

EUROPEAN ROADMAPS & STRATEGIES FOR THE FUTURE OF MOBILITY

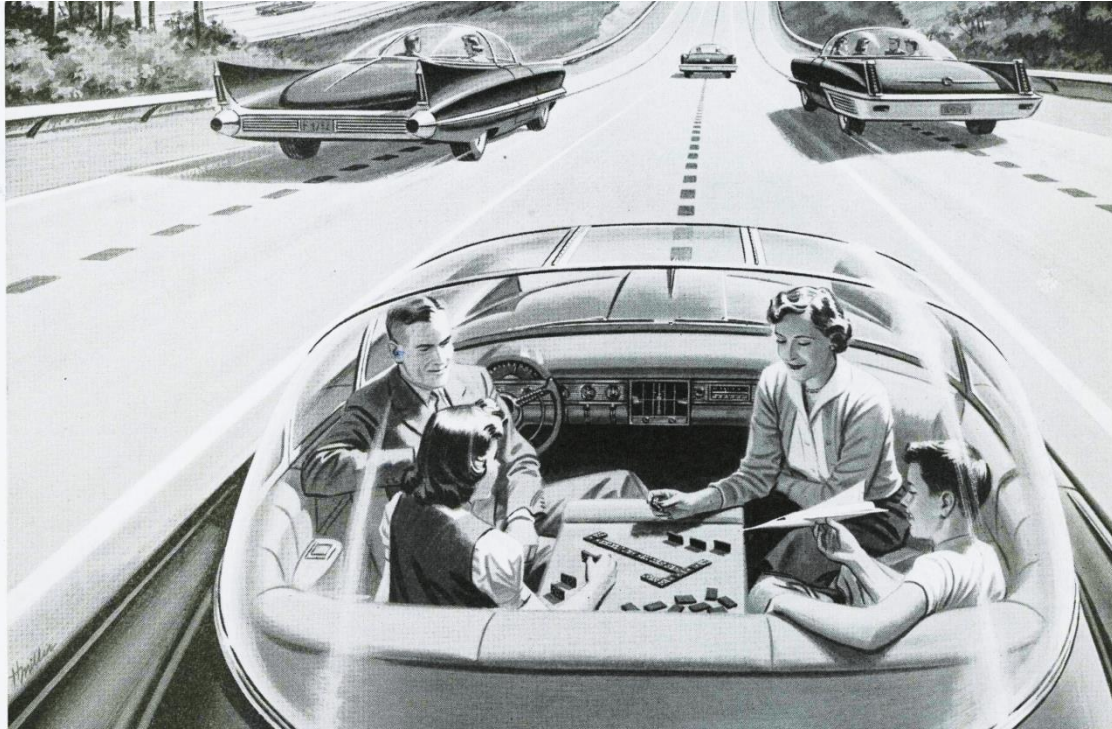
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BACK INTO THE FUTURE

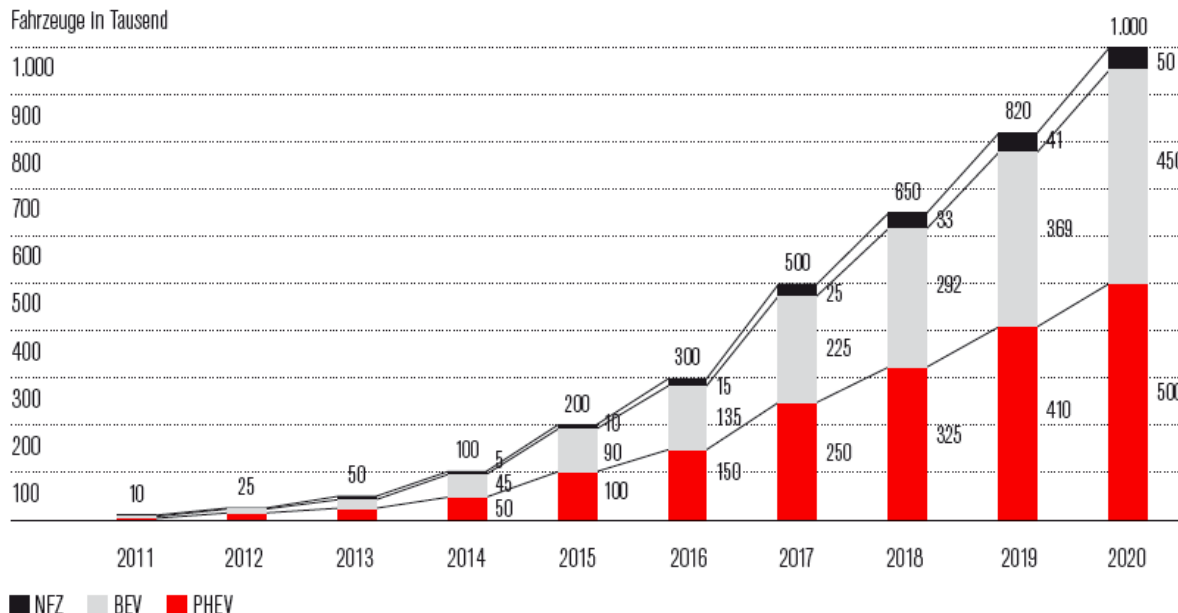


ELECTRICITY MAY BE THE DRIVER. One day your car may speed along an electric super-highway, its speed and steering automatically controlled by electronic devices embedded in the road. Travel will be more enjoyable. Highways will be made safe—by electricity! No traffic jams . . . no collisions . . . no driver fatigue.

TEN YEARS OF ELECTRIC MOBILITY



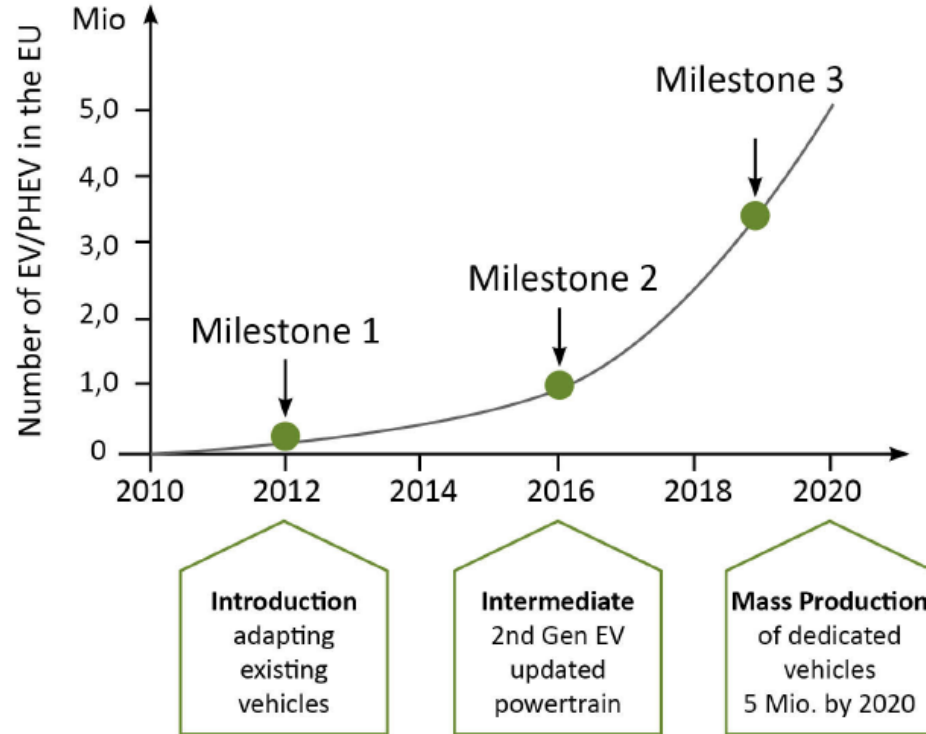
EXPECTED MARKET RAMP-UP (D)



TEN YEARS OF ELECTRIC MOBILITY



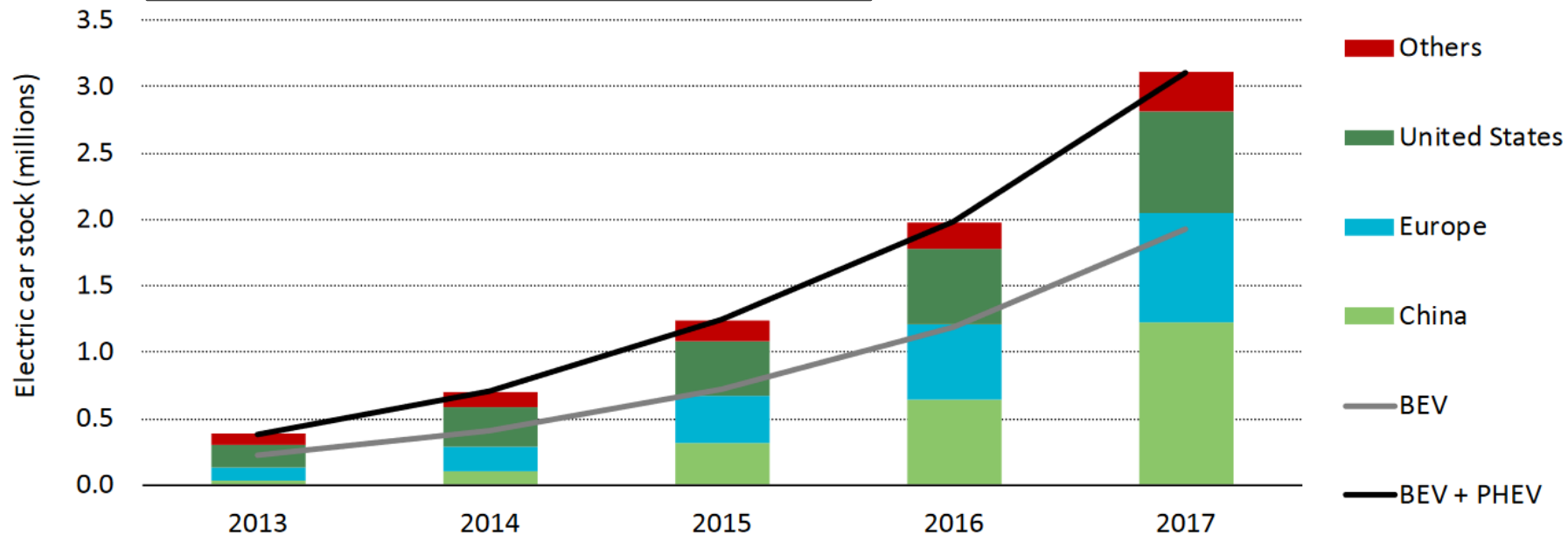
EXPECTED MARKET RAMP-UP (EU)



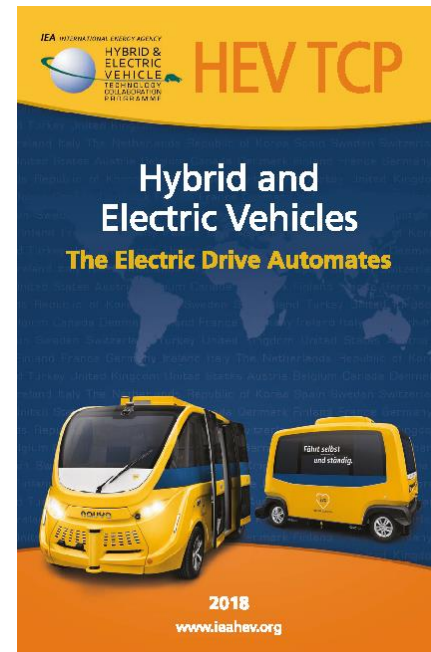
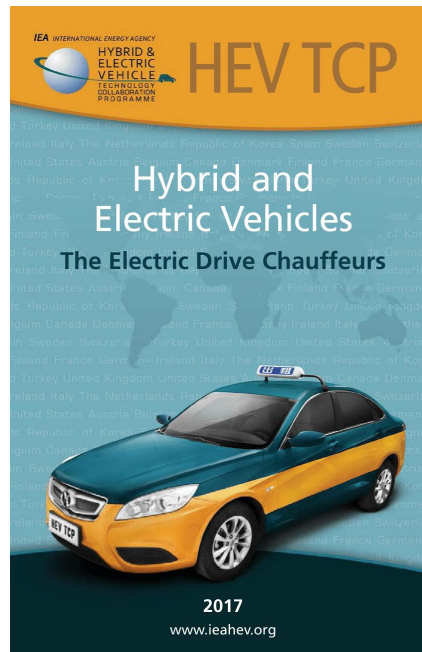
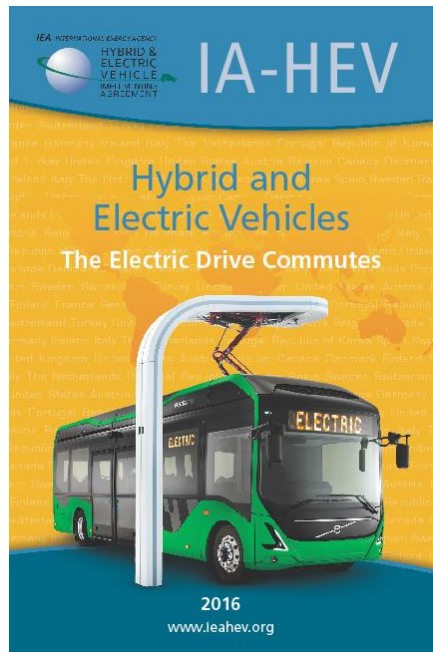
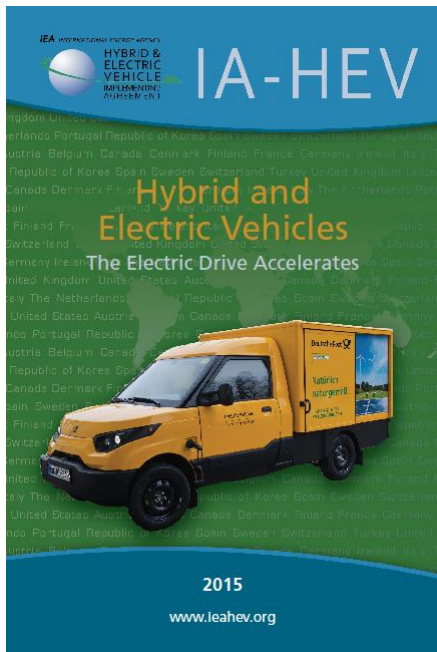
STATUS QUO: VEHICLE REGISTRATIONS



3 MILLION ELECTRIC VEHICLES WORLDWIDE



MULTITUDE OF APPLICATIONS



Annual Reports of the Technology Collaboration Programme
Hybrid and Electric Vehicles of the IEA
www.ieahev.org

INTEGRATED, MULTIMODAL, SEAMLESS, EFFICIENT AND ACCESSIBLE

ACTION PLAN FOR THE FUTURE OF TRANSPORT NETWORKS ANSWERING USER NEEDS



- TECHNOLOGY**
- ROBOTICS
 - ADVANCED ALTERNATIVE FUELS
 - HYPERLOOP
 - SMART SYSTEMS
 - INTELLIGENT TRANSPORT SYSTEMS
 - SMART ENERGY FLOWS
 - LIGHT PERSONAL VEHICLES
 - LIGHT MATERIALS
 - MEGA AIRCRAFT
 - 3D PRINTING
 - BIO FUEL
 - BATTERY TECHNOLOGIES
 - ELECTRIFICATION
 - ARTIFICIAL INTELLIGENCE
 - INTEROPERABILITY
 - BIG DATA
 - POSITION BASED INFORMATION
 - E-TICKET
 - DRONES
 - SMART ENERGY GENERATION AND STORAGE
 - CHARGING E-VEHICLES WHILE DRIVING
 - AUTOMATION
 - SOLAR ENERGY
 - STORE AND GIVE ENERGY TO THE NETWORK

<p>STAKEHOLDERS' NEEDS</p> <ul style="list-style-type: none"> SOCIAL INCLUSION <ul style="list-style-type: none"> Mobility solutions designed for everyone (e.g. older population) Promotion of passengers rights Increase in cultural diversity Definition of standards on accessibility USER CENTRICITY <ul style="list-style-type: none"> Solutions adapted to users needs Flexible transport services 	<ul style="list-style-type: none"> CUSTOMERS' EXPECTATIONS <ul style="list-style-type: none"> Real time information Accessibility of information Usability of devices and services Permanent connection and tracking Fill the digital divide CHANGING DELIVERY MODELS <ul style="list-style-type: none"> 24/7 Decentralisation of sources and solutions 	<ul style="list-style-type: none"> SAFETY AND SECURITY <ul style="list-style-type: none"> Resilient by design Cyber-security Data privacy Ethical considerations on safety and security systems Data security in transport and sharing services 	<p>ECONOMIC CLIMATE</p> <ul style="list-style-type: none"> URBANISATION <ul style="list-style-type: none"> City- Regions & Megacities Extending transport networks Smart applications connecting mobility and energy networks GLOBAL ECONOMIC CHANGES <ul style="list-style-type: none"> European GDP relative decline Redistribution of wealth Increased income disparity CHANGING WORKING CONDITIONS <ul style="list-style-type: none"> Teleworking and part-time New travel patterns Less peak time travel More free time 	<ul style="list-style-type: none"> PRODUCTION AND DISTRIBUTION <ul style="list-style-type: none"> Individualised and local production vs global supply chain Alliance between sectors for business Clean Production Circular economy MODELS OF BUSINESS 	<p>POLITICAL FACTORS</p> <ul style="list-style-type: none"> ENVIRONMENTAL POLICIES <ul style="list-style-type: none"> Tight regulations on emissions Greener materials Green agenda Reduce GHG and CO2 emissions Reduce NOx and PM10 emissions ENERGY AND RESOURCES <ul style="list-style-type: none"> Uncertainty about oil prices and supplies Alternative fuels 	<ul style="list-style-type: none"> NEW APPROACHES OF GOVERNANCE <ul style="list-style-type: none"> Harmonised decision making across EU Better cooperation of institutions Decisions of ECI on business models or novel concepts PUBLIC PLANNING AND FUNDING INSTRUMENTS <ul style="list-style-type: none"> Sustainable Urban Mobility Plan Cross and multi sector transport policies
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ROLE OF PUBLIC TRANSPORT



City	Ranking	
	Quality of Living	Sustainable Mobility
Vienna	1	6
Zürich	2	2
Auckland	3	not researched
Munich	4	14
Vancouver	5	28
Düsseldorf	6	not researched
Frankfurt	7	10
Geneva	8	31
Copenhagen	9	12
Sydney	10	51

**FACTOR FOR
QUALITY OF LIVING**



Arcadis (2017): Sustainable Cities Mobility Index
Mercer (2018): Quality of Living Ranking 2018

ELECTRIC AUTOMATED DRIVING

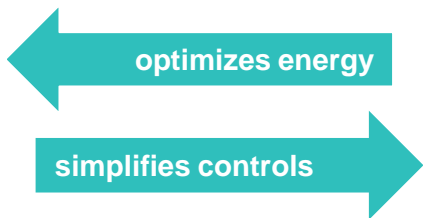
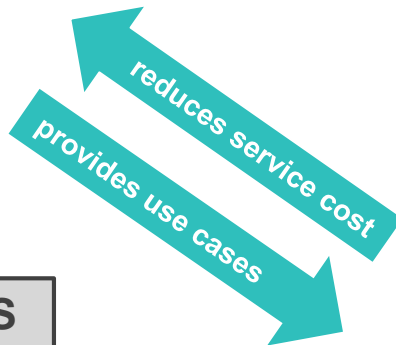
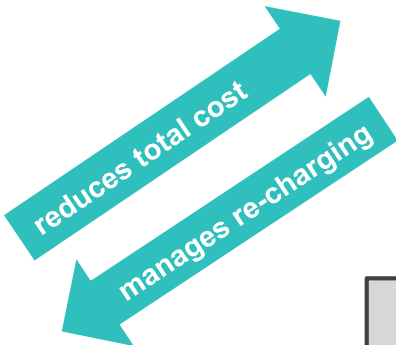


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Sharing

SYNERGIES



Electrification

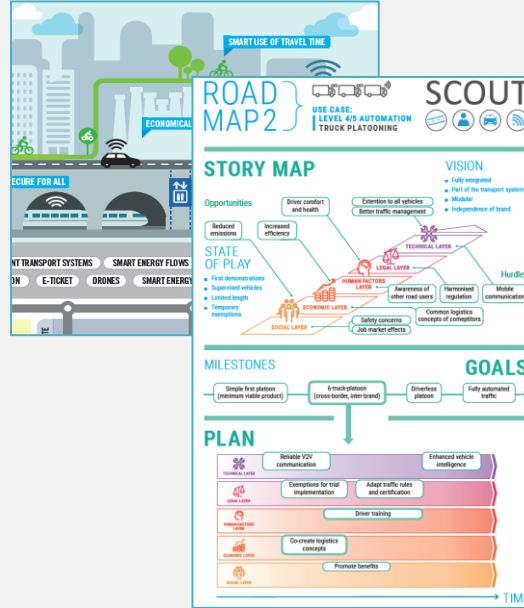


Automation

STRATEGIC INNOVATION PLANNING



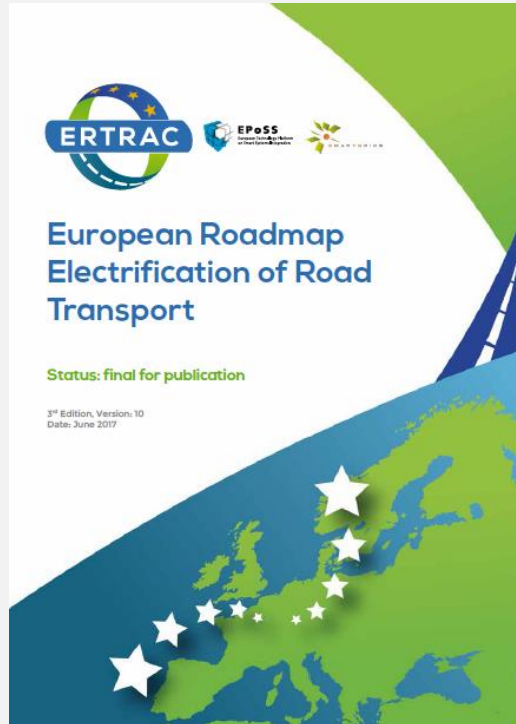
Industry Perspective



Customer Perspective

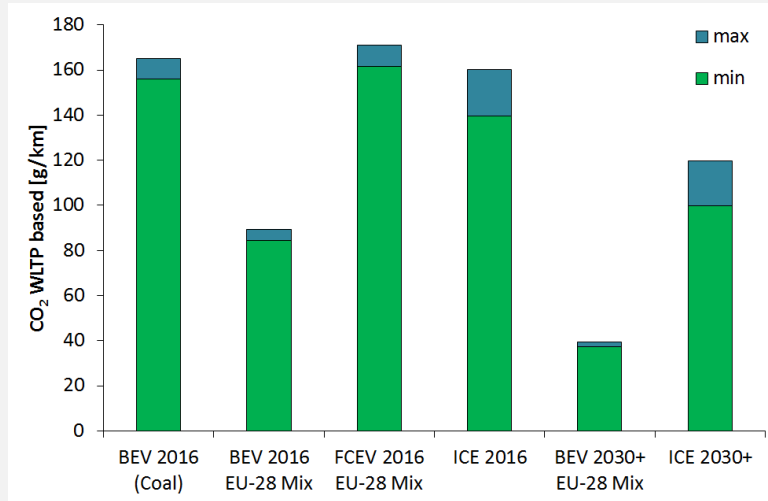


Policy Perspective



EUROPEAN ROADMAP ELECTRIFICATION OF ROAD TRANSPORT

- Joint effort of European Technology Platforms involved in the European Green Vehicles Initiative cPPP (ERTRAC, EPoSS, EITP SNET)
- Building on consensus of > 100 experts
- Base document for FP7 / Horizon 2020 funding call topic recommendations on electric mobility since 2009
- Topics covered by > 100 projects

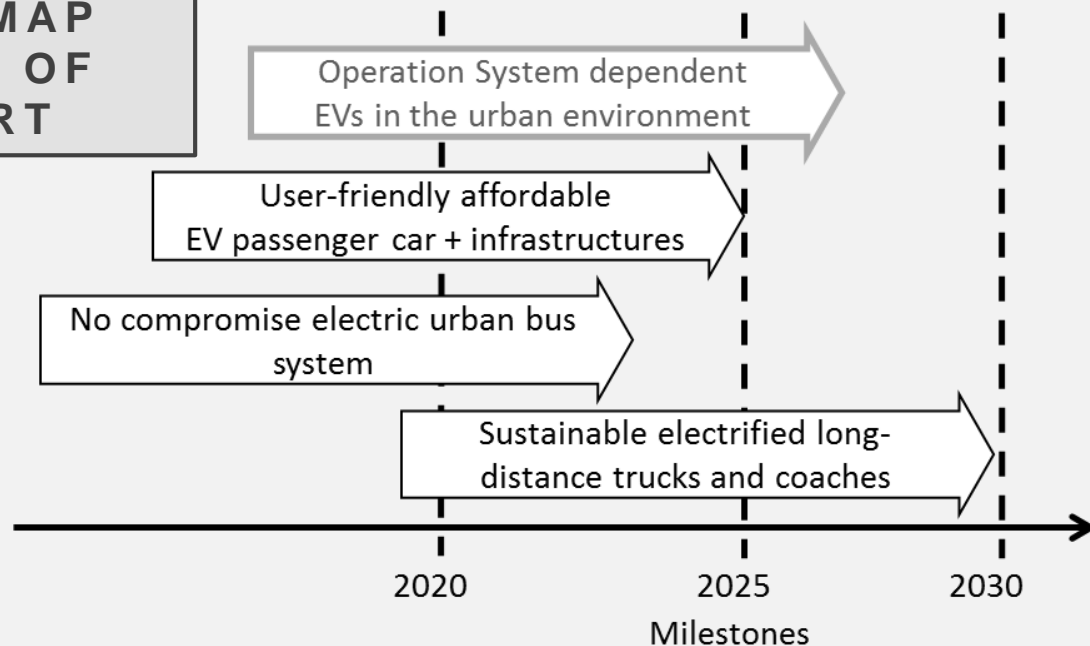


EUROPEAN ROADMAP ELECTRIFICATION OF ROAD TRANSPORT

- Zero emission mobility is the main driver for electric mobility
- CO₂ reduction potential of EVs depends on WTW energy efficiency and emissions of the primary energy source

EUROPEAN ROADMAP ELECTRIFICATION OF ROAD TRANSPORT

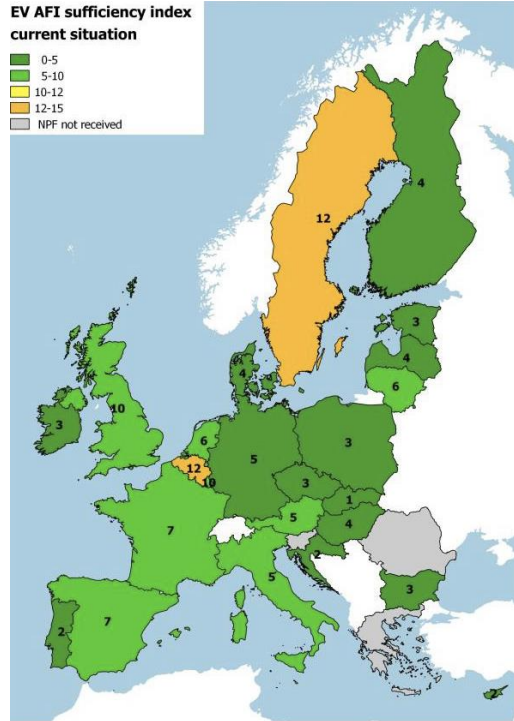
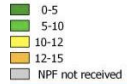
- Four big initiatives for research and innovation in electric mobility for various use scenarios



PROBLEM: CHARGING

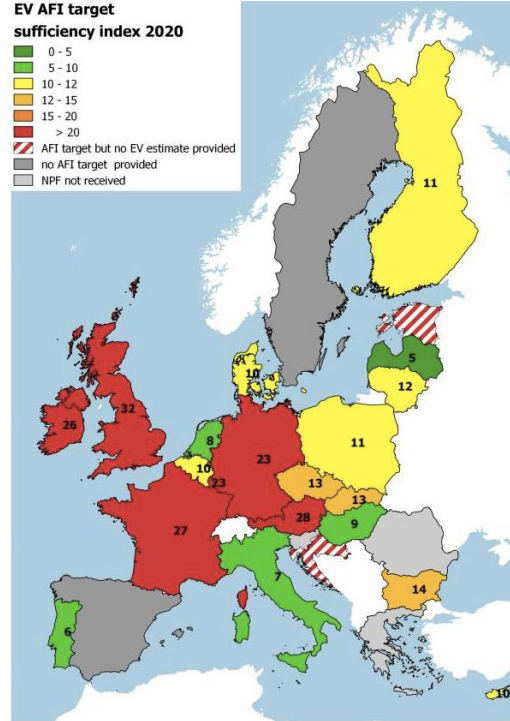
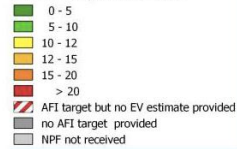


EV AFI sufficiency index
current situation



2017

EV AFI target
sufficiency index 2020



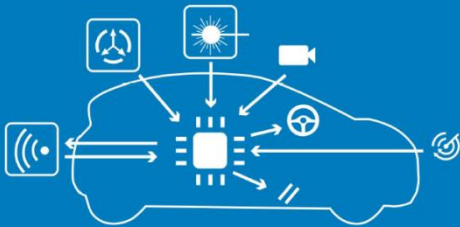
2020

NUMBER OF VEHICLES
PER CHARGING SPOT

Detailed Assessment of the National Policy Frameworks
European Commission, SWD (2017), 365

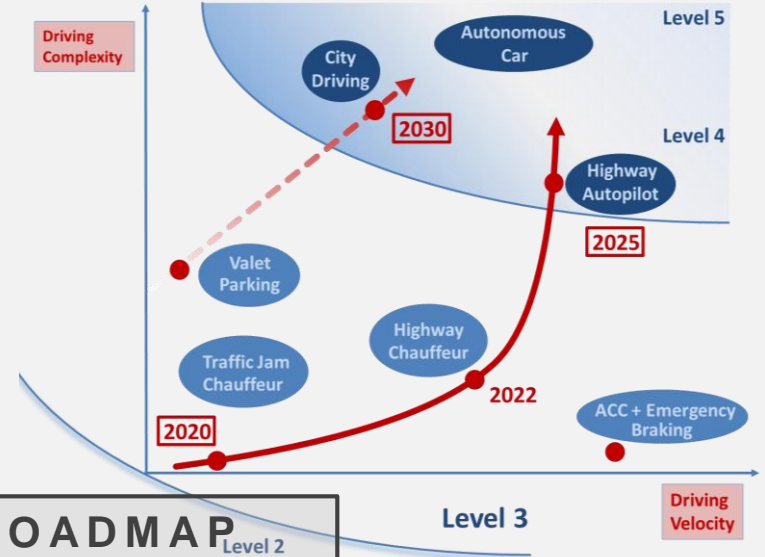


European Roadmap Smart Systems for Automated Driving



2015

- Evolutionary and revolutionary development paths have to be distinguished



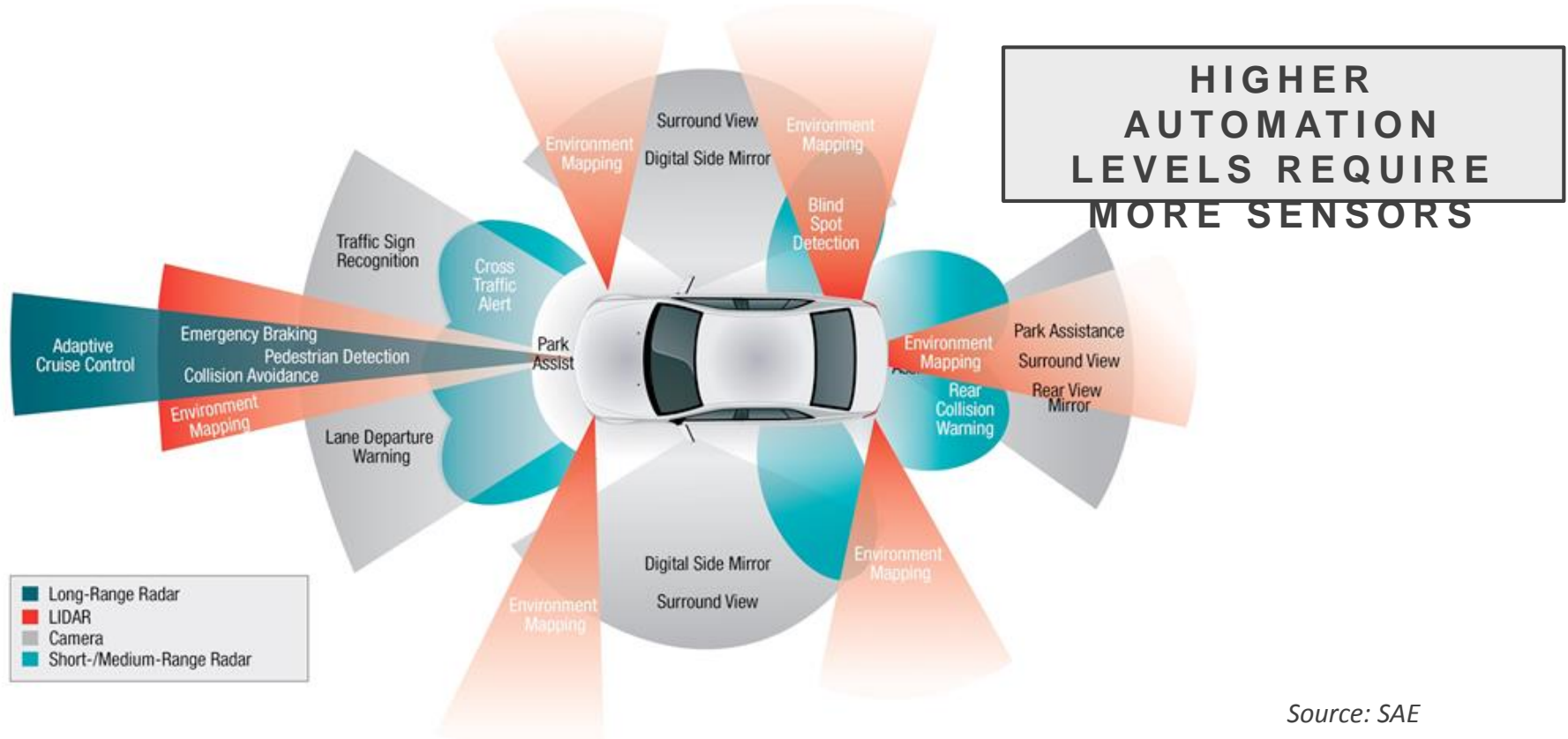
EUROPEAN ROADMAP
SMART SYSTEMS FOR
AUTOMATED DRIVING

INDUSTRY: AUTOMATION



EPoSS
European Technology Platform
on Smart Systems Integration

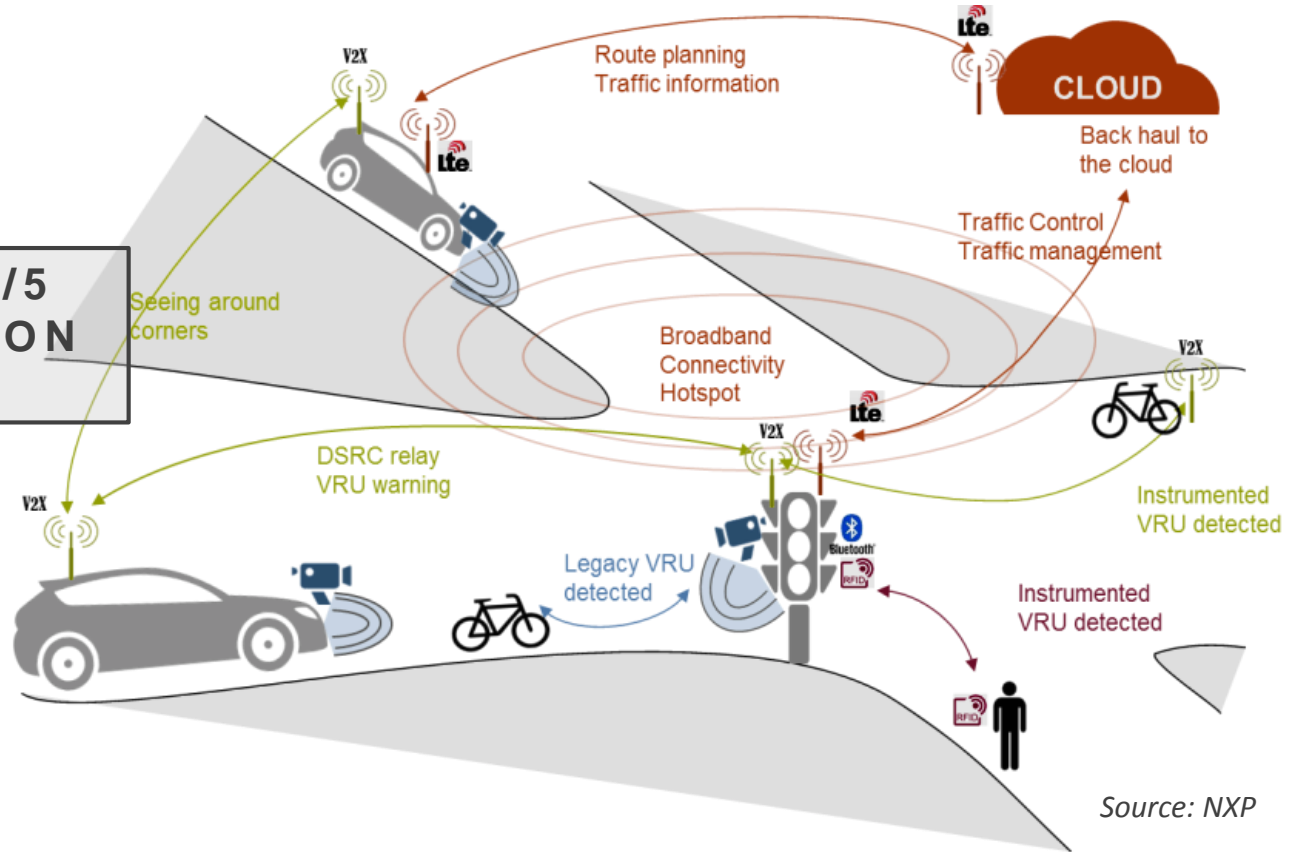
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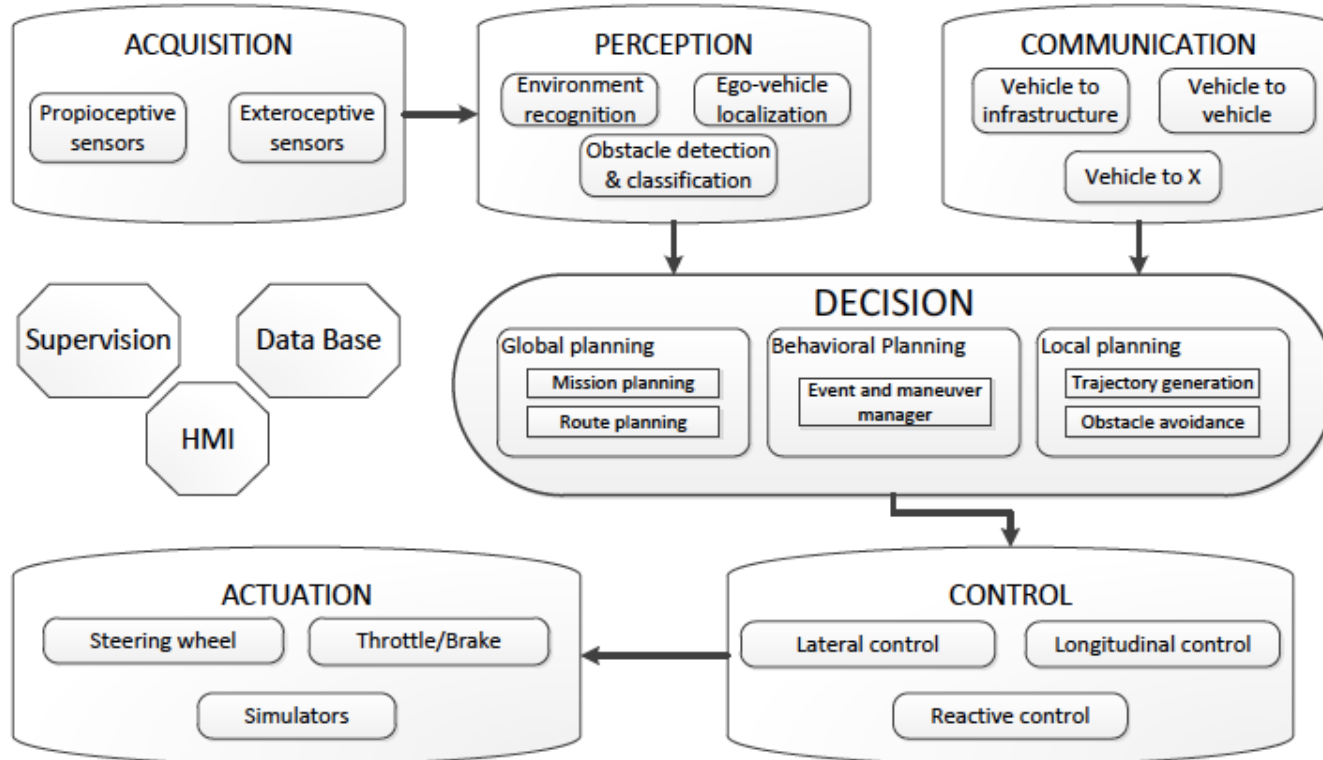
Source: SAE

INDUSTRY: AUTOMATION

**FOR LEVEL 4/5
COMMUNICATION
IS A MUST**



PROBLEM: SAFETY AND SECURITY

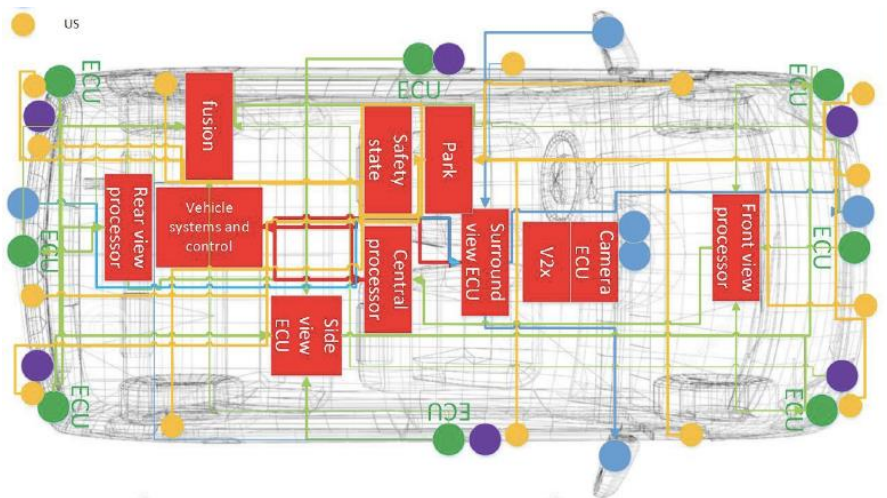


PROBLEM: SAFETY AND SECURITY



EPOSS
European Technology Platform
on Smart Systems Integration

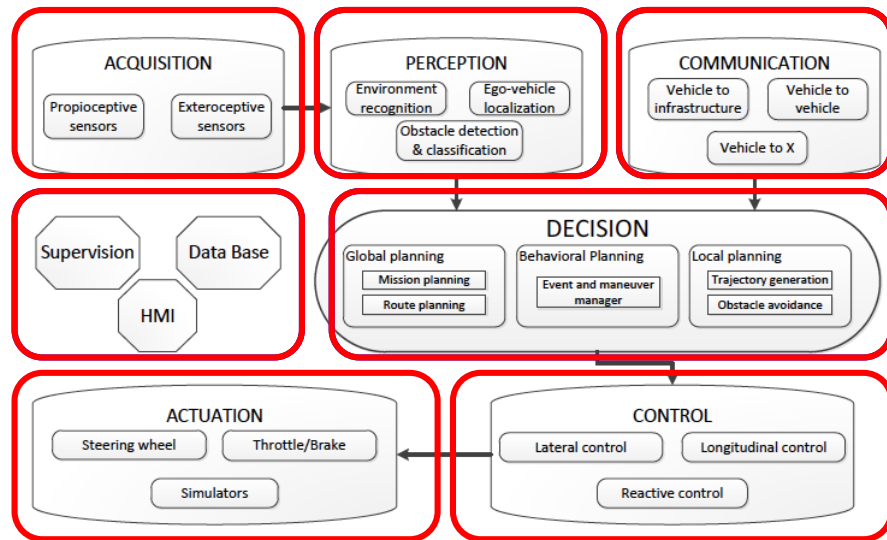
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Level 1

Level 3

Level 5

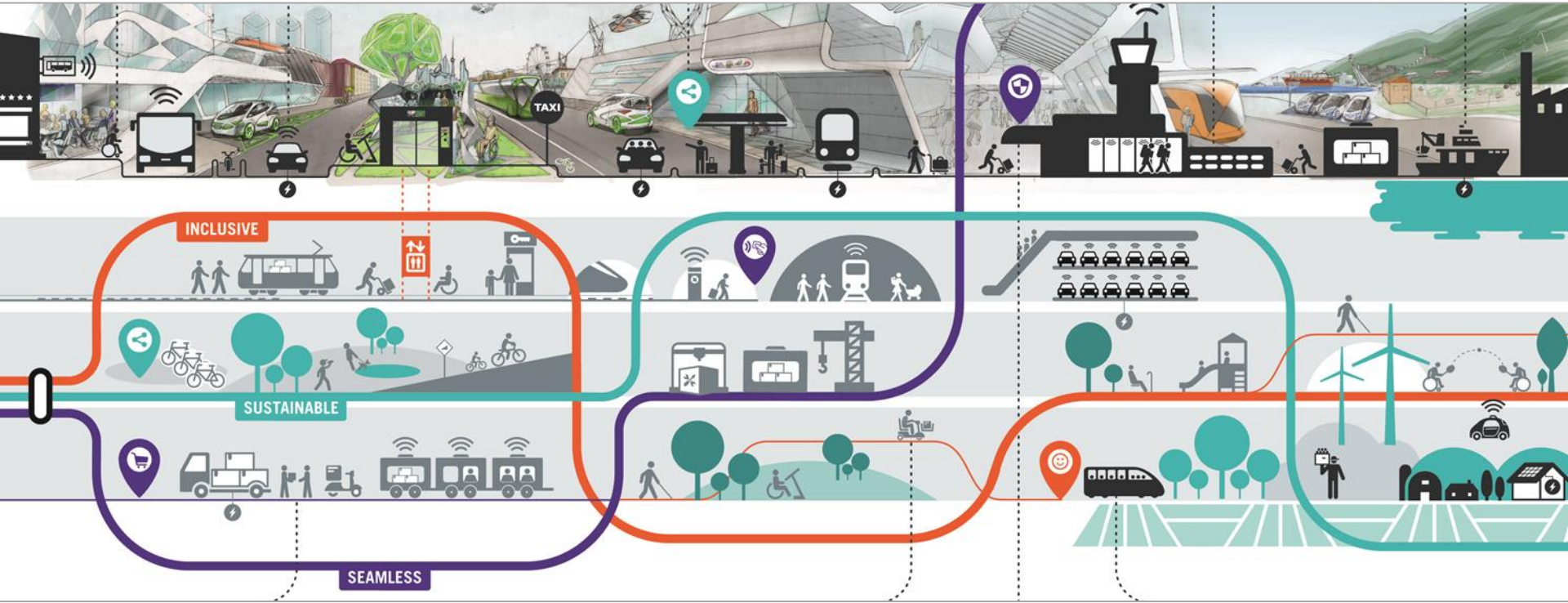


VULNERABILITY OF THE NETWORK ARCHITECTURE IS INCREASING

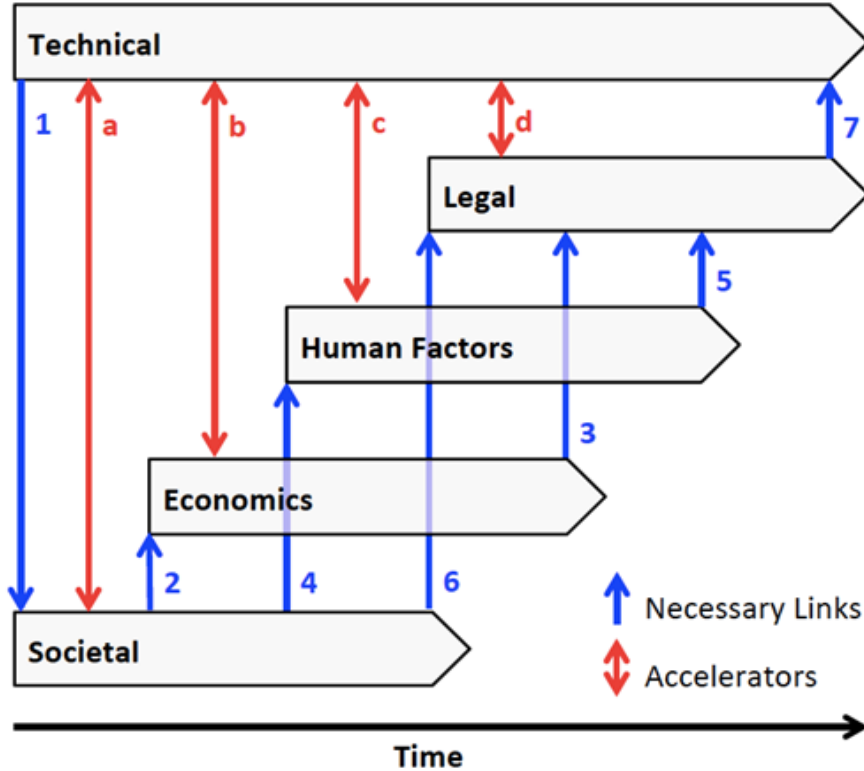
Normal Function
Safety-Critical Function

Source: AVL

USERS: FUTURE VISION



USERS: CO-CREATION



- Roadmaps need to be distinct for use cases, and focused on goals and milestones
- Innovation can be accelerated by agile shortcuts anticipating hurdles and roadblocks, e.g. living labs, pilots, sandboxes, hackathons

ROAD MAP 1



USE CASE:
LEVEL 4/5 AUTOMATION
AUTOMATED
ON-DEMAND SHUTTLE

SCOUT

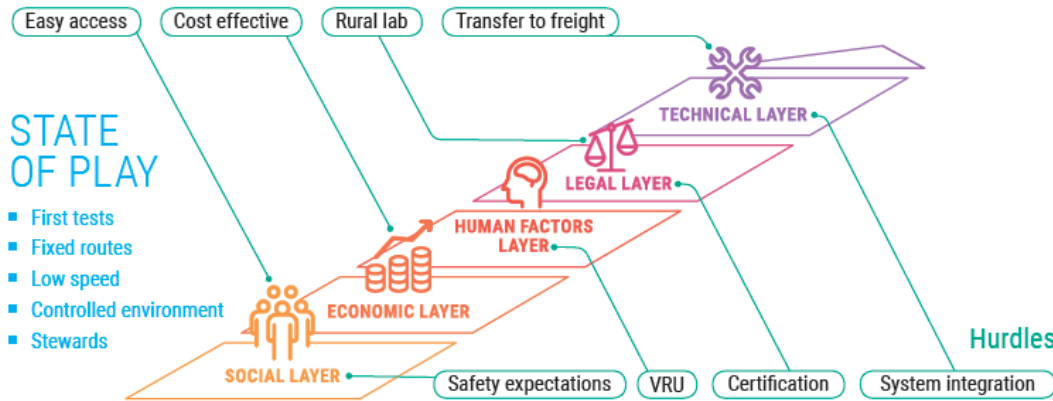


STORY MAP

VISION

- Fully integrated
- Part of the transport system
- On-demand

Opportunities



STATE OF PLAY

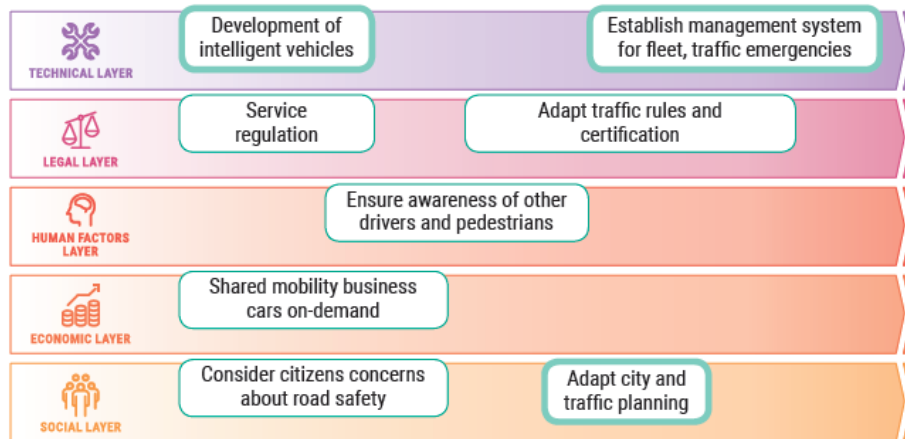
- First tests
- Fixed routes
- Low speed
- Controlled environment
- Stewards

MILESTONES



GOALS

PLAN



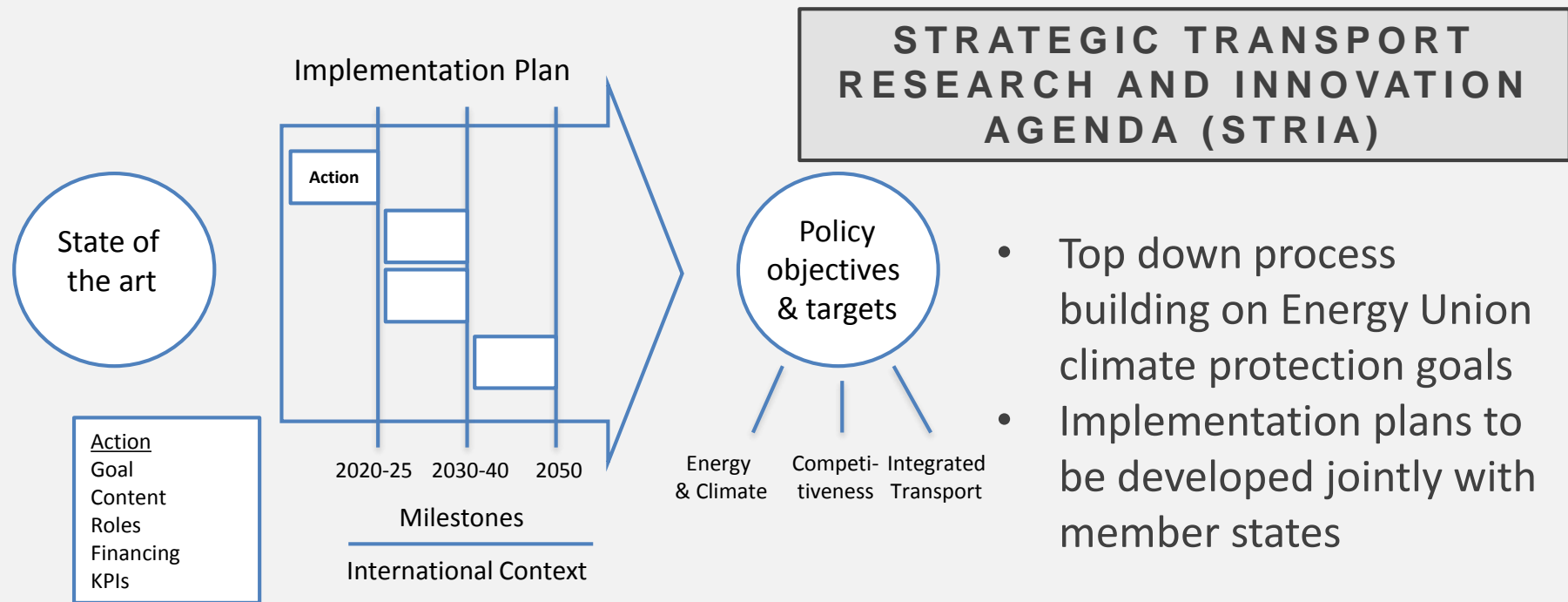
→ TIME

POLICY: STRIA ROADMAPS



STRATEGIC TRANSPORT RESEARCH AND INNOVATION AGENDA (STRIA)

- European Union Roadmap until 2050 covering 7 transversal themes across all transportation modes
- Published as part of the Europe on the Move policy package in 2017
- Implementation roadmap underway



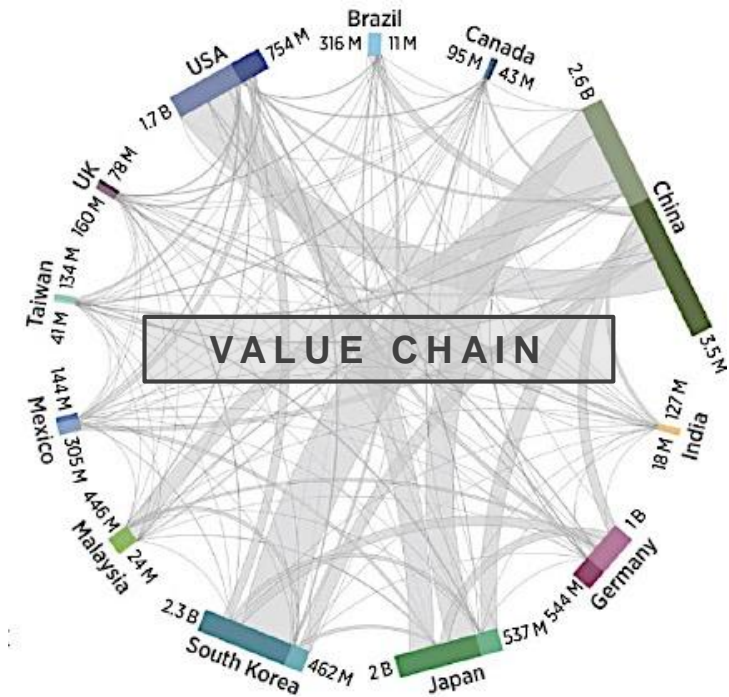
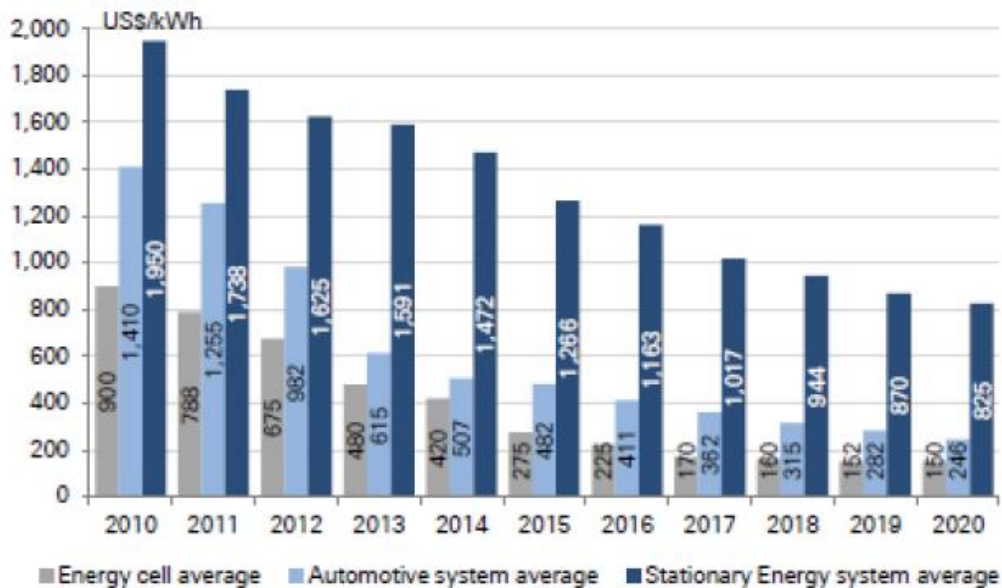
PROBLEM: BATTERIES



EUROPEAN
COMMISSION

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DEVELOPMENT OF COSTS



EU Competitiveness in Advanced Li-Ion Batteries

JRC, 2017

POLICY: EU ROADMAPS



	Deployment	Product Development and Operating Models	RESEARCH AND INNOVATION
Enable & Deliver 2020	Increase market share for electric passenger cars, even higher in the urban environment (bikes, buses, vans)	As far as general purpose vehicles are concerned, cost reductions will enlarge the customer base. At the same time, new vehicles will cater for emerging business models based on total-cost-of-ownership considerations, e.g. fleet applications, car sharing, delivery vans	<i>Initiatives listed in the roadmap of ETRAC / EPoSS / Smart Grids</i>
Action 1	Promote a 400km+ range electric passenger car that meets customer expectations		
Action 2	Progress and demonstration in urban bus electrification R&I program on energy storage systems, thermal comfort as well as low energy air-conditioning. KPI is a Carry all energy for a one day trip on the bus and still stay within cost targets		
Action 3	Public and commercial procurement of EVs Promote the market and create awareness of electric vehicles' maturity and a second hand market of electric vehicles in line with revision of Directive 2009/33/EC		
Action 4	Certification of electric vehicles performance Better comparability of EV types, also for commercial use	Action 5	Development of small and light smart electric vehicles: Components and concepts enabling radical reduction of energy consumption
Action 6	Support local production of batteries, components and electric vehicles Awareness actions for smart specialization and governance in anticipation of value chain disruptions due to shift from conventional to electrified vehicles		

STRATEGIC TRANSPORT RESEARCH AND INNOVATION AGENDA (STRIA)

- Example:
2020 actions in the road transport section of the electrification roadmap

EU FUNDING: OPEN CALLS



DT-ART-03-2019: Human-centred design for the new driver role in highly automated vehicles (RIA , 8 Mio Euro)

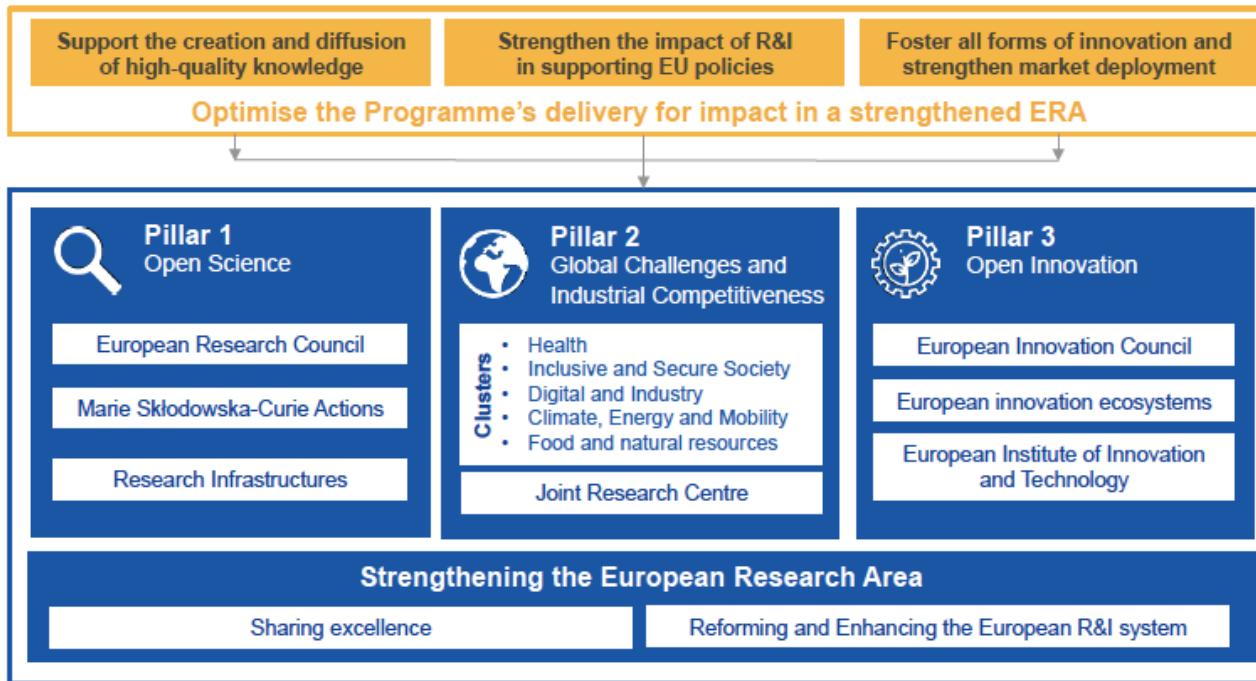
DT-ART -04-2019: Developing and testing shared, connected and cooperative automated vehicle fleets in urban areas for the mobility of all (IA, 30 Mio. Euro)

LC-GV-03-2019: User centric charging infrastructure (IA, 35 Mio. Euro)

LC-GV-04-2019: Low-emissions propulsion for long-distance trucks and coaches (IA, 25 Mio. Euro)

LC-GV-05-2019: InCo flagship on Urban mobility and sustainable electrification in large urban areas in developing and emerging economies (IA, 18 Mio. Euro)

Specific objectives of the Programme



HORIZON EUROPE (2021 ff.)



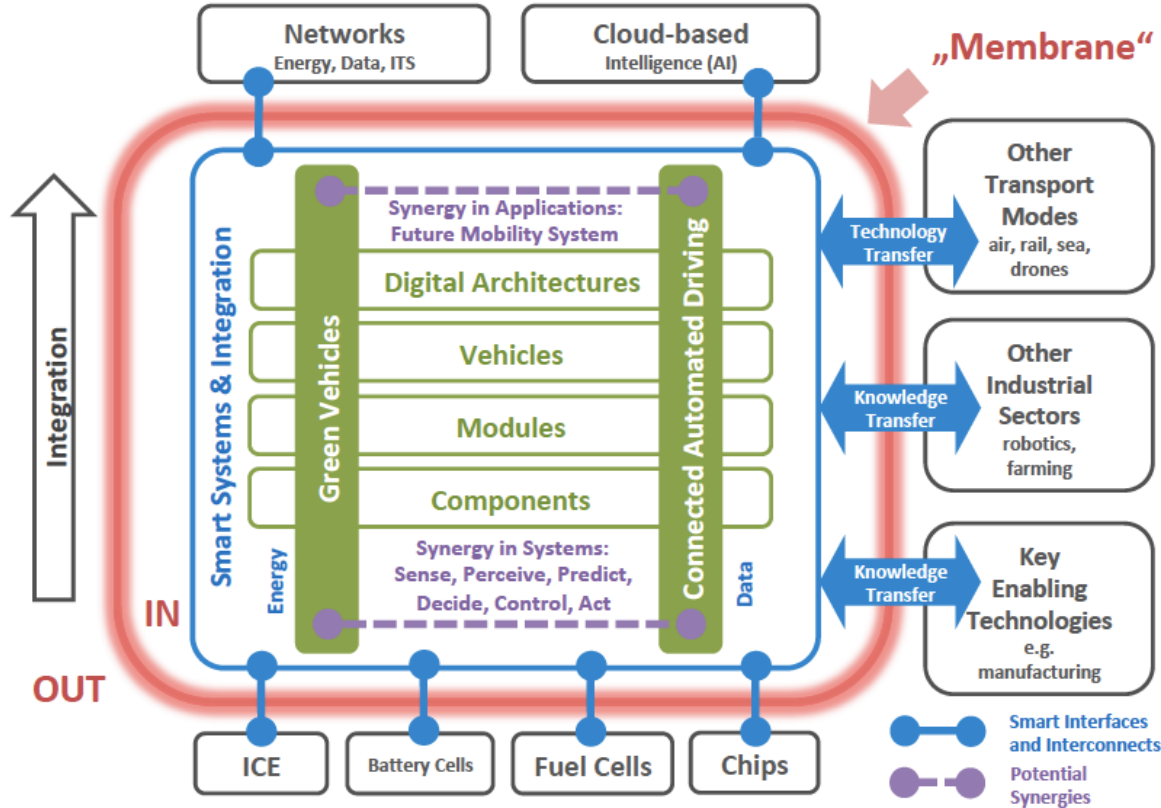
Clusters implemented through usual calls, missions & partnerships	Budget (€ billion)
Health	€ 7.7
Inclusive and Secure Societies	€ 2.8
Digital and Industry	€ 15
Climate, Energy and Mobility	€ 15
Food and Natural Resources	€ 10
Joint Research Centre supports European policies with independent scientific evidence & technical support throughout the policy cycle	€ 2.2

FUTURE OF cPPP EGVI



EPOSS
European Technology Platform
on Smart Systems Integration

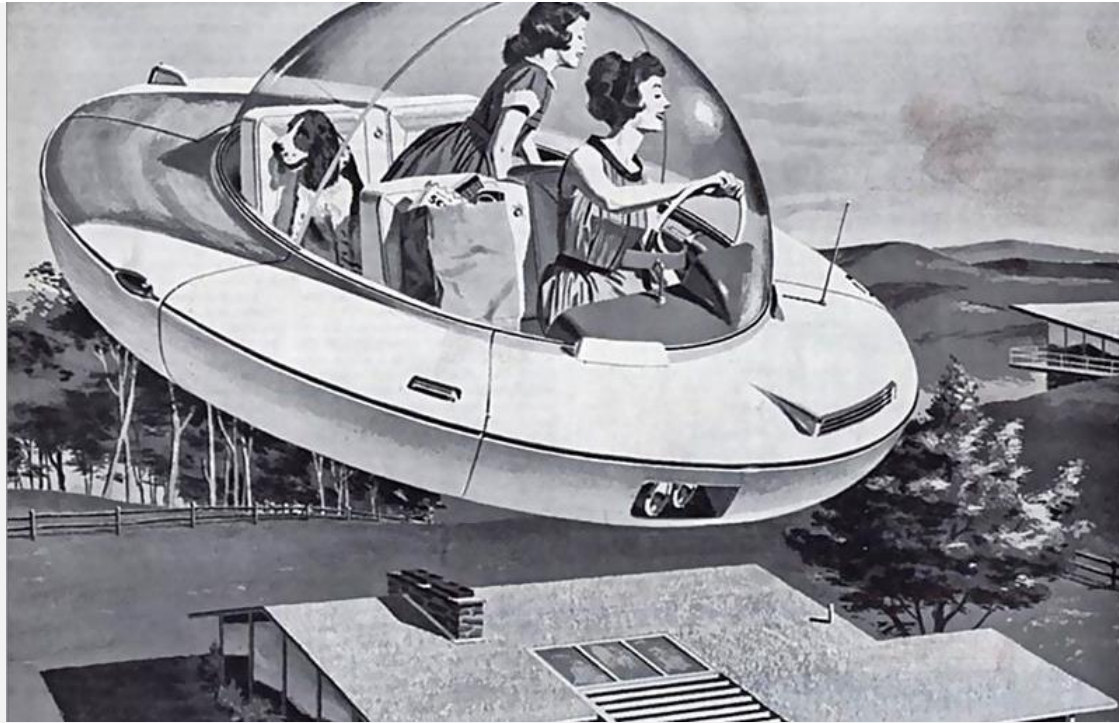
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- Joint ETP proposal
- “Digital” and “Green” under one umbrella
- Aiming at targets in energy, safety and urban mobility domains
- Synergy potentials
- cPPP as a lean instrument preferred

MORE TRANSFORMATION COMING

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YOUR PERSONAL "FLYING CARPET" Step into it, press a button, and off you go to market, to a friend's home, or to your job. Take off and land anywhere; no parking problems. Plug in to any electric outlet for recharging. They're working on it!

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