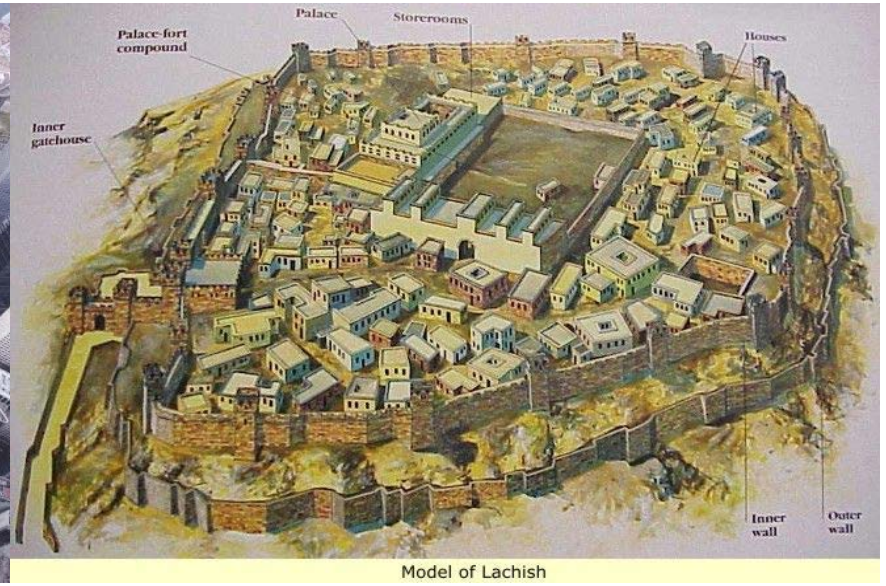
CHALMERS
UNIVERSITY OF TECHNOLOGY

Smart cities and infrastructures

Bijan A. Zarrabi zarrabi@chalmers.se

What is the definition of a smart city?

‘The answer is: there is no universally accepted definition of a smart city. It means different things to different people. The conceptualisation of Smart City, therefore, varies from city to city and country to country, depending on the level of development, willingness to change and reform, resources and aspirations of the city residents’.

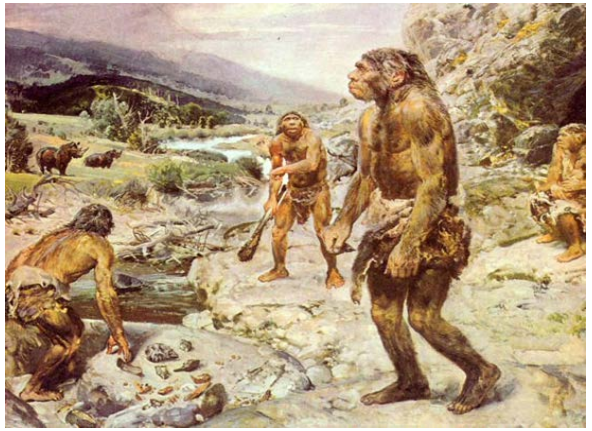


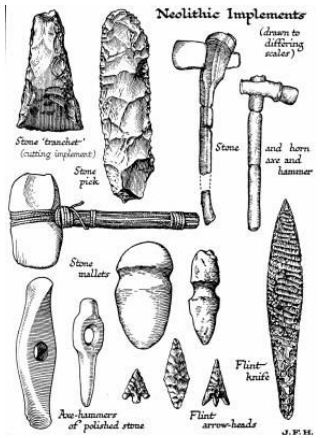
Model of Lachish

In order to survive we need:

- Air
- Water
- Food
- Shelter

A suitable environment



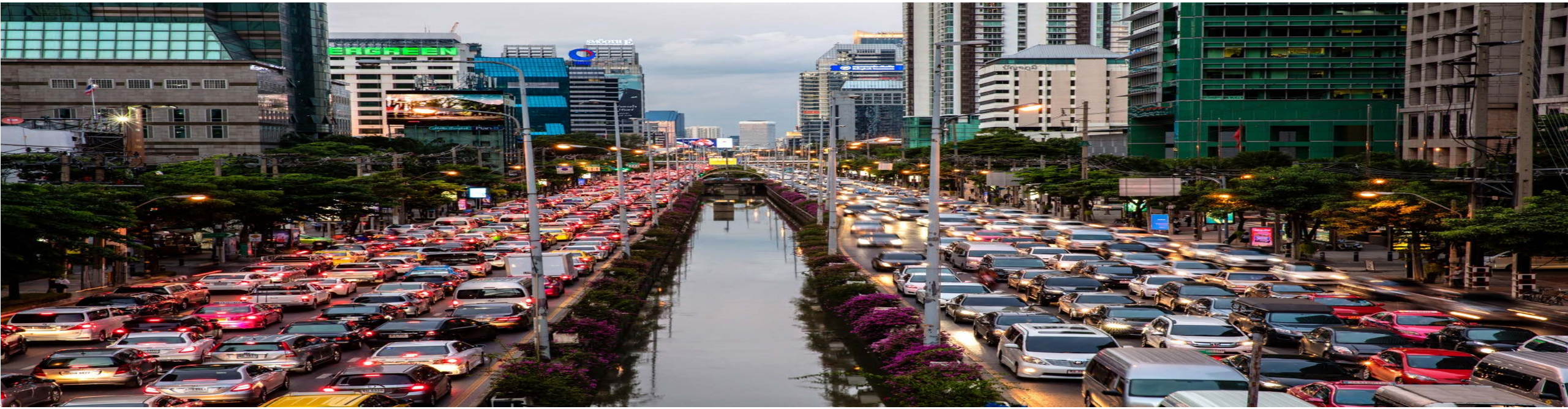


Time

World population:
7,7 Billion

- Our cities have always been smart because smartness depends on time, place and challenges.

My definition: A smart city is a city which utilize the recent knowledge and technical tools for enhancing its inhabitants social, economical and ecological condition.



Challenges (world)

Air (environment)		
Forest loss this year	2,242,980	(hectares)
Land lost to soil erosion this year	3,019,658	(ha)
CO2 emissions this year	17,493,793,061	(tons)
Desertification this year	5,175,586	(hectares)
Toxic chemicals released in the environment this year	4,223,441	(tons)
Water		
Water consumed this year	4,856,463,389	(million L)
Deaths caused by water related diseases this year	363,167	persons
People with no access to a safe drinking water source	**850,324,548**	persons
Food		
Undernourished people in the world	837,300,447	persons
Overweight people in the world	1,677,283,984	persons
People who died of hunger **per day**	**14,304**	person

City level

- Densification of cities
- Urbanization
- Immigration
- Climate change
- …..
- ……

Tools for running a city in **Digital Age**:

- Different type of hard infrastructure:

- Mobility: Transport infrastructure
- Electrical devices: Electrical grid
- Heating/cooling: District heating network
- Water: Water supply network
- Wastewater: Sewage network
- **Communication (ICT):** Underground Cables
- …….

Robotization

Internet Of Things (IOT)

Digitalization

Optimization

Advanced material

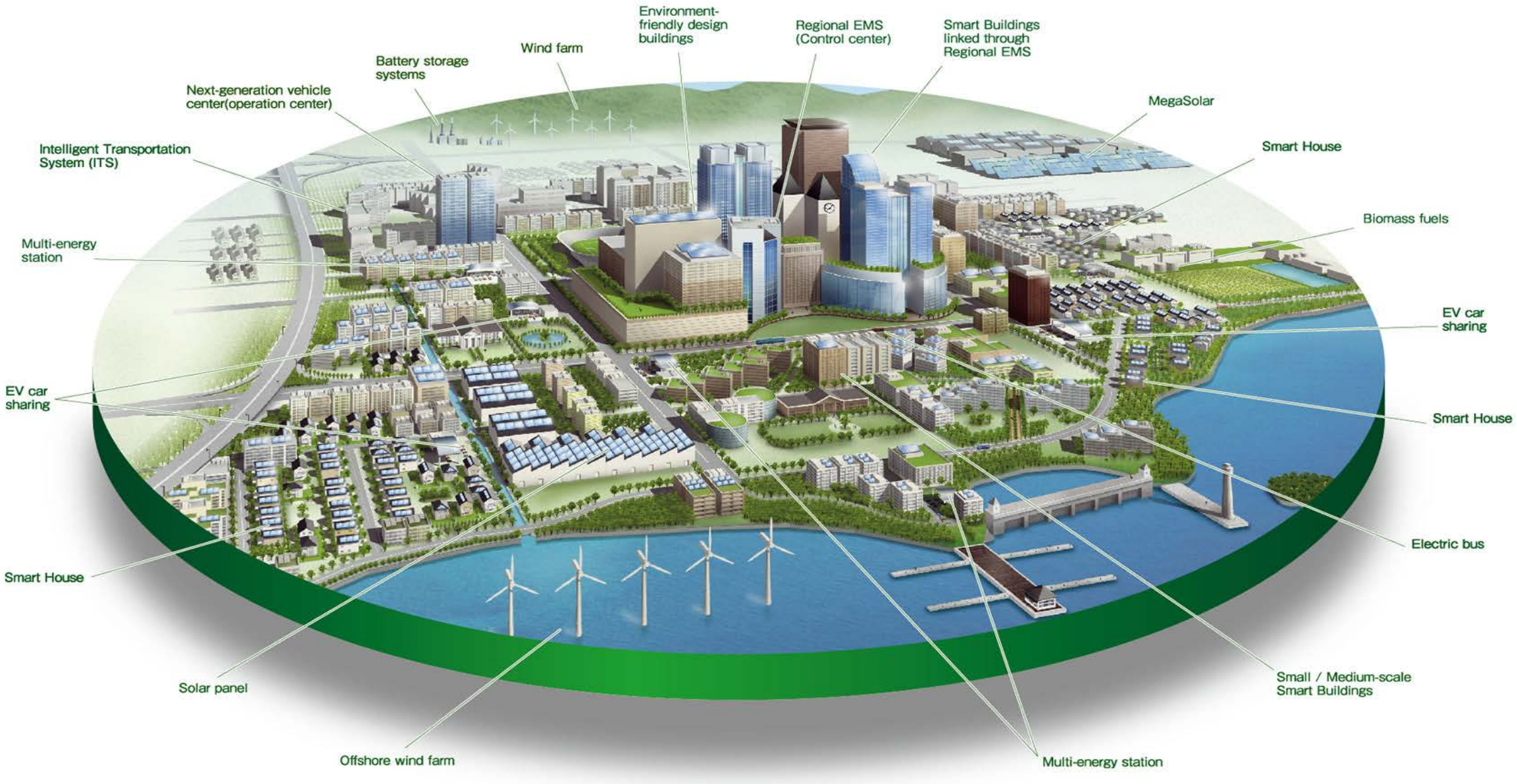
Virtual reality (VR)

Artificial Intelligence (AI)



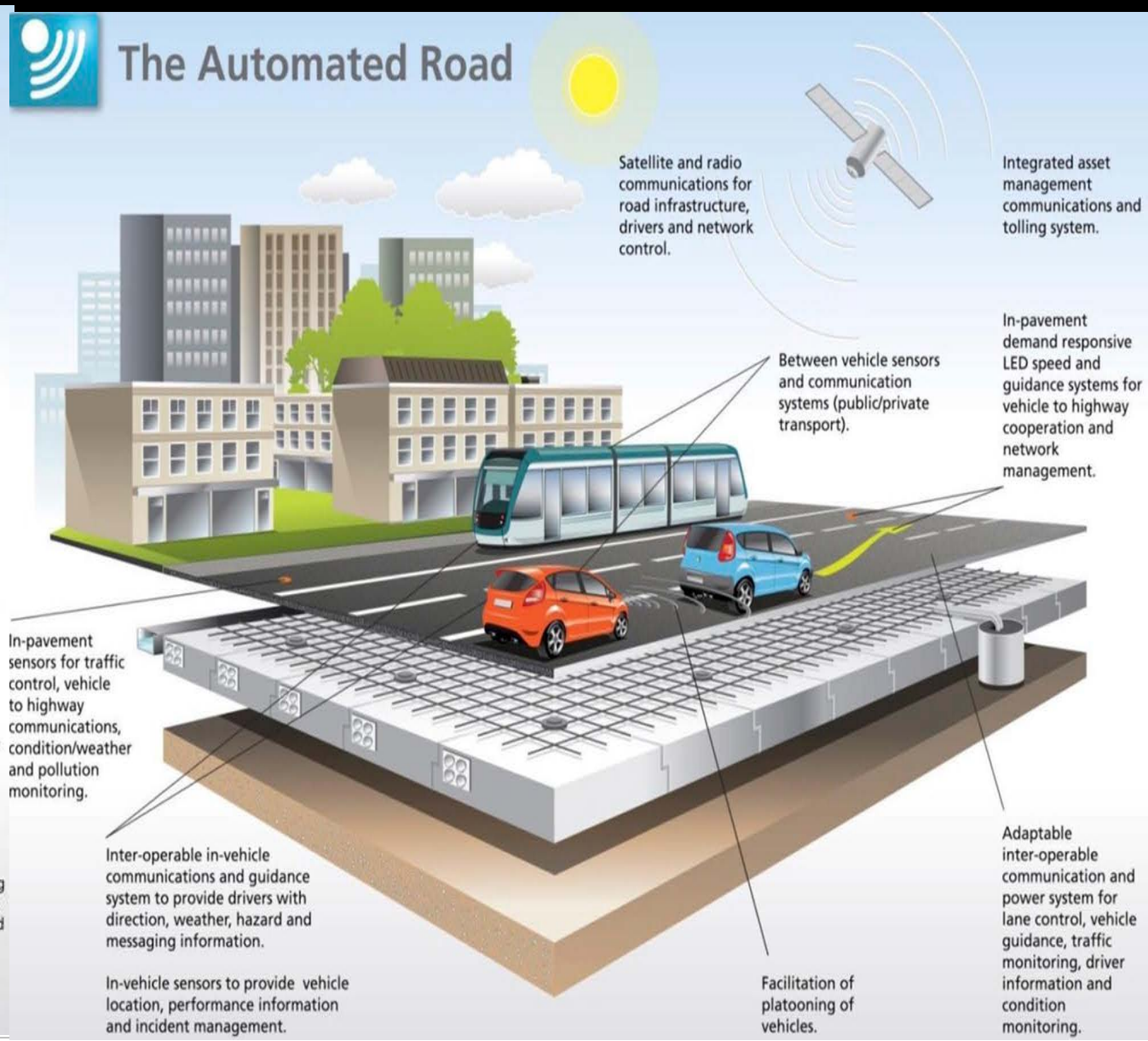

- Smartness should be added layer by layer.
- Preventing repeating the old mistakes.

…Working wonders with oil through **research**, Humble provides energy in many forms – to help heat our homes, power our transportation, and to furnish industry with a great variety of versatile chemicals."


Environment-friendly design buildings
Regional EMS (Control center)
Smart Buildings linked through Regional EMS
Wind farm
Battery storage systems
Next-generation vehicle center(operation center)
MegaSolar
Intelligent Transportation System (ITS)
Smart House
Biomass fuels
Multi-energy station
EV car sharing
EV car sharing
Smart House
Electric bus
Smart House
Small / Medium-scale Smart Buildings
Solar panel
Offshore wind farm
Multi-energy station


SMART HOUSE
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam.
Try Now
Smart Home
Security
Climate
Light
Music


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.
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.
Low carbon sub-base and pavement.
Pre-fabricated inter-locking, sub-base with integrated drainage, services and communications channels.
Adaptable/removable communication/power channels for lane control, traffic monitoring, driver information and condition monitoring.
Removable/self-cleaning drainage reservoirs feeding carbon capture planting.


The Automated Road
Satellite and radio communications for road infrastructure, drivers and network control.
Integrated asset management communications and tolling system.
In-pavement demand responsive LED speed and guidance systems for vehicle to highway cooperation and network management.
Between vehicle sensors and communication systems (public/private transport).
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.

It is much easier to implement the innovations in new buildings ,new infrastructure..

How to implement the innovations in existing building , infrastructure, ..?

Suggestion: Collaboration for creating an European Master Program for

‘Resilience Smart Cities’

The program should train EU-engineers for Digital Age.
Aiming to foster professionals having ability to:

- developing a holistic picture of ‘Smart cities concept’ and its **resilience,**
- analyzing recent and coming innovative **tools,**
- quantifying the results of each smart measure
- ……
- …….

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CHALMERS

DIGITAL TWIN CITIES (possible competence center –application in final stage of evaluation)


Thank you for your attention.