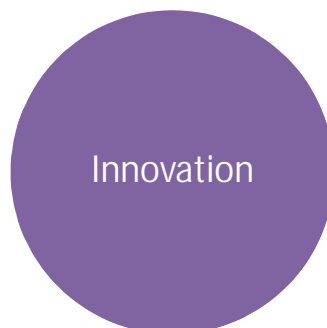
FEHRL: the cornerstone of research, innovation and implementation in Europe



35 top R&D centres in Europe & Worldwide



Regular cooperation with the European Union Institutions

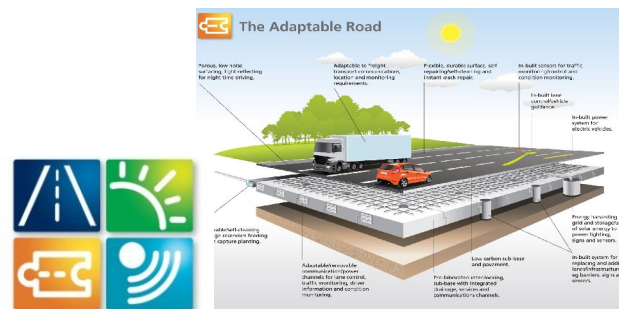


MoU
CEDR-FEHRL

Active cooperation with

- EAPA
- EUROBITUME
- ECTP
- ETRAC

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- 4th generation - the continuous road/motorways
- 5th generation – FOREVER Open Road



FOREVER Transport Infrastructure (FORx4)



❖ Adaptable



❖ Automated



❖ Climate change resilient



FOREVER OPEN ROAD
Redefining Road Transport for the 21st Century



FEHRL's Flagship Programme





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.

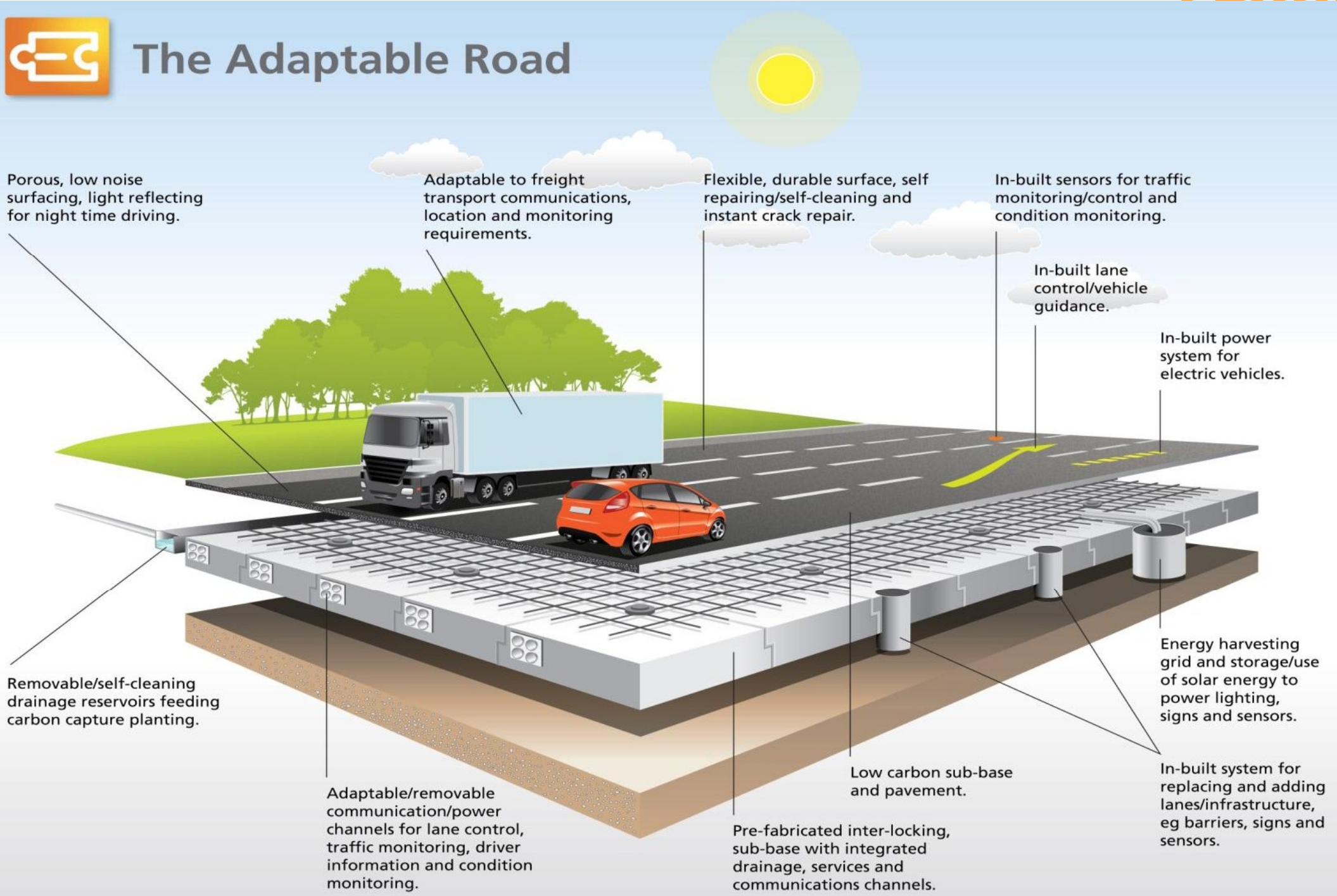
Adaptable/removable communication/power channels for lane control, traffic monitoring, driver information and condition monitoring.

Low carbon sub-base and pavement.

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

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



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.

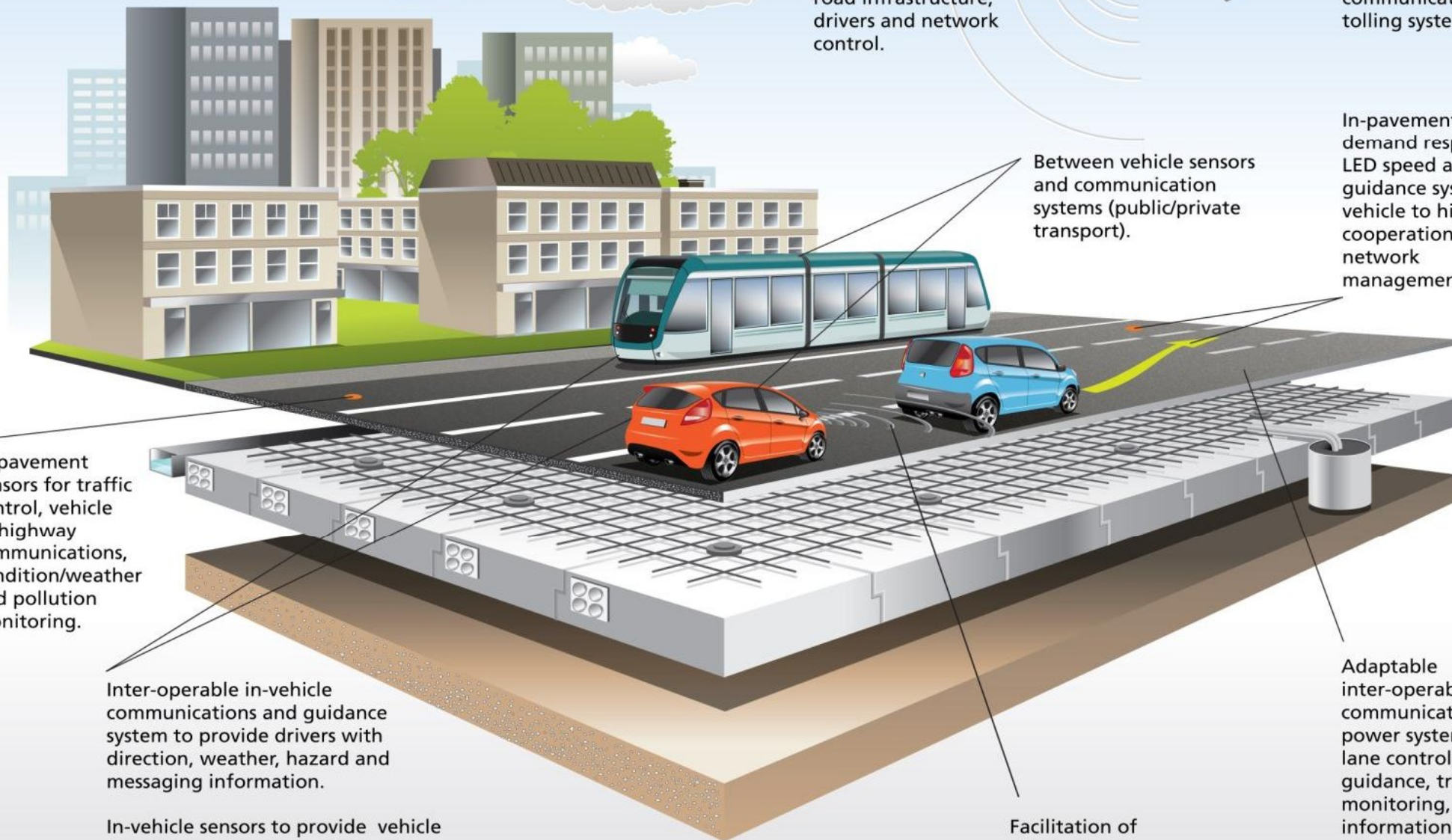
In-pavement sensors for traffic control, vehicle to highway communications, condition/weather and pollution monitoring.

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.

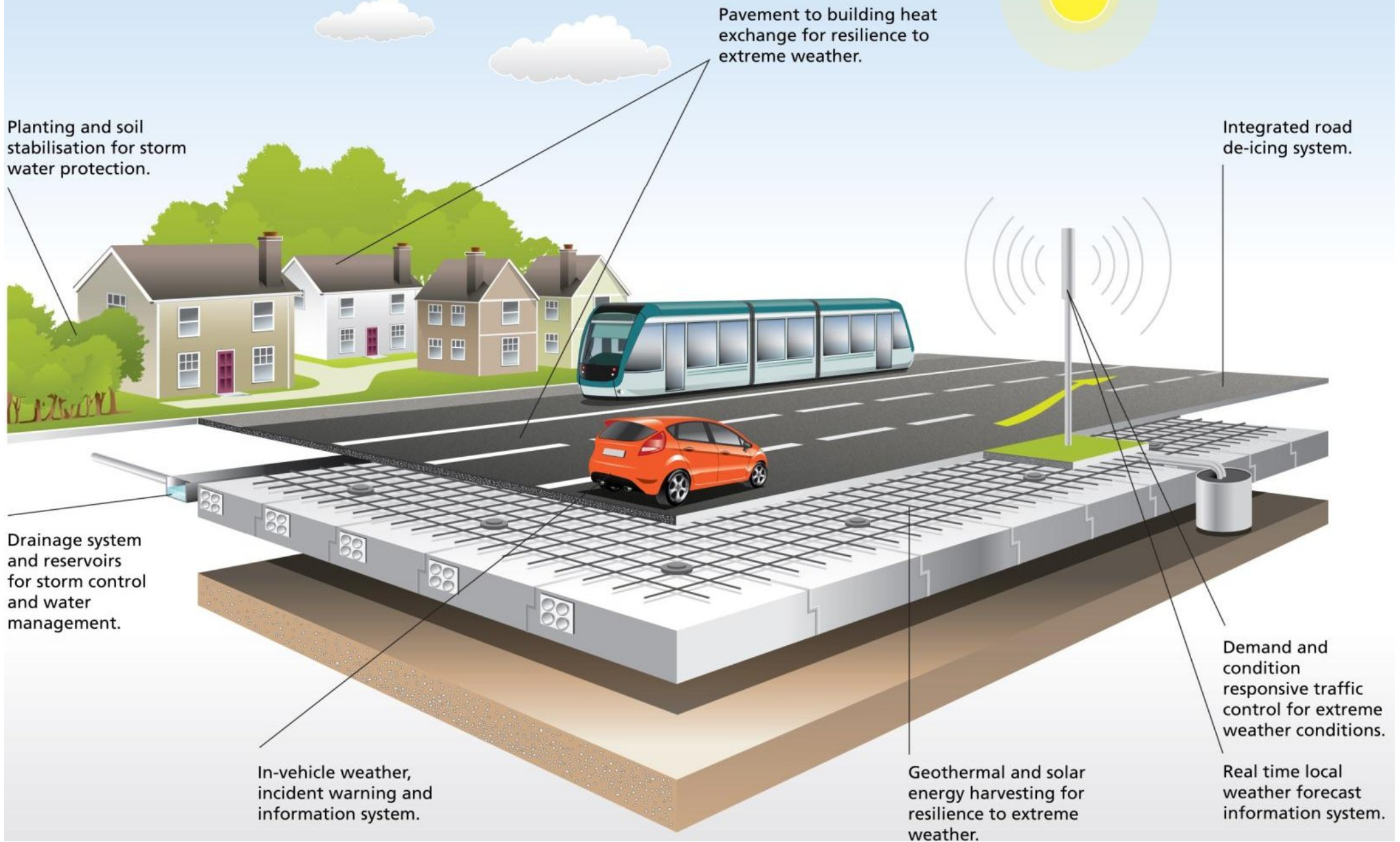
Facilitation of platooning of vehicles.

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



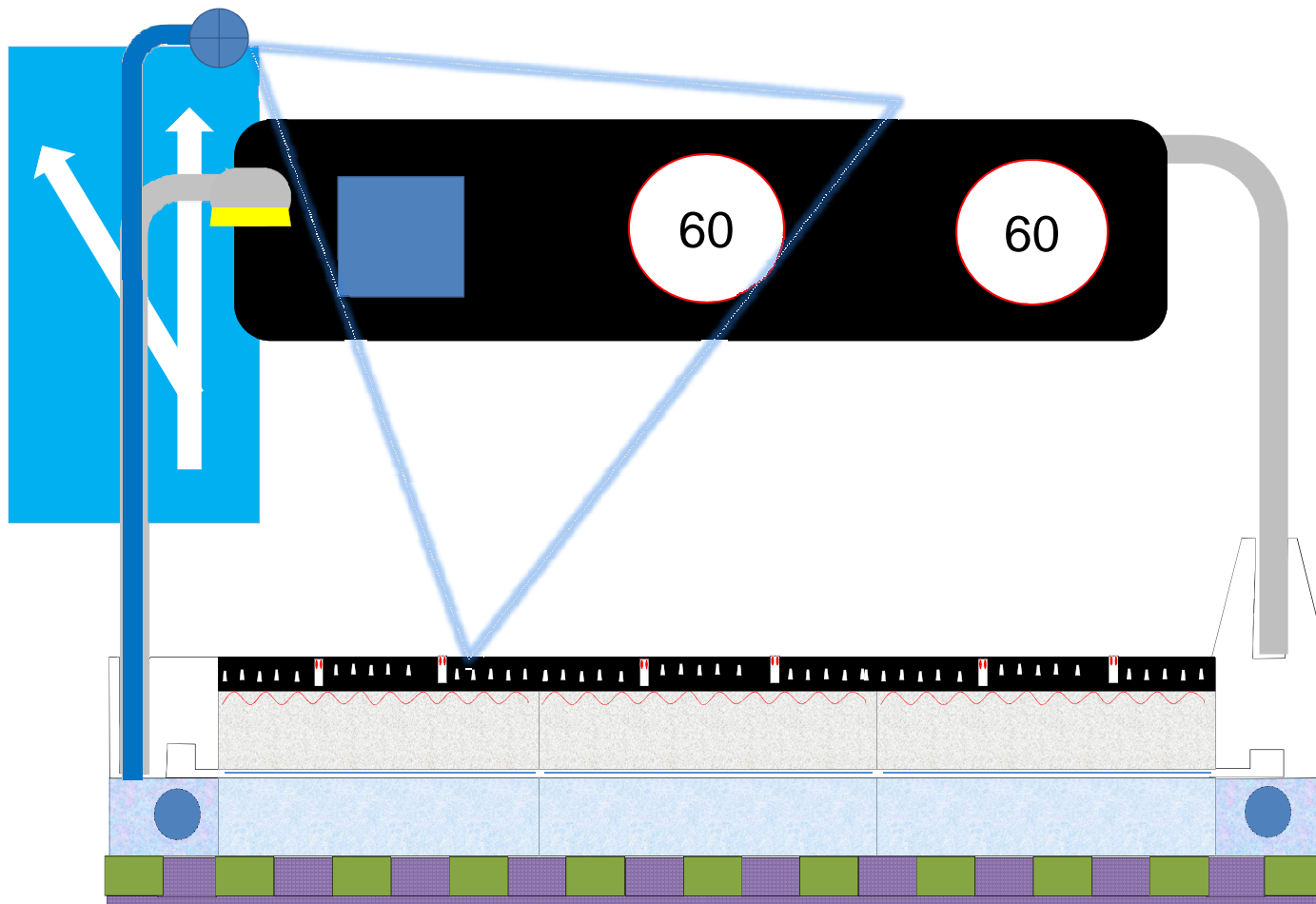


The Resilient Road



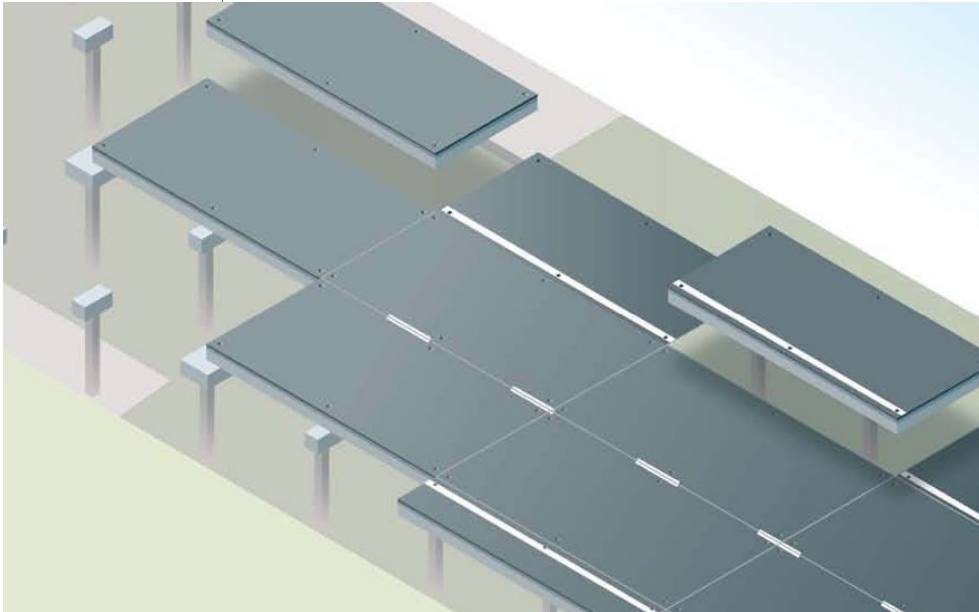


New Construction Systems?





ModieSlab Prefabricated Road





Road on a Roll, Netherlands





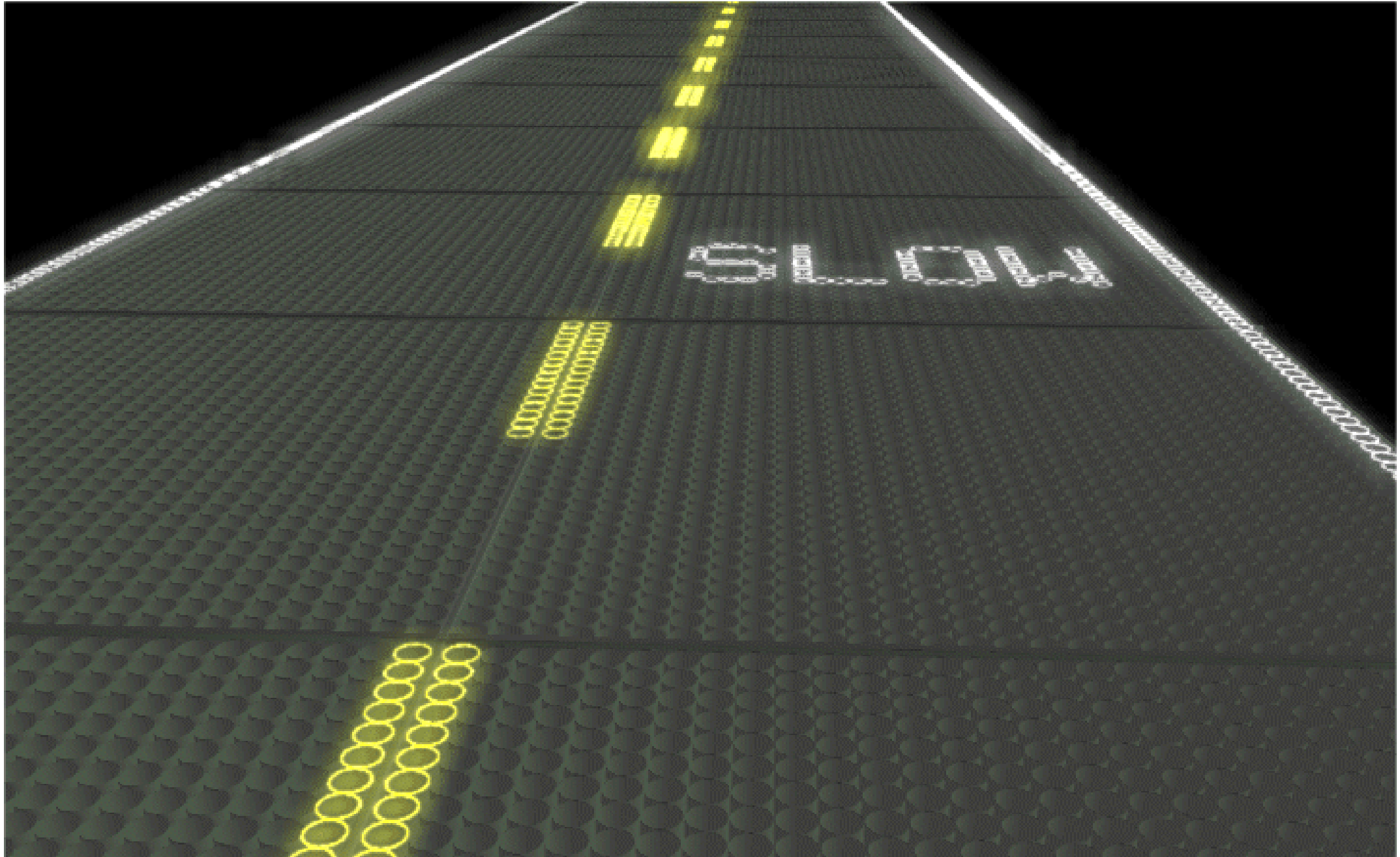


Contactless Charging of Electric Vehicles



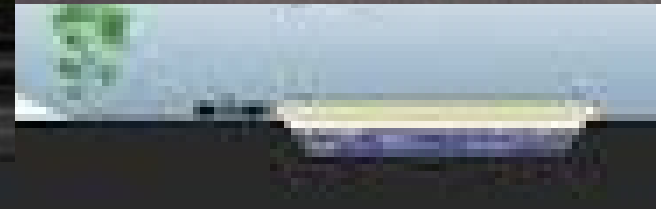
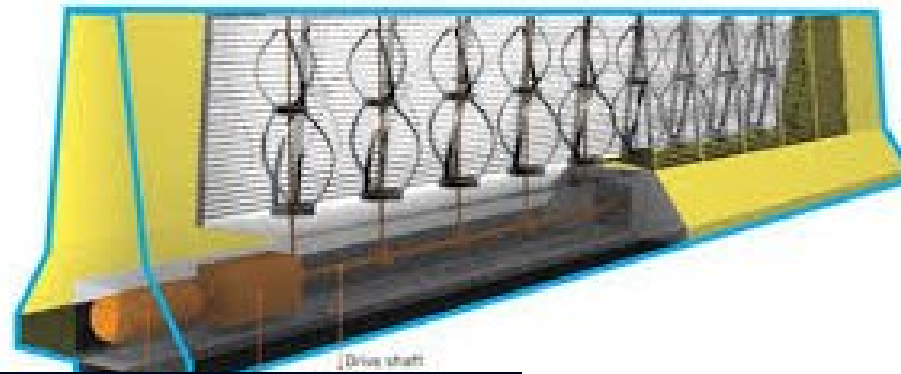


Solar Road



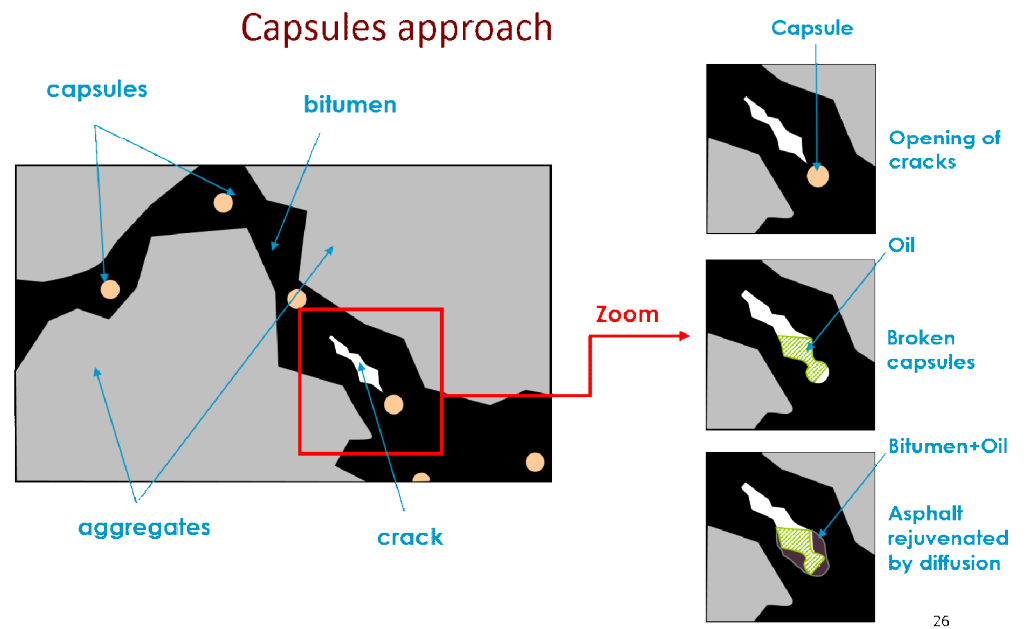
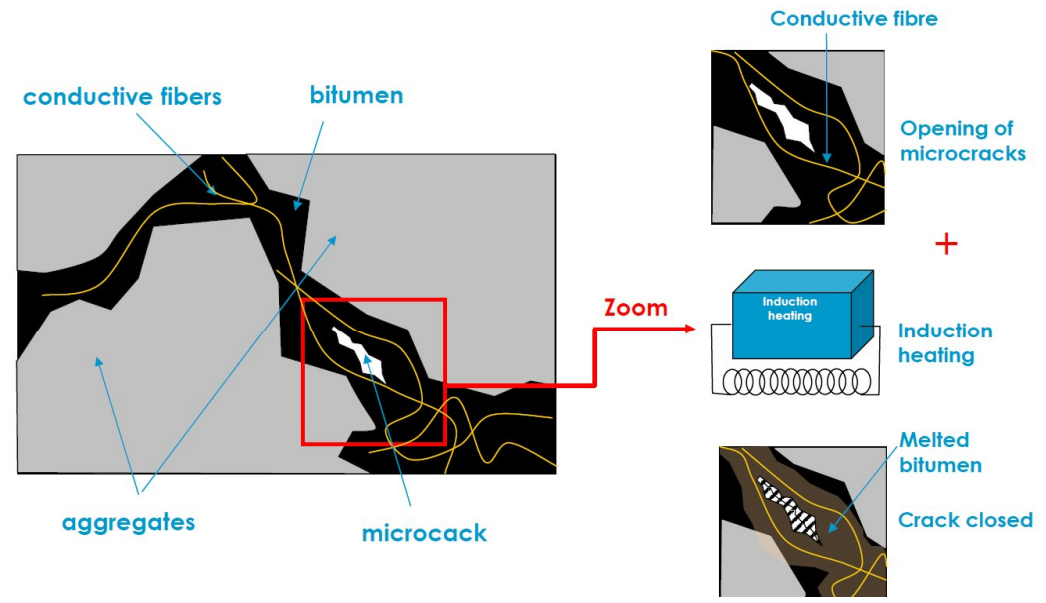
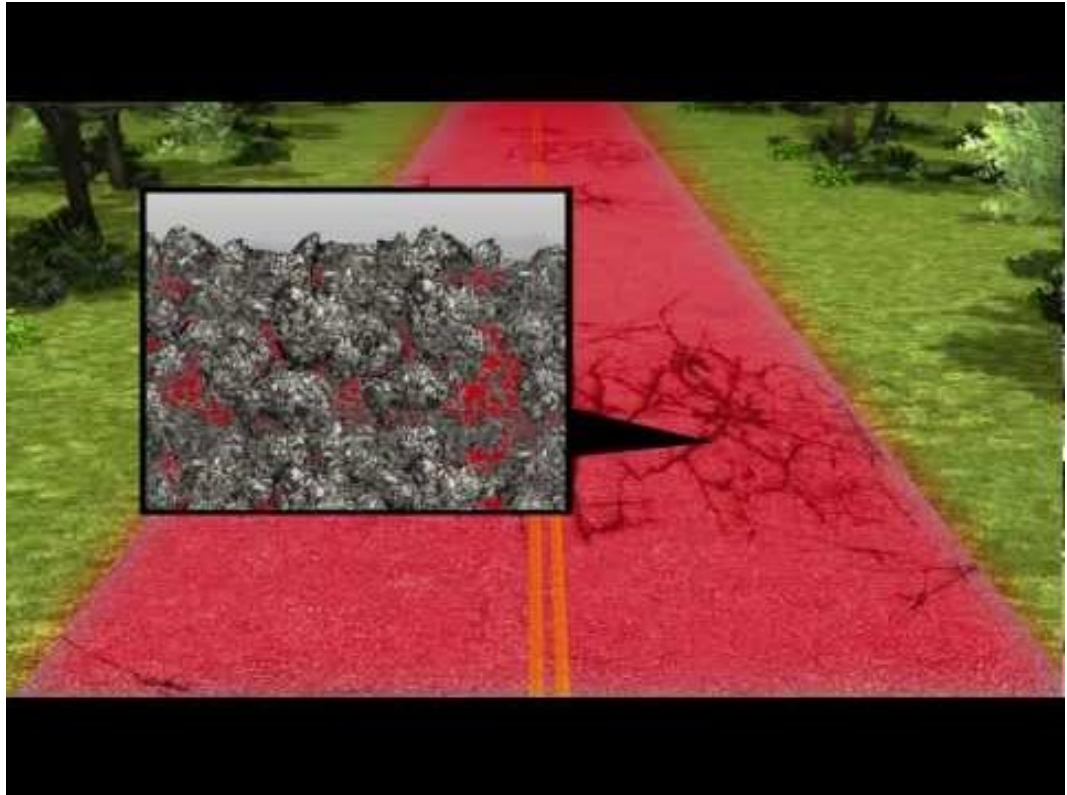


Wind Road



Self Healing Asphalt

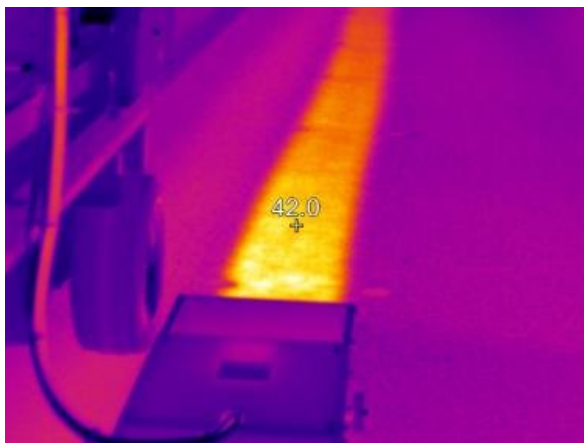
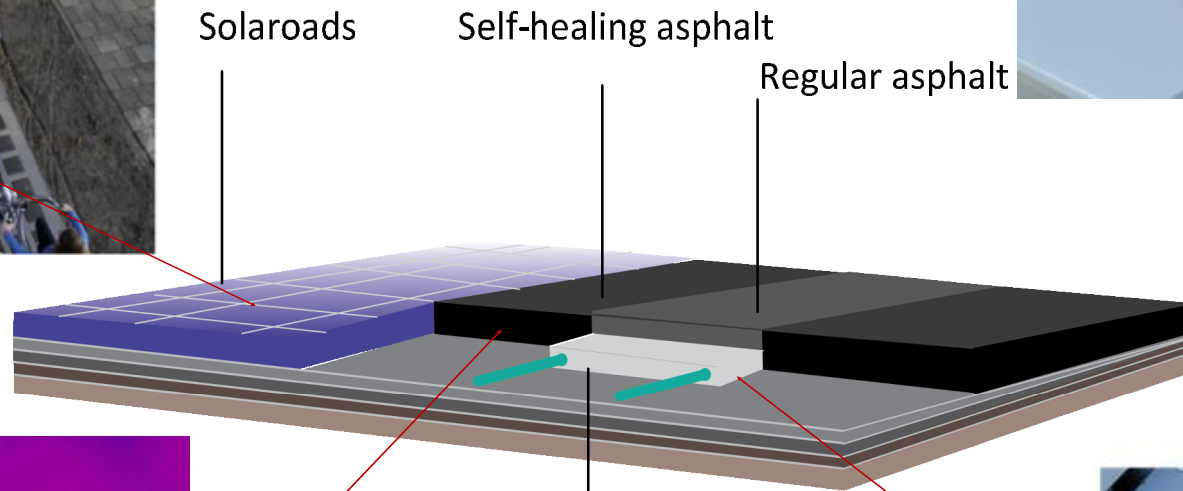
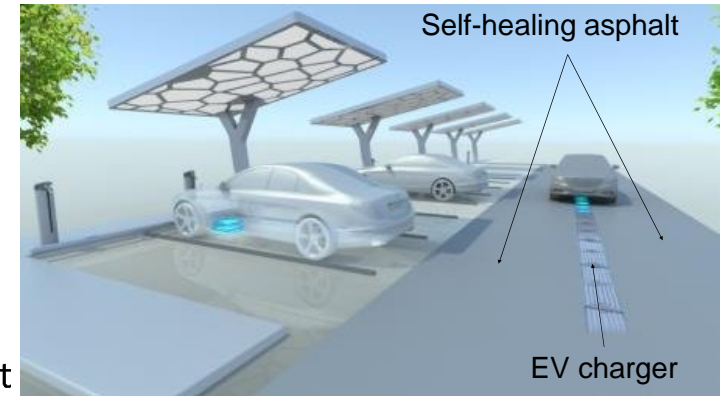
Steelwool fibres and induction energy



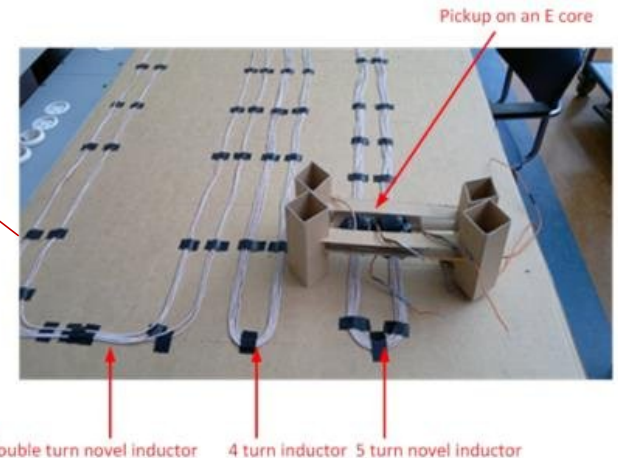
Future roads - 2030

- **Forever Open Road:**

- Self healing road with EV capabilities.

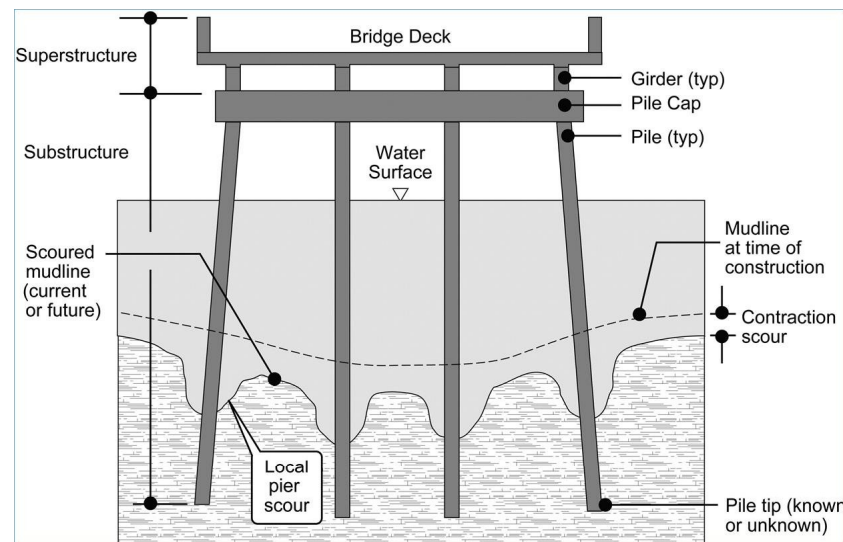


Concurrent inductive power and healing





Safe utilization of seawater and salt-contaminated aggregates (natural or recycled)



Generating renewable energy / energy harvesting from transport infrastructure – R & D & I topics

from “limited generation / harvesting of renewable energy

to “widespread generation / harvesting of renewable energy”

Integration of energy generation in transport infrastructure














































Relevant to		Research, Development & Implementation Topics	Mode	Timeline	
Level of application	Domain Type			2017	2030 onwards
		1.1	Identify suitable scenarios for conventional PV and develop policy, guidance and standards to support greater use		
	 	1.2	Development of novel PV products e.g. solar roads and solar powered trains		
		1.3	Development of lower cost conventional PV products and more streamlined installation		
		1.4	Cost-benefit study estimating the payback time from different types of PV		
		2.1	Identify scenarios where the optimum energy solution is combined renewables		
		2.2	Development of methods (physical and software systems) to intergate and balcance different energy sources		
		2.3	Develop supporting policy, guidance etc. to support use		
	 	3.1	Trials of connecting vehicles with regenerative braking to sub-stations or other forms of using the energy captured	 	
		3.2	Development of national/European protocols, identification of legal barriers		
		3.3	Cost-benefit study to establish the level of traffic required to make this cost-effective and the best applications for captured energy		

Figure 32 Generating renewable energy

Innovation

- General model
- Road mapping of technology transfers and development

REFINET
INFRASTRUCTURE MOBILITY

USE-iT
FOX

SETRIS
www.useitandfoxprojects.eu

- Implementation plans

Implementation

- Investment plans
- Bid book

Investment



Thank you!



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