EUROPEAN ROADMAPS & STRATEGIES FOR THE FUTURE OF MOBILITY

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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)

Sachstand und Eckpunkte zum
Nationalen Entwicklungsplan Elektromobilität

Berlin, 10. November 2008

Fahrzeuge in Tausend

- NFZ
- BEV
- PHEV
TEN YEARS OF ELECTRIC MOBILITY

EXPECTED MARKET RAMP-UP (EU)

- **Milestone 1**: Introduction adapting existing vehicles
- **Milestone 2**: Intermediate 2nd Gen EV updated powertrain
- **Milestone 3**: Mass Production of dedicated vehicles 5 Mio. by 2020
STATUS QUO: VEHICLE REGISTRATIONS

3 MILLION ELECTRIC VEHICLES WORLDWIDE

IEA, Global EV Outlook (2018)
## Role of Public Transport

### City Ranking
<table>
<thead>
<tr>
<th>City</th>
<th>Ranking</th>
<th>Quality of Living</th>
<th>Sustainable Mobility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vienna</td>
<td>1</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Zürich</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Auckland</td>
<td>3</td>
<td>not researched</td>
<td></td>
</tr>
<tr>
<td>Munich</td>
<td>4</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Vancouver</td>
<td>5</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Düsseldorf</td>
<td>6</td>
<td>not researched</td>
<td></td>
</tr>
<tr>
<td>Frankfurt</td>
<td>7</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Geneva</td>
<td>8</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>Copenhagen</td>
<td>9</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Sydney</td>
<td>10</td>
<td>51</td>
<td></td>
</tr>
</tbody>
</table>

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**Factor for Quality of Living**

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

Electrification

- reduces total cost
- manages re-charging
- optimizes energy
- simplifies controls

Sharing

- reduces service cost
- provides use cases

SYNERGIES

Automation
STRATEGIC INNOVATION PLANNING

Industry Perspective

Customer Perspective

Policy Perspective
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

www.egvia.eu
Zero emission mobility is the main driver for electric mobility.

CO\textsubscript{2} reduction potential of EVs depends on WTW energy efficiency and emissions of the primary energy source.
INDUSTRY: ELECTRIFICATION

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

EUROPEAN ROADMAP ELECTRIFICATION OF ROAD TRANSPORT

- Operation System dependent EVs in the urban environment
- User-friendly affordable EV passenger car + infrastructures
- No compromise electric urban bus system
- Sustainable electrified long-distance trucks and coaches

Milestones:
- 2020
- 2025
- 2030

www.egvia.eu
PROBLEM: CHARGING

Detailed Assessment of the National Policy Frameworks European Commission, SWD (2017), 365
Evolutionary and revolutionary development paths have to be distinguished.
INDUSTRY: AUTOMATION

HIGHER AUTOMATION LEVELS REQUIRE MORE SENSORS

Source: SAE
INDUSTRY: AUTOMATION

FOR LEVEL 4/5 COMMUNICATION IS A MUST

Source: NXP
PROBLEM: SAFETY AND SECURITY

PROBLEM: SAFETY AND SECURITY

VULNERABILITY OF THE NETWORK ARCHITECTURE IS INCREASING

Level 1  Level 3  Level 5

Normal Function
Safety-Critical Function

Source: AVL
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.
USERS: AUTOMATION

MILESTONES

- In public on selected lanes
- Mixed traffic: everywhere
- Fully automated traffic

GOALS

PLAN

1. Technical Layer
   - Development of intelligent vehicles
   - Establish management system for fleet, traffic emergencies

2. Legal Layer
   - Service regulation
   - Adapt traffic rules and certification

3. Human Factors Layer
   - Ensure awareness of other drivers and pedestrians
   - Shared mobility business: cars on-demand

4. Economic Layer
   - Consider citizens concerns about road safety
   - Adapt city and traffic planning

5. Social Layer

TIME
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

www.ec.europa.eu/research/transport/
Top down process building on Energy Union climate protection goals

Implementation plans to be developed jointly with member states
PROBLEM: BATTERIES

DEVELOPMENT OF COSTS

EU Competitiveness in Advanced Li-Ion Batteries
JRC, 2017
### Example:

2020 actions in the road transport section of the electrification roadmap

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Promote a 400km+ range electric passenger car that meets customer expectations</td>
</tr>
<tr>
<td>2</td>
<td>Progress and demonstration in urban bus electrification R&amp;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</td>
</tr>
<tr>
<td>3</td>
<td>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</td>
</tr>
<tr>
<td>4</td>
<td>Certification of electric vehicles performance Better comparability of EV types, also for commercial use</td>
</tr>
<tr>
<td>5</td>
<td>Development of small and light smart electric vehicles. Components and concepts enabling radical reduction of energy consumption</td>
</tr>
<tr>
<td>6</td>
<td>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</td>
</tr>
</tbody>
</table>

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-05-2019: InCo flagship on Urban mobility and sustainable electrification in large urban areas in developing and emerging economies (IA, 18 Mio. Euro)
HORIZON EUROPE (2021 ff.)

Specific objectives of the Programme

- Support the creation and diffusion of high-quality knowledge
- Strengthen the impact of R&I in supporting EU policies
- Foster all forms of innovation and strengthen market deployment

Optimise the Programme’s delivery for impact in a strengthened ERA

Pillar 1: Open Science
- European Research Council
- Marie Skłodowska-Curie Actions
- Research Infrastructures

Pillar 2: Global Challenges and Industrial Competitiveness
- Health
- Inclusive and Secure Society
- Digital and Industry
- Climate, Energy and Mobility
- Food and natural resources
- Joint Research Centre

Pillar 3: Open Innovation
- European Innovation Council
- European innovation ecosystems
- European Institute of Innovation and Technology

Strengthening the European Research Area
- Sharing excellence
- Reforming and Enhancing the European R&I system
### Clusters
implemented through usual calls, missions & partnerships

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Budget (€ billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>€ 7.7</td>
</tr>
<tr>
<td>Inclusive and Secure Societies</td>
<td>€ 2.8</td>
</tr>
<tr>
<td>Digital and Industry</td>
<td>€ 15</td>
</tr>
<tr>
<td>Climate, Energy and Mobility</td>
<td>€ 15</td>
</tr>
<tr>
<td>Food and Natural Resources</td>
<td>€ 10</td>
</tr>
<tr>
<td><strong>Joint Research Centre</strong></td>
<td><strong>€ 2.2</strong></td>
</tr>
</tbody>
</table>

- Joint Research Centre supports European policies with independent scientific evidence & technical support throughout the policy cycle.
FUTURE OF cPPP EGVI

- 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

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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