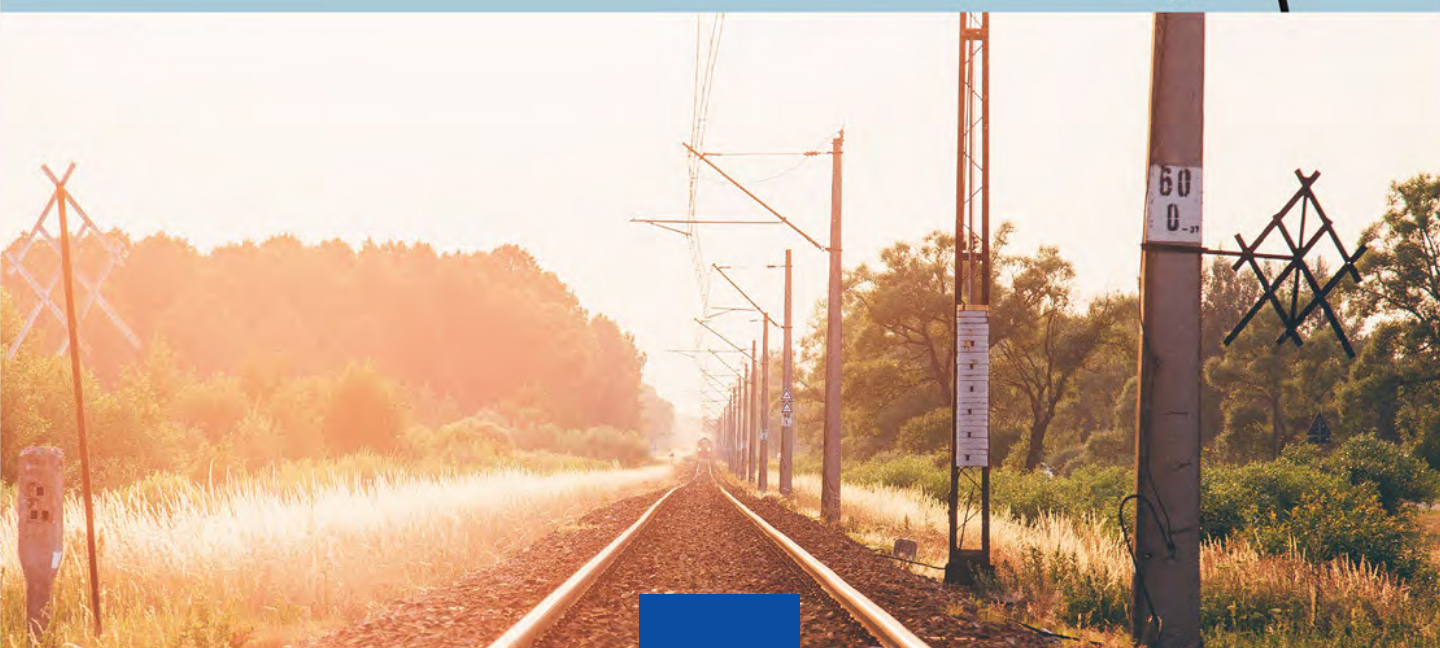
European Commission

Transport Electrification

Roadmaps



In Brief

Transport electrification can contribute to breaking transport dependency on oil and decrease carbon dioxide emissions. The increasingly decarbonised electricity generation will provide cleaner electricity to propel electric vehicles (EVs). EVs will be able to provide storage services to the grid, favouring further expansion of renewables.

The development of energy storage technologies and devices remains the cornerstone of a fully electrified transport system integrated in a clean energy network. Decreasing battery costs while increasing their energy density and lifetime will speed up electrification of road transport. The deployment of a network of recharging points covering the whole EU road network is another key enabling condition for transport electrification.

The Strategic Transport Research and Innovation Agenda (STRIA) *Roadmap for Transport Electrification* aims to bring forward, the developments carried out in the framework of the European Green Vehicles Initiative and encourage multi-sectorial and multi-disciplinary research and innovation activities on new materials, advanced propulsion systems and information computer technology.

Current Developments

Road: The number of battery-electric and plug-in hybrid vehicles on the road is increasing. Vehicle manufacturers are launching dedicated models on the market, grid operators are installing public charging infrastructures and governments are funding multiple demonstrations and pilots, and creating framework conditions, regulations and incentives for the purchase and use of electric vehicles. In addition, electric bicycles and pedelecs are now more common. Electrification of road vehicles has been extended to delivery vans, light trucks and buses, and prototypes of larger electrified trucks are being developed.

Waterborne: Ships use electrical power on board to support service and loads. This includes fans, pumps, compressors, cranes, lighting, heating, electronics and computing. On-board diesel generators are used to supply these loads in port, however to improve local air quality the use of shore based plug in electrical supplies is being encouraged. Ships are propelled by mechanical and electrical means. Around 2,500 ships in the world are powered by electric propulsion including cruise liners, shuttle tankers, offshore support vessels, liquid nitrogen gas tankers and ferries. Electric propulsion offers advantages in performance and/or efficiency over traditional mechanical drives which are popular in vessels that operate over long distances.

Integrated Full Electrical Propulsion systems are commonly found in ships from passenger vessels, Liquefied Natural Gas tankers, shuttle tankers, cruise ships, ferries and offshore support vessels. All electric battery powered ships are emerging for shorter ferry routes up to 50km.

Aviation: The aviation sector is in the midst of a pioneering era with regard to electro-mobility. Currently, electro-mobility for aircraft only exists in the single/twin-seater categories and consists of retrofits of existing conventional designs with reduced payload capability. Regarding fixed-wing commercial aviation, at current technology levels the development of even a hybrid-electric passenger aircraft appears challenging.

Rail: On busy lines electrification makes economic sense. On low-density lines there is no proven cost-efficient solution to replace diesel-powered trains. Nonetheless, when return of investment for electric wiring is not possible due to the frequency and the usage of certain lines, hydrogen and fuel cells can be considered as an alternative.

Key Research Innovation Pathways

The Roadmap sets out key priority R&I actions for electric mobility in each transport mode until 2050.

The scope of the activities in the area of transport electrification takes into account both advanced power-train technologies and new vehicles architectures, weight reduction, improved aerodynamics and rolling resistance and component development for alternative fuel vehicles.

The following table highlights identified key R&I actions until 2050.

Road transport	
1	*Promote a +400 kilometres range for electric passenger cars*
2	*Progress and demonstration in urban bus electrification*
3	*Public and commercial procurement of electric vehicles*
4	*Certification of electric vehicles performance*
5	*Development of small and light smart electric vehicles*
6	*Support local production of batteries, components and electric vehicles*
7	*Further development of small and light smart electric vehicles*
8	*Demonstration of electrified road systems for heavy duty vehicles*
9	*Develop electro-chemical systems for future high-density electric batteries*

Waterborne	
1	*Raise public awareness of benefits of electrified vessel*
2	*Deploy new materials and technologies*
3	*Support education and training*
4	*Innovative financing tools*
5	*New business models*

Aviation	
1	*Electric aircraft design*
2	*Zero emission and very low noise airports*
3	*Ensure a specialised interdisciplinary work force*
4	*Decrease cost and increase product development speed*
5	*Energy storage systems improvement*
6	*Achieve maturing in High Temperature Superconductors*

Rail	
1	*Increase the potential of utilisation of electric motorisation*
2	*Intensify electric freight rail transportation*
3	*Harmonise energy characteristics for rails in the EU*
4	*Development of new motorisation*
5	*Increase energy savings*
6	*Develop light vehicles*
7	*Develop intermodal hubs in cities*
8	*Minimise the losses of electric railway infrastructure*

Transport Research and Innovation Agenda

The Strategic Transport Research and Innovation Agenda (STRIA) outlines future transport research and innovation (R&I) priorities to decarbonise the European transport sector.

STRIA is one of five interlocking dimensions set out in the Energy Union strategy that provides a framework to achieve EU energy and climate goals. It supports the vision of a clean, connected and competitive European transport system.

In coordination with Member States and transport stakeholders, STRIA aims to set out common priorities to support and speed-up the research, innovation and deployment process leading to radical technology changes in transport.

STRIA builds on and integrates seven thematic transport research areas:

- Cooperative, connected and automated transport;
- Transport electrification;
- Vehicle design and manufacturing;
- Low-emission alternative energy for transport;
- Network and traffic management systems;
- Smart mobility and services; and
- Infrastructure.

STRIA is also the interface between other relevant sectors such as energy and information and communication technology.

About TRIMIS

The Transport Research and Innovation Monitoring and Information System (TRIMIS) supports the implementation and monitoring of STRIA and its seven roadmaps.

TRIMIS is an open-access information system to map and analyse technology trends and R&I capacities, as well as monitor progress in all transport sectors.

Contact:
European Commission • Joint Research Centre, Ispra, Italy
Email: EU-TRIMIS@ec.europa.eu

https://trimis.ec.europa.eu/