



EGVI
European Green
Vehicles Initiative

D2.4 Recommendations for the deployment of innovative road transport solutions in Europe

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Summary

The Horizon 2020 project FUTURE-RADAR is a support action that aims to create and implement the research and innovation strategies needed for a sustainable and competitive European road transport system. In this deliverable, the work done in analysing the automotive research and technology development (RTD) government funding landscape at EU level and in six European countries with a major automotive industry (Germany, France, Italy, the United Kingdom, Austria and the Czech Republic) is reported, providing inspiration for possible future RTD strategies and programmes in Europe.

This report includes the results of three activities. The first activity was an assessment of the national funding mechanisms for road transport RTD in the aforementioned countries. Secondly, within the framework of the reported task, best practice funding programmes or calls have been identified and assessed for each of the countries.

Thirdly, a comparison was made with the RTD landscape in four non-European countries (as described in Deliverable 2.5) and recommendations have been made for future RTD policies and programmes in Europe. These recommendations are included in this report as well.

Considering each of these three activities together, the following can be reported in summary.

Assessment of national funding mechanisms

The RTD funding mechanisms for each of the six countries are described along the following steps:

1. Overview of strategic plans (such as national policy documents or technology roadmaps) related to road transport RTD.
2. The governance system of RTD and the hierarchy of the funding landscape.
3. The main funding organisations and public or private stakeholders that influence RTD in road transport
4. Detail on grant programmes and open calls for projects on specific topics such as electric vehicles or automated driving
5. Overview of international RTD collaboration ongoing.
6. Summary of the main findings per country and identification of funding good practices examples per country. These are benchmarked against a pre-defined best practice

Main findings – road transport RTD

The European countries studied have specific research programmes (and calls) for automotive research in the field of electric vehicles, hydrogen fuelled vehicles and automated vehicles. In all countries there is a strong interest to lead, internationally, in one or more fields of automotive research.

When comparing the overall objective of transport RTD in Europe and outside Europe, the interest to remain world leader in one or more fields of automotive research remains the strongest driver.

Other long-term objectives that drive transport RTD differ slightly between regions and countries. In Europe environmental concerns (addressing air pollution, climate change etc.) prevail. These are of major importance in Japan and China as well. In China, the push towards electrification of powertrains is mainly driven by concerns over air quality in urban areas.

Other main drivers are increasing energy security (specifically addressed in the USA and Japan), improving road safety (in the USA, in the EU), and preparing the transport sector for aging of the population through support of RTD in the field of CAV (Japan).

When we compare the European approach towards RTD support, we see that these transport challenges are addressed primarily through thematic programmes in Austria, Germany, France and the United Kingdom. The approach to RTD support in the Czech Republic and Italy is mainly through funding in cross-sectoral programmes.

Specific country findings

The assessment of the funding mechanisms in the six countries led to the following findings:

- Management of RTD funding programmes is mainly carried out by one dedicated agency in Austria, the Czech Republic and France. A different approach is taken in Germany, whereby funding is provided by the ministries, but for programme management (incl. tendering procedures) separate, often independent organisations are appointed (“Projektträger”).
- There are relatively large differences in the duration of funding programmes (application and evaluation periods). The shortest application procedures last four months (e.g. UK’s APC managed three calls per year), to almost a year in other countries (due to relatively long submission periods and/or evaluation periods)
- Funding calls are transparent, key information easy to find, although primarily available in the national language only

RTD support for a specific theme or technology is usually the result of a national policy initiative that includes RTD support. Examples are

- The Zero Emission Mobility Programme in Austria, which builds upon the national Climate and Energy Strategy
- The RTD funding call Vehicles and Transport of the Future (testing of CAVs) from ADEME builds upon the French Industrial Autonomous Vehicle Roadmap
- The Faraday Battery Challenge is one of the “sectoral” strategies of the UK’s Industrial Strategy

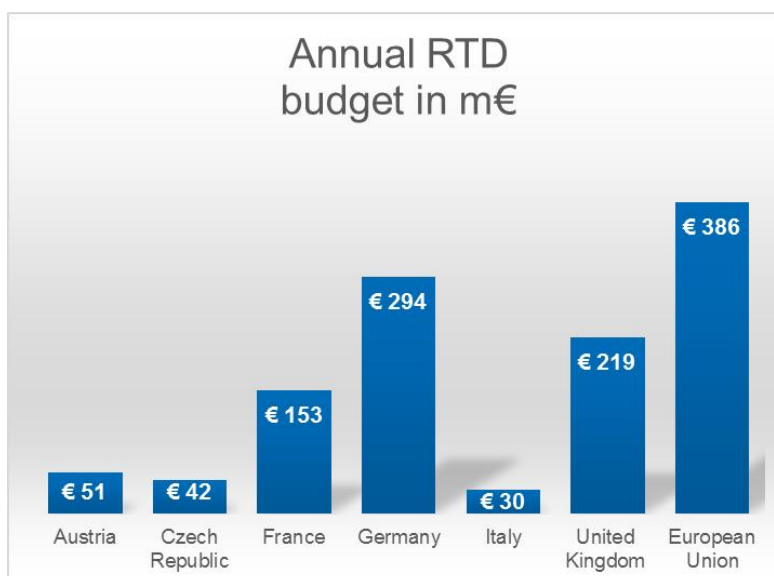
Additional interesting findings per country are the following:

- Austria has about three to five research programmes or calls that are fully or loosely linked to transport research. All of them are relatively small in size. In addition, there is the “Basisprogramm” that takes a different approach. The main objective of this programme is to increase the competitiveness of industry; the funding combines grants with low-interest loans and proposals can be submitted at any time.

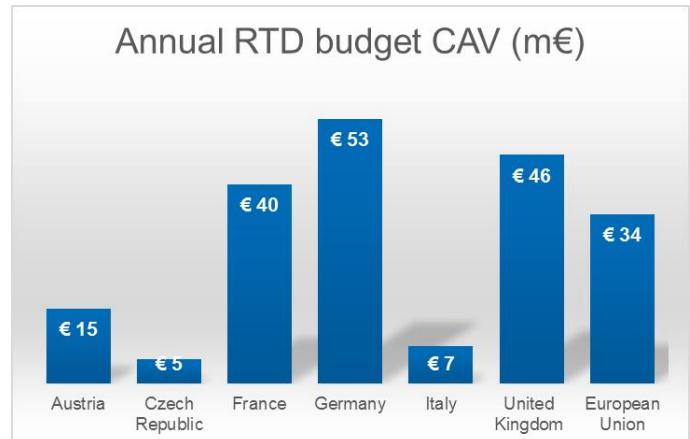
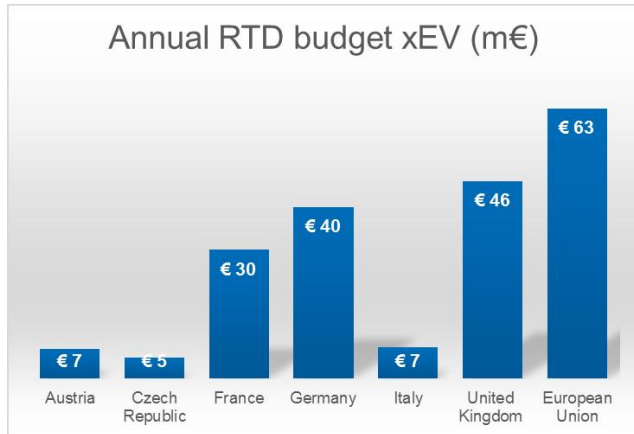
- The main aim of RTD policy in the Czech Republic is to promote applied RTD in the private sector in general, without giving clear preference to specific sectors. In 2019, however, the first specific transport RTD programme was launched.
- Germany has the largest number of funding programmes. There are about ten RTD programmes, funded by different ministries for topics such as automated driving, electromobility, battery cells or urban mobility.
- In Germany, additional (pre-competitive) research is provided through a public private partnership: the FVV (Research Association for Combustion Engines) also finances research through members contribution (OEMs and other companies in the transport sector) with projects sometimes combined with public funding.
- In addition to grant funding, the French government also provides RTD tax credits for private companies. France offers one of the most generous RTD tax incentives among OECD countries.
- In Italy, the amount of national funding in the field of automotive RTD is limited, but this is partly compensated by funding programmes from Italian regions.
- In the United Kingdom there is strong focus on electric vehicles and battery research (Faraday Battery Challenge) and strong multi-annual support for automated driving (aiming to create unique testing infrastructure).
- The United Kingdom has well defined exploitation strategies in all programmes, e.g. within the Faraday Battery Challenge an exploitation plan has to be included within each proposal. The Advanced Propulsion Centre in the UK includes a specific programme for SME support.

Funding of transport RTD

Below the annual budgets for public RTD from national funds are shown. Figures are based on 2018 or 2019 calls for proposals. Horizon 2020 funding (average annual budget of the 2018-20 period) is included for comparison.



A comparison was also made of the RTD funding of different types of electric vehicles (xEV) and connected and automated vehicles (CAV), as shown in the graphs below.



Identification of best practice funding

As in Deliverable 2.5 a best practice assessment was carried out for the national RTD funding calls. The same method for benchmarking best practice was used as in the previous deliverable, with the same scoring.

In total eight best practice criteria were determined following literature research. Therefrom, a best practice example was defined against which other programmes were benchmarked and rated (qualitatively and, for six criteria, on a relative scale). As a result of this exercise, examples of best practice in existing funding programmes were identified.

The six best practice criteria that were rated are:

- How are targets or objectives defined?
- What are the financing guidelines of the programme?
- What commercialisation of project results is expected?
- How are the project results to be verified?
- How open is the funding programme?
- What is the duration and flexibility of the application process?

In addition, the best practice assessment also included three not relatively rated criteria;

- The Technology Readiness Level expected from the projects within the funding programme,
- The eligibility criteria of the programme
- The coverage of the programme (e.g. an overall RTD programme versus a programme specifically addressing one automotive research topic).

Main conclusions – best practice

The best practice assessment was carried out for twenty-four funding calls, from those in Austria, the Czech Republic, France, Germany, Italy and the United Kingdom. Programmes (programme calls) were selected that at least partly fund transport related research. These RTD programmes were benchmarked against the best practice based on a relative scoring of +2 (fully in line with best practice) to – 2 (not in line at all with best practice). Based on the six criteria, a perfect score, best practice for all criteria, would mean a score of +12. The results of the benchmarking of the key RTD programmes are shown below.

Country	Funding organisation	Programme	Description	Score
Austria	KLIEN (Climate & Energy Fund)	Zero emission mobility	Programme addressing electric mobility. The focus is on the integration of electrified, automated and publicly accessible mobility in urban and rural transport services	9+
Austria	FFG (Research Promotion Agency)	Basisprogramm	Thematically open programme that finances (industrial) development projects of (private) companies. Result should be commercially exploitable products, processes or services.	7+
Austria	FFG	Mobility of the Future: 1) Automated driving, 2) Freight transport	Specific R&I projects in the field of Automated Driving and Freight Mobility	7+
Czech Republic	Technology Agency of the Czech Republic	TRANSPORT 2020+	First transport specific RTD programme in the Czech Republic	5+
Czech Republic	Technology Agency of the Czech Republic	TREND	Experimental development programmes with special attention for automotive and Industry 4.0	6+
Czech Republic	Technology Agency of the Czech Republic	EPSILON	A thematically open programme for the support of applied research and experimental development	6+
France	ADEME	Transport & sustainable mobility	Programme in line with national policy towards sustainable mobility and promotes development of technologies, services and innovative solutions.	6+
France	ADEME	Experimentation for autonomous vehicles on road	Programme supports the use of CAV, technologies marketable by 2022.	6+

France	ADEME	Hydrogen mobility ecosystems	Practical (market introduction support) for hydrogen infrastructure	8+
France	ADEME	Experimentation for the development of Mobility as a Service (MaaS)	Support for experiments with MaaS concepts (replicability of solutions required)	8+
Germany	BMVI	Automated and Connected Driving	Application oriented research in the field of CAV and digitization	6+
Germany	BMU	Renewably Mobile	Programme funds electric mobility projects like coupling EVs to renewable energy, market launch of EVs with ecological standards, resource availability & recycling	8+
Germany	BMW i	New Vehicle and System Technologies	Funding of technologies for CAV and for innovative vehicles (including technologies such as light weighting)	6+
Germany	BMW i	ELECTRIC POWER II	Contribution to technical leadership in the field of EV production taking into account the whole value chain	5+
United Kingdom	Industrial Challenge Fund	Faraday Battery Challenge	Support for R&I projects (business led) that develop new and improved battery technologies that are more cost effective. Route to market to be included in proposal	10+
United Kingdom	Advanced Propulsion Centre	APC competitions	Applied research up to market introduction. Detailed evaluation of ongoing / finalised projects	10+
United Kingdom	Innovate UK & Zenzic	Connected & Autonomous Vehicles competitions	Financing for the UK testing ecosystem for CAV, wider impact of research to be described	7+
United Kingdom	Innovate UK	Integrated Delivery Platform	Funding for ultra-low emission technology, exploitation plan required.	8+

The assessment of the funding programmes showed that the best scoring programmes (based on the six rated criteria) were the:

- Faraday Battery Challenge, part of the Industrial Challenge Fund (UK) – 10+
- Advanced Propulsion Centre competitions (UK) – 10+
- Zero Emission Mobility programme of the Austrian Climate & Energy Fund – 9+

Then four programmes received a score of 8+, these were:

- Hydrogen mobility ecosystems (ADEME), France
- Experimentation for the development of MaaS (ADEME), France
- Renewably mobile (BMU), Germany
- Integrated Delivery Platform (Innovate UK)

The main reasons that these programmes score closest to “ideal best practice” are that they include:

- Clearly stated objectives and performance indicators stated in the programme call
- Clearly stated information about the verification / monitoring of research results
- Clearly stated exploitation activities for the research results
- All the information required for the funding application and the selection process, as well as a list of earlier selected projects, is available online.
- A fixed timeline for proposal submission (with sufficient time to apply) and for evaluation and contract negotiation. Optimally the whole process of submission and evaluation should not take more than six months.

Based on this assessment, we may conclude that in order to develop an RTD funding programme close to best practice, the following guidelines should be taken into account.

- RTD funding programmes should include clearly defined objectives and (performance) targets, such that the specifically envisaged results might be achieved. This also enables easier verification and evaluation after project end.
- Programme targets that are in line with the (long-term) objectives of the (automotive) industry have a better chance of commercialisation.
- Monitoring of the use of project results for a specific amount of time after the end of the funding could show if the research projects funded lead to the (long-term) results that were stated at the start of the work. Such monitoring would identify lessons learned from existing funding practices and improve upcoming funding programmes.
- Promoting the use of research results by setting up a fund for exploitation (with financial contributions from both public and private actors) could be a way of ensuring that RTD project results are adopted. In addition, exploitation and commercialisation of research results should be a mandatory part of a funded project.
- Openness and transparency of the application process helps applicants to orient themselves quickly within the different grant funding opportunities. All countries studied have developed such web-based platforms.

Recommendations

When comparing funding practices abroad, we can conclude that in order to learn from funding practices abroad, it is suggested to study the following approaches:

- The approach to commercialisation in e.g. the US and Japan. Specific programmes exist for addressing commercialisation of project results. There may be different approaches that are worthwhile following.

- In Japan, RTD project results are monitored up to five years after projects ends. There are examples of follow-up monitoring as well in some EU Member States (MS), but such an approach could be done systematically in EU funded programmes as well
- In China, an Innovation Fund exists that enables 1) commercialising results of other funding programmes and 2) supports the establishment of start-ups. A combination of these two activities is an example to follow.

Other recommendations, based on actual experience with several national and European funding programmes are related to the following:

- To have impact at both national and/or EU level, thresholds for funding programmes are suggested to overcome the following problems:
 - Sub-critical funding rate. In some European and national funding programmes this may be at a level (e.g. below 40% funding) that leads to decreased interest from partners to participate and research budgets not being spent.
 - Sub-critical project/funding budget: single projects, with e.g. funding < 500 k€, may have a negligible impact on EU or global scale
 - Subcritical programme volume. Relatively small national RTD projects, with only few projects supported, may have a low success rate (e.g. < 15%)

Within this research it was not possible to set such a threshold, but it should be assessed what such an optimal threshold could be.

- A remaining issue is how to deal with uncertainty in research. There are different ways to deal with this issue, with each of the approaches suiting different types of research.
 - One example is from the US. The merit review process used there has several go/no-go points during the course of the project. This may lead to termination of a project before the project ends.
 - The approach taken often in Europe is that there are regular evaluation meetings (e.g. every 3 to 6 months) and terminating a project before regular end is a possibility (often this is only the last possible option when other options like scope change are not seen as feasible).
 - An alternative possibility would be to split RTD projects in two phases, with the second phase only starting after certain milestones have been reached.
- As was seen in the results from Task 2.1 and Task 2.3, large cities are initiating their own mobility solutions. Therefore, cities should be encouraged to partner with RTD organisations. Nowadays, cities are often only followers in RTD projects.
- Another issue often addressed by project applicants on national and European level is the administrative burden. In an attempt to reduce the administrative burden, the EC has recently started a pilot with lump sum funding, where the final funding amount is only dependent on successful project completion and not on cost claims based on timesheets etc. It remains to be seen if this route has any benefits.

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List of abbreviations

European and general abbreviations

Abbreviation	Description
ACEA	European Automobile Manufacturers Association
AI	Artificial Intelligence
ART	Autonomous Road Transport
BERD	Business Expenditures for R&D
CAV	Connected and Automated Vehicles
CNG	Compressed natural gas
CO ₂	Carbon dioxide
DG CONNECT	Directorate-General for Communications Networks, Content and Technology
DG MOVE	Directorate-General for Mobility and Transport
DG Research	Directorate General for Research and Innovation
EARPA	Association of automotive R&D organisations
EBA	European Battery Alliance
ECSEL	Electronic Components and Systems for European Leadership Joint Undertaking
EGVIA	Association of the European Green Vehicles Initiative
ERC	European Research Council
ERTRAC	European Technology Platform for Road Transport
EUCAR	European Council for Automotive R&D
EV	Electrified Vehicles
FCH JU	Fuel Cell and Hydrogen Joint Undertaking
FTI	Fast Track to Innovation
GDP	Gross Domestic Product
GERD	Government Expenditure for R&D
ICE	Internal Combustion Engine
ICT	information and communication technologies
IPCEI	Important Projects of Common European Interest
LNG	Liquefied natural gas
MaaS	Mobility as a Service
MG	Mobility for Growth
MRL	Manufacturing Readiness Level
NO _x	Nitrogen oxides
PM	Particulate matter
PPP	Public Private Partnership
SCC	Smart Cities and Communities

SME	Small and Medium Enterprises
STRIA	Strategic Transport Research Innovation Agenda
TRL	Technology Readiness Level

Austria

Abbreviation	Description
BMBWF	Bundesministerium für Bildung, Wissenschaft und Forschung, <i>Federal Ministry of Education, Science and Research</i>
BMDW	Bundesministerium für Digitalisierung und Wirtschaftsstandort, <i>Federal Ministry of Digital and Economic Affairs</i>
BMNT	Bundesministerium für Nachhaltigkeit und Tourismus, <i>Federal Ministry of Sustainability and Tourism</i>
BMVIT	Bundesministerium für Verkehr, Innovation und Technologie, <i>Federal Ministry of Transport, Innovation and Technology</i>
CDG	Christian Doppler Research Association
FFG	Forschungs Förderungs Gesellschaft, <i>Austrian Research Promotion Agency</i>
FWF	Fonds zur Förderung der wissenschaftlichen Forschung, <i>Austrian Science Fund</i>
KLIEN	Klima- und Energiefonds, <i>Climate and Energy Fund</i>

Czech Republic

Abbreviation	Description
AutoSAP	Czech Automotive Manufacturers Association
CZK	Czech Crowns
ESF	European Social Fund
ERDF	European Regional Development Fund
GA CR	Grant Agency of the Czech Republic
KET	Key Enabling Technologies
MIT	Ministry of Industry and Trade
NIP	National Innovation Platforms
OP	Operational Programme
TA CR	Technological Agency of the Czech Republic

France

Abbreviation	Description
AAP	Appels à projets, <i>Calls for projects</i>
ADEME	Agence de l'environnement et de la maîtrise de l'énergie, <i>Environment and Energy Management Agency</i>
AMI	Appel à manifestation d'intérêt, <i>Call for Expression of Interest</i>
BPI	Banque Publique d'Investissement, <i>French Public Investment Bank</i>

CDC	Caisse Des Dépôts, <i>Public institutional investor</i>
CIR	Crédit d'Impôt Recherche, <i>Research Tax Credit</i>
ANR	Agence Nationale de la Recherche, <i>National Research Agency</i>
FNSR	French National Strategy for Research
MESRI	Ministry of Higher Education, Research and Innovation
PIA	Programme d'investissements d'avenir, <i>Strategic Investment Programme</i>
PSPC	Programme Structurant Pour la Compétitivité, <i>Structural Program for Competitiveness</i>
SGPI	Secretary General for Investment

Germany

Abbreviation	Description
AVF	Automatisiertes und vernetztes Fahren, <i>Automated and connected driving</i>
BASf	Bundesanstalt für Straßenwesen, <i>Federal Highway Research Institute</i>
BMBF	Bundesministerium für Bildung und Forschung, <i>Federal Ministry of Education and Research</i>
BMU	Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit, <i>Federal Ministry for the Environment, Nature Conservation and Nuclear Safety</i>
BMVI	Bundesministerium für Verkehr und digitale Infrastruktur, <i>Federal Ministry of Transport and Digital Infrastructure</i>
BMWi	Bundesministerium für Wirtschaft und Energie, <i>Federal Ministry for Economy and Energy</i>
DFG	Deutsche Forschungsgemeinschaft, <i>German Research Foundation</i>
FVV	Forschungsvereinigung Verbrennungskraftmaschinen, <i>Research Association for Combustion Engines</i>
NIP	Nationales Innovationsprogramm Wasserstoff- und Brennstoffzellentechnologie, <i>National Innovation Programme Hydrogen and Fuel Cell Technology</i>
NPE	Nationale Plattform Elektromobilität, <i>National Platform for Electric Mobility</i>
UBA	Umweltbundesamt, <i>Federal Agency for the Environment</i>

Italy

Abbreviation	Description
FCS	Fund for Sustainable Growth
MISE	Ministry of Economic Development
MIUR	Ministry of Education, University and Research
PNIR	National Programme for Research Infrastructures
PNR	National Research Programme
PON	National Operational Programme

United Kingdom

Abbreviation	Description
APC	Advanced Propulsion Centre



EGVI
European Green
Vehicles Initiative

BEIS	Department for Business, Energy & Industrial Strategy
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
EPSRC	Engineering and Physical Sciences Research Council
IDP	Integrated Delivery Platform
ISCF	Industrial Strategy Challenge Fund
LowCVP	Low Carbon Vehicle Partnership
ODA	Official Development Assistance
OLEV	Office for Low Emission Vehicles
RTO	Research and technology organisation
SMMT	Society of Motor Manufacturers and Traders
TDAP	Technology Developer Accelerator Programme
UKRI	UK Research and Innovation

1 Introduction

The Horizon 2020 project FUTURE-RADAR (Grant Agreement Number 723970) is the support action for ERTRAC¹ (the European Technology Platform for Road Transport) and EGVI² (the Association of the European Green Vehicles Initiative) which aim to create and implement the needed research and innovation strategies for a sustainable and competitive European road transport system.

Specific tasks of ERTRAC include:

- Providing a strategic vision for road transport research and innovation in Europe.
- Defining strategies and roadmaps to achieve this vision through the definition and update of a Strategic Research Agenda and implementation research roadmaps.
- Stimulating effective public and private investment in road transport research and innovation.
- Contributing to improving coordination between the European, national, regional public and private RTD activities on road transport.
- Enhancing the networking and clustering of Europe's research and innovation capacities.
- Fostering European commitment to Research and technological development, ensuring that Europe remains an attractive region for researchers, and enhancing the global competitiveness of the transport industries.
- Supporting the implementation of Horizon 2020.

EGVI is a contractual Public-Private Partnership (PPP) dedicated to delivering green vehicles and mobility system solutions which match the major societal, environmental and economic challenges ahead. With a focus on the energy efficiency of vehicles and alternative powertrains, the EGVI PPP aims at accelerating research, development and demonstration of technologies allowing the efficient use of clean energies in road transport.

Linking representatives of all stakeholder groups, the activities of FUTURE-RADAR include project monitoring, strategic research agendas, international assessments and recommendations for innovation deployment and comprehensive dissemination and awareness activities, while working to facilitate the exchange between cities in Europa, Asia and Latin America on urban electric mobility solutions.

This Deliverable 2.4 is one of the two reports resulting from FUTURE-RADAR Task 2.2. This task covers three activities:

1. The first activity is the assessment of the national funding mechanisms for automotive RTD in four non-European countries (USA, Japan, China and Brazil). It also includes the development of best practice criteria for the identification of best practices. This was the assessment included in Deliverable 2.5.
2. Secondly, a similar assessment of funding mechanisms for automotive RTD at EU level and in six EU Member States (Austria, Czech Republic, France, Germany, Italy and the United Kingdom)

¹ ERTRAC members include public and private research providers and their researchers, automotive suppliers, the ITS industry, the road sector, in particular the infrastructure, service providers, vehicle manufacturers, and the energy/fuel supply sector

² EGVI members represent industry and research and include automotive OEMs, automotive suppliers, the smart systems industry and smart grid industry.

was carried out. This is reported here in Deliverable D2.4, “Recommendations for the deployment of innovative road transport solutions in Europe”.

3. Thirdly, on the basis of the above work, the funding mechanisms in the EU were compared to those outside the EU, combining the findings from activities 1 and 2. This forms the basis of recommendations to the European Commission on key policies to support and strengthen the automotive industry and research. These are also included in this report.

This deliverable report relates to the activities performed during the period M18-30 in Task 2.2. It has been written by Ricardo and involves the contributions from the partners: AVL, VDI/VDE-IT, Valeo, CRF and CTU Prague.

1.1 Objectives

In this report the road transport innovation funding landscapes in Austria, the Czech Republic, France, Germany, Italy and the United Kingdom, are identified and described. Based on this description, examples of research funding programmes in the six countries are benchmarked to a pre-defined best practice of research funding.

To achieve this the structures of the national funding organisations in each of the six countries will be described with regard to road transport research, and information on their respective funding programmes will be analysed, including:

- National spending and funding on road transport and automotive related RTD
- Research priorities for road transport and automotive related RTD
- Information on the calls and types of projects financed
- Details about the selection, evaluation and the dissemination of the projects as can be found.
- Recent international cooperation in the field of road transport and automotive related research

Analysis of these areas will lead to identification of lessons learned from the funding mechanisms in the four countries and allow recommendations for future European Commission and EU member-state funding programmes to be generated.

1.2 Method

The method used in this report is the following:

- Firstly, a picture will be created of the research landscape with the public organisations involved on national level (e.g. responsible ministries and implementing agencies) and the private stakeholders involved in setting research priorities
- Secondly, national funding programmes will be described regarding their priorities, calls and eligible participants

- Thirdly, from the examples of national funding programmes, best practice examples will be selected based on criteria defined in this report
- Fourthly, with the best practice examples, a set of recommendations will be developed based on these experiences.

Within the project consortium it was agreed to limit the assessment to grant funding on national level (excluding funding mechanisms on regional (sub-national) level) and to exclude privately funded research.

This report is based on comprehensive investigations performed by researchers in Austria, the Czech Republic, France, Germany, Italy and the United Kingdom. Knowledge from these and other external experts was combined with results from desk research. The data collection was carried out from October 2018 to April 2019.

1.3 Background

The review of the funding landscape in the six countries is comparable to the research done in the EU FP7 project EAGAR (2008-2010). This project looked mainly at automotive research. For the FUTURE-RADAR project the method of the EAGAR project was partly adapted. FUTURE RADAR moved a step further and included a wider selection of road transport modes and interaction with other modes of transport. Another addition to the EAGAR project is that the research also looked at international collaboration in road transport RTD, since more and more initiatives are developed between countries Europe, North America and Asia.

The FUTURE-RADAR project also continues where the Horizon 2020 project FOSTER-ROAD ended. The FOSTER-ROAD project had been investigating the challenges of converting (grant-funded) RTD project results into successful innovation. The project launched an “Innovation Survey” to collect opinion and insight into the potential success factors and barriers on the pathway from research to innovation and commercial exploitation. The research showed that correlating EC-funded projects with product innovations can be difficult for many reasons, such as the development “gap”, many RTD projects contributing to a single innovation, lost in the knowledge transition between RTD to advanced technology development and requirements for further financing. In summary, innovation success requires positive collaboration, time to innovate and a ready market for the product to be introduced.

The FUTURE-RADAR project and this study continues with the previous research by assessing national, European and international framework conditions and deployment strategies, in order to strengthen European competitiveness.

1.4 Overview of data sources used

This report investigates the framework conditions for six European countries (Austria, the Czech Republic, France, Germany, Italy and the United Kingdom) in the field of road transport RTD and innovation.

The type of data that were collected were the following:

- Published national policy documents, such as action plans for science and technology, roadmaps for transport research etc.
- Reports from international organisations, on research funding in some of the given countries.
- Websites of funding organisations and their hierarchies for automotive and/or road transport research
- Documents and websites on national public funding programmes with the most recent calls, e.g. between 2017 and 2019
- Where available, details of open calls, such as eligible applicants, grant funding rates and budgets, selection processes etc.
- Information about international cooperation initiatives in each of the four countries.

Documents were gathered from websites of national ministries and funding agencies, reports on RTD funding and in interviews with local experts. The complete list of data sources used, and experts consulted for all four country sections is included in the literature list.

1.5 Assessment of best practice

The third activity reported herein the selection of best practice examples based on criteria defined in the previous report. It would have been possible to carry out the assessment for four specific entity types, 1) Funding organisations, 2) Funding programmes, 3) Funding calls and 4) Funded projects. In this report, the choice was made for the assessment of 3) Funding calls.

The reason for choosing Funding calls was that their assessment requires information about funding practices (e.g. how funding applications work in the relevant country) to be collected, combined with information about chosen automotive research topics. This activity can, therefore, potentially bring the most useful information within the FUTURE-RADAR CSA, as the project is addressing future research needs. Furthermore, the assessment would create a picture of how funding organisations work but less about the funding topics that are financed. The alternative assessment of single projects could give detailed information about projects but comparison of projects in different countries would have been very difficult with the chosen set of criteria.

1.6 Acknowledgements

This study is a combined effort from experts from Ricardo and from FUTURE-RADAR partner organisations. From the FUTURE-RADAR consortium the following organisations and people contributed to this report:

- For Austria, Verena Wagenhofer and Clara Horvath from AVL
- For the Czech Republic, Jan Macek from CTU Prague
- For France, Jean-Luc Brossard and Francis Roy from MPSA and Jean-Luc di Paola-Galloni from Valeo
- For Italy, David Storer from CRF



- For Germany, Frauke Bierau-Delpont from VDI/VDE-IT
- For the United Kingdom, Corin Wren and Neville Jackson from Ricardo.

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2 Road transport research landscapes

This chapter includes the road transport research landscape in the EU and the six European countries: Austria, the Czech Republic, France, Germany, Italy and the United Kingdom.

For the section on the EU and each of the six country sections, an identical structure is used for presenting the information found. This structure has six sections as shown in the picture below. Section 1 includes an overview of strategic plans (such as national policy documents or technology roadmaps) related to road transport RTD. Section 2 includes the governance system of RTD and illustrates the hierarchy of the funding landscape. Section 3 describes the main funding organisations and other public and private stakeholders that influence RTD in the road transport sector. Section 4 provides as much detail as possible related to the grant programmes and open calls for projects. Section 5 will give an overview of the international collaboration (e.g. bilateral) ongoing with other countries. Section 6 will summarize the main findings per country and identify at least three good practice examples per country. These will be benchmarked against a pre-defined best practice in chapter 3.

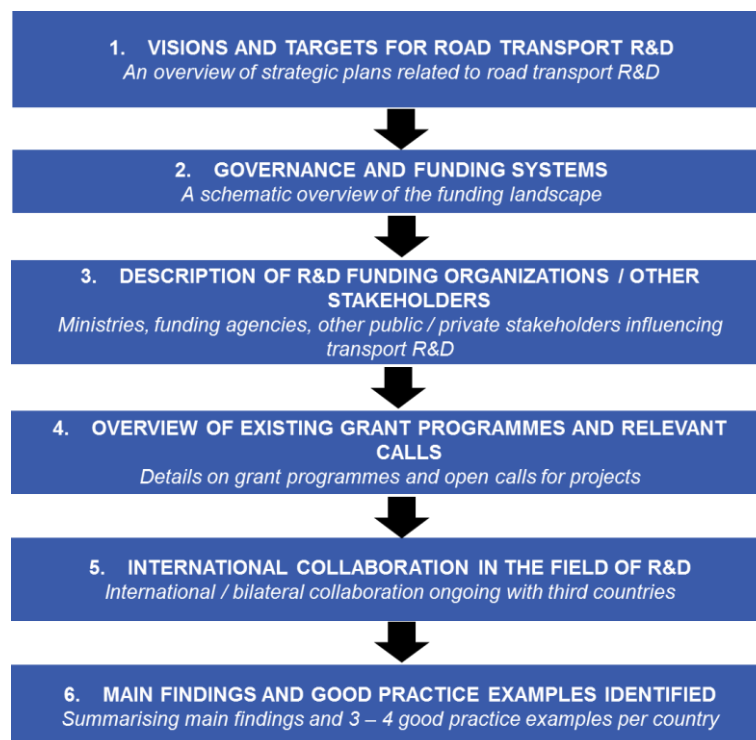


Figure 1 Deliverable 2.4 structure

2.1 European Union

This section includes a brief overview of the main European research programmes. First a brief overview of EU policy documents and the main policy targets will be presented. This concerns especially those that

are influencing the European research agenda. This is followed by the structure of the European research funding system and the main stakeholders involved.

2.1.1 Visions and targets for road transport RTD

The European Commission has addressed community wide transport policy since the early 1990s. First priorities of the common transport policy were related to market opening, but quickly followed by increasing attention for environmental issues (e.g. addressing air pollution, climate change).

The current EU transport policy includes a number of policy targets, that are highlighted the 2011 White Paper, a Roadmap to a Single European Transport Area. The main targets from this White Paper are still valid today and are related to:

- Developing a sustainable transport system
- Increasing road safety
- Increasing competitiveness of the European transport industry

2.1.1.1 Emission limits

In 2018, the European Commission proposed new emission limits for passenger cars and trucks. These have been recently adopted by the European Council.

CO₂ emission cuts for new passenger cars

The European Council agreed in Autumn 2018 that average CO₂ emissions of new passenger cars registered in the EU will have to be 15% lower in 2025 and 35% lower in 2030, compared to the emission limits valid in 2021. These are EU wide fleet targets and the CO₂ reduction effort will be distributed among manufacturers on the basis of the average mass of their vehicle fleet. By 2021, phased in from 2020, the fleet average to be achieved by all new cars is 95 grams of CO₂ per kilometre.

CO₂ emission cuts for new heavy-duty vehicles

During May 2018, the European Commission presented a legislative proposal setting the first ever CO₂ emission standards for heavy-duty vehicles in the EU. The targets for average CO₂ emissions from new lorries are:

- In 2025, 15% lower than in 2019
- In 2030, at least 30 % lower than in 2019 (indicative target, subject to review in 2022)

This proposal was adopted by the Council in June 2019.

2.1.1.2 EU transport policy documents - RTD and sustainability

The most recent EU policy documents addressing transport RTD and sustainability are the following:

- Strategic Transport Research Innovation Agenda (STRIA) - SMART MOBILITY AND SERVICES ROADMAP – 2016
- New Industrial Policy Strategy (2017) – full title: Investing in a smart, innovative and sustainable Industry: A renewed EU Industrial Policy Strategy
- Europe on the Move (2017) – An agenda for a socially fair transition towards clean, competitive and connected mobility for all – includes:
 - ANNEX 2 – Strategic Action Plan on Batteries
- On the road to automated mobility: An EU strategy for mobility of the future (2018)

Clean Mobility Package – Europe on the Move (2017/2018)

This policy paper is subtitled “An agenda for a socially fair transition towards clean, competitive and connected mobility for all”

“Europe on the Move” is a wide-ranging set of initiatives that will make traffic safer; encourage smart road charging; reduce CO₂ emissions, air pollution and congestion; cut red-tape for businesses; fight illicit employment and ensure proper conditions and rest times for workers. The long-term benefits of these measures will extend far beyond the transport sector by promoting growth and job creation, strengthening social fairness, widening consumers’ choices and firmly putting Europe on the path towards zero emissions.

Part of this strategy is to revise the post-2020/2021 carbon dioxide standards for cars and vans.

Options under review include specific targets for low and/or zero-emission vehicles. EU standards for heavy duty vehicles are also under consideration by the Commission. These proposals are envisaged respectively for the end of this year and the first half of 2018. They will be based on modernised test procedures closer to real-world emissions. Targets for personal cars have been agreed upon between the Member States in October 2018, for heavy duty vehicles, the European Commission has proposed policy documents, but they have to be agreed upon by the Member States.

Europe on the Move includes three “packages”:

- EUROPE ON THE MOVE I (May 2017) – Commission takes action for clean, competitive and connected mobility
- EUROPE ON THE MOVE II (Nov 2017) – Commission takes action to reinforce EU’s global leadership in clean vehicles
- EUROPE ON THE MOVE III (May 2018) – Commission completes its agenda for safe, clean and connected mobility

Strategic Action Plan on Batteries

Special attention is paid to battery electric vehicles, especially the production and use of batteries. This “Strategic Action Plan on Batteries” was developed as an Annex to the third “Europe on the Move” paper from May 2018.

This Strategic Action Plan has been developed in close consultation with stakeholders including industry and Member States in the framework of the 'European Battery Alliance' and builds on the industry-led approach whereby EU industry players have themselves adopted and are starting to implement targeted actions.

This Strategic Action Plan combines targeted measures at EU level including in raw materials (primary and secondary), research and innovation, financing/investment, standardisation / regulatory, trade and skills development, in order to make Europe a global leader in sustainable battery production and use, in the context of the circular economy.

More specifically its aims to:

1. Securing the sustainable supply of raw materials
2. Supporting European projects covering different segments of the battery value chain, including cells manufacturing
3. Strengthening industrial leadership through stepped-up EU research and innovation support covering the full value chain
4. Developing and strengthening a highly skilled workforce in all parts of the value-chain and making Europe an attractive location for world class experts in batteries development and production
5. Supporting a sustainable battery value chain – i.e. requirements for safe and sustainable batteries production - as a key driver for EU competitiveness
6. Ensuring consistency with the broader enabling and regulatory framework in support of batteries and storage deployment

The latest technology trend, the development of connected and automated vehicles is addresses in the Communication **“On the road to automated mobility: An EU strategy for mobility of the future (2018)”**.

With this Communication the Commission proposes *“a comprehensive EU approach towards connected and automated mobility setting out a clear, forward looking and ambitious European agenda”*.

The ambition is to make Europe a world leader in the deployment of connected and automated mobility, making a step-change in Europe in bringing down the number of road fatalities, reducing harmful emissions from transport and reducing congestion.

The deployment of driverless mobility – when fully integrated in the whole transport system and accompanied by the right support measures and synergies between driverless mobility and decarbonisation measures – is expected to contribute significantly to achieving these key societal objectives. Ultimately this is expected to lead to achieving the so-called Vision Zero, i.e. no road fatalities on European roads by 2050.

2.1.2 Governance and funding system

The structure of the European funding system, limited to the entities which are relevant for automotive research, is displayed below³.

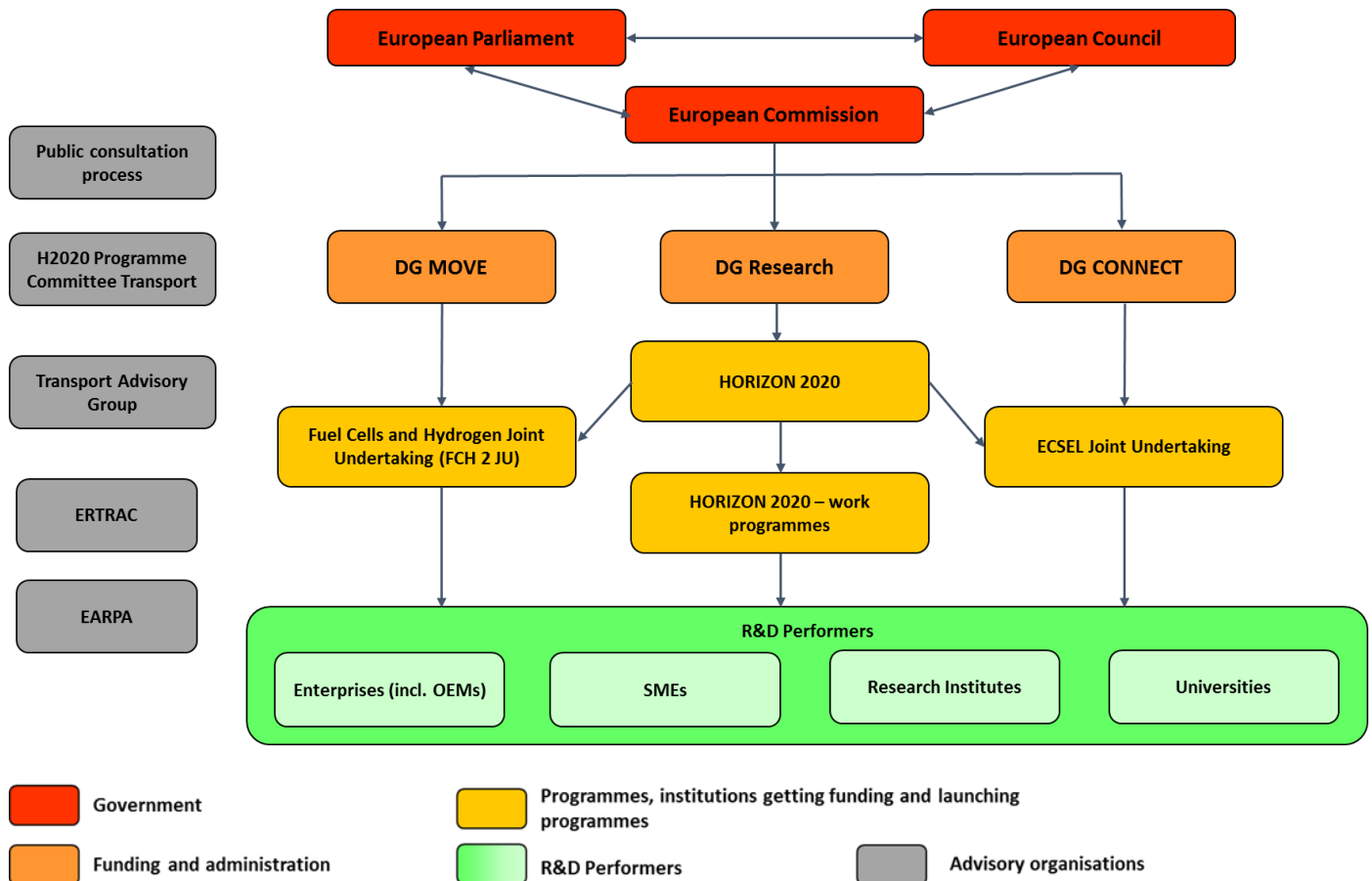


Figure 2 European RTD funding landscape

The following three directorate generals have an important influence on the RTD agenda:

Directorate General for Research and Innovation:

The Directorate General for Research and Innovation (DG RESEARCH) is a branch of the European Commission dedicated to a specific field of expertise. The “Research Directorate General” administers the European policies in the field of technology and research including transport, energy, materials etc.⁴

Directorate-General for Mobility and Transport:

³ Based on EAGAR (2010), updated end 2018

⁴ https://ec.europa.eu/info/publications/directorate-general-research-and-innovation_en

The Directorate-General for Mobility and Transport (DG MOVE), was founded in 2010, partly as successor of DG TREN. It manages the European policies in the field of transport. Compared to DG Research the focus is more on technology demonstration and policy measures.⁵

The Directorate-General for Communications:

The Directorate-General for Communications Networks, Content and Technology (CONNECT) is the Commission department responsible to develop a digital single market to generate smart, sustainable and inclusive growth in Europe.⁶

2.1.3 Overview of the funding organisations and other key stakeholders

2.1.3.1 Horizon 2020

The most important research and innovation programme in the EU is Horizon 2020. Horizon 2020 is the biggest EU research and innovation programme ever. Its aim is to support breakthroughs, discoveries and world-firsts by taking great ideas from the lab to the market. Almost €80 billion of funding is available over the 7 years budget period (2014 to 2020) – in addition to the private and national public investment that this money will attract.

HORIZON 2020 BUDGET (in current prices)

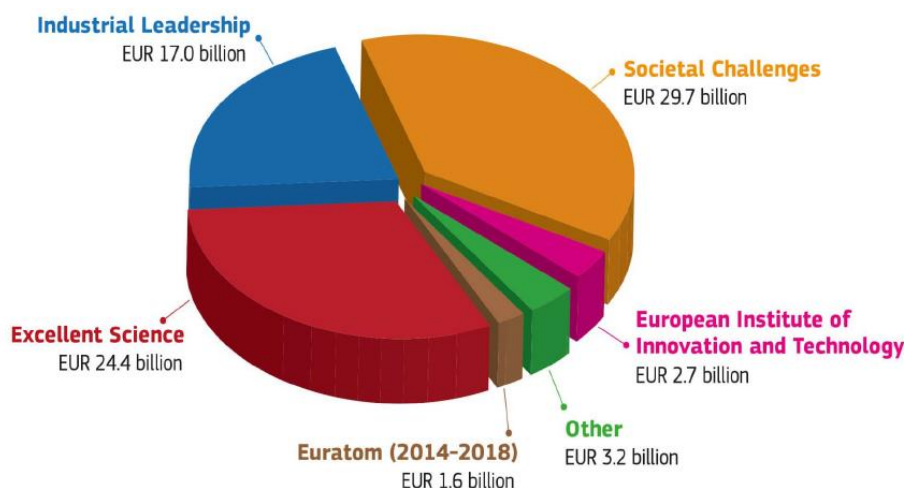


Figure 3 Horizon 2020 budget distribution

Transport RTD is covered under the topic of “Smart, Green and Integrated Transport” under the heading of Societal Challenges. The Transport Challenge is allocated with a budget of € 6,339 million for the period

⁵ http://ec.europa.eu/dgs/transport/index_en.htm

⁶ https://ec.europa.eu/info/departments/communications-networks-content-and-technology_en

2014-2020, which means more than 8% of the total H2020 programme. A detailed budget breakdown of is shown in the table below.

Horizon 2020 (2014-2020)		
	Final breakdown	Estimated final amount in m€
III Societal challenges, of which	38.53%	29 679
1. Health, demographic change and wellbeing;	9.70%	7 472
2. Food security, sustainable agriculture and forestry, marine maritime and inland water research and the Bioeconomy;	5.00%	3 851
3. Secure, clean and efficient energy	7.70%	5 931
4. Smart, green and integrated transport	8.23%	6 339
5. Climate action, environmental resource efficiency and raw materials	4.00%	3 081
6. Europe in a changing world – Inclusive innovative and reflective societies	1.70%	1 309
7. Secure societies – Protecting freedom and security of Europe and its citizens	2.20%	1 695

The Specific Programme of SC4 "Smart, green and integrated transport" is structured in four broad lines of activities aiming at:

- Resource efficient transport that respects the environment. The aim is to minimise transport's systems' impact on climate and the environment (including noise, air and water pollution) by improving its efficiency in the use of natural resources, and by reducing its dependence on fossil fuels and energy imports.
- Better mobility, less congestion, more safety and security. The aim is to reconcile the growing mobility needs with improved transport fluidity, through innovative solutions for seamless, inclusive, affordable, safe, secure and robust transport systems that make full use of modern information and communication technologies (ICT) capabilities.
- Global leadership for the European transport industry. The aim is to reinforce the competitiveness and performance of European transport manufacturing industries and related services on global markets including logistic processes and retain areas of European leadership (e.g. such as aeronautics).

- d) Socio-economic and behavioural research and forward-looking activities for policy making. The aim is to support improved policy making which is necessary to promote innovation and meet the challenges raised by transport, including the internalisation of external costs, and the societal needs related to it. Socio-economic research is also an important instrument for reaching the objectives under this programme

These activities are addressed in annual or bi-annual Work Programmes through specific Calls for Proposals on the following calls for proposals:

- 1) Call Mobility for Growth: This call contains a "Building a low-carbon, climate resilient future" Focus Area section (section 1. 'Building a low-carbon, climate resilient future: Low-carbon and sustainable transport')
- 2) Call 'Digitising and transforming European industry and services: Automated Road Transport' and
- 3) Call 'Building a low-carbon, climate resilient future: Green Vehicles'

In addition to the three Calls for proposals, the Transport Challenge contributes to: the cross-cutting call 'Building a low-carbon, climate resilient future: Next-Generation Batteries' Blue Growth, the Energy part of the Work Programme (through ELENA facility and Smart Cities and Communities).

The revision of the Work Programme for 2019 presents a novelty with the new cross-cutting Call "Building a Low-Carbon, Climate Resilient Future: Next-Generation Batteries", which brings together research and innovation efforts on the next generations of batteries from various parts of Horizon 2020. The Transport Challenge contributes with dedicated topics on batteries for electro mobility.

2.1.3.2 Partnerships with Industry and Member States

Under Horizon 2020 the Commission has joined with key industry partners to work together on the grand challenges of tomorrow. Partnerships between the Commission and industry intend to bring project results closer to the market and improve the link between research and societal growth. There are seven partnerships set up by the Commission to implement Horizon 2020. Among them are five partnerships that address transport related research:

- **Fuel Cells and Hydrogen 2 (FCH2)** accelerates market introduction of clean and efficient technologies in energy and transport - <https://www.fch.europa.eu/>
- Clean Sky 2 (CS2) develops cleaner, quieter aircraft with significantly less emissions
- **Electronic Components and Systems for European Leadership (ECSEL)**: to boost Europe's electronics manufacturing capabilities - <https://www.ecsel.eu/>
- Shift2Rail has been created to develop better trains and railway infrastructure that will drastically reduce costs and improve capacity, reliability and punctuality - <https://shift2rail.org/>
- Single European Sky ATM Research (SESAR) develops the new generation of European Air Traffic Management system that will enhance the performance of air transport

Two of these partnerships, the FCH2 and ECSEL are joint undertakings. Joint undertakings are a form of public-private partnerships set up in strategic areas of research and innovation aiming to mobilise both public and private investments to support the EU economy.



The selection of the partnerships was made in order to maximise their value to the EU and their expected impact. A strong and long-term commitment from the industry partners supports the Commission and contributes to the delivery of the JUs' highly ambitious goals.

Fuel Cells and Hydrogen Joint Undertaking

The Fuel Cells and Hydrogen Joint Undertaking (FCH JU) is a unique public private partnership supporting research, technological development and demonstration (RTD) activities in fuel cell and hydrogen energy technologies in Europe. Its aim is to accelerate the market introduction of these technologies, realising their potential as an instrument in achieving a carbon-clean energy system.

Fuel cells, as an efficient conversion technology, and hydrogen, as a clean energy carrier, have a great potential to help fight carbon dioxide emissions, to reduce dependence on hydrocarbons and to contribute to economic growth. The objective of the FCH JU is to bring these benefits to Europeans through a concentrated effort from all sectors.

The three members of the FCH JU are the European Commission, fuel cell and hydrogen industries represented by Hydrogen Europe and the research community represented by Hydrogen Europe Research.

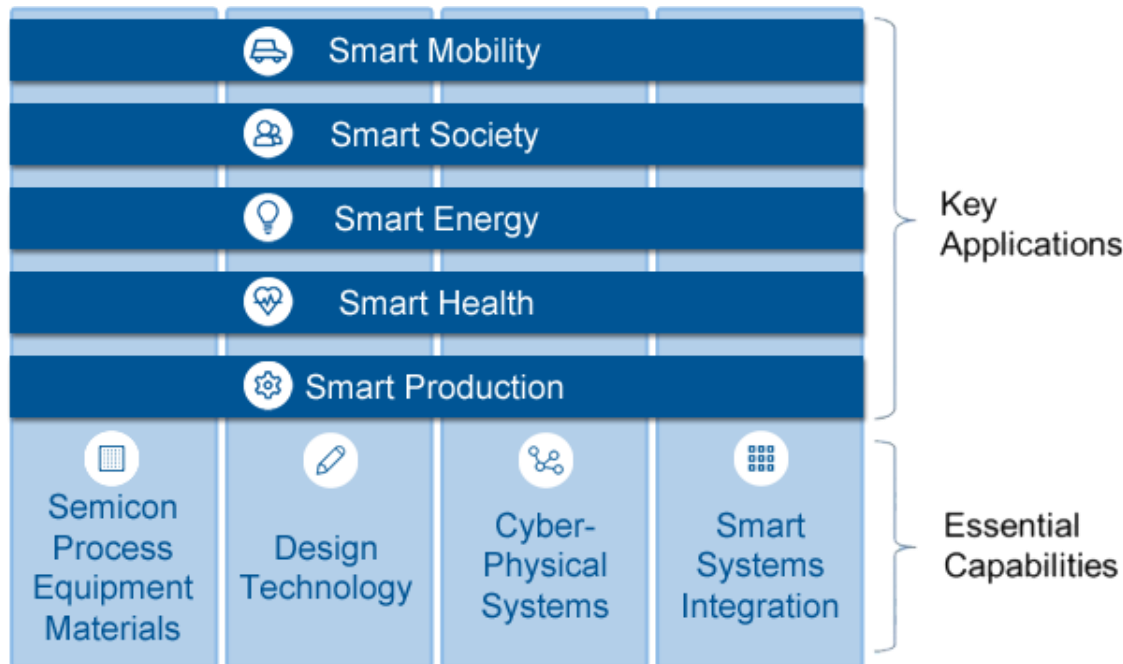
The FCH JU was established by a Council Regulation on 30 May 2008 as a public-private partnership between the European Commission, European industry and research organisations to accelerate the development and deployment of fuel cell and hydrogen technologies.

The second phase of the FCH JU is continuing as FCH 2 JU under Horizon 2020. The FCH 2 JU is set up for a period lasting until 31 December 2024. It brings public and private interests together in a new, industry-led implementation structure, ensuring that the jointly defined research programme better matches industry's needs and expectations, while focusing on the objective of accelerating the commercialization of fuel cell and hydrogen technologies.

RTD projects financed under the FCH JU have similar conditions as other H2020 projects.

ECSEL Joint Undertaking - Electronic Components and Systems for European Leadership

The ECSEL-JU programme started with the merge of the previous ARTEMIS-JU and the ENIAC-JU in June 2014 and will finish in 2024. Three industry associations (including ARTEMIS Industry Association) represent actors from the areas of Micro-/Nanoelectronics, Embedded and Cyber-Physical Systems and Smart Systems. The ECSEL-JU programme features innovation and competitive projects in several key application areas and crucial key enabling technology areas (essential capabilities). In the figure below, the key research topics are shown.



The total ECSEL budget for 2014 to 2020 is €4.8 billion, of which €1.2 billion is funding from the EU, €1.2 billion funding from participating member states and associated countries, and at least half of the total costs of around €2.4 billion from industrial partners⁷.

Examples of automotive RTD projects that are financed under ECSEL-JU are:

- Autodrive project - <https://autodrive-project.eu/>
- Prystine project - <https://prystine.automotive.oth-aw.de/> - Programmable Systems for Intelligence in Automobiles
- DENSE - <https://www.dense247.eu/home/> - Developing a 24/7 sensor suite that enables cars to operate safely even in severe weather conditions
- ENABLE S3 - <https://www.enable-s3.eu/> -

2.1.3.3 The European Battery Alliance

The European Battery Alliance (EBA) was launched in October 2017 by the European Commission with the aim to create a competitive manufacturing value chain in Europe with sustainable battery cells at its core.⁸ It is the central instrument for discussions between European politics and industry on the future of battery cell production in Europe and for coordinating development activities. To set it apart from Asian competitors producing toxic batteries based on rare materials, the European Commission targets environmentally friendly batteries adhering to EU standards; the industry, however, is rather pointing to solid-state batteries as a technological solution.

⁷ <https://artemis-ia.eu/ecsel-joint-undertaking.html>

⁸ <https://www.eba250.com/>



EGVI
European Green
Vehicles Initiative

This cooperative platform gathers:

- the European Commission
- interested EU countries
- the European Investment Bank
- key industrial stakeholders
- innovation actors

The immediate objective is to create a competitive manufacturing value chain in Europe with sustainable battery cells at its core. To prevent a technological dependence on competitors outside the EU and capitalise on the job, growth and investment potential of batteries, Europe has to move fast in the global race. According to some forecasts, Europe could capture a battery market of up to €250 billion a year from 2025 onwards. Covering the EU demand alone requires at least 10 to 20 'gigafactories' (large-scale battery cell production facilities). The scale and speed of the necessary investment require a combined effort to address this industrial challenge.

In the field of RTD, additional research calls were published for battery research. An updated Work Programme for Horizon 2020 covering both H2020 Energy and Transport funding opportunities in 2018 - 2020, was published in July 2018 and included new cross-cutting call for project proposals, *Building a Low-Carbon, Climate Resilient Future: Next-Generation Batteries*. This aims to bring together research and innovation efforts on the next generations of batteries from various parts of Horizon 2020. In 2019, around 110 m€ will be available to fund projects in seven topics of the call (with application period starting on 24 January 2019). During 2020, three more research topics will open with an indicative budget of 70m€.

2.1.3.4 Other RTD stakeholders

ERTRAC

ERTRAC is the European Road Transport Research Advisory Council. It is the European technology platform which brings together road transport stakeholders to develop a common vision for road transport research in Europe. ERTRAC members include public and private research providers and their researchers, automotive suppliers, the ITS industry, the road sector, in particular the infrastructure, service providers, vehicle manufacturers, and the energy/fuel supply sector⁹.

EGVI

The European Green Vehicles Initiative is a contractual public-private partnership dedicated to delivering green vehicles and mobility system solutions which match the major societal, environmental and economic challenges ahead. With a focus on the energy efficiency of vehicles and alternative powertrains, the EGVI PPP aims at accelerating research, development and demonstration of technologies allowing the efficient use of clean energies in road transport. EGVI members represent industry and research and include automotive OEMs, automotive suppliers, the smart systems industry and smart grid industry¹⁰.

⁹ <http://www.ertrac.org/>

¹⁰ <https://egvi.eu/>

EARPA

Founded in 2002, EARPA is the association of automotive RTD organisations. It brings together the most prominent independent RTD providers in the automotive sector throughout Europe. Its membership counts at present 53 members ranging from large and small commercial organisations to national institutes and universities¹¹.

EUCAR

EUCAR is the European Council for Automotive RTD of the major European passenger car and commercial vehicle manufacturers. EUCAR facilitates and coordinates pre-competitive research and development projects and its members participate in a wide range of collaborative European RTD programmes¹². According to EUCAR: “*the European automobile manufacturers are the largest private investors in RTD in Europe with over €50 billion investment per annum, or 4% of turnover.*” EUCAR members are BMW, DAF, Daimler, FIAT Chrysler Automobiles, Ford of Europe, Opel Automobile GmbH, Hyundai, IVECO, Jaguar Land Rover, PSA Peugeot Citroën, Renault, Toyota, Volkswagen, Volvo Cars and Volvo Group. EUCAR is closely connected to ACEA, the European Automobile Manufacturers Association.

2.1.4 Overview of existing grant programmes and relevant calls

The total Horizon 2020 calls for proposal budget (Transport Challenge) for 2019 was 386 m€, out of a total of 945 m€ in 2018-2020. The major transport RTD policy orientations are the following:

1. Decarbonisation, with the following funding calls:
 - a. Cross-cutting call “Building a Low-Carbon, Climate Resilient Future: Next Generation Batteries”
 - b. Green Vehicle Call: 3 topics in 2019 preparing the ground for the massive increase of electrified vehicles on our roads
 - c. Mobility for Growth Call: 7 topics on low carbon transport solutions in aviation, waterborne and logistics
2. Digitisation, with funding calls in the field of automated driving (ART calls):
 - a. Connected and automated driving continues to play a major role, contributing to road safety, better traffic flow, less congestion, fuel efficiency and carbon emission reductions
 - b. Focus on the socio-economic dimension of the ART call: user behaviour and acceptance, users’ mobility needs, innovative door-to-door solutions in urban areas
3. Safety of all transport modes: waterborne freight, road mobility, drones and logistics
4. International cooperation: Three flagship topics in 2019 addressing global challenges in aviation, logistics and urban mobility

¹¹ <https://www.earpa.eu/>

¹² <http://www.eucar.be/>

A detailed overview of research topics and budgets for the period 2018-20 are shown in the table below.

Topics	2018 budget (m€)	2019 budget (m€)	2020 budget (m€)
ART – Automated road transport	15	38	50
GV – Green Vehicles	56	78	55
MG – Mobility for Growth, of which	197.4	168.7	191
<i>Road transport topics</i>	<i>103.4</i>	<i>51.7</i>	<i>85</i>
BAT – Next generation batteries	-	85	82

Research calls related to hydrogen are covered under the Fuel Cells and Hydrogen Joint Undertaking. The 2018 Call for proposals had a total budget of 73.2 m€.

There is a separate topic of Smart Cities and Communities (SSC), providing an 83 m€ budget, but this topic combines energy and transport related research¹³.

Automated road transport (ART) calls

Calls for proposals to support research and innovation for automated road transport are planned for 2018-2020 with a total budget of 103 m€¹⁴.

The emphasis of these calls is on large scale demonstration pilot projects to test highly automated driving systems for passenger cars, efficient freight transport operations and shared mobility services in urban areas. Other research priorities include user acceptance, design of a safe human-machine interface, road infrastructure to support automation and testing and validation procedures of automated driving functions. In addition, the Commission will offer support in 2018 for testing the use of 5G connectivity to enable highly automated driving functions and new mobility services with a budget totalling around 50 m€.

Similarly, support from the Connecting Europe Facility (a total of 443 m€ triggering 1,173 m€ of total investments) helped to digitise road transport infrastructure across the EU, in support of automation.

Horizon Europe – The Future of Transport RTD

The new Horizon Europe programme is in preparation, an EC proposal was adopted on 7 June 2018 – negotiations with the European Council and the European Parliament are ongoing. Transport Research & Innovation (R&I) to be included in Cluster 4 on «Climate, Energy and Mobility» - main features are:

¹³ https://ec.europa.eu/inea/sites/inea/files/10_ssc_call_jens_final_2_14h15_0.pdf

¹⁴ On the road to automated mobility: An EU strategy for mobility of the future
https://ec.europa.eu/transport/sites/transport/files/3rd-mobility-pack/com20180283_en.pdf

- More than the sum of the respective H2020 parts;
- More impact-focused R&I – supporting the implementation of EU policy goals and links between fuels/electricity (supply-side) and transport (demand-side)
- Introducing new holistic / system-wide / integrated view – e.g. focus on citizens, industry and user needs
- More synergies across R&I areas, along the full innovation cycle, within the FP and with other EU funding instruments (CEF, Life)
- Mainstreaming and thus more impact of Social Sciences & Humanities, citizen & consumer empowerment, economic & behavioural aspects, standardisation and innovation-friendly frameworks

2.1.4.1 Overview of other funding programmes

The Horizon 2020 funds for research and innovation support projects that are generally between TRL 3 and 7. Programmes that include the other TRL are shortly described below.

The European Research Council

The European Research Council (ERC) – the first pan-European funding body for frontier research - was set up in 2007 under the EU's Seventh Framework Programme for Research (FP7, 2007-2013). It aims to enhance the dynamic character, creativity and excellence of European research at the frontiers of knowledge.

The European Research Council supports frontier research, cross disciplinary proposals and pioneering ideas in new and emerging fields which introduce unconventional and innovative approaches. The ERC's mission is to encourage the highest quality research in Europe through competitive funding and to support investigator-driven frontier research across all fields of research, on the basis of scientific excellence.

In contrast to the standard approach in Horizon 2020, research funded within the ERC requires no consortia to be formed and finances 1 host institution and 1 researcher. The ERC is now part of the first pillar - 'Excellent Science' - of Horizon 2020. The ERC represents 17% of the overall Horizon 2020 budget, i.e. € 13.1 billion (2014-2020). This equals 1.9 billion €/year of funding.

The type of grants that the ERC funds are:

- ERC Starting Grant for young, early-career top researchers (2-7 years after PhD)
- ERC Consolidator Grant for already independent excellent researchers 7-12 years after PhD)
- ERC Advanced Grant for senior research leaders with significant research achievements in the last 10 years
- ERC Proof of Concept Grants for ERC grant holders who want to check the market and/or innovation potential of research results from ERC-projects
- ERC Synergy Grants to address ambitious research questions

Fast Track to Innovation

The Fast Track to Innovation (FTI) is a bottom-up innovation support programme promoting close-to-the-market innovation activities open to industry-driven consortia that can be composed of all types of participants. It can help partners to co-create and test breakthrough products, services or business processes that have the potential to revolutionise existing or create entirely new markets, under the helm of the Enhanced European Innovation Council (EIC) pilot. TRL of projects funded under the FTI are close to market innovation and at TRL 6 to 8/9.

The FTI's aim is to:

- reduce time from idea to market,
- stimulate the participation of first-time applicants to EU research and innovation funding, and
- increase private sector investment in research and innovation.

EIC Accelerator Pilot

Start-ups and small and medium-sized enterprises that are based in one of the EU's Member States or are established in a Horizon 2020 Associated Country can receive EU funding and support for breakthrough innovation projects with a market-creating potential as part of the Enhanced European Innovation Council (EIC) pilot. The Enhanced EIC pilot provides grant-only support (as in former **SME Instrument**) along with blended finance (grant in combination with equity investment). The Enhanced EIC pilot's stage funding will boost fast company growth and market-creating innovation. It will also facilitate the scaling up of innovative companies by providing them access to Business Acceleration Services.

The EIC Accelerator Pilot is part of the Enhanced European Innovation Council pilot (Enhanced EIC pilot). The Enhanced EIC Pilot will pave the way to a fully-fledged EIC; it builds on the lessons learnt from the previous EIC pilot launched in late 2017. The Enhanced EIC Pilot serves as the umbrella for several EU funding instruments: the EIC Pathfinder (FET-Open and FET-Proactive) the EIC Accelerator (former SME Instrument): the Fast Track to Innovation (FTI), and Horizon Prizes, thus providing a 'one stop shop' for funding of breakthrough, market-creating innovation across the EU.

The EIC Accelerator Pilot supports close-to-market activities, with the aim to give a strong boost to breakthrough innovation with a market-creating potential. Highly innovative SMEs with a clear commercial ambition and a potential for high growth and internationalisation are the prime target.

2.1.5 International collaboration in the field of RTD

There are a number of international collaboration initiatives in the field of transport RTD with countries all over the world. This section shortly presents the collaboration with Japan, China and the USA as RTD practices in these countries were addressed in Deliverable 2.5.

2.1.5.1 Japan

With the EU, the Japan Science and Technology Agency has signed, in 2011, the “Agreement between the European Union and the Government of Japan on Cooperation in Science and Technology”. Under this agreement, co-funded research by the two sides (the EU and Japan) is taking place with several projects already assigned.

Japanese participation is possible in most of the Calls for Proposals of the EC Horizon 2020 Programme. There are also 22 Call topics that specifically encourage cooperation with Japan in Horizon 2020 Work Programme 2018-2020. The main calls relevant for road transport area in 2019:

- DT-ART-03-2019 Human centred design for the new driver role in highly automated vehicles (Deadline on 24 Apr 2019)
- DT-ART-04-2019 Developing and testing shared, connected and cooperative automated vehicle fleets in urban areas for the mobility of all (Deadline on 24 Apr 2019)
- MG-2-9-2019 Integrated multimodal, low emission freight transport systems and logistics (Inco Flagship) (From 16 Jan 2019 to 12 Sep 2019)

EU-Japan cooperation was also supported in the 2018 calls: DT-ART-01-2018 and DT-ART-02-2018

EU-US-Japan ITS cooperation

The European Commission, the United States Department of Transportation (US DOT) and the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) of Japan have a long history of sharing information on ITS (Intelligent Transportation Systems) activities. This exchange was formalized in 2009 and 2010 with a series of three bilateral agreements among the three parties, officially authorizing exchange activities among them¹⁵.

The **Trilateral EU US JP Automation in Road Transportation Working Group** has been established in October 2012 to support the cooperation between Europe, United States and Japan on the topic of Automation. The trilateral Working Group focuses on automated operation involving all road users, within a connected environment, for broad information sharing and focused collaboration across the regions.

The working group exchanges and discuss views and perspectives on relevant topics in the area of vehicle and road transport automation that apply to the role of public authorities with all stakeholders, to disseminate the state of the art and to define needs for harmonization and standardization in order to support international developments and deployment.

2.1.5.2 United States

The EC and U.S. Department of Transportation (USDOT) have agreed to support twinning of selected Horizon 2020 (H2020) research projects and corresponding USDOT research projects to expand the breadth of learning, optimize the use of mutual resources, and improve transportation outcomes in both regions. In the Horizon 2020 Work Program 2016-2017 for "Smart, green and integrated transport" a limited number of topics in the areas of safety, infrastructure, Intelligent Transport Systems and road

¹⁵ From: CARTRE: D2.3 Overview and status of trilateral exchange and emerging markets.

automation were identified by the EC as having potential for twinning with USDOT projects. USDOT-sponsored research projects have been selected by several of the Department's Operating Administrations for twinning with EC projects from the 2016 H2020 Solicitation. The first of these twinned projects started in 2017. There are currently five EU-funded projects contracted in 2017 that have twinned with DOT projects. Projects are related to road safety and to automated driving.

The EC and USDOT require that the project teams conducting the twinned projects develop a single, mutually agreed 'twinning agreement' to guide future project coordination. This 'twinning agreement' is intended to help the project teams reach a clear, shared understanding on the terms of the twinning arrangements, the objectives or outputs to be pursued, and the nature of teams' plans for engagement and interaction. The responsibility is on the project teams to work together to develop a robust and clear plan for achieving a mutually beneficial collaboration.

Annual EU-US Transport research symposia

Specific support is provided for the organisation of the annual EU-US Transport research symposia. It concerns the preparation of support to the EU-US Transport Research Symposia, to be organised annually in 2018-2020 (second quarter of each year). In 2018 and 2020, the EU-US symposia will be held in Brussels, while in 2019 the symposium will take place in Washington, D.C.

EU-US Science & Technology Agreement

Based on the work of the Joint Consultative Group (JCG), established under the EU-US Science & Technology Agreement, cooperation on research and innovation with the United States is addressing some priority RTD areas including transport.

The main purpose of the EU-US collaboration in surface transport research is to address global societal challenges and to pursue international standardisation requirements. Mutual benefit, joint priority setting, co-funding and critical mass through programme level cooperation are the underlying features. In 2013, the US and EU signed an Implementing Arrangement (February 2013), covering Cooperative Activities in the Field of Research, Development, Technology, and Innovation Applied to all Modes of Transport.

With regards to the transportation research, the areas of cooperation are currently the following ones:

- development of highway infrastructures,
- road safety,
- automation
- urban logistics
- ITS (Intelligent Transportation System)

Cooperation is visible at programme level, e.g. at the level of the Horizon 2020 programme. Another element is EU-US "twinning" cooperation, e.g. collaboration between DG MOVE and DG RTD and US Department of Transport.

A milestone in EU-US transport cooperation was reached by the launch in 2013 and 2015 of Interoperability Centres for smart grids and e-vehicles by the Joint Research Centre and the US Department of Energy.

In the years to come US scientists will find specific calls inviting in US cooperation in the areas of:

- Automated driving and road automation in general
- Air quality and low-emission freight transport systems
- Multi-modal inter-urban transport

2.1.5.3 China

There are a number of funding-related initiatives ongoing in the EU and targeting China (Petino, 2018), some of them funded through the Horizon 2020 programme. The H2020 Work Programme on Transport mentions specific calls where the cooperation of Chinese entities is encouraged. Topics addressed are urban mobility and low-emission transport systems. The following calls are intended for common projects:

- Joint EU-China STI Flagship initiatives with the Ministry of Science and Technology (MOST), open to Co-Funding from both EU and China. There is 1 topic in Surface Transport (LC-MG-1-1-2018: InCo flagship on reduction of transport impact on air quality)¹⁶:
- H2020 topics targeting cooperation with China in transport sector, specifically the following calls for proposals:
 - LC-GV-05-2019: InCo flagship on “Urban mobility and sustainable electrification in large urban areas in developing and emerging economies”
 - LC-MG-1-1-2018: InCo flagship on reduction of transport impact on air quality: A) Low-emission oriented driving, management and assistance (China, CELAC)
 - MG-2-9-2019: Integrated multimodal, low-emission freight transport systems and logistics (Inco Flagship)
- Another H2020 call where international cooperation with e.g. China is encouraged is the following:
 - LC-MG-1-3-2018: Harnessing and understanding the impacts of changes in urban mobility on policy making by city-led innovation for sustainable urban mobility

¹⁶ <http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/lc-mg-1-1-2018.html>. 1st stage deadline: 30 January 2018; 2nd stage deadline: 19 September 2018.

2.2 Austria

2.2.1 Visions and targets for road transport in Austria

Due to the importance of the automotive industry, and because of its central position in Europe as an important transport corridor, the grand challenges of European transport are an important background for the RTD objectives of the Austrian automotive sector. In general Austria follows the European Union's vision and targets for road transport.

Although the Austrian automotive industry is modest in size compared to neighbouring countries, there are presently around 800 companies active in the sector in Austria, with about 34,000 employees and an annual production of 162,000 vehicles in 2018.

Concerning future powertrain systems, the move from pure internal combustion engine (ICE) based powertrains to partially electrified systems, i.e. ICE-hybrids and plug-in-hybrids with ICE, to pure electric powertrains with e-motors, batteries and/or fuel cells is under consideration. This will allow to achieve significant reductions in energy consumption and emissions of pollutants and noise¹⁷.

Currently, three main research topics in the field of transport RTD are supported, automated driving, electromobility and intermodal transport.

2.2.1.1 Research topic – Automated Driving

In order to support research in the field of automated driving, the BMVIT (Federal Ministry of Transport, Innovation and Technology) has laid down a strategy for automated driving for the coming years in the "Automated Driving Action Plan"¹⁸.

The action plan laid out Austria's strategy in approaching the issue of automated driving and involved building (inter)national networks of Austrian supplier firms and research institutions, the expansion of scientific excellence, amendments at the legal level, first measures for the management of digital infrastructure, as well as the establishment of test facilities combined with testing and development measures in a real environment.

BMVIT invested the following amounts to create a good basis for the development of automated driving in Austria (between 2016 and 2018):

- 6m€ for technology funding
- 6m€ for putting test environments out to tender, with preliminary studies
- 5m€ for the rapid set-up of test environments and the associated RTD projects
- 1 to 3m€ for at least one endowed professorship at Austrian universities
- 0.3m€ for evaluations and studies

¹⁷ Further information at the website of the Ministry of Transport: <https://www.bmvit.gv.at/en/index.html>

¹⁸ More detailed information to be found in the Automated Driving Action Plan: https://www.bmvit.gv.at/en/service/publications/downloads/action_automated_mobility_2019-2022_ua.pdf, following the first action plan: https://www.bmvit.gv.at/en/service/publications/downloads/actionplan_automated_driving_2016-2018.pdf

According to the BMVIT, these investments are expected to trigger follow-up investments in the amount of 20 to 30m € from other players such as industry and local entities¹⁹.

Since the publication of the Action Plan Automated Driving of the BMVIT in 2016, the following measures have been implemented:

- The establishment of a Department in the BMVIT for the overall coordination of automated driving (focussed on: enabling testing, analysing impact, engaging public sector and society in open dialogue, EU representation).
- The establishment of an interdisciplinary Council of Experts for evaluating test applications and advising the BMVIT. This is made up of members from traffic organisation, business, science, civil society and administration fields.
- The creation of a regulatory framework for testing on public roads through amendments to motor vehicle legislation (KfG) (2016), and the production of a Regulation concerning automated driving (version dated 19 December 2016).
- Ongoing tests on Austrian roads (motorway pilot scheme with lane-holding assistance, self-driving military lorries and self-driving minibuses).
- The start of multiple test environments in Austria:
 - The “ALP.Lab” (Austrian Light Vehicle Proving Region for Automated Driving), set up in Autumn 2017 in Styria²⁰
 - “DigiTrans” - in North Central Austria (Linz – Wels – Steyr) in the spring of 2018. DigiTrans focusses on requirements and usage cases for commercial and special vehicles, especially in the area of logistics hubs and on the common use of the infrastructure of test environments for autonomous driving.
 - Europe’s first test environment for automatic trains on open line in Burgenland. Started in autumn 2018, new railway technologies and level crossings will be researched in the “Open.RailLab”. Among other things, this should serve to prevent accidents.
- Funding for RTD projects as part of the programmes “Mobility of the future”, “ICT of the future”²¹
- Set-up and commissioning of pilot projects related to self-driving minibuses (“Digibus@Austria”) and the evaluation of the impact of more energy-efficient, networked lorry convoys (“Connecting Austria”)
- Implementation of extensive impact analyses, for the overall consideration of the impact of automated driving on system effects

The new Automated Driving Action Plan (2019-2022) builds on the results of the first action plan.

¹⁹ There are no specific calls on automated driving, investments are part of other funding programmes listed in this chapter.

²⁰ Project website: <https://www.alp-lab.at/>

²¹ See table from FFG annual report 2017 in section 2.2.4.3

One of the most important measures is the “Promotion of interdisciplinary research and technology for automated mobility (including aviation) at the national level”

Annual calls on the topic of automated mobility with the FTI programmes Mobility of the Future, Take Off, ICT of the Future, KIRAS and ASAP (Austrian aerospace programme) will have a budget of 60 m€ for the four-year period 2019-2022.

2.2.1.2 Research topic – electromobility

The implementation of electromobility in Austria addresses mainly transport and energy systems to contribute to an affordable, demand-oriented mobility, and to the protection of the environment. Research, development, and innovation up to the production of structural components, and system-integrated solutions from Austria open potentials of added value and employment for the relative sectors, such as the automotive industry, or the electric and electronic industries.

To implement electromobility in the transport and energy systems in Austria, steps have been taken to launch and establish intelligent incentives systems on the market, raise awareness for new mobility solutions, and maximise positive impacts on the environment²².

In 2018 the funding programme “Zero Emission Mobility” was launched as part of the annual research funding programme of the Austrian Climate and Energy Fund (KLIEN)²³.

2.2.1.3 Research topic – intermodal transport

The promotion of intermodal transport and the intensified use of combined transport are seen by the Austrian government of being of utmost importance for the establishment of competitive alternatives to road transport. Therefore, Austria has been introducing early measures for the support of environment friendly modes, such as rail or combined transport:

- Innovation Programme for combined freight transport
- Programme for the support of trans-shipment facilities for intermodal transport (road/rail/ship)
- Financial support for operation
- Programme for the development of intermodal transports and for the promotion of combined transport projects on the Danube

Financial support for combined transport by rail is based on contracts between the BMVIT and railway undertakings and is granted for each consignment transported in Austria. The extent of this support depends on the size and weight of the intermodal transport unit and the distance covered on the Austrian railway network. Furthermore, the financial support differentiates between national, bilateral and transit transport²⁴.

²² More information at: https://www.bmvit.gv.at/en/verkehr/electromobility/emobil_austria.html

²³ More information on the Zero Emission Mobility programme: <https://www.ffg.at/zero-emission-mobility/1.Ausschreibung>

²⁴ More information at: <https://www.bmvit.gv.at/en/verkehr/transportation/combinedtransport/index.html>

2.2.2 Governance and funding system

The structure of the funding organisations for automotive research in Austria is rather centralised. Most programmes for automotive RTD are being administered by one agency (FFG - Austrian Research Promotion Agency, see figure below). The automotive research sector is clearly laid-out and the leading actors know each other. Also, the government departments which are responsible for programmes liaise with the researchers in both institutes and companies and tend to catch up trends and drivers for key technologies. The influence of the leading competence centres and influential organisations in the definition of RTD themes is a positive aspect. The evaluation of project proposals is usually done by independent panels also staffed with foreign experts.

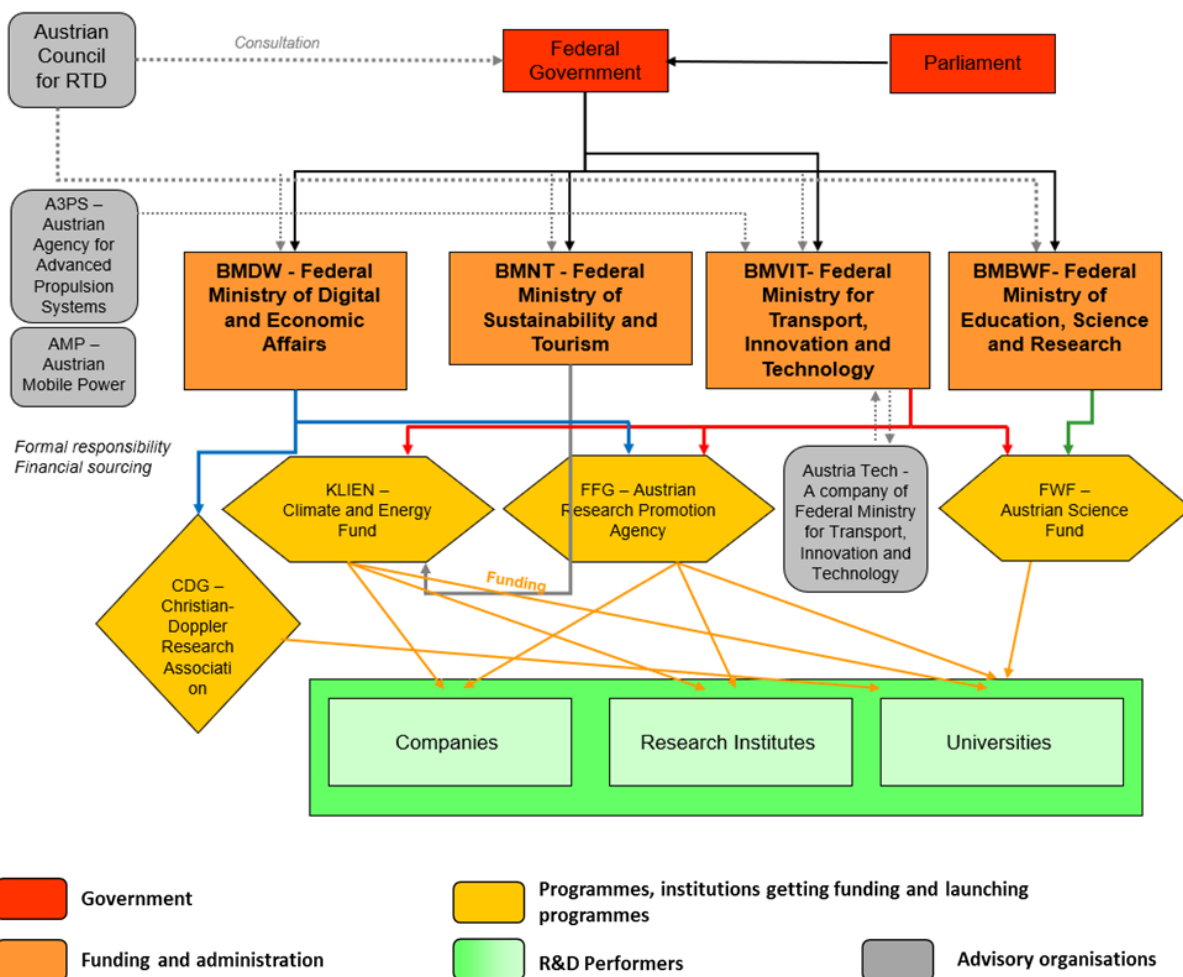


Figure 4 Funding landscape of Austrian RTD Funding

2.2.3 Overview of funding organisations and other key stakeholders

2.2.3.1 Providers of research funds

Federal Ministry of Transport, Innovation and Technology (BMVIT)

The BMVIT is responsible for both transport infrastructure and transport related RTD. It administers the largest public funding budget for transport research in Austria (direct investments in infrastructure as well as RTD programme funding). The BMVIT provides general framework for infrastructure from rail to road, water and air to telecommunications and technology development in Austria.

Federal Ministry of Digital and Economic Affairs (BMDW)

The goal of the Federal Ministry for Digital and Economic Affairs is to further enhance the positive development of the Austrian business location, to actively take advantage of the opportunities offered by the digitalisation of business and society and to strengthen entrepreneurship. The tasks of the Ministry are performed by various Centres and Directorates General with differing priorities.

These support programmes are developed and handled in close cooperation with the other technology ministries, the Austrian Council for Research and Technology Development as well as the funding organisations. Furthermore, the support programmes are regularly evaluated by independent experts. This ensures that they are optimally aligned with the needs of the respective target groups.

Federal Ministry of Education, Science and Research (BMBWF)

The Federal Ministry of Education, Science and Research is responsible for education at all levels (primary, secondary and higher education) and also finances basic research. Funding for basic research (lower TRL) is done through the Austrian Science Fund (FWF).

Federal Ministry of Sustainability and Tourism (BMNT)

Together with BMVIT, the Federal Ministry of Sustainability and Tourism is responsible (also financially) for the Climate and Energy Fund KLIEN.

2.2.3.2 Management of RTD programmes

Austrian Research Promotion Agency (FFG - Forschungs Förderungs Gesellschaft)

The Austrian Research Promotion Agency (FFG)²⁵ is the national funding agency for applied industrial research and development in Austria. As a "one-stop shop" offering a diversified and targeted programme portfolio, the FFG gives Austrian businesses and research facilities access to research funding.

²⁵ <https://www.ffg.at/>

The FFG was established on 1 September 2004²⁶ and is fully owned by the Republic of Austria, represented by the BMVIT and the BMDW. As a provider of funding services, however, the FFG also works for other national and international institutions.

The FFG manages most public funding programmes on behalf of the responsible ministries and also provides consulting services in all phases of technology development and innovation.

KLIEN – Climate and Energy Fund

The Austrian Climate and Energy Fund was established in 2007 and is led by the BMVIT and the BMNT²⁷. The focus is on energy efficient technologies, climate research, regional mobility projects, freight transport, mobility management. The funding calls are administered by FFG.

Typically, the annual funding programme covers the following subtopics (example from 2018)²⁸:

- Fundamental research
- Energy systems and networks
- Industrial energy systems
- Traffic and mobility systems (mutual optimization of the internal combustion engine using alternative fuels, development of hybrid powertrains through reciprocal adjustments of battery electric powertrains and internal combustion engines, lightweight construction, participation in RTD co-operations with the IEA)
- Conversion and storage technologies (bioenergy, chemical conversion and storage technologies, electrochemical storage, geothermal energy, photovoltaics, solar heat, thermal storage, heat pumps and cooling devices, hydropower and pump storage systems, wind energy)

The Fund established a special “Zero Emission Mobility” supporting research and demonstration in the field of sustainable mobility and energy supply. The first call for proposals was published in 2018.

FWF Austrian Science Fund

The Austrian Science Fund (FWF)²⁹ is Austria's central funding organization for basic research activities at universities and non-university research institutions. The programme is thematically open and due to its rather scientific orientation the projects and results generally serve as a basis for applied transport related research. It covers all science areas, including the humanities.

²⁶ Established pursuant to the FFG Act on establishing a research promotion agency, Federal Law Gazette I No. 73/2004

²⁷ More information of the fund on: <http://www.klimafonds.gv.at>

²⁸ https://www.ffg.at/sites/default/files/allgemeine_downloads/thematische%20programme/Energie/leitfaden_energieforschung_2018.pdf

²⁹ <http://www.fwf.ac.at/en/index.asp>

2.2.3.3 Other key stakeholders

Regional Automotive Clusters

There are three regional Automotive clusters with in total about 550 member organisations, mainly industry and Small and Medium size Enterprises.

- Automotive Cluster Upper Austria: www.automobil-cluster.at
- Automotive Cluster Styria: www.acstyria.com
- Automotive Cluster Vienna Region: www.acvr.at

The main objective of the clusters is to provide a platform for networking, qualification initiatives and support for business development.

CDG - Christian Doppler Research Association

The CDG supports application-oriented fundamental research³⁰. The CDG research laboratories are set up in universities and research institutions in collaboration with companies. The funds for a CDG lab provided by member companies are doubled by the CDG on the basis of financial support by the BMDW in the scope of its "matching funds". Within the CDG funding programme, the topics are defined bottom-up jointly by research institutions and industries. Due to the more fundamental character of the research conducted in CDG research laboratories, rather few topics are directly related to mobility and transport. On average, approx. 13% of the laboratories having been established so far were active in this area.

Austrian Council for Research and Technology Development

The Council advises the federal government, the ministers and the regional governments in all matters related to research, technology and innovation, defines a long-term national RTD strategy and gives recommendations for strengthening Austria's position in international programmes and co-operations.

A3PS - Austrian Agency for Advanced Propulsion Systems

The A3PS is a coordination platform between the Austrian research and development institutions and the BMVIT's Technology policy in the field of advanced propulsion systems and fuels. It is also acting as an Austrian national technology platform.

AMP Austrian Mobile Power

Austrian Mobile Power was founded in 2009 as support platform for electromobility in and from Austria. Its members stem from different industries and therefore combine know-how of vehicles, infrastructure, energy, application and special interest groups.

AustriaTech (owned by BMVIT)

The mission of AustriaTech is to assist the BMVIT in the transformation and change processes taking place in the context of transport and mobility. AustriaTech provides contributions to the BMVIT regarding

³⁰ <https://www.cdg.ac.at/>

technological, organizational and legal aspects for the implementation and further development of our mobility system³¹.

2.2.4 Overview of existing grant programmes and relevant calls

The Austrian research funding programmes relevant for co-operative research in the area of road transport provide financial support predominantly for applied research and pre-competitive development. The majority of the programmes is managed by the FFG which is responsible for the administration on behalf of the Ministry of Transport, Innovation and Technology (BMVIT) and also on behalf of the Austrian Climate and Energy Fund (KLIEN). There is rather limited funding for demonstration and industrialization topics such as e.g. within the KLIEN's lighthouse projects for e-mobility demonstration.

Fundamental research is mainly performed by universities and non-university research institutions. Research funding for them and the supervision of the project execution is handled by the "FWF – the Austrian Science Fund" with a bottom-up principle funding scheme.

Most programmes are made for collaborative initiatives, with still growing importance. According to State-Aid regulations a bonus in funding rates can be obtained, if collaboration can be shown and a certain distribution of the project budget to various partners is ensured. In general, there is evidence of a decreasing public support for single partner programmes although many research performing companies clearly appreciate these programmes even if financial support is lower.

2.2.4.1 Overview of technology specific programmes for automotive RTD

The table below presents the programmes from FFG, the number of projects funded and their budget in 2017³².

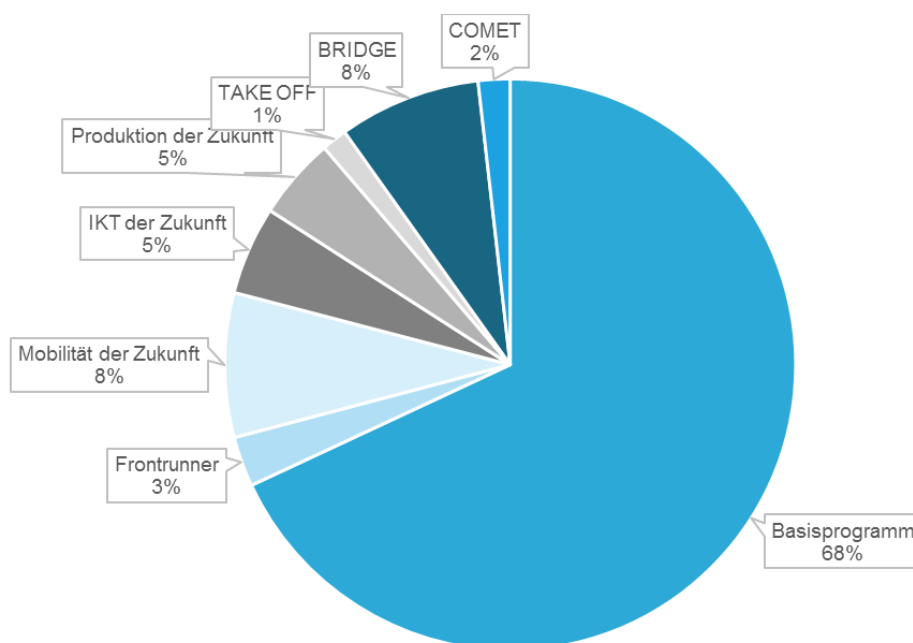
Organisation	Programme	Themes	No. of projects	Funding (k€)
FFG	Basisprogramm	Thematically open/incl. transport & mobility, experimental development project	1 658	196 805
FFG	Frontrunner	Thematically open/incl. transport & mobility, Frontrunner-Strategy/ Headquarters in Austria	69	18 121
FFG	Mobilität der Zukunft	Mobility: People, Freight, Vehicle Technologies, Transport Infrastructure	199	18 256
FFG	IKT der Zukunft	ICT - Information and Communication Technologies. (System-of-Systems, Safe/Secure Systems, Intelligent Systems, Interoperability)	122	11 315

³¹ <https://www.austrian-mobile-power.at/de/about-us/wer-wir-sind/>

³² FFG annual report 2017

FFG	Produktion der Zukunft	Production technologies; increasing productivity	113	22 953
FFG	TAKE OFF	Aeronautics RTD	35	5 594
FFG	BRIDGE	Thematically open/incl. transport & mobility: RTD at the junction between basic RTD at universities and experimental development at companies	196	14 761
FFG	COMET (K_vif, KNOW-Center)	Competence Centre Programme Thematically open/incl. transport & mobility: long-term co-operations between universities and companies	44	44 672
			2 436	332 477

Below the distribution of funding between the different programmes is shown. As can be clearly seen, the Basisprogramm covers more than 2 thirds of the funding.



Source: FFG Annual Report 2017

Figure 5 RTD budget distribution of the Austrian FFG (2017)

Basisprogramm

The funding strategy of the Basisprogramm (General Programme) for experimental development is based on the bottom-up principle. It is open to all branches of industry and research topics and eligible to companies and projects of all sizes. General Programme aims to strengthen the competitiveness of companies based in Austria by funding the development of new products, processes and services. Co-operation with scientific partners as well as involvement of young researchers is possible.

Due to the bottom-up character of the "Basisprogramm", explicit data regarding the share of mobility and transport related projects funded under this scheme are not available. However, it can be assumed that

the share of projects dealing with such topics is in the same range as on EU-project level where 25% of the projects funded under H2020 are related to mobility and transport technologies.

This assessment applies also to the other funding schemes thematically open such as the “Frontrunner” and “COMET” programme.

Frontrunner

The Frontrunner funding within General Programme offers funding to companies with frontrunner-strategies within their fields of RTD to reach or enlarge leading market position (hidden champions). The funding model is open to all branches of industry, research topics and size of companies or projects. The evaluation is carried out throughout the General Programme scoreboard and some additional guidelines for Frontrunner funding³³.

Mobilität der Zukunft (Mobility of the Future)

Mobility of the Future is Austria’s national transportation research funding program for the period 2012–2020. The program was developed and adopted by BMVIT based on national and European policy documents, interviews with key stakeholders from a wide variety of backgrounds, results of technology platforms, laws and regulations, and relevant action plans.

Mobility of the Future is a mission-oriented research and development program to help Austria create a transport system designed to meet future mobility and social challenges by identifying and refining middle-to long-term improvement ideas (see also the Transport Master Plan for Austria, and RTI strategy of the Austrian government). The program takes a comprehensive and multidimensional approach to research because mobility is an extremely complex subject and is closely related to many fundamental social challenges³⁴.

Mobility of the Future has established a program structure based on the following characteristics:

- Highly focused mission-orientated research
- Four specific research themes: “Personal Mobility”, “Goods Transport”, “Transport Infrastructure” and “Vehicle Technologies”
- Focus on medium-to long-term research thus providing consistent support levels and program predictability for researchers
- Increased consideration of organizational and social innovations in addition to technology
- Comprehensive accompanying measures designed to help improve research quality, project management, exploitation and visibility
- Increased flexibility through collaboration between research themes and with other national and international research programs and initiatives
- Increased research coordination through use of a comprehensive topic management system

³³ <https://www.ffg.at/en/frontrunner-programm>

³⁴ https://www.ffg.at/sites/default/files/downloads/mobility_of_the_future.pdf

IKT der Zukunft (ICT of the Future)

ICT of the Future is the funding programme of the BMVIT for the promotion of challenging technology development and innovation in information and communication technology, interlinked with application fields and societal challenges. The programme supports ICT innovation in a comprehensive perspective. It aims to contribute to the goal of the federal government to lead Austria from the group of so-called Innovation Followers to the group of Innovation Leaders – to become one of the most innovative countries within the EU³⁵.

Produktion der Zukunft (Production of the Future)

Production of the Future deals with key issues of the manufacturing industry as part of innovative RTD projects. The focus is on manufacturing competitive products and on enhancing productivity with the aim of fostering economic growth in Austria³⁶.

BRIDGE

The FFG's BRIDGE Programme aims to close the "funding gap" between basic and applied research. BRIDGE acts as an umbrella structure for projects which are predominantly of basic research character. Open for all research topics, scientists and companies of all specialist disciplines and sectors; research close to the foundation work, which will result in marketable results in the next 3-5 years³⁷.

COMET

COMET Projects aim to carry out high-quality research in science - industry collaboration. They are characterised by a medium-term perspective and clearly defined topics having the potential for further development. COMET Projects contribute to initiating product, process and service innovations. COMET Projects open access to the COMET Programme for new consortia and topics. They may also develop into COMET Centres over the long term³⁸.

2.2.4.2 Overview of technology specific programmes for automotive RTD

2.2.4.2.1 Zero Emission Mobility

The Austrian Climate and Energy Fund has developed the programme "**Zero Emission Mobility**" supporting research and demonstration in the field of sustainable mobility and energy supply. A 1st call for proposals was published in 2018³⁹. An amount of 7 m€ is available for the first Zero Emission Mobility Call. The projects should promote 100 % electrification of vehicles and enable the development and testing of intelligent e-mobility and hydrogen infrastructure.

The 1st call of the Zero Emission Mobility programme focuses on 100 % electrification (batteries, fuel cells, high-performance capacitors) of vehicles and the development and testing of intelligent e-mobility

³⁵ <https://www.ffg.at/en/ictofthefuture>

³⁶ <https://www.ffg.at/en/production-future-programme>

³⁷ <https://www.ffg.at/en/bridge>

³⁸ <https://www.ffg.at/en/comet-competence-centers-excellent-technologies>

³⁹ For details see: <https://www.ffg.at/zero-emission-mobility/1.Ausschreibung>

infrastructure. The main focus is on the integration of electrified, automated and publicly accessible mobility in urban and rural transport services.

The call focuses on 3 thematic areas to achieve this goal:

- a. Zero-Emission Vehicles – projects that develop (further) cable-bound vehicles so that their degree of electrification reaches 100%
- b. Zero-Emission Infrastructure – projects that address the development and pilot implementation of electromobility infrastructure components as well as their integration into infrastructure and overall transport concepts
- c. Zero-Emission Logistics & Public Transport – the development and demonstration of zero-emission freight logistics concepts as well as the integration of electromobility into the public transport system

2.2.5 Assessment of funding programmes

For **Austria**, the following funding programmes have been selected:

- KLIEN – Zero Emission Mobility – supporting research and demonstration in the field of sustainable mobility, energy supply – 1st [call for proposals](#) 2018, 2nd [call for proposals](#) in 2019
- The [Basisprogramm](#) from the Austrian Research Promotion Agency (FFG). A thematically open programme, supporting experimental development projects for SMEs and industry
- The programme “*Mobilität der Zukunft*” (Mobility of the Future), also from the FFG. This programme supports research related to mobility-related societal challenges; specific calls for proposals in the field of transport in 2019 are the following:
 - Mobilität der Zukunft - [13. Ausschreibung Automatisiertes Fahren](#) – 13th call automated driving (Spring 2019)
 - Mobilität der Zukunft - [13. Ausschreibung Gütermobilität](#) – 13th call Freight Transport (Spring 2019)

Detailed assessment per programme can be found in chapter 3 and in the Annex. Here a short description per programme is given.

Zero Emission Mobility

This programme is a funding initiative of the Climate and Energy Fund in support of the implementation of the e-mobility initiative of #mission2030 – the Climate and Energy Strategy of the Austrian Federal Government.

The aim of the programme is to contribute to the #mission2030 objectives, including reduction of transport emissions to 15.7 million tonnes CO₂eq by 2030 and fossil-free mobility by 2050. The Climate and Energy Fund programme constitutes the research core required to implement the Austrian Federal Government's e-mobility initiative and plays a key role in transforming the automotive sector in Austria.

Basisprogramm

The funding strategy of General Programme is based on the bottom-up principle. It is open to all branches of industry and research topics and eligible to companies and projects of all sizes. The General Programme aims to strengthen the competitiveness of companies based in Austria by funding the development of new products, processes and services. Funding is up to 50 % (for Start-ups up to 70 %) of total eligible project costs. The FFG uses a combination of several financing instruments - such as grants as well as low-interest loans. With a permanently open call, submission of an application is possible at any time.

All projects are analysed and assessed in terms of the technical and economic aspects for funding. Technical funding criteria include the degree of innovation and the technical challenge of the planned project. Economic assessment focuses on the commercialisation potential and the applicant's economic performance. Main target groups of the General Programme are SMEs & Start-ups and large enterprises.

Mobility for the Future programme

The Mobility for the Future programme includes a number of specific calls, two of them from mid-2019 have been assessed in detail. The call priorities are the following.

Call Priorities of the Freight Transport Call:

1. Cooperative logistics networks
2. Transport chains and networks
3. Cross-company cooperation
4. Lateral thinking in transport logistics
5. Development of new job descriptions

Call objectives of the Automated Driving Call:

- Enable cross-border development and testing of automated systems and drive participation in European and international initiatives.
- Specific bilateral and multilateral cooperation with neighbouring countries (such as Hungary and Slovenia) will be strengthened and stimulated with concrete actions (for example joint calls for tenders). (...)

2.2.6 Austria – main findings

General findings related to the RTD landscape:

- The automotive sector is of significant importance in Austria with about 800 active companies.
- Currently, three main research topics in the field of transport RTD are supported, automated driving, electromobility and intermodal transport.
- National RTD initiatives such as the Automated Driving Action Plan are an example of attempts to create national expertise through a combination of measures.
- Since the establishment of the 1st “Automated Driving Action Plan”, followed by a 2nd one in 2019, about 25m€ has been invested in the creation of expertise in the field of automated driving through research and pilot projects. Research calls have been published through 3 different programmes.

- The structure of the funding organisations for automotive research in Austria is rather centralised. Programmes for automotive RTD are being administered by the FFG (Austrian Research Promotion Agency), except for the Zero Emission Mobility Programme, that is managed by the Climate and Energy Fund (KLIEN).

Main findings related to grant programme assessment:

- All programmes have well defined objectives and address current challenges, e.g. the Zero Emission Mobility Programme is in line with national policy related to sustainable mobility.
- Programmes / calls are relatively small in size, which implies that only a few projects can be financed per programme.
- In addition to the transport related Mobility for the Future Programme, there are other programmes that are loosely linked to transport, ICT of the Future and Production of the Future (with annual budgets of around 10m€).
- The Basisprogramm is on the contrary broadly defined, aimed at competitiveness of industry. But as such less suitable for promoting specific RTD in the field of transport.
- Funding in the Basisprogramm includes relatively low grant percentages (19-31%) combined with low-interest loans.
- The Basisprogramm is favourable for applicants through its flexible submission. Projects are selected in regular evaluation meetings.
- Funding for the Zero Emission Mobility Programme / Mobility for the Future programme is relatively attractive for applicants given its relatively high funding percentage.
- Funding agency for most RD programmes (except Zero-Emission) is the Austrian Research Promotion Agency (FFG) – meaning application procedures are similar.

Examples of best practices:

- Programmes like the Zero Emission Mobility Programme are in line with national priorities for sustainable transport (e.g. #mission 2030 objectives)
- Overarching RTD initiative in the field of automated driving includes a combination of measures such as sharing of know-how, legal measures and financial support for RTD projects.

2.3 Czech Republic

The Czech Republic has a long-lasting industrial tradition with a strong automotive industry, which has increased in importance after privatization / investment support started following the economic transformation in the 1990s. Not only new assembly plants (such as TPCA - currently Toyota without PSA or Hyundai) have been constructed using investment support, but own development has been kept at OEM's as Skoda Auto or IVECO CZECH (former Karosa and IRIS Bus - buses). Moreover, domestic companies like SOR (buses), TATRA Trucks or Zetor (tractors) enlarged their own RTD. Except for this, there are smaller OEM's in the motorcycle and trailer business. Many suppliers of Tier 1 manufacture products based on their own RTD as well (fuel injection equipment Motorpal a.s., turbocharger manufacturers CZ a. s. and PBS Turbo s.r.o. together with Garrett Motion Czech Republic - former Honeywell, etc.). Some foreign manufacturers of Tier 1 (e.g., Bosch) transferred part of their development to the Czech Republic as well.

Automotive industry in the Czech Republic contributes to 9% of GDP, and directly employs 155,000 people, including supply chains close to 400,000 and covers 25% of the export value of the Czech Republic⁴⁰. During 2017, 1 345 000 cars, 4 500 buses and 600 trucks have been manufactured, making the Czech Republic the 2nd largest per-capita manufacture in the world. The manufacturers established the Automotive Manufacturers Association AutoSAP⁴¹.

2.3.1 Visions and targets for road transport in the Czech Republic

Although the automotive industry is of key importance in the Czech Republic, for years no specific automotive RTD strategy was existing. This situation is changing step-by step now. Following European Union recommendations, the Action Plan for Green Mobility has been elaborated in 2015. The aftermaths of Diesel Gate and the change of VW RTD policy towards electromobility and currently carried out restructuring led to an industrial initiative.

2.3.1.1 Action Plan on the Future of the Automotive Industry

This initiative was the Memorandum between the Government of the Czech Republic and AutoSAP signed in 2017. With this memorandum both parties *declared their common interest to strengthen the competitiveness of the Czech automotive industry in global competition and to support its position as one of the key pillars of the Czech economy.*

As part of this memorandum the Action Plan on the Future of the Automotive Industry in the Czech Republic was published. It addresses four main topics (with examples of specific activities proposed):

- Electromobility
 - Analysing possible ways of supporting purchase and operation of electric vehicles

⁴⁰ According to the recently published Memorandum on the Future of Automotive industry

⁴¹ More information, see: www.autosap.cz

- Analysis & design of solutions to support the development of domestic charging infrastructure
 - Facilitating the construction of a backbone network of charging stations
- Autonomous Driving
 - Creating an environment for testing partially / fully autonomous vehicles in a closed environment as well as in real traffic
- Digitization
 - Broadband Internet and related infrastructure of electronic communications networks along transport routes
- Cross-cutting activities
 - Ensuring the alignment of grant and RTD programs with the needs of automotive industry
 - Analysis and revision of fields of secondary vocational education with regard to the emergence of new trends in the automotive industry

2.3.1.2 National RTD Policy

Until recently, RTD policy lacked coordination, but that changed with the adoption of the National R&D Policy. The **National R&D Policy**, updated in 2016, states⁴² that the automotive industry as the second largest R&D player (after IT, microelectronics and optics) creates 15.43% of business expenditures for R&D (BERD), which involves 61 R&D providing companies (of which 31 SMEs) for 1 209 enterprises.

Before the publication of these strategies only isolated initiatives existed, examples are the following ones:

- In the year 2000, the Ministry of Education, Youth and Sports (responsible for universities and research) launched the long-term program of Research Center.
- Two programs for the establishment of research centers (2000-2004 and 2005-2011) supported the more strategic and continuous RTD. Automotive research was successful in receiving funded project in both programs and extended the activities to European level.
- An important project was the Technology Platform of Vehicles for Sustainable Mobility, supported by ESF resources and the Operational Program for Entrepreneurship and Innovations elaborated strategic research agenda during the years 2010-2013. This way, the outputs for strategic visions of automotive RTD were at least partially based on bottom-to-up initiatives and prepared for National Innovation Platform activities since 2015.

The recently updated (2017) **National Research and Innovation Strategy for Smart Specialisation of the Czech Republic (RIS3 strategy)** stressed the high foreign trade (ZO) dependence of the national economy with the automotive industry as major player⁴³.

⁴² National Research and Innovation Strategy for Smart Specialisation of the Czech Republic (National RIS3 Strategy)

⁴³ Source: Ministry of Industry and Trade - <https://www.mpo.cz/cz/podnikani/ris3-strategie/>

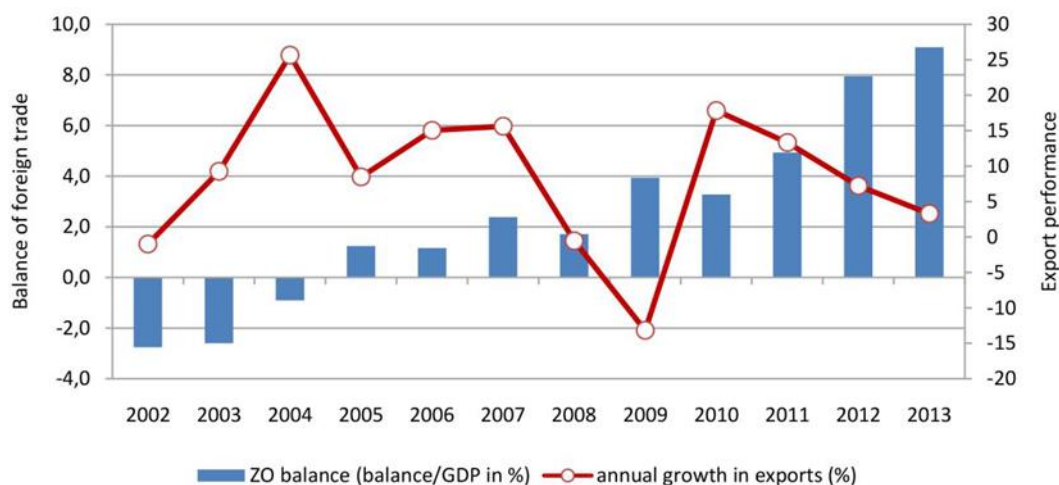


Table 3: Knowledge intensity in selected industries – Czech Republic vs. OECD average

NACE	NACE – Description	BERD share in GVA (average for 2006–2009)		
		Czech Rep.	OECD countries	OECD=100
21	Manufacture of pharmaceutical products and preparations	25.34	30.20	83.9
30	Manufacture of other transport equipment	12.19	8.92	136.7
29	Manufacture of motor vehicles	7.71	8.54	90.3
26/27	Manufacture of computer, electronic and optical products / Manufacture of electrical equipment	4.25	14.52	29.3
28	Manufacture of machinery and equipment	3.04	6.24	48.7

The first automotive-specific outcome of the RIS3 Strategy has been the establishment of National Innovation Platforms (NIP). One of them, NIP III, is focused on transport means, including automotive, rail vehicle and aviation industries, still rather broad for real prioritization.

The bottom-to-up procedure of stating the visions for automotive industry has been based on long research activities since the year 2000.

In 2018 the long-term program of Research Centers was started at Ministry of Education, Youth and Sports. This is a follow-up of earlier programmes of the TA CR, Centers of Competence (2012-2019) with some projects running until 2017 / 2018).

Inside these previous programs, the Research Center for Automotive and Engine Technologies was established at the Czech Technical University with increasing number of project partners developed its activities and visions since 2000, being closely linked to Automotive Manufacturers Association of the Czech Republic and stepwise increasing activities at European level.

The outcomes from NIPs have been used for RIS3 strategy updating and starting of new RTD programs, as National Centers of Competence, with the first phase starting in 2018, with projects running until 2020 – 2022. A second phase will be launched in 2020, with projects running until 2026.

2.3.1.3 Recent developments

During 2019, two new initiatives were started as well as a new RTD programme for applied research and experimental development.

Innovation Strategy

The Czech Republic's Innovation Strategy 2019-2030 was approved by Government Resolution No. 104 of 4 February 2019. It is a strategic framework that predetermines government policy in the area of research, development and innovation and is intended to help among the most innovative countries in Europe. The Innovation Strategy was elaborated by the Government Council for Research, Development and Innovation in close cooperation with a team of over thirty members of entrepreneurs, scientists, academics and public administration.

The Innovation Strategy consists of nine interconnected pillars that contain the starting points, the basic strategic objectives and the tools to achieve them. These are: RTD funding and evaluation, Innovation and research centers, National start-up and spin-off environments, Polytechnic education, Digitization, Mobility and the construction environment, Intellectual property protection, Smart investments and Smart marketing.

The Innovation Strategy has set a number of high-level targets, including:

- Strengthen RTD funding (measured as % of GDP) from 1.8% in 2018 to 3% in 2030.
- Strengthen the targeted support for institutions whose results are applied in practice
- Support the orientation towards participation in Horizon Europe and maintain research funding from European funds.

Programme The Country for the Future

This programme was approved by the government on May 20, 2019, and provides an additional CZK 6.1 billion (240m €)⁴⁴ for RTD from the state budget in the period 2020-2027. The programme includes the stepwise implementation of sub-programmes for:

- Start-ups
- Digital Leaders
- Innovation in Practice

A new call addressing Innovation in Practice is planned by the end of this year. It aims to support activities related to projects supported in classical RTD programs, filling in the “gap” before the start of the next ESIF period.

The TREND Programme

The programme for applied research and experimental development, TREND, aims to implement the principles from the Innovation Strategy and the Programme, The Country for the Future.

⁴⁴ 1 EUR = 25.45 CZK, www.oanda.com, exchange rate of December 16, 2019.

2.3.2 Governance and funding system

Figure 2 and 3 show the structure of public support of RTD in the Czech Republic.

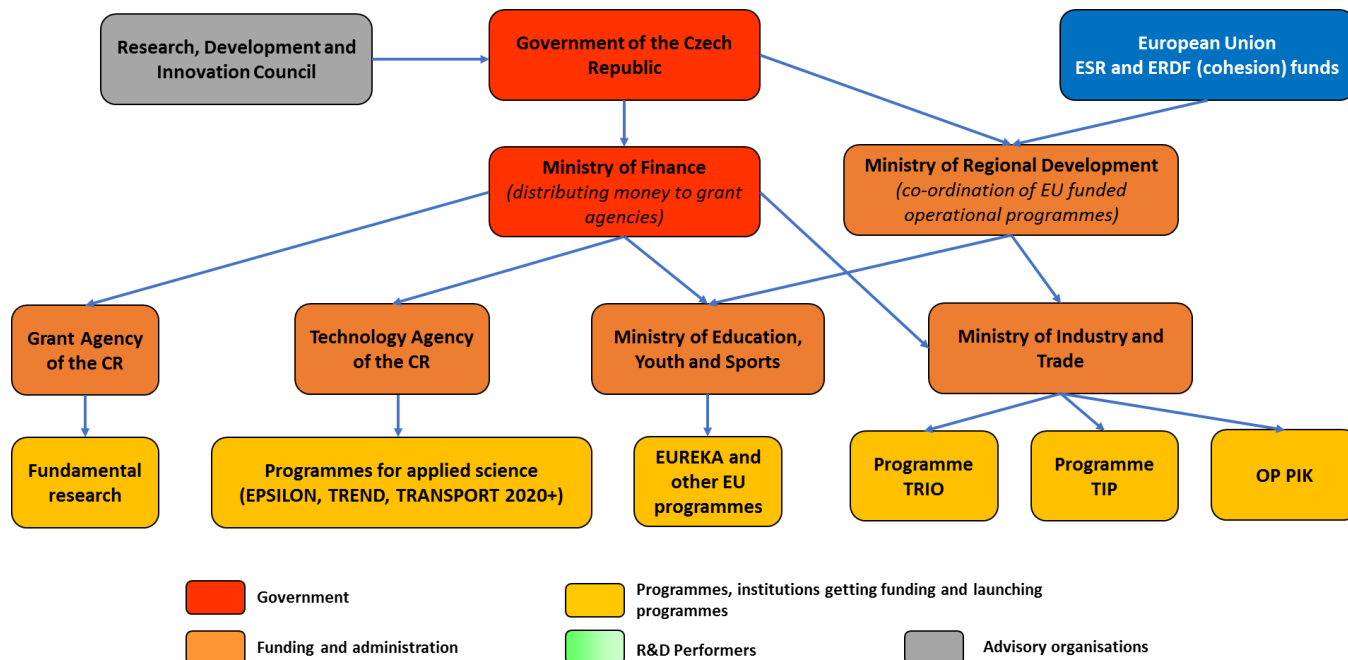


Figure 6 Funding system of Czech RTD

Figure 3 below shows the RTD programmes that finance transport related projects.

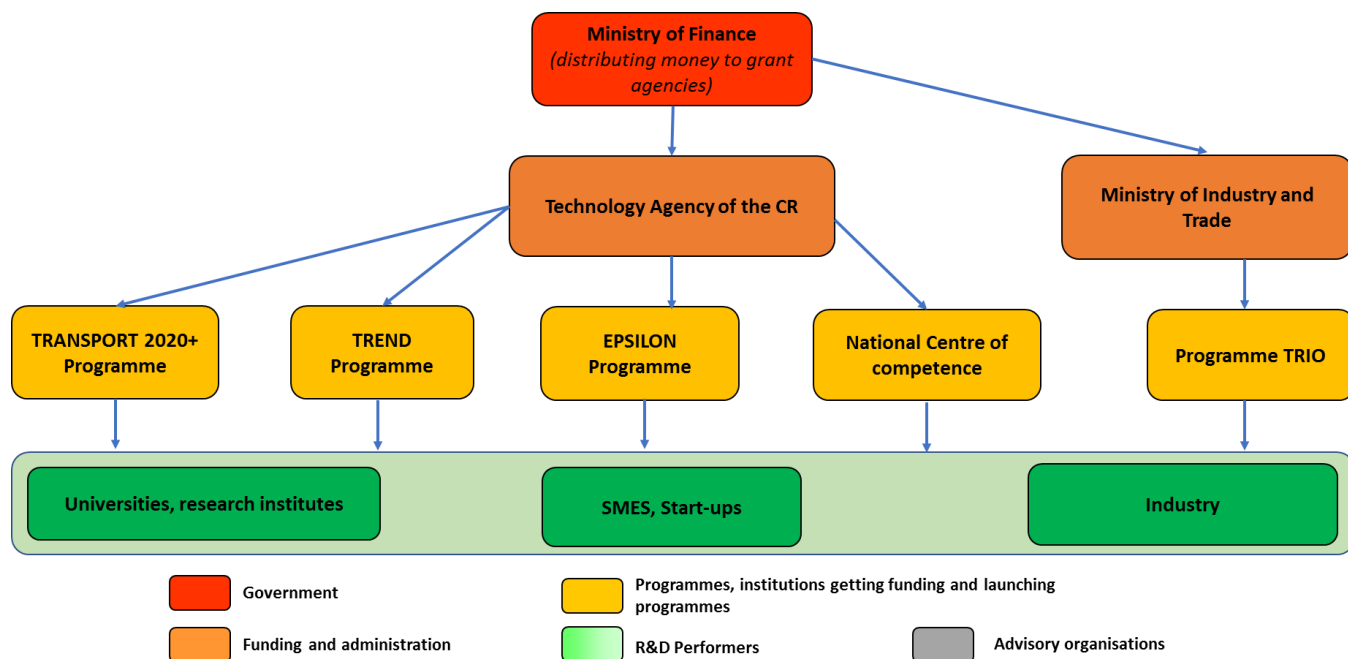


Figure 7 Funding system of transport related RTD programmes

RTD goals and basic funding decisions are coordinated at the governmental level by the RTD and Innovation Council, chaired by the prime-minister. The national strategies were elaborated by the Governmental Administration, but now the responsibility for them is moved to the Ministry of Industry and Trade under supervision of the RTD and Innovation Council. The national budget (distributed by the Ministry of Finance) is assigned to two funding agencies and to distributed resources at ministry level.

These two agencies are the Grant Agency of the CR – GACR (fundamental research) and Technological Agency of the CR – TACR (applied RTD), which were established to improve coordination of national public funding. The individual RTD programs, created by other ministries in past, were transferred originally to them. The only major programme for applied RTD not managed by TA CR is the applied research program TRIO, managed by the Ministry of Industry and Trade.

The coordination of ESF and ERDF funds is with the Ministry of Regional Development which then channels the funding to respective ministries. E.g. to the Ministry of Education, Youth and Sport for scientific / educational programmes and to the Ministry of Industry and Trade to investment support through the OP PIK (Entrepreneurship and Innovations for Competitiveness).

Almost all RTD programs open one call annually with exception of the largest project programs (e.g., Centers of Competence or National Centers of Competence) and subprograms of Operation programs, based on ESF or ERDF resources. The calls are organized as public tenders for defined types of applicants, in most cases private industrial or research companies, public research companies, sometimes with specific conditions for SMEs or public research bodies, according to valid EU directives.

2.3.3 Overview of the funding organisations and other key stakeholders

The major RTD programmes are described in the following pictures. Being focused on fundamental research, GA CR is not too much involved in transport RTD (see Table 4 below).

Agency	Programme name	Annual budget	Total budget
Grant agency of the CR	Fundamental Research Programme (2012-2018)	3 billion CZK	25 billion CZK
	Support of Excellence in Research (2012-2018)	450 million CZK	3 billion CZK
	International Cooperation Support (2012-2020)	80 million CZK	640 million CZK
	Junior Researcher Grants (2015-2023)	400 million CZK	3.6 billion CZK
	Post-doc Grants (2012-2016)	200 million CZK	1.1 billion CZK

Table 8 Overview of the GA CR research budget

The largest source of funding is the TA CR with a wide range of programs as shown in figure 5 below (status end of 2018).

The programme **EPSILON** is directly devoted to support of industrial and applied RTD. Only in 2019, the TA CR introduced two programmes for specific support of transport RTD (**TREND** and **TRANSPORT 2020+**). The latter, TRANSPORT 2020+ is the only programme only focused on transport related applied research.

Before the establishment of the TREND and TRANSPORT 2020+ programmes, transport has only been funded indirectly with some partial exceptions such as the ALFA program (TACR 2011-2017), in which a specific sub-program oriented to general transport (road, rail and airborne) was available.

This does not mean that transport RTD was not supported. All of other programs have supported at least one project related to transport. E.g. the ETA programme on social sciences includes a project on ethics associated with autonomous driving.

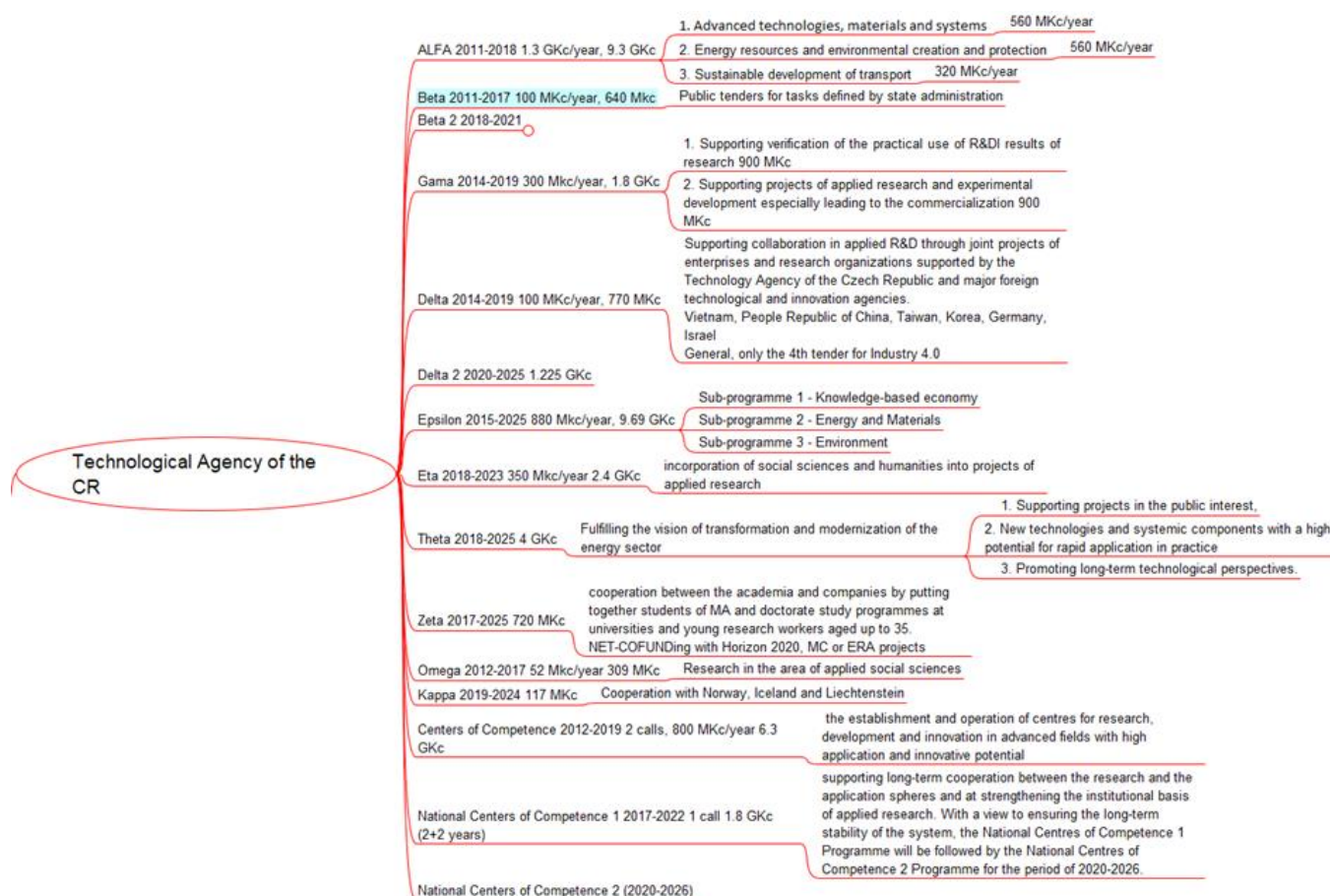


Figure 9 Applied research is mostly supported by TA CR with a large number of technology neutral programs

Several ministries are responsible for European funds projects inside different Operation Programs (OP), focused mostly on investment to RTD (Ministry for Education, Youth and Sports) - Figure 11 and both industry RTD and equipment for manufacture (Ministry for Industry and Trade) - Figure 10.

European Operational Programs support the personnel and other direct costs, associated with investment provision and setting it into operation together with funding of starting research activities, as well, but in rather limited amount (typically up to 15-20% of project budget).

The Ministry of Education, Youth and Sports provides support for the start of new infrastructures in the National Programs for Sustainability, which are time limited and have to follow the OP projects.

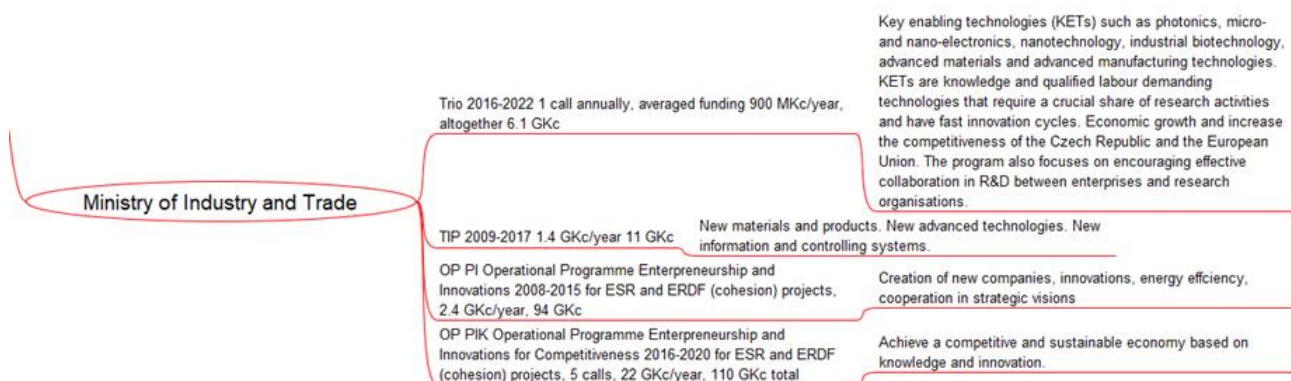


Figure 10 Applied research funded by Ministry of Industry and Trade inside operational programs of EBRD/ESF is partially focused on innovations. National program Trio helps to fund industrial needs.

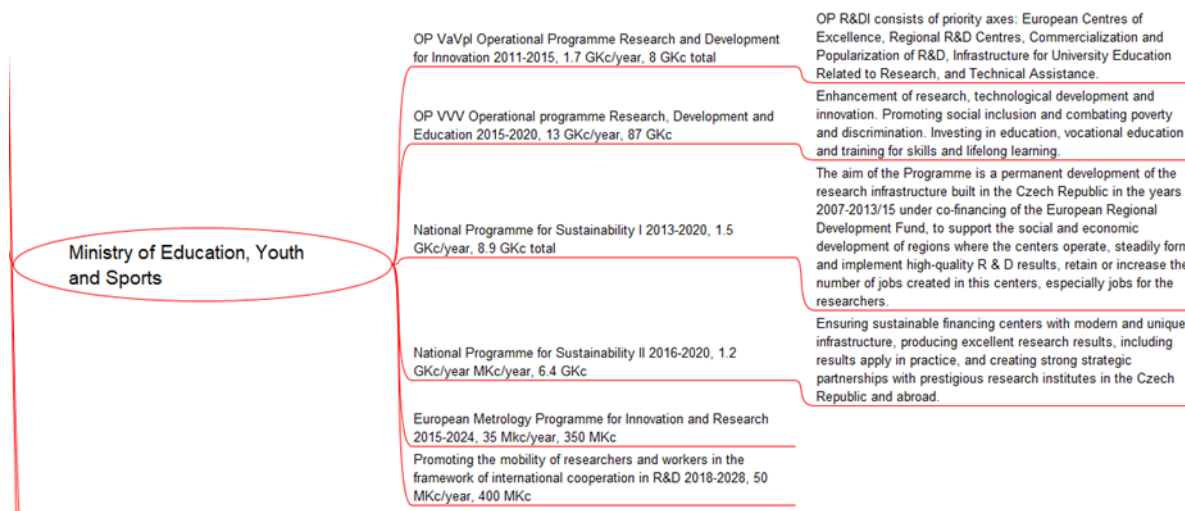


Figure 11 Ministry of Education is responsible for EBRD/ESF operational programs, focused on universities and Academy of Sciences

2.3.4 Overview of existing grant programmes and relevant calls

As of mid-2019, there are two grant programmes, specifically aimed at transport research, the TRANSPORT 2020+ programme and the TREND programme. Both are described in detail below.

2.3.4.1 *The TRANSPORT 2020+ programme*

In March 2019, the Czech Ministry of Transport announced a new RTD program for applied research, specifically aimed at transport, the TRANSPORT 2020+ programme⁴⁵. This is the first RTD programme of its kind for applied research that solely addresses transport research.

The duration of the Program is from 2020 to 2026 (7 years). The program was launched with the announcement of the first tender for research, experimental development and innovation in 2019, with the first projects being supported from January 2020 onwards. The programme is expected to include four public tenders in total with the respective projects launched in 2020, 2021, 2022, 2023 (calls for proposals during the previous years). The expected duration of projects in the programme is 36 months, although a range between 12 and 48 months is acceptable.

The four research topics addressed are:

- Sustainable transport – including alternative fuels and electrification
- Promotion of safe and durable transport and transport infrastructure – mainly aimed at safety of traffic and resilience of infrastructure
- accessible and interoperable transport – accessibility of citizens, smart cities, first-mile, last-mile solutions
- Automation, digitization, navigation and satellite systems – among others funding for automated driving.

The Program Agency is the Technological Agency of the CR. The first call for proposals was published on June 13, 2019 and deadline for submission of proposals was August 13, 2019. Approved projects may commence from January 1, 2020 onwards.

Support will be provided in the form of grants, the financial contribution will depend on the type of organisation applying. Universities / public research organisations may receive 100% funding of their eligible costs, SMEs 70-80% and large companies 50-65%.

There is, however, a limit of 80% funding of the total project eligible costs. This means that public research organisations can only receive more funding if other organisations in the consortium are willing to transfer part of the funding to them.

A budget of 1,950 mCZK (77 m€) has been allocated for the programme. On average, 500m CZK will be available (19.6 m€) per funding call.

⁴⁵ More info at: <https://www.tacr.cz/index.php/cz/programy/program-doprava2020.html> (in Czech only)

2.3.4.2 The TREND programme

This is a new programme from the Ministry of Industry and Trade supporting industrial research and experimental development. As for the TRANSPORT 2020+ programme, the Program Agency is the Technological Agency of the CR.

The main objective of the Program is to increase the international competitiveness of Czech enterprises, in particular by expanding their markets abroad, penetrating new markets and moving higher in global value chains. The objective will be achieved by supporting industrial research and experimental development projects and putting their results into practice, especially in industrial production and in the market for product offerings.

The programme will contribute to

- Increasing the number of enterprises carrying out their own research and development activities and their involvement in collaborative research;
- strengthening the orientation of research organizations in the Czech Republic to internationally competitive applied research with benefits for industry and society.

The sub-objectives, which focus on the preferred fields and areas identified in the relevant policy documents and strategies, are to support:

- increasing the use of modern production methods, planning, managing and distributing products according to the principles of Industry 4.0,
- development of new areas of digitization and its use in industry and services,
- **use of new technologies in automotive and other key application sectors identified by strategic documents and initiatives of the Czech Republic and the EU,**
- application of the circular economy principles by introducing innovations in the area of secondary raw material recovery fully utilizable in industry and construction.

Project proposals addressing sectors Automotive and Industry 4.0 are preferred (receiving bonus points).

The total allocated budget for the TREND programme is 9.7b CZK (381 m€).

Two other programmes are of significance for transport related research, the EPSILON programme and the TRIO programme.

2.3.4.3 The EPSILON programme

The EPSILON Programme is a programme for the support of applied research and experimental development (2015 – 2025). Calls were published in 2014, 2016, 2017, 2018.

Priority areas of the programme are:

- Competitive knowledge-based economy
- Sustainability of energy and material resources
- Environment for quality of life

The programme is aimed at support of applied research projects whose results have high potential for rapid application in new products, production processes and services. In addition, there are specific subprogrammes for poorer regions (northern and eastern regions) within EPSILON.

2.3.4.4 The TRIO programme

This program focuses on the development of the Czech Republic's potential in the field of key enabling technologies (KETs) such as photonics, micro- and nano-electronics, nanotechnology, industrial biotechnology, advanced materials and advanced manufacturing technologies. KETs are knowledge and qualified labour demanding technologies that require a crucial share of research activities and have fast innovation cycles.

These technologies can be applied in new products and services with high value added and they will enforce the economic growth and increase the competitiveness of the Czech Republic and the European Union.

The program also focuses on encouraging effective collaboration in research and development between enterprises and research organisations as its low intensity belongs to main weaknesses of the national research system.

2.3.4.5 National Centre of Competence

Another programme supporting transport research is the National Centre of Competence. This programme is a follow-up of the Centres of Competence programmes which main aim was to support the establishment and operation of centres for research, development and innovation in advanced fields with high application and innovative potential.

Multi-annual projects addressing key sectors of the economy were financed through this programme. The programme supported e.g. the Centre of Excellence for the automotive industry, a project consortium from academic and industrial partners under the leadership of CTU Prague.

The National Centre of Competence was launched in Spring 2018. Approximately 10 projects were supported, different themes, one of them "Transport and Smart Cities".

A new project coordinated by CTU Prague (including more than 20 industrial and academic partners) has been approved under this theme with an annual budget of 3m€.

2.3.5 International collaboration in the field of RTD

The road transport RTD activities in the Czech Republic have been effectively supported by presence of some Czech research organizations (e.g., Czech Technical University in Prague) and industry (e.g., Skoda Auto) in EU projects FP6, FP7 and H2020.

Apart from cooperation with EU partners, there is a long-term cooperation with several US companies, mostly coordinated by their industrial partners in the CR, e.g., on grants of DoE, and partners of domestic automotive industry in Asia.

Moreover, there is a long-term direct bi-lateral cooperation with vehicle powertrain software provider Gamma Technologies Inc., Westmont, IL (USA).

2.3.6 Assessment of funding programmes

For the Czech Republic, in total 4 funding programmes are assessed:

- TRANSPORT 2020+ programme – Technological Agency of the CR) – a new programme, with a [first call](#) launched in 2019⁴⁶ for transport related applied research – low to medium TRL
- TREND programme – Technological Agency of the CR – another new programme with a [first call](#) launched in 2019 supporting industrial research and experimental development. Thematically open programme, but preference is stated for RTD projects in the sector of automotive and Industry 4.0. medium to high TRL
- The [EPSILON Programme](#) of applied research and experimental development (Technological Agency of the CR) *and*
- [TRIO programme](#) – managed by the Ministry of Industry and Trade, a programme for so-called key enabling technologies (KETs)

Detailed assessment per programme can be found in chapter 3 and in the Annex.

2.3.7 Czech Republic – main findings

General findings related to the RTD landscape:

- Automotive industry in the Czech Republic contributes to almost 10% of GDP. At the same time, the automotive industry creates 15% of business expenditures for R&D (BERD). Despite this importance, no specific national strategies exist for automotive RTD.
- Statistics show that Czech companies invest less in RTD than their counterparts in other OECD countries. This holds for both domestic companies as companies with foreign ownership (that do not prioritise RTD in the Czech Republic itself)
- RTD programmes set up recently try to overcome this problem by 1) increasing the funding amounts available for applied research and 2) promote the cooperation between the private and public sector.
- The funding system is primarily coordinated by the ministry-independent Grant Agency of the CR for fundamental research and the Technological Agency of the CR for applied RTD. With this, application procedures for different programmes are similar.

⁴⁶ As there are no other specific transport related programmes, this new programme was chosen (1st call for proposals opened in June 2019)

Main findings related to grant funding assessment:

- RTD Programmes in the CR were until recently generic in nature. The most likely reason for developing generic programmes is the wish to promote applied RTD in the private sector in general (after a lack of research funding during the last decades), without giving preference to specific sectors.
- Two new programmes have been launched in 2019 specifically addressing transport RTD:
 - A first call for proposals on the TRANSPORT 2020+ programmes promote transport related RTD (with broadly specified targets) and
 - one call for proposals from a programme for applied industrial research that addresses three priority sectors, including transport (TREND).
- All programmes assessed have relatively short, from 6 weeks to 2 months, which is a clear disadvantage for applicants⁴⁷. In combination with the long evaluation period afterwards (5 to 6 months) suggests that funding organisations are understaffed.
- Most programmes for applied research are managed by one agency, which is positive in that sense that this organisation is experienced in funding grant programmes
- (Co-)financing guidelines are relatively clear, with lower funding percentages for private sector organisations compared to public research organisations.
- All programmes give particular attention to commercialisation and exploitation of project results, with a special role for the so-called application guarantor (a stakeholder that declares its interest to utilize the results).
- Based on opinions of programme users, administration of grant funded projects is demanding and requires sufficient staff from the side of grant applicants.
- The programme documents have stated performance targets, so this should enable programme evaluation later on. As all programmes are still running, no evaluation was possible at present.

Main observations:

- If the objective is to support competitiveness and research among private companies, then the existing programmes are sufficient to reach this objective. But these programmes cannot support specific transport topics that would be in line with the objectives of the automotive sector.
- More specific transport calls could be developed in line with the experience and research needs of market sector parties in the Czech Republic.
- For applicants it is positive that calls for proposals are concentrated with two major agencies, meaning similar application procedures for different programmes.

⁴⁷ Experiences from project applicants learns that “draft work programmes” are available some months before the official publication of the tender, meaning preparation can start earlier. But details of the call texts may change up to the publication date of the official call.

2.4 France

The automotive industry is of key importance for the French economy. The French automotive industry employs 223,000 people, 7.7% of the workforce. In 2018, 2,338,000 cars were produced in France, of which 1,763,000 passenger cars.

2.4.1 Visions and targets for road transport in France

The French government's policy in the field of RTD is outlined in a number of strategic documents:

France Europe 2020

The Strategic Agenda for Research, Technology Transfer and Innovation - France Europe 2020, published in May 2013, is a national comprehensive strategy for research, technology transfer and innovation, that comprises⁴⁸:

- a) the principle of setting a national research strategy focused on answering to the major technological, scientific, economic, societal and environmental challenges;
- b) specific measures to foster transfer and innovation and strengthen France's position within the European Research Area.

French National Strategy for Research (2015)

The French National Strategy for Research (FNSR) aligns with the European policies for science and innovation and the Horizon 2020 programme, focusing on three areas:

- a) Excellent science
- b) Industrial leadership
- c) Societal challenges

The FNSR identifies **10 societal challenges** and outlines **5 action programmes**, which will be the priority for the French research bodies and will define the strategic plan of public funding agencies such as ANR.

Recently, a new government climate plan was developed, that when implemented will have far-reaching impacts on the car fleet in France.

Government Climate Plan (2017)

To achieve carbon neutrality by 2050, the French Government's Climate Plan was presented in July 2017 by the Minister of State for Ecological and Inclusive Transition. In the Plan, measures are presented for all sectors of the economy. The most ambitious measure for the transport sector is to take greenhouse gas emitting vehicles of the market. This will be achieved by banning sales of cars emitting greenhouse gases by 2040⁴⁹.

⁴⁸ <https://stip.oecd.org/stip/policy-initiatives/2017%2Fdata%2FpolicyInitiatives%2F3902>

⁴⁹ Source: <https://www.gouvernement.fr/en/climate-plan>

Specific transport related RTD strategies are the following:

The National Strategy for the Development of Autonomous Vehicles

Presented on May 14, 2018, the National Strategy for the Development of Autonomous Vehicles is under the direction of the Senior Official for the National Strategy for the Development of Autonomous Vehicles, appointed by the Government⁵⁰. This document presents the strategic framework with actions for the national government supporting the development of automated or autonomous vehicles.

The primary objective here is to facilitate the emergence, then the deployment, of innovative automation technology, supporting technological progress via a secure framework for industry and public services, and taking into account the development of both the international framework and local expectations and needs. The goal is also to help French companies achieve a favourable position in new markets for technological services linked to autonomous vehicles.

According to the strategy, step 1 is to define a solid legislative framework for testing. Step 2 is to prepare for the technical maturity of highly automated vehicles, expected for the years 2020-2025, particularly in terms of rules of conduct, liability regime and driver training.

In total, the French government has allocated 200m€ of funding RTD and experimental development in the field of autonomous vehicles.

Hydrogen deployment plan for the energy transition (2018)

This Plan sets the government's vision on how to fast-track the development and deployment of hydrogen in France. The plan targets energy storage, electricity generation in transport, gas networks and CO₂ storage.

The Plan is organised on three main actions to focus on: 1) Production of hydrogen by electrolysis for industry, phase of initiation, 2) A valorisation by uses of the mobility in complementarity of the batteries, and 3) ensuring the stabilization of energy networks in the medium-long term. Ten specific measures and objectives are subsequently defined⁵¹.

2.4.2 Governance and funding system

At the policy level, two main ministries share the responsibility for research and innovation policy in France:

- Ministry of Higher Education, Research and Innovation (French acronym: MESRI)⁵² – this ministry designs and coordinates research policy. It is assisted by a consultative body: the Strategic Research Council.

⁵⁰ Source: <https://www.ecologique-solidaire.gouv.fr/vehicules-autonomes>

⁵¹ <http://www.lse.ac.uk/GranthamInstitute/law/hydrogen-deployment-plan-for-the-energy-transition/>

⁵² The former Ministry of National Education, Higher Education and Research (MENESR) was split into two different bodies, , the Ministry of (primary and secondary) Education & the Ministry of Higher Education, Research and Innovation (MESRI)

- Ministry for the Economy, Industry, and Digital Affairs. This ministry is responsible for industrial research and plays a specific role on the subject of business RTD.

France's funding structure

The RTD funding structure in France is centrally organised. The Secrétariat Général Pour l'Investissement (SGPI) (Secretariat-General for Investment), which is under the responsibility of Prime Minister is the agency responsible for distributing grant funding among four main agencies. These are:

- The Agence Nationale de la Recherche (ANR), National Research Agency, is providing funding for fundamental research
- Agence de l'environnement et de la maîtrise de l'énergie (ADEME): Environment and Energy Management Agency is the main funding provider in the field of transport and energy research.
- Banque Publique d'Investissement (BPI), the French Public Investment Bank, financing among others, projects in the field of innovation
- Caisse Des Dépôts (CDC): Public institutional investor (owner of BPI with French State)

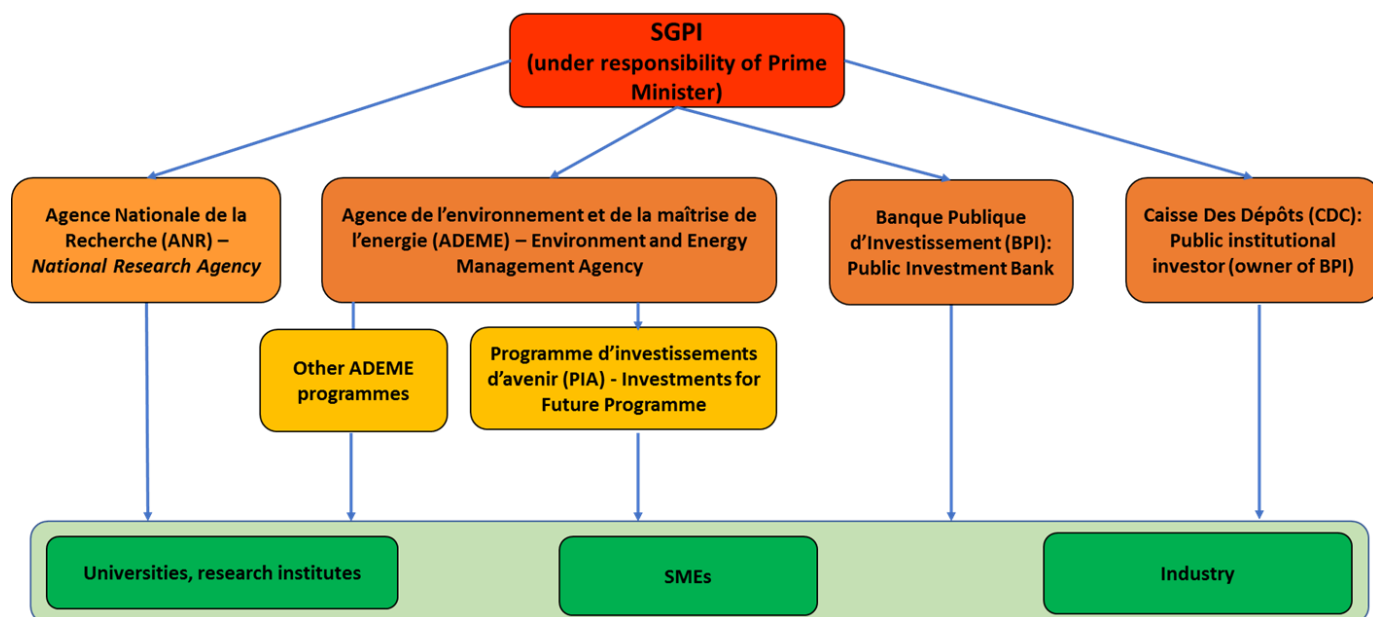


Figure 12 Funding landscape of French RTD

In addition to the abovementioned funding programmes and organisations, the French government also provides RTD tax credits for private companies.

2.4.3 Overview of the funding organisations and other key stakeholders

2.4.3.1 Bpifrance

Bpifrance, a subsidiary of the state-owned Caisse des Dépôts investment fund, acts as a partner for entrepreneurs, financing businesses (SMEs, mid-size companies and organizations of strategic importance to the French economy) from the seed phase to stock exchange listing, through loans, guarantees and equity investments.

Bpifrance provides operational services and enhanced support for innovation, exports and external growth in partnership with Business France and Coface. With its 42 regional offices, Bpifrance offers a one-stop finance and investment service for entrepreneurs in each of France's regions⁵³.

Bbifrance also acts as intermediary in finding possible funding opportunities for RTD for both small, medium and large enterprises.

2.4.3.2 ADEME

The French Environment and Energy Management Agency supports research, development and innovation, encourages research to accompany the energy and environmental transition, and searches for ways to mitigate climate change. The research projects funded by ADEME help devise responses to societal concerns, to provide support to public authorities as they build up sustainable development policy and action. Research work can also foster the emergence of innovative technology and services offered by French companies to meet the coming challenges.

ADEME finances research projects, demonstrators and preindustrial experiments via research programmes and strategic investment programmes entrusted to the agency. ADEME finances:

1. RTD projects with subsidies and repayable aid. The projects financed are between TRL 4 to 7 and are in the field of experimental research. Research organisations, private companies, NGOs and local authorities are eligible for this support
2. Innovation projects (under France's Strategic Investment Programme), mainly financing demonstration projects carried out by private companies. Projects are TRL 6 to 9.

Within the first category, ADEME has directly funded 87 m€ in 450 projects between the years 2014 to 2016.

Significantly higher in volume is the **Strategic Investment Programme** (Programme d'investissements d'avenir (PIA)⁵⁴), created by the French government in 2010 to boost economic growth potential in France. The programme is directed by the Secretary General for Investment (SGPI), under the office of the Prime Minister, with the Ministry for an Ecological and Solidary Transition, the Ministry of Higher Education, Research and Innovation, and the Ministry for the Economy and Finances. Since its inception, ADEME has been the prime operator of the programme for the expert analysis and funding of eco-efficient innovation to accompany the energy and environmental transition (phases PIA 1 and 2, 2010-2017). ADEME is currently the operator for the third phase, PIA 3.

⁵³ For further information, please visit: www.bpifrance.fr

⁵⁴ <https://www.gouvernement.fr/le-programme-d-investissements-d-avenir>

2.4.3.3 RTD tax incentives

France provides RTD tax relief through a volume-based tax credit – Crédit d'Impôt Recherche (CIR) - and an exemption from social security contributions for young and innovative firms⁵⁵. In general, France offers one of the most generous RTD tax incentives among OECD countries. Support for Industrial RTD mainly operates through this RTD tax credit scheme. The CIR gives companies a 30% tax reduction up to 100 m€ RTD expenses (and 5% beyond) since 2008.

2.4.4 Overview of existing grant programmes and relevant calls

2.4.4.1 Investments for the Future (PIA)

The PIA (Programme d'Investissements d'Avenir – Investments for Future Programme) was established in 2009 and covers the period 2010-2020. It aims to prepare France for the challenges of tomorrow (competitiveness, environment, energy, health, etc.) and to increase its growth potential by investing in higher education and training, research, industry and SMEs, sustainable development and digitization.

The Investments for Future Programme are intended to support projects fostering innovation and the creation of jobs in sectors with strong potential for the French economy. The implementation of the Investments for the Future programme is managed by the General Secretariat for the Investment (SGPI). It is supported by several operators, including ADEME, who is one of the major actors responsible for innovation for energy and ecological transition in France. To date, 1.2 billion € from the PIA has been allocated through ADEME to about 300 energy projects.

PIA 3 programme

The current PIA 3 programme is endowed with a budget of €1 billion divided between State subsidies (600 m€) and capital funding (400 m€). With these funds ADEME will continue to provide financial support for demonstrators of the energy and environmental transition, in three main segments:

- "Demonstrators and territories with ambitions" – this segment will develop energy and environmental transition demonstrators, and also provide equity financing for path-breaking innovative infrastructure on a commercial scale.
- Innovation Contest – supporting innovative projects mounted by start-ups and SMEs, following along the lines of the SME Initiative operated by ADEME.
- "Accelerating the development of advanced innovation ecosystems" – this segment is dedicated exclusively to transport and mobility. This segment targets cooperative projects between companies and research institutes.

Projects from the third segment are generally selected through calls for projects (Appels à projets - AAP).

⁵⁵ For details, see: <https://www.oecd.org/sti/rd-tax-stats-france.pdf>

PIA 1 and PIA 2 funding

Between 2010 and 2017 funding was provided through PIA 1 and PIA 2. Through these programmes ADEME provided 2.5 billion € in funding. This included funding for 745 projects including 89 EV charging infrastructure projects. Funding was concentrated into 4 main themes⁵⁶:

- Transport and Vehicles of the Future – 902 m€ in funding
- Renewable Energy, Energy Storage and Smart Grids – 1,106 m€
- Buildings, Industry, Agriculture and Green Chemistry – 288 m€
- The Circular Economy and Waste Management – 214 m€

In the field of “Transport and Vehicles of the Future”, funding was provided for 311 projects over 4 different themes:

- Road transport (53% of the funding)
- Maritime and river shipping (24%)
- Rail transport (14%)
- Electric Vehicle Charging Infrastructure (9%)

In road transport, the following types of innovation were supported:

- Electric vehicle powertrains;
- Home-work carpooling services for commuters and digital platforms to make them possible;
- Advanced materials (lightweight alloys, composites) and industrial processes that are suitable for the pace of production in the automobile industry
- Dissemination of digital and mobile tools for vehicle sharing, intermodal transport and optimisation of urban logistics
- New communication technologies for connected and autonomous vehicles

2.4.4.2 Programme Structurant Pour la Compétitivité (PSPC)

The “PSPC” call for projects is a support mechanism financed by the Future Investments Program (PIA), which aims to select competitive research and development projects. Its 8th call for projects is now open from February 18, 2019 to January 14, 2020⁵⁷.

This program proposes to support collaborative research and development projects (bringing together industrial and research partners) aimed in particular at direct economic and technological benefits in the form of new products, services and technologies, and indirect spin-offs in terms of sustainable structuring of sectors. The economic benefits expected from the projects and these structuring of sectors must concern all the industrial partners and in particular small and medium-sized enterprises (SME).

⁵⁶ Source: https://www.ademe.fr/sites/default/files/assets/documents/2010-2017-report-france_s-strategic-investment-010592-062018.pdf

⁵⁷ <https://www.bpi.fr/fr/A-la-une/Appels-a-projets-concours/Projets-de-recherche-et-developpement-structurants-pour-la-competitivite-PSPC-22882>

Their realization can include phases of industrial research as well as more downstream phases of experimental development, prior to the placing on the market. This programme is cross-sectoral. The expected projects typically have a budget between 4 and 50 m€.

Nearly 750 million euros, managed on behalf of the State by Bpifrance, have been committed for the co-financing of PSPC projects under the PIA since 2011. They made it possible to finance seventy-five collaborative R & D projects in multiple domains.

In view of the success of this procedure and the concrete results it has achieved for the development of the national economy, the Government has decided to allocate an additional 150 m€, under the PIA 3, to the 2019 edition of the PSPC action.

2.4.4.3 ADEME – Specific automotive calls for expression of interest

ADEME manages the main calls for proposals related to automotive research. Four major calls for proposals address automotive research:

AAP EVRA – Experimentation of autonomous road vehicle⁵⁸

This is a two-phase call, including 1) a Call for Expressions of Interest (AMI) & 2) a Call for Projects (AAP). Projects need to be selected in the Expression of Interest to be eligible for the call for projects but with the possibility to integrate new partners during the call for projects phase. The choice of ADEME is to select a limited number of projects, of sufficient critical size that enables pooling of skills necessary for experimentation. It aims at selecting one or more groups of actors in order to structure one or more relevant consortia leading to one or more several experimentation projects of autonomous road vehicles.

This Call is thematically part of the National Strategy for the Development of Autonomous Vehicles, the aim of which is to support, in a coordinated way, research, development and experimentation initiatives in France and across Europe.

The main objective of the call is to support pilot projects for the use of autonomous vehicles, marketable by 2022, in the field of individual, shared or collective mobility, freight and logistics. The call targets experimental projects that can contribute to:

- Validate the security of these autonomous systems;
- To study the behaviour of users of these vehicles and the acceptability of third-party road users;
- Evaluate the relevance of new public transport services to the mobility needs of people and goods, and their appropriation by users and customers.

The first call for proposals was published in Spring 2018 and closed in November 2018. Currently, a new call is open with submission deadline in December 2019.

⁵⁸ <https://appelsaprojets.ademe.fr/aap/EVRA2018-21>

AAP ADEIP - Accelerate the development of successful innovation ecosystems (transport and sustainable mobility)⁵⁹

The call for projects aims to finance research, development and innovation projects carried out by companies, public research laboratories and research institutes located in France. As the name of the AAP indicates, only projects under the theme of transport, logistics and sustainable mobility are eligible for support. The AAP aims to select industrial projects developing technologies, services and / or solutions that are ambitious, innovative and sustainable in terms of transport (passengers or goods), logistics and mobility. They lead to an ambitious economic development of the companies that develop them. Thematic areas covered by this Call for Projects are the following:

- Cleaner and more efficient vehicles
- Automated and connected vehicles
- Smart mobility solutions
- Guided transportation (rail transport, cable transportation)
- Maritime transport, river transport
- Integrated road infrastructures – within this theme, projects should aim at innovations to improve the construction, maintenance and operation of infrastructure and reduce their impact on the environment. It could also promote new uses of infrastructure such as storage or energy production.

The call for projects “Hydrogen mobility ecosystems”

This call for projects is part of the Hydrogen Deployment Plan for the Energy Transition announced on 1 June 2018. It is established in application of the measures to deploy territorial ecosystems of hydrogen mobility, on the basis of deployment of fleets of professional vehicles. It also responds to the desire to support the development of a range of heavy vehicles, whether road or other modes (boats, trains, aeronautics). Two calls of projects have been published, one in 2018, the other in 2019. The first call for proposals led to the selection of 11 hydrogen mobility projects for funding⁶⁰.

A "hydrogen mobility ecosystem" is defined as a given area, territory or geographical area on which hydrogen production and distribution logistics are simultaneously organized, as well as local uses of passenger transport vehicles or merchandise:

- Zone, territory, geographical area: city, agglomeration, urban area, rural territory, valley, activity area, port, airport, logistics basin, etc.
- Production and distribution logistics: production by electrolysis, processes using biomass or biogas, but also a local source of hydrogen co-produced by electrolysis; distribution stations at 350 or 700 bars, etc.
- Local uses of transport vehicles: light vehicles, light trucks, trucks, river shuttles, boats, logistic vehicles, buses, etc.

⁵⁹ <https://appelsaprojets.ademe.fr/aap/ADEIP2019-25>

⁶⁰ <https://fuelcellsworld.com/news/france-11-hydrogen-mobility-projects-selected-for-public-funding/>

Call for Projects - Investments for the Future - Experimentation for the Development of Mobility as a Service (MaaS)

This Call is also part of the Program of Investments of Future (PIA) and aims at financing development & experimentation projects of mobility of services supported by companies (operators of offer of transportation, IT companies) and / or territories. These experiments help to improve the route of passengers regardless of the mode or modes used, and relate to one or more of the following fields:

- Multimodal information upstream and throughout the journey, route planning;
- Multimodal reservation;
- Multimodal sales (ticketing systems);
- Improved interfaces.

The experiments proposed by the selected projects contribute to the structuring of "MaaS" on a significant territorial scale and make it possible to test, evaluate and validate the relevance and replicability in other territories of solutions tested under real operating conditions, while pointing out possible difficulties or barriers.

2.4.5 International collaboration in the field of RTD

Worth mentioning is the "Hydrogen and Electricity Infrastructure for Future Mobility" – A French and Japanese cooperation in the field of hydrogen. More information can be found here:

<https://www.ademe.fr/en/expertise/mobility-and-transport/hydrogen-and-electricity-infrastructure-for-future-mobility-a-french-and-japanese-cooperation>

2.4.6 Assessment of funding programmes

For France, the funding programmes selected are all financed by ADEME, the national Environment & Energy Management Agency. The following transport related funding calls have been assessed:

- Transports et Mobilité durable (transport and sustainable mobility) – funding calls in [2018](#) and [2019](#)
- Expérimentation du véhicule routier autonome (Experimentation of autonomous road vehicles) – two-stage funding call in [2018](#)
- H2mobilité 2019 – projects supporting the establishment of "hydrogen mobility ecosystems". These are defined as areas on which hydrogen production and distribution logistics are simultaneously organized. Calls for proposals were published in [2018](#) and [2019](#).
- Experimental development for the Development of Mobility as a Service – funding call in [2018/2019](#)

2.4.7 France – main findings

General Findings:

- The French government has set a number of strategic documents in the field of RTD (such as a National Strategy for Research, National Strategy for the Development of Autonomous Vehicles)
- The French funding is centrally organised with the SGPI (Secretariat-General for Investment) under the responsibility of Prime Minister distributing grant funding among four main agencies.
- ADEME, the Environment and Energy Management Agency is the main funding provider in the field of transport and energy research. Support is mainly provided through the Investments for Future Programme (PIA)
- In addition to grant funding, the French government also provides RTD tax credits for private companies. France offers one of the most generous RTD tax incentives among OECD countries.

Findings from grant programme assessment:

- The funding programmes assessed addressed a broad selection of topics (electric vehicles, hydrogen/fuel cells, automated driving, mobility of the future). Each programme is focused on one of these topics and sets specific objectives
- Some of these programmes support projects from medium TRL (applied research) to high TRL (demonstration)
- As all programmes are from ADEME, financing rules are similar (e.g. different funding percentages for different legal entities)
- The objectives of the Transport and Sustainable Mobility call are in line with national policy objectives in that field (e.g. with the Mobility Orientation Law)
- Specific feature is that there is a minimum funding amount for projects (not seen in other countries). This gives the impression that larger projects are preferred.
- The time available for submission of proposals is relatively long, which is positive for applicants, but means long process duration.
- Future commercial exploitation required in many programmes (especially higher TRL)
- Two-phased call (for autonomous vehicles), reason is the wish to select limited number of projects of sufficient critical mass.

2.5 Germany

The German automotive industry is by far the largest in Europe and is of key importance for the German economy. The German automotive industry employs 869,000 people, 11.8% of the workforce. In 2018, 5.64 million cars were produced in Germany, of which 5.12 million passenger cars.

2.5.1 Visions and targets for road transport RTD

The main policy document on federal level laying out the strategy for research policy in Germany is the Federal High-Tech Strategy (2014)⁶¹. The main objective of this High-Tech Strategy is to move Germany forward on its way to becoming a worldwide innovation leader.

With the new High-Tech Strategy, the German government is establishing thematic priorities in research and innovation. In the strategy, the focus is on areas that feature dynamic innovation and that hold potential for economic growth and prosperity. And the strategy is concentrating on areas which help to address global challenges and thereby enhance the quality of life for everyone. The six priority tasks relative to future prosperity and quality of life are the following:

- The digital economy and society
- The sustainable economy and energy
- The innovative workplace
- Healthy living
- Intelligent mobility
- Civil security

In addition, the German Federal Government is pursuing several strategies in the field of development related to road transport in order to achieve the European and national targets of road security, sustainability and reduction of harmful emissions. These are:

1. The Government Programme Electric Mobility (2011)
2. Strategy for Automated and Connected Driving of the German Federal Government (2015)
3. The Mobility and Fuels Strategy of the German Government (2013)
4. Freight Transport and Logistics Action Plan (2017)
5. National Innovation Programme Hydrogen and Fuel Cell Technology (NIP) 2016 – 2026
6. Support for battery cell production

1) Government Programme Electric Mobility (2011)

A corner stone of the transformation of the (road) transport sector is given by the electrification strategy of the Federal Government which is summarized in the Government Programme Electric Mobility, published in May 2011⁶². Integrated in its energy, climate, innovation, transport and economic policies, the Federal

⁶¹ https://ec.europa.eu/knowledge4policy/sites/know4pol/files/hts_broschuere_engl_bf.pdf

⁶² https://www.bmwi.de/Redaktion/DE/Downloads/P-R/regierungsprogramm-elektromobilitaet-mai-2011.pdf?__blob=publicationFile&v=6
<https://www.bmwi.de/Redaktion/EN/Dossier/electric-mobility.html>

Government is pursuing a coordinated and targeted strategy for electric mobility. This combines the promotion of research and development in order to take a pioneering role on the international market for electric mobility and the implementation of attractive framework conditions for electrified vehicles, so as to achieve the goal to expand Germany to a lead market for electric mobility. The National Development Plan Electric Mobility originally targeted 1 million electric vehicles on German roads by 2020. The government programme for electric mobility comprehends RTD funding programmes, demonstration pilots, means for education and training, standards and regulations, charging infrastructure, grid integration and energy supply, materials and recycling, financial and non-financial incentives as well as potential international co-operations. In order to achieve the national goals and to coordinate the required actions, the German National Platform for Electric Mobility (NPE) was founded as an advisory body of the Federal Government. It brings together 150 representatives from industry, science, politics, trade unions and trade associations for strategic dialogue and orchestrates the development of electric mobility in Germany. Collectively, they investigate the economic, social and environmental potential of electric mobility and recommend actions for politicians and business. In the course of 2018, the National Platform Electric Mobility postponed the target of reaching one million electric vehicles on the road to 2022 due to actual market developments. The new challenges of transforming the German transport system reflect in the re-naming of the National Platform Electric Mobility to National Platform for the Future of Mobility and the adapted focus on sustainable and affordable mobility of the future sustainable transport system, having the key aspects climate protection, sustainable alternative propulsion systems and alternative fuels, digitization, automated driving and novel mobility services, battery cell production, natural resources and recycling, sector coupling for infrastructure, and standardisation⁶³.

2) Strategy for Automated and Connected Driving of the German Federal Government (2015)

In order to reach the national goals of a safe, secure, clean and efficient mobility, the Federal Government developed a comprehensive digitalization strategy in the field of mobility. The Strategy for Automated and Connected Driving was published in September 2015 and provides a wide range of measures in five main action areas in order to create added value, positive environmental effects and new jobs. These action areas are infrastructure, legislation, innovation, cyber security and data protection. More specifically, the government promotes the deployment of intelligent and connected digital infrastructure and the development of standards for intelligent roads⁶⁴ and engages in adapting national and international regulatory frameworks towards the promotion of automated and connected driving. Funding (through the Ministry of Transport and Digital Infrastructure) is provided for promoting innovations in automated and connected driving in terms of research and demonstration pilots, such as the A9 Digital Motorway Testbed. The government strategy further includes the enabling of collecting, processing and intelligently linking traffic data exchanged between vehicles and infrastructure; data ownership should remain with the users.

Pursuing its strategy, the Federal government envisions to tackle societal challenges by tapping the potential of automated and connected driving by enhancing road safety, increasing traffic efficiency and therewith reducing emissions from transport. Furthermore, new digital technologies enable Germany to

<https://www.gtai.de/GTAI/Content/EN/Invest/SharedDocs/Downloads/GTAI/Brochures/Industries/electromobility-in-germany-vision-2020-and-beyond-en.pdf?v=3>

⁶³ <https://www.bundesregierung.de/breg-de/aktuelles/fuer-eine-bezahlbare-und-nachhaltige-mobilitaet-1523914>

⁶⁴ "Intelligent roads" are defined as smart communication infrastructure, such as intelligent traffic lights, sensors, V2I.

become a more competitive site for economic activity and a more attractive location for innovative businesses⁶⁵.

The Government of the Federal Republic of Germany pursues its Strategy for Automated and Connected Driving launched in September 2015 in which RTD projects funded by the Federal Ministry of Education and Research (BMBF) are an important pillar. The BMBF works in close cooperation with the Federal Ministry of Transport and Digital Infrastructure (BMVI) which currently aims at **establishing test areas** in seven designated locations throughout Germany.

3) The Mobility and Fuels Strategy (MFS) of the German Government (2013)

The Mobility and Fuels Strategy of the German Federal Government is a concrete contribution by the transport sector for achieving the targets set in the government's Energy Concept. The strategy was published in March 2013 and identifies ways to implement the energy revolution in Germany with respect to the transport sector, i.e. options to achieve the reduction of energy consumption by more than 10 percent by 2020 and by 40 percent by 2050 relating to 2005 level. This should mainly be achieved by a diversification of energy sources for propulsion and increasing energy efficiency through new technologies. The Mobility and Fuels Strategy gives a comprehensive overview of the technologies and different alternatives for energy supply and fuels, addressing not only road transport but also other modes of transport such as rail, air and waterborne. The use of alternative fuels⁶⁶ other than electrification is especially addressing transport modes and vehicle types which cannot easily be electrified, for example heavy duty road transport vehicles. For road transport, the strategy focuses on drive technologies and options to reduce CO₂ emissions and gain efficiencies for passenger cars, light duty and heavy-duty road vehicles⁶⁷.

4) Freight Transport and Logistics Action Plan (2017)

The German freight logistics sector is currently the largest in Europe and operates a large network of transport infrastructure with multiple links between the different modes of transport. An efficient freight transport and logistics system is the backbone of manufacturing industries and a modern industrial and service economy based on the division of labour. In order to tackle the challenges of globalization and rapidly growing freight and logistics markets and, at the same time, making freight transport more environmentally, climate and resource – friendly, the German Federal Government published an Action Plan in October 2017. The “Federal Government's Freight Transport and Logistics Action Plan – Towards a Sustainable and Efficient Future” is a strategic approach providing the framework and containing concrete measures to transform the freight transport and logistics system in the required way. The measures range from the implementation of mode-specific national strategies and masterplans, the consolidation of logistics networks through the modernization and expansion of transport infrastructure to an enhancement of interconnectivity of all transport modes and the promotion of environmentally friendly and energy-efficient freight transport.

It was jointly developed by policy makers, the freight transport and logistics industry, environmental groups and trade unions. Focus is on the transformation and interconnection of infrastructure to be safer, more

⁶⁵ https://www.bmvi.de/SharedDocs/EN/publications/strategy-for-automated-and-connected-driving.pdf?__blob=publicationFile

⁶⁶ In this strategy, alternative fuels include LNG/CNG, biofuels and hydrogen

⁶⁷ https://www.bmvi.de/SharedDocs/EN/Documents/MKS/mfs-strategy-final-en.pdf?__blob=publicationFile

intelligent and more efficient as well as on cross-sectoral activities. The three key areas addressed in the Action Plan are first investment, promising 40 percent more public investment in structural maintenance and upgrade and also involving more private capital in the form of public-private partnerships. Second is modernization, i.e. supporting the industry to make innovations into alternative drivetrains or longer goods vehicles on the road. The third key area is digitalization, including for example an overall quick internet access, especially in rural areas⁶⁸.

5) National Innovation Programme Hydrogen and Fuel Cell Technology (NIP) 2016 - 2026

The interdisciplinary National Innovation Programme Hydrogen and Fuel Cell Technology (NIP) ensures the continuation of research and development in the area while simultaneously addressing the pressing issue of market activation and providing necessary support for initial products.

The implementation of NIP is conducted via the corresponding measures of the federal ministries involved. The Federal Ministry of Transport and Digital Infrastructure (BMVI – Bundesministerium für Verkehr und digitale Infrastruktur) is initially allocating a sum of 250 m€ until 2019 to support hydrogen and fuel cell technology. The Funding Guideline for “Measures of Research, Development and Innovation”⁶⁹ was published on 29 September 2016.

With the Funding Guideline for “Market Activation Measures within the Framework of the National Innovation Programme Hydrogen and Fuel Cell Technology Phase 2 (Focus: Sustainable Mobility)” of 17 February 2017, the BMVI supports the market activation of products that have attained market maturity but are not yet competitive in the market, as a preliminary step of the market launch.

The Federal Ministry for Economic Affairs and Energy (BMWf – Bundesministerium für Wirtschaft und Energie) will continue supporting applied research and development in hydrogen and fuel cell technology with around 25 m€ annually within the framework of the 6th Energy Research Programme. Moreover, in August 2016 the BMWf launched a funding programme within the scope of the National Action Plan Energy Efficiency (NAPE – Nationaler Aktionsplan Energieeffizienz) for the procurement of fuel cell heating devices for private customers.

6) Support for battery cell production

In addition, the German government recently started to support battery cell production. Embedded in the activities and goals for a planned battery cell production in Europe, Germany strives for setting up two production plants in Germany and provides 1 billion € funding; additional 600 m€ funding will be provided for a new research institute for the development of battery cells and concepts. The European Commission has started to shape a European Battery Alliance (EBA) for pursuing its goal to cover around 30 percent of the global demand for battery cells from German and European production by 2030 by the means of “green batteries”. To set it apart from Asian competitors producing toxic batteries based on rare materials, the European Commission targets environmentally friendly batteries adhering to EU standards; the industry, however, is rather pointing to solid-state batteries as a technological solution.

⁶⁸ https://www.bmvi.de/SharedDocs/EN/publications/freight-transport-logistics-action-plan.pdf?__blob=publicationFile

⁶⁹ Förderrichtlinie für “Maßnahmen der Forschung, Entwicklung und Innovation”, published 29 September 2016: https://www.now-gmbh.de/content/2-bundesfoerderung-wasserstoff-und-brennstoffzelle/1-foerderrichtlinien/foerderrichtlinie_banz-at-29.09.2016-b4.pdf

The German Ministry for Economy and Energy (BMWi) will provide 1 billion € as subsidies to manufacturers until 2021, supporting in particular German companies that engage in joint project with European partners. The respective funding framework will be set up in line with the European interests for battery cell production in Europe and in accordance with the possibilities of the “Important Projects of Common European Interest” opened up by the European Commission⁷⁰.

2.5.2 Governance and funding system

The figure below shows the funding system of RTD in Germany.

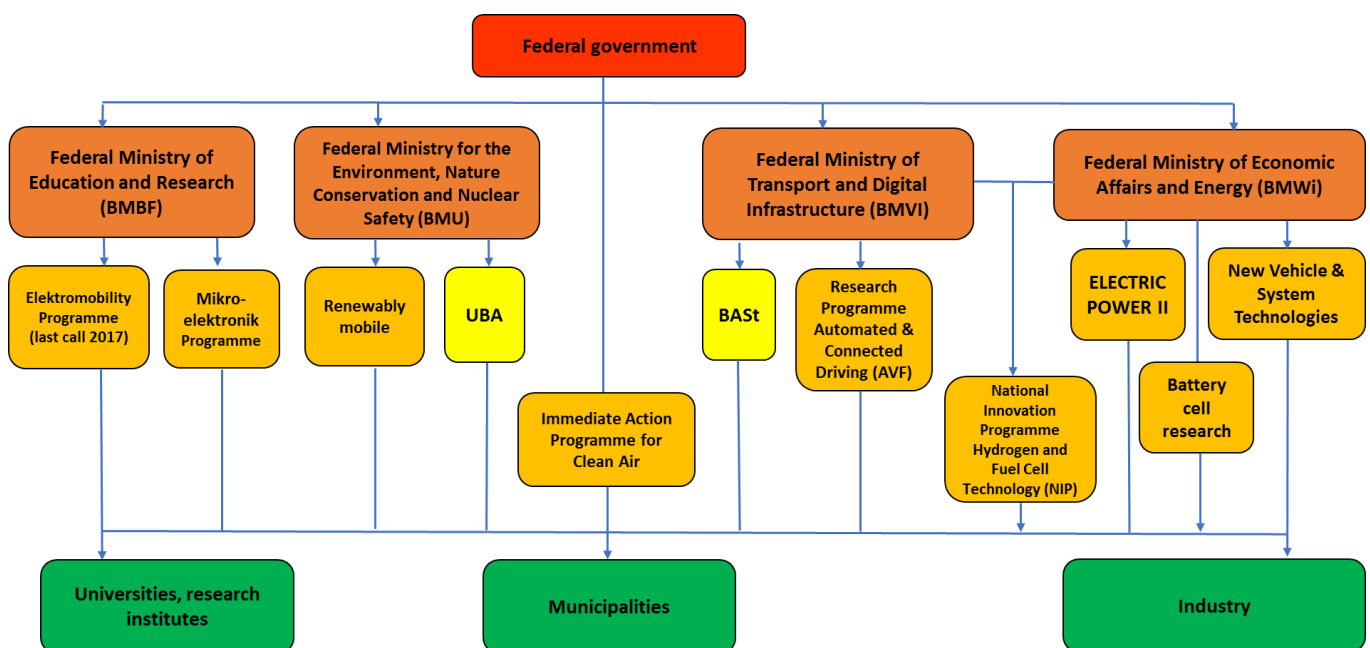


Figure 13 Funding landscape of RTD in Germany

The federal budget is drafted by the Federal Ministry of Finance per year and discussed and approved by the Federal Council and Parliament. The federal funds are accordingly divided among the federal ministries and government agencies for fulfilling the governmental tasks.

As can be seen in the above figure, four Federal Ministries engage in the promotion and funding of RTD in the field of transport and mobility, in terms of funding programmes, issuing studies, supporting industrial alliances etc. These ministries are the following:

- Federal Ministry of Education and Research (BMBF)
- Federal Ministry of Transport and Digital Infrastructure (BMVI)
- Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)
- Federal Ministry for Economic Affairs and Energy (BMWi)

⁷⁰ <https://www.electrive.net/2018/09/10/zellfertigung-2-mrd-euro-foerdergeld-fuer-zwei-werke/>

Thereby, each ministry focuses on different aspects of transport and mobility and gives different types of support and promotion.

In addition, there are the Federal Highway Research Institute (BAST) and the German Environment Agency (Umweltbundesamt – UBA), subordinate agencies of the BMVI and the BMU, respectively which have own budgets to promote transport-related issues.

The actors accepting funding are in general universities and research institutes, small, medium and large companies and municipalities who perform own or joint projects in the framework of funding programmes.

Since Germany is a Federal system, there are separate funding systems of the same structure in the sixteen federal states. At the state level as well, there are various ministries and subordinate authorities involved in the promotion and funding of road transport research. Due to its complexity, funding organisations of the federal states are not described in detail.

2.5.3 Overview of the funding organisations and other key stakeholders

Federal Ministry of Education and Research (BMBF)

The BMBF⁷¹ supports innovative projects and ideas in research through topic-specific or open-topic funding programs in all areas of science and provides funding for the implementation of research and innovation projects. Funding programmes of the BMBF are tailored to various key innovation fields and technology fields.

In the field of transport and (electric) mobility, the BMBF is responsible for the technological development of vehicles, components and systems, in particular hardware, and also technologies for the communication of vehicles with the environment. Another focus is on the development and design of new education and training programs tailored to young academics and engineer related to future mobility, e.g. mechatronics.

Firstly, the ministry promotes battery research through the development of competence in electrochemistry, especially at universities. Germany should become a competitive production site for batteries. For this, the knowledge about battery materials in the industry has to be built up and knowledge about the production of battery cells has to be regained. And the ministry wants to create the basis for Germany's future - in the post-lithium sector - that Germany will be able to assume a leading position in battery technology in the future. The most important goals are a larger storage capacity with lower weight, a drastic shortening of the loading times and of course a reduction of the manufacturing costs.

Secondly, efforts are promoted to reduce the energy consumption of all components of the electric vehicle as far as possible in order to optimally use the available energy. Because the energy will remain a precious commodity in the electric car.

Thirdly, at least as important as research is education and training. The goals will not be achieved without highly qualified and highly motivated specialists. This applies to both vocational and academic training.

⁷¹ <https://www.bmbf.de/en/index.html>



Above all, the challenge lies in better linking the qualification profiles of hitherto separate job profiles and the integration of electromobility competences into existing training courses.

As it is not possible to wait until the next well-educated generation enters the workforce, investments need to be made in further qualification for those who are already working.

Apart from battery research, the BMBF is also funding projects related to Automated Vehicles (components and systems for autonomous vehicles).

Federal Ministry of Transport and Digital Infrastructure (BMVI)

The scope of the BMVI⁷² extends to all tasks related to the transport of persons, goods and data. This includes including the required physical (federal highways, railway networks, waterways and air traffic routes) and digital infrastructure, as the widespread availability of modern broadband networks. The BMVI is responsible for transport-related policies and for ensuring the safety of transport in all modes which includes the planning and financing of investments to maintain and expand the infrastructures.

The main focus in the field of digital infrastructure is a nationwide supply of fast Internet (transmission speed of at least 50 Mbit / s). Another task is the modernization of mobility (alternative powertrains and fuels, networking of vehicles and infrastructure, intelligent transport systems and automated mobility). This includes the establishment of a Digital Test Field for the testing of innovative vehicle technologies.

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)

The BMU⁷³ is in charge of environmental policy and keeping the interests of environmental and nature conservation. The range of government policies which are under responsibility of the BMU are reflected in the name of the ministry itself. The ministry engages in the protection of the public from environmental toxins and radiation and to establish an intelligent and efficient use of raw materials, in order to advance action towards climate protection and to promote a use of natural resources that conserves biodiversity and secures habitats.

In the context of transport and mobility, activities and funding of the BMU always target the achievement of national climate protection goals. Focus is on logistics, heavy-duty road transport (for example RTD of E-Trucks powered by catenary systems) etc. In the context of testing and deploying electric mobility concepts which should contribute to the achievement of climate protection goals, the BMU also provides funding for public and private procurement of electric vehicles.

Federal Ministry for Economic Affairs and Energy

The BMWi⁷⁴ deals with the questions of globalization, digitization, demographic change, the development of Europe and the energy transition. Central task of the BMWi is to strengthen the German economy in the face of existing and future challenges.

⁷² <https://www.bmvi.de/EN/Home/home.html>

⁷³ <https://www.bmu.de/en/ministry/tasks-and-structure/>

⁷⁴ <https://www.bmwi.de/Navigation/EN/Home/home.html>

Related to transport and mobility, the BMWi is responsible for the promotion and strengthening of manufacturing and production, the integration of electric vehicles in the grid, energy supply and storage.

Federal Highway Research Institute (BAST)

The BAST⁷⁵ is a practice-oriented, technical-scientific research institution of the federal government in the field of road transport. Its mission is the improvement of road safety, environmental compatibility, economic efficiency and the performance of roads, its scope extends to all tasks resulting from the interaction of people, road, and environment. The BAST performs both own research projects and provision of funding for external scientists. The development of regulation and standards for road transport and the introduction of national, European and international legislative and harmonization procedures is an important action field of the BAST.

BAST has an annual research budget of 47 m€ per year. The organisation is managing 300 internal research projects and financing 400 external projects.

DFG (German Research foundation)

The DFG (Deutsche Forschungsgemeinschaft) provides funding in the field of low TRL (fundamental research). The DFG provides funding for basic research or young researchers. The federal government and the federal states almost completely finance (budget 2018: 99% according to annual report 2018 the largest research funding organization in Europe as a non-profit, registered association).

Research related to transport topics is limited, although some research topics could theoretically lead to transport applications in the future. An example is a call for projects on Polymer-based Batteries⁷⁶.

2.5.3.1 Other organisations

German National Platform for Electric Mobility

The German National Platform for Electric Mobility ("Nationale Plattform Elektromobilität" – NPE) is an advisory council of the German Federal Government for electric vehicle introduction. It consists of the top representatives of industry (10 Members), politics (6), science (3), associations (3) and unions (1). It was officially established on 3 May 2010 during a meeting with German chancellor Angela Merkel. Its task is to push on the National Development Plan for Electric Mobility ("Nationaler Entwicklungsplan Elektromobilität"). The goal for 2020 of the NPE is to make Germany the leading supplier and lead market for electric mobility and to gain an employment effect of 30,000 additional jobs.

FVV – Research Association for Combustion Engines

The FVV (Forschungsvereinigung Verbrennungskraftmaschinen / Research Association for Combustion Engines) is a worldwide innovation network of companies, research & technology performers (RTD) and funding bodies. In the context of pre-competitive Industrial Collective Research (IGF), manufacturers of automotive engines, industrial engines and turbomachinery as well as their suppliers and service providers

⁷⁵ https://www.bast.de/BAST_2017/DE/BAST/Forschung/Forschung_node.html

⁷⁶ https://www.dfg.de/foerderung/info_wissenschaft/2019/info_wissenschaft_19_24/index.html

work together with universities and other research establishments on cutting-edge technologies. The aim is to make engines and turbines cleaner, more efficient and sustainable – for the benefit of society, industry and the environment.

The projects supported by the FVV usually receive funding from the FVV (through members contributions) and public funding (e.g. BMWi). The FVV Prime Movers Innovation Network includes more than 100 research centres, universities and institutes in Germany and Europe. Together with their strong partners in research funding, FVV has invested over 500 m€ in more than 1,200 pre-competitive research projects over the past 60 years⁷⁷.

The research programme is financed by annual contributions from members and public funds. Collective scientific and technical research and development projects are always conducted at a pre-competitive level by industrial research associations representing a specific industry sector or technology field. The results of the research work shall form the basis for the development of new or significantly improved products, processes and services or lead to regulations or standards, and must include transfer proposals as well as statements on the economic significance and feasibility of each individual project.

2.5.4 Overview of existing grant programmes and relevant calls

2.5.4.1 Automated and Connected Driving – AVF

The programme Automated and Connected Driving (Automatisiertes und vernetztes Fahren – AVF)⁷⁸ from the BMVI strives for the promotion of application-oriented innovative solutions in the context of automated and connected driving. Addressed are four main topics:

- interaction between driver and vehicle
- Traffic management and planning
- connectivity and data management
- social aspects

Projects funded under this programme should provide a significant insight into how automated and connected vehicles can be integrated in the existing transport system, how functional safety can be ensured over the entire vehicle life cycle and which factors can contribute to a widespread public acceptance of automated and connected driving⁷⁹. The programme has a total budget of 100 m€ and four calls have been published so far with 24 projects financed⁸⁰.

Under this programme there are special “*Funding Guidelines for Automated and Connected Driving on Digital Test Beds in Germany*”.⁸¹

⁷⁷ For more information, see: <http://www.fvv-net.de/en/>

⁷⁸ Programme website: <https://www.bmvi.de/SharedDocs/DE/Artikel/DG/forschungsprogramm-automatisierung-vernetzung-strassenverkehr.html>

⁷⁹ <https://www.bmvi.de/SharedDocs/DE/Artikel/DG/forschungsprogramm-automatisierung-vernetzung-strassenverkehr.html>

⁸⁰ Project descriptions to be found at: <https://www.bmvi.de/DE/Themen/Digitales/AVF-Forschungsprogramm/Projekte/avf-projekte.html>

⁸¹ <https://www.bmvi.de/SharedDocs/EN/Articles/DG/research-programme-on-automation-and-connectivity-in-road-transport.html>

The purpose of these funding guidelines is to provide targeted financial assistance to innovative application-related solutions in the context of automated and connected driving making use of digital test beds. The projects to be funded are to develop, in particular, solutions that help to generate findings on mixed traffic and on the readiness for commercial application of different automation and connectivity components and their degrees of efficiency. Inter alia, the spotlight is on innovative infrastructure elements that upgrade the functionalities on digital test beds and support automated and connected driving. In this context, connected driving using vehicle-to-infrastructure (V2I) communication and sophisticated sensor technology plus real-time communication with the latest transmission standards are thematic focus areas.

2.5.4.2 *Renewably mobile*

The programme Renewably mobile (Erneuerbar Mobil) from the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) funds research projects in the context of electric mobility with the aim to reach the climate and energy policy objectives for the road transport sector⁸².

Focus in this funding programme is on environmental and climate aspects of electric mobility, the coupling of electric vehicles to renewable energies and grid integration, market launch of electric vehicles with ecological standards, and on resource availability and recycling. Projects financed under this programme should be striving for achievement of national climate protection targets. Topics are:

- Public and private procurement of electric vehicles.
- Testing and deployment of electric mobility concepts in order to reach climate protection goals. Focus is on logistics, heavy load, catenary systems etc.

The programme publishes annual calls with a budget of around 30 m€ per call.

2.5.4.3 *BMBF programmes*

The Federal Government Programme Electric Mobility is implemented in various programmes within the Ministry of Education and Research, for example in the Funding Programme Microelectronics. The BMBF promotes research on electric vehicles, components and systems. Large focus is also on battery research.

The Electromobility Programme

The Electromobility Programme (Elektromobilität Programm) promotes technologies for energy storages and the enhancement of energy efficiency. Adaptation and development of education programmes for electric mobility. Until 2017, the Electromobility Programme had a budget of 83 m€ per year

The Ministry has states its three main priorities as follows: (1) improving energy storage, (2) better energy efficiency of batteries and (3) increasing number of qualified scientists and technicians.

⁸² <https://www.erneuerbar-mobil.de/foerderprogramme/das-foerderprogramm-erneuerbar-mobil>

At the time of writing (autumn 2019), the BMBF is no longer funding any further projects on electronic mobility or publishing any calls for funding aimed at the development of systems or components for electric vehicles, its focus moved to automated driving.

Framework programme Mikrosystemtechnik

There are ongoing projects within the framework programme **Mikrosystemtechnik**, which is running until 2020. In the framework of this programme, projects are funded that address the development of systems for autonomous vehicles using synergies with electric vehicles.

Earlier calls for proposals within this programme were e.g. the “*Disruptive Vehicle Concepts for Autonomous Electric Mobility (Auto-Dis)*”.

On the basis of this funding guideline, the BMBF promoted innovations that addressed the key challenges of future mobility. Powerful microelectronics and sensor technology and digitization are pacesetters for the intelligent mobility of the future, which helps to meet the challenges of climate change, to strengthen the quality of life in the metropolises and to exploit the opportunities offered by digitization for avoiding traffic congestion.

The programme has a total budget of 400 m€ over a period of five years (2016-2020), meaning about 80 m€ per year (part of this provided to transport related research. Guidelines for this research programme were published in 2017. An example of a project funded through this funding call is UNICARagil: (https://www.unicaragil.de/index_en.html)

Research Agenda for Sustainable Urban Mobility

The Research agenda for sustainable urban mobility (Forschungsagenda Nachhaltige urbane Mobilität) is the basis and strategic framework for research funding and innovation policy support for the BMBF in the field of urban mobility. So, it is something different. Planned measures in the agenda include research for sustainable mobility systems in cities/rural areas, municipal pilot projects and international measures (e.g. JPI Urban Europe).

2.5.4.4 ELECTRIC POWER II – Positioning of the value added chain

The programme ELECTRIC POWER II from the Federal Ministry for Economic Affairs and Energy (BMWi) is currently supporting 15 co-operative projects with partners from industry, research and science. Funding is available for RTD projects that contribute to efficient, flexible, robust, reliable and scalable production in electromobility, e.g. in the following thematic areas⁸³:

- Technology and systems planning
- Methods for increasing the efficiency of the innovation process
- Robust methods and processes for a predictable, fast and stable production start-up
- Efficiency increase in production
- electromobility as part of energy system transformation

⁸³ <https://www.bmwi.de/Redaktion/EN/Artikel/Industry/electric-mobility-r-d-funding.html>

The overall objectives are to:

- Integrate electric vehicles in the energy systems in an intelligent and economic manner
- Reduction of production costs through the application of efficient production technologies
- Increase added value share through digitisation of production
- Reduce total system cost of electric mobility by using new technologies
- Increase the competitiveness of German e-vehicles through norms and standards

Currently, ELECTRIC POWER 2 is running with a funding of 29 m€ (13 research, rest production related), inductive charging system, safety, data protection.

Between 2011 – 2016 – ELECTRIC POWER I was running. For ELECTRIC POWER II, the 1st phase evaluation has just been completed (2016-2018).

2.5.4.5 New Vehicle and System Technologies

Focus of this programme of the BMWi is primarily on the development of new vehicle and system technologies, which should be safe, convenient, efficient, low-emission and resource-friendly. At the end of each project, a prototype test should be carried out. Funding under this program is provided for product and application-oriented research measures in the field of vehicle and system technologies, with strong industrial relations. The two main pillars of the program are "Automated Driving" and "Innovative Vehicles"⁸⁴

From June 2015 till November 2018, a funding budget of 15.6 m€ was provided to car manufacturers, suppliers, IT companies and research institutions for the development of technologies with high application relevance for automated driving and innovative vehicles with alternative powertrains and new materials. In November 2018, the funding programme was extended until December 2022.⁸⁵

2.5.4.6 Funding for battery research (BMWi)

In addition, there is a separate funding programme for battery research from the BMWi. Early 2019, BMWi published a promotion call for battery cell production (Expressions of interest could be submitted until 15 March 2019). Interested companies and consortia could submit project ideas for building a competitive and sustainable battery cell production.

The aim is to create a network for the production of battery cells of the latest generations, together with other European countries. The sketches are intended to comprehensively present the project ideas and to justify the need for public funding.

In order to cover the value chain of battery production as widely as possible in the future, the Federal Ministry of Economics plans to provide up to € 1 billion.

⁸⁴ http://www.tuvpt.de/fileadmin/downloads/bmw_i_Neue_Fahrzeug-_und_Systemtechnologien_2015_s06.pdf

⁸⁵ <http://www.tuvpt.de/index.php?id=fahrzeugundsistemtechnologien>

The European Commission has announced the set-up of an IPCEI (Important Projects of Common European Interest) on battery cell production. German players participating in projects that are part of the IPCEI's will receive funding through the new BMWi programme. Little detail is known yet as the programme is in a preliminary stage.

In the field of RTD, the BMWi announced that it is providing 23 m€ per year for research projects on cell technologies, components, modules, battery systems and integration into vehicles as part of the Federal Government's 7th energy research program. Funds from other federal ministries will be available as well⁸⁶.

2.5.4.7 Immediate Action Programme for Clean Air

The Federal Government is providing 1 billion euros in the framework of existing or new funding initiatives for the creation of clean air in the approximately 60 cities where the limit values are permanently exceeded. There are 6 main topics:

- (1) electrification of transport,
- (2) digitization of municipal transport systems,
- (3) retrofitting of diesel buses,
- (4) promotion of cycling,
- (5) improvement of logistics concepts and
- (6) bundling of traffic flows.

The funding will be made available for a variety of measures operated by different funding organisations, mostly ministries.

The programme supports cities and municipalities to implement short-, mid- and long-term measures for the reduction of harmful emissions (NO_x) caused by transport especially in particularly affected cities and regions. The cities and municipalities selected have all exceeded a critical value in NO_x emissions.

Focus is on measures supporting the collection, analysis and usage of data on mobility, environment and meteorology, traffic management and planning as well as automation, cooperative and connected driving. Funding is provided for cities and municipalities, municipal companies such as public transport operators, special purpose associations and other entities under the ownership of an affected city or municipality.

Directive on the promotion of energy-efficient and / or low-CO₂ heavy-duty vehicles in road haulage companies – Federal Ministry of Transport and Digital Infrastructure (BMVI)

This is a purchase subsidy for trucks and semi-trailer tractors powered by compressed or liquefied natural gas (CNG, LNG) or by electric drive in the meaning of §2, number 2 and 4 of the German Electric Mobility Act, which have a gross vehicle weight of more than 7. tons and are deployed for freight transport.

The main objective of this programme is the Reduction of emissions and negative impact of road heavy-duty freight transport on the environment and climate. The programme also promotes deployment of low/zero emission vehicles for regional and long-distance freight logistics.

⁸⁶ Source: <https://www.bmwi-energiewende.de/EWD/Redaktion/Newsletter/2019/03/Meldung/direkt-erklaert.html>

2.5.4.8 National Innovation Programme Hydrogen and Fuel Cell Technology (NIP)

Based on the government's 2016 to 2026 hydrogen and fuel cell technology programme, the interdisciplinary National Innovation Programme Hydrogen and Fuel Cell Technology (NIP) ensures the continuation of research and development in the area while simultaneously addressing the pressing issue of market activation and providing necessary support for initial products.

In the framework of this programme, an amount of 1.4 billion € is provided from the federal government for RTD, demonstration and marketing preparation (40%) and supporting measures for market activation (60%), from all ministries participating.

2.5.4.9 Research agenda Sustainable Urban Mobility

The research agenda "Sustainable Urban Mobility" of the BMBF outlines how science and practice can shape the way to an environmentally friendly mobility system. With the competition MobilitätsWerkStadt 2025, the BMBF calls on municipalities to submit proposals for model projects. The funding initiative 'Mobility Future Lab 2050' aims to develop systemic innovations for the mobility of the future⁸⁷.

The BMBF wants to contribute with their research agenda to a transition to a sustainable urban mobility system. So far, the transport sector has a significant impact on people and the environment, inter alia, through greenhouse gas emissions, local pollution, noise and land use. In addition, infrastructure is partly overburdened and not easily accessible to everyone, which restricts individual mobility.

The research agenda focuses on cities and peri-urban areas. Sustainability, thus, encompasses ecological, social and economic aspects. The task is:

- to minimize transport-related emissions and resource consumption,
- to ensure individual needs, security, free development and participation of all population groups, and
- to strengthen social welfare, competitiveness and quality of the city's business location.

The BMBF will help local authorities to work together with relevant players from economy, civil society and science, to agree on these requirements and to find locally suitable answers.

The BMBF is therefore strengthening mobility research with two funding measures under the research agenda "Sustainable Urban Mobility", for which 34 million euros are available in this legislative period⁸⁸. As of today, the BMBF published two funding guidelines to call for project proposals:

MobilitätsWerkStadt 2025

The BMBF supports 2025 municipalities with the competition MobilitätsWerkStadt to shape the transformation of the mobility sector in cooperation with key players and multipliers from economy, civil

⁸⁷ <https://www.fona.de/en/measures/funding-measures/mobility-in-the-city.php>

⁸⁸ <https://www.fona.de/de/nachhaltige-mobilitaumltsforschung>

society and science. The common task is to develop sustainable, innovative and tailor-made local mobility concepts. Submission deadline: 31.03.2019.

This is a two-phase call for proposals where during the first phase only municipalities (cities, districts, counties, municipalities) as well as municipal and other public enterprises (especially public transport companies) of the Federal Republic of Germany are eligible to apply. During the second phase other entities like universities, research institutes and enterprises (incl. SMEs) can be taken on board.

Funding will be provided for R & D projects that develop and test innovative municipal mobility concepts. The funding aims to make progress towards sustainable urban mobility, to provide proven solutions and implementation know-how. The funded projects should show:

- how to make transport movements more sustainable and to meet mobility needs with less traffic, without any limitations;
- how technological innovations can be linked and harmonized with individual and societal expectations, environmental requirements and economic interests;
- which forms of political, planning and technological control are suitable and practicable for the implementation of mobility concepts in the real environment.

MobilitätsZukunftsLabor 2050

The BMBF supports interdisciplinary research projects that create new systemic solutions and impulses for sustainable mobility concepts of the future. It should be examined how societal change can be linked to more sustainable forms of mobility. The intention is to develop sound foundations for long-term innovation and transformation management. Submission deadline for this call was end of April 2019.

2.5.5 International collaboration in the field of RTD

This section gives an overview of international collaboration (e.g. bilateral) ongoing with third countries (outside the EU).

Electric Vehicle Initiative (EVI)

The Electric Vehicles Initiative (EVI)⁸⁹ is a multi-government policy forum dedicated to accelerating the introduction and adoption of electric vehicles worldwide. In 2010, EVI was one of several initiatives launched under the Clean Energy Ministerial (CEM), a high-level dialogue among Energy Ministers from the world's major economies. EVI members include Canada, Chile, China, Finland, France, Germany, India, Japan, Mexico, the Netherlands, New Zealand, Norway, Portugal, Sweden, the United Kingdom and the United States. The International Energy Agency is the EVI Co-ordinator.

⁸⁹ <https://www.iea.org/topics/transport/evi/>

IEA Hybrid and Electric Vehicle Implementing Agreement

The Implementing Agreement for co-operation on Hybrid and Electric Vehicle Technologies and Programmes (IA-HEV)^{90,91} enables member parties to discuss their respective needs, share key information, and learn from an ever-growing pool of experience from the development and deployment of hybrid and electric vehicles.

IA-HEV was formed in 1993 to produce and disseminate balanced, objective information about advanced electric, hybrid, and fuel cell vehicles. IA-HEV is an international membership group collaborating under the International Energy Agency (IEA) framework. Implementing Agreements are at the core of the IEA International Technology Co-operation Programme coordinated by the IEA Committee on Energy Research and Technology (CERT).

An Implementing Agreement is a system of standard rules and regulations to encourage multinational, collaborative efforts to meet energy challenges. This allows interested IEA member and non-member governments and other organizations to pool resources for research, development, and deployment of particular technologies. An Implementing Agreement runs for a fixed time period, usually in five-year phases. IA-HEV has completed three phases and is currently in Phase 4 which runs from 2009–2015.

Sino-German Co-operation on Electric Mobility

As part of German-Chinese intergovernmental consultations in June 2011, both countries published a "Joint Statement on the Establishment of a Strategic Partnership for Electric Mobility" in Berlin. Since then, German-Chinese cooperation in the field of electromobility has continued to evolve, including topics such as the performance and safety of vehicles and batteries, battery recycling and smart grids. In 2015, for example, both sides agreed on uniform standards for AC charger plugs. Vehicles of both countries can be charged with the same AC system⁹².

In the framework of this cooperation, the Sino-German Institute on Electromobility (IAPS) - Joint Research Institute for Advanced Power Sources for Electric Vehicles was established in 2010⁹³. IAPS carries out research and development of electrochemical energy technologies with a focus on electromobility.

NEDO Japanese-German Co-Funding Programme

The Co-Funding Program aims to promote innovation in technological development through collaborative efforts in RTD projects with the German partners. The partnership should complement each other and demonstrate an added value to the project.

⁹⁰ <http://www.ieahev.org/about/>

⁹¹ https://ec.europa.eu/jrc/sites/jrcsh/files/MEYER_%20Ispra%202015.pdf

⁹² <https://metal-eco-city.com/zmgblog/blogdetailallgemein/deutsch-chinesische-kooperation-zur-elektromobilitaet.html>
(declaration in German)

⁹³ <http://www.internationales-buero.de/en/iaps.php>

Japanese – German Cooperation on the Promotion of Research and Development on Automated Driving Technologies

This is a joint effort in both Japan and Germany towards bilateral cooperation to promote the research and development (RTD) of automated driving technologies⁹⁴.

The Cabinet Office of Japan has been implementing a national RTD project on Automated Driving Systems under the Cross-ministerial Strategic Innovation Promotion Program (SIP) to address common technological challenges among auto manufacturers and other stakeholders from both the public and private sectors. It is planning to start a large-scale Field Operational Test (FOT) on public roads and at test sites from September 2017.

The Government of the Federal Republic of Germany pursues its Strategy for Automated and Connected Driving launched in September 2015 in which RTD projects funded by the Federal Ministry of Education and Research (BMBF) are an important pillar. The BMBF works in close cooperation with the Federal Ministry of Transport and Digital Infrastructure (BMVI) which currently aims at establishing test areas in seven designated locations throughout Germany.

TU9 – Academic cooperation of nine German technical universities with international universities and institutes all over the world in engineering sciences⁹⁵

Related to road transport research, German political, scientific, or industrial actors are involved in this collaboration initiative.

2.5.6 Assessment of funding programmes

For Germany, the following funding programmes have been selected for detailed assessment:

- [Automated and Connected Driving](#) (AVF) - Federal Ministry of Transport and Digital Infrastructure (BMVI)
- [Renewably mobile](#) - Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)
- [ELECTRIC POWER II](#): Electric Mobility – Positioning the Value Chain - Federal Ministry for Economic Affairs and Energy (BMWi)
- [New Vehicle and System Technologies](#) - Federal Ministry for Economic Affairs and Energy (BMWi)

⁹⁴ http://www8.cao.go.jp/cstp/kokusaiteki/nichidoku/jointdeclaration_en.pdf

⁹⁵ <https://www.tu9.de/tu9/en/1473.php>

2.5.7 Germany – main findings

General findings on the funding mechanism:

- German ministries provide significant project funding in the field of electromobility (including battery research), automated driving and hydrogen & fuel cells.
- Support is provided throughout the whole TRL scale from fundamental battery research at the level of the German Research Foundation (DFG) to market introduction through the Action Programme Clean Air.
- The German Federal Government is pursuing several strategies in the field of development related to road transport in order to achieve the European and national targets of road safety, sustainability and emission reduction.
- In addition, Germany has developed a High-Tech Strategy with the objective to move Germany forward on its way to becoming a worldwide innovation leader.
- Four Federal Ministries engage in the promotion and funding of R&D&I in the field of transport and mobility, each focusing on different aspects of transport and mobility:
 - Ministry of Education and Research (BMBF)
 - Ministry of Transport and Digital Infrastructure (BMVI)
 - Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)
 - Ministry for Economic Affairs and Energy (BMWi)
- Additional (pre-competitive) research is provided through FVV (Research Association for Combustion Engines) that finances research through members contribution (sometimes combined with public funding)
- Germany has by far the highest RTD funding budget in the field of road transport among the countries studied. This should not come as a surprise as Germany has the largest automotive industry of all European countries.
- Based on opinions of programme users, administration of grant funded projects is demanding and requires sufficient staff from the side of grant applicants. The same stakeholders mentioned, however, that the chance of success is much higher with national funding.

Findings related to the funding assessment:

- Significant funding is provided to the topic of automated driving and for electric mobility. Currently funding for automated driving remains significant, but has slightly decreased for EV (one of the major programmes of BMBF stopped funding EV related RTD) while RTD in the field of CAV is increasing in size
- Where other EU countries have established grant funding agencies that manage RTD programmes, the German government takes a different approach. Funding is provided by the ministries, but for programme management (incl. tendering procedures) separate organisations are appointed (“Projektträger”). Some of these are independent private entities, others are federally owned (some of them established by federal ministries).
- Dissemination of project results is viewed as important in all programmes. Accessibility to the public is also mandatory, same as having an exploitation plan after the end (projects are also promoted on the websites of the ministries)
- Strong participation of private firms in research projects



EGVI
European Green
Vehicles Initiative

- Often more than 1 tender per year, proposal evaluation is usually 2 to 3 months, which is relatively short.

Observations / main findings:

- Some calls are open for a long time. This gives the applicants time to react and prepare a good proposal. Approach of other countries (e.g. UK is to have shorter, but more frequent calls). Especially in applied research, speed of the process is important. Having the process taking more than 6 months may not be beneficial.

2.6 Italy

As in the other European countries in the report, the automotive industry is of major importance for Italy. The Italian automotive industry employs 163,000 people. In 2018, 1,028,000 cars were produced in Italy.

As a result of the long recession started in 2008, industrial production and investment in Italy experienced dramatic reductions, weakening business performances in RTD and innovation. Due to the recession and imposed austerity measures, public RTD is now significantly lower than in economies of comparable size like Germany and France.

In 2015 Italy's total R&D expenditure (GERD) was €22.1 billion, 1.34% of GDP; data for 2016 indicate an increase to €23.2 billion, 1.38% of GDP. In France and Germany 2015 total R&D expenditure was 2.22% and 2.94% of GDP respectively.

RTD financed by businesses has shown a slight increase, while government budgets for RTD have been decreasing since 2007. Between 2007 and 2015, the Italian government's budget allocated to RTD activities fell from €9.9 billion to €8.3 billion⁹⁶. Other figures show that from 2010 to 2015, public RTD expenditure decreased in real terms by 18%.

2.6.1 Visions and targets for road transport RTD

The National Research Programme 2015-2020

The framework for Italy's research and innovation policy is provided by the National Research Programme (PNR) for the years 2015-2020, that was developed by MIUR and approved in May 2015 by CIPE, a Ministerial Committee.

National Programme for Research Infrastructures - PNIR (February 2017)

The National Programme for Research Infrastructures (PNIR) is the Italian multiannual strategy for Research Infrastructures, in the meaning of the European Strategy Forum for Research Infrastructures. It also fulfils the ex-ante conditionality for the European Structural and Investment Funds.

Policies for business research and innovation

While the National Research Programme provides a framework for public action on research and innovation, the most important policy effort in recent years has focused on the rise of indirect tax incentives to firms for a wide range of activities, including RTD, patents, human capital, investment in machinery and in the digital technologies of the Industry 4.0 programme.

The main measures introduced for supporting Italian firms' research and innovation are here:

- RTD tax credits – The RTD tax credit was introduced in 2007 and is limited to firms financing research projects in partnership with universities and employing highly skilled workers in RTD.

⁹⁶ RIO Country Report, Italy: <https://rio.jrc.ec.europa.eu/en/country-analysis/Italy/country-report>

- The Patent Box – The emphasis put in recent decades on a greater protection of intellectual property rights (IPRs) has brought to Italy – with the 2015 stability law - the 'patent box', a specific tax benefit for firms' earnings coming from patents, trademarks, licenses and software.
- Loan guarantees for SMEs
- Support for start-ups

Industry 4.0

The concept of Industry 4.0 (*Impresa 4.0*) originated in Germany to support the digital transformation of production, challenging US monopoly power in digital networks and platforms. The Italian government identified the specific goal of spreading advanced digital technologies such as robotics and automation, cloud computing, big data, sensors, 3D printers and introduced a wide range of measures.

MISE is in charge of the implementation of 'Impresa 4.0' with a multi-level coordinating body that includes six ministries, Cassa Depositi e Prestiti, business organisations, trade unions and Polytechnics.

2.6.2 Organisations and funding programmes

Below the Italian funding programme landscape is shown.

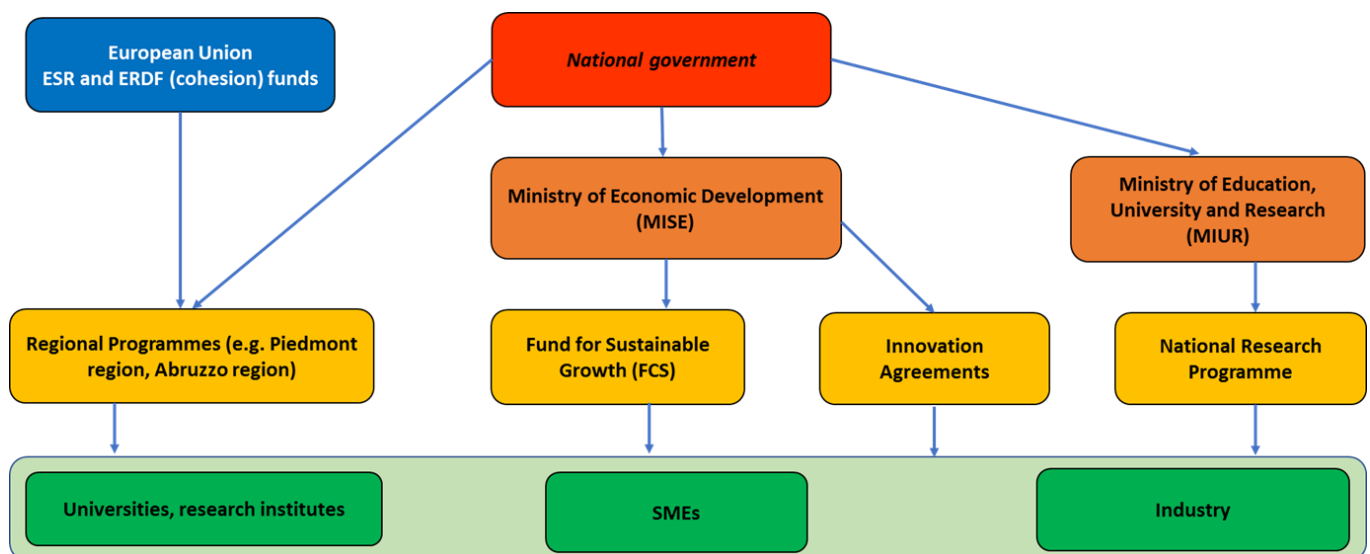


Figure 14 Funding landscape of RTD in Italy

The main national organisations funding RTD in Italy are the Ministry of Economic Development (MISE) and the Ministry of Education, University and Research (MIUR). Funding is also provided by some Italian regions, especially those from the north of Italy.

Ministry of Education, University and Research (MIUR)⁹⁷

The MIUR is responsible for the following areas related to education: university education, programming the intervention on the university system; addressing and coordinating, supervising, financing and evaluating university activities as far as teaching and research are concerned. These actions concern public research agencies too.

The ministry also coordinates the participation of national agents to international research programmes. It supports research activities of private firms, including through specific funds.

The Ministry manages the National Research Programme NRP, running from 2015 to 2020. The latest **Call** for Industrial Research and Experimental Development Projects was published at the end of 2017 for 12 specialised areas. Projects approved under this call started in January 2019.

Of these twelve specialised areas, the following were related to transport RTD:

- **Sustainable Mobility** – road, railway and maritime transport, distribution logistics and related production chains. [design, production and management of powertrain systems; materials and components for vehicles and transport systems; sensors, logistics and specific ICT applications for Intelligent Transport Systems (ITS)]
- **Energy** – components, technologies and innovative systems for the production, storage and distribution, in a logic of efficient management, of sustainable energy and low CO₂ emissions
- **Smart, Secure and Inclusive Communities** – technological solutions for the implementation of innovative models integrated in the management of urban and metropolitan areas, of the intelligent mobility of goods and people.
- **Design, Creativity and Made-in-Italy** – Areas connected to the distinctive character of the Made-in-Italy products, characterized by the adoption of new process and product technologies and by advanced design activities, digital crafts and cultural and creative industries
- **Green Chemistry** – Product and process innovations related to biorefineries, production and use of bio-based products, biomaterials and new or innovative fuels from dedicated forest or agricultural biomass and from by-products and waste from their production, as well as by-products and waste from production and processing of the animal supply chain"

Ministry of Economic Development (MISE)⁹⁸

This Ministry is responsible for a wide variety of policies, including economic development and cohesion, energy and mineral resources, telecommunications, internationalisation and business incentives. The Ministry manages a Fund for Sustainable Growth (FCS). Under this fund RTD projects in the technological areas identified by Horizon 2020 are financed. Two calls have been published in recent years:

- Call PON (National Operational Programme) I&C 2014-2020 during October 2016
- Large RTD projects call - PON (National Operational Programme) I&C 2014-20 during December 2016

⁹⁷ www.miur.gov.it

⁹⁸ www.mise.gov.it

One of its programmes was programme 7.4: *Implementation of an intelligent, ecological and integrated transport system*.

In parallel, the MISE funds projects under the so-called Innovation Agreements. Projects funded under the programme “*Innovation Agreements*” concern industrial research and experimental development activities aimed at the creation of new products, processes or services or the significant improvement of existing products, processes or services, through the development of one or more of the technologies identified by the Horizon 2020 Programme.

2.6.3 Overview of existing grant programmes and relevant calls

2.6.3.1 National Research Programme

The National Research Programme for 2015-2020 only forms a framework for RTD policy in Italy and also includes calls for industrial research and experimental development projects in 12 specialization areas. These areas are⁹⁹:

1. Aerospace;
2. Agri-food;
3. Cultural Heritage;
4. Blue Growth;
5. Green Chemistry;
6. Design, Creativity and Made in Italy;
7. Energy;
8. Smart Manufacturing;
9. Sustainable Mobility;
10. Health;
11. Smart, Secure and Inclusive Communities;
12. Technologies for Living Environments.

The financial investment of the Ministry of Education, University and Research in the NRP, is about €2.5 billion euro over the first three years, which add up to a €8 billion funding that the Ministry of Education, University and Research currently allocates to Universities and Research Institutions every year.

The definition of specialization areas of applied research are intended to provide research policies with consistency, thus avoiding inefficiency due to inaccurate planning; predictability, by providing a time, financial and project frame that is shared by all public stakeholders from the beginning; and specialisation, thus avoiding the dispersion of resources in too many directions, but instead focusing them on the most promising areas, while ensuring the necessary and unavoidable support to basic, free and fundamental research.

⁹⁹ <https://www.researchitaly.it/en/national-research-programme/>

NRP strongly invests in fundamental research, mainly through actions directed to human capital and research infrastructures, without giving priority to any scientific fields. The NRP 2015-2020 classified its research into the twelve specialization areas mentioned above.

These are the areas where research, especially if carried out jointly by public and private bodies, can produce the best results. The areas, which take into account the industrial weight of their related production sectors, were cross analysed using two types of indicators: those assessing the relevance of Italian research in the various fields in terms of scientific publications, and those assessing the innovative capability associated with patenting activity. The resulting areas combine the strategic choices made at the European level – especially those under the Framework Programme Horizon 2020 – with the policies defined at the national and regional level.

Based on the analysis of the strengths and weaknesses of the Italian research system, six intervention programmes have been defined, each having specific objectives, actions and dedicated resources.

1. The **first** objective is the internationalization, coordination and integration of national initiatives with European and global ones. The growing weight of European resources as compared to national resources, and of resources accessible on the basis of competition as compared to ordinary ones, requires a different approach to the national planning activities. For this reason, the NRP integrates the national programmes and resources with European resources, in particular the Cohesion Policy and those under the Horizon 2020 programme, and aligns each NRP Programme to criteria and instruments established at European level, also contributing to preparing actors and results of the Italian research for international competition.
2. The **second** objective is to give centre stage to investment in human capital. The NRP strategy focuses primarily on people working in public and private research, with the aim of increasing the number of educated and trained researchers, while creating an environment and opportunities that stimulate the best talents and give them a major role transfer of knowledge.
3. The **third** objective is to provide selective support to research infrastructures. The NRP pays great attention to research infrastructures, a pillar of Italian and international research, especially of fundamental research. The NRP defines and starts for the first time an infrastructure assessment process, aligning it to the criteria and mechanisms of the European Strategy Forum on Research Infrastructures (ESFRI).
4. The **fourth** objective is the public-private collaboration, considered as the driving force of research and innovation. In this context, the National Technology Clusters, set up based on the specialization areas of applied research, are recognized as permanent infrastructures for the dialogue between universities, public research bodies and enterprises and between central and local authorities. The NRP recognizes as a priority the interaction with society through support of social innovation, philanthropic funding of research, and constant and transparent communication and information actions on the role of research.
5. The **fifth** objective is support for Southern Italy. Priority actions are defined to support research and innovation in this area, by creating a synergy between the National Operational Programme, Regional Operational Programmes and ordinary resources.
6. The **sixth** objective, actually a prerequisite to all the others, is that of efficiency and quality of expenditure, through the definition and strengthening of evaluation, monitoring, transparency, simplification and administrative reinforcement processes. A seemingly minor issue that has

become relevant to ensure that public investments in research and innovation are credible, efficient and timely.

NRP 2015-2020 – Call for research proposals

Until the end of 2017 a Call for industrial research and experimental development projects in the 12 specialization areas was opened. November 2017 was the deadline for proposals (new projects started January 2019). For each of the specialisation areas a budget of 29.5 m€ was available. TRL of projects is estimated at 3 to 5.

2.6.3.2 Regional funding programmes

In addition to national funding, Italian regions, mainly those in the north of the country provide support for RTD. Specific automotive research and development is funded by the regional programmes of the Piedmont region and the Abruzzo region. Significant funding is also provided by Lombardy region and the region of Alto Adige.

Funding of the Abruzzo region

This region provides aid for industrial research projects and experimental development for automotive and mechatronic companies, implementing the regional development programme of the Abruzzo Region. Part of the programme is funded through the European Cohesion Funds¹⁰⁰.

Among the main requirements for funding are that projects must have major impact in the region. Dissemination of the research is mandatory.

The automotive section of this programme amounted to 8.8 m€, distributed every 3 to 4 years.

Funding of the Piedmont region

Within the regional development programme of the Piedmont region there was a call for tenders to support industrial research projects and / or development in the scientific-technological area of Automotive according to activity I.1.1. "Innovative platforms" POR ERDF 2007/2013 ex REG EC n. 1083/2006. Part of the programme is funded through the European Regional Development Fund (ERDF).

Eligible for funding are only companies located in the Piedmont region. Projects should be in the form of public private partnerships, with at least 30% of the budget allocated to SMEs.

The automotive section of this programme amounted to 30 m€, distributed every 5 years.

2.6.4 Assessment of funding programmes

For **Italy**, the following programmes have been selected for further assessment:

¹⁰⁰ More info on: <https://opencoesione.gov.it/en/programmi/2007AB002FA001/>

- Programme of the Ministry of Education, University and Research (MIUR)
- Programme of the Ministry of Economic Development (MISE)
- Innovation agreements of the Ministry of Economic Development (MISE)
- Programme of the Piedmont region

Regional programmes have been included here due to the lack of specific automotive programmes on national level. When comparing the research budgets between the six countries, funding budgets of the regional programmes have not been taken into account.

2.6.5 Italy – main findings

General findings on the funding mechanism:

- Compared to the other European countries in this study, the Italian national government provided provides relatively little funding.
- This lack of national funding is partly compensated with regional funding, but funding amounts differ strongly per region. The largest funding amounts are provided by the regions from the north of Italy.
- Specific automotive research is funded by the regional programmes of the Piedmont region and the Abruzzo region
- Funding programmes like the Fund for Sustainable Growth and the Innovation Agreements are cross-sectoral, without a specific transport RTD budget.
- Experience from project applicants shows that the application process is relatively long. From proposal preparation to approved funding takes at least a full year.
- At the same time, project applicants experience is that projects are
- As RTD funding opportunities in Italy are limited, Italian RTD organisations focus heavily on EU funded research like Horizon 2020.

Findings related to the funding assessment:

- Cross-sectoral programmes, meaning flexibility of choosing the research topic, but little focus of the programmes.
- Objectives of RTD programmes are not that specific and provide flexibility to applicants.
- Demonstration / dissemination of key importance
- Long duration of tendering process
- Only the NPR mentioned that there is a detailed funding process
- Regional programmes to provide funding for automotive research, but only accessible to organisations located in that specific region.
- Regional programmes have other specific features like the need to disseminate project results in the region and a minimum SME contribution in the project (e.g. 30% of budget share in the Piedmont region).
- Programme calls for regional programmes are less than once a year.

2.7 United Kingdom

Public RTD Funding in the United Kingdom can be related to two funding sources. Main source of funding for RTD (both industrial and university research) is the Department for Business, Energy and Industrial Strategy. Specifically, for transport research, the Department for Transport is also providing funding.

As in the other European countries in the report, the automotive industry is of major importance for the United Kingdom. The UK automotive industry employs 159,000 people, another 238,000 in the wider supply chain. In 2018, 1.8m cars were produced in the UK.

2.7.1 Visions and targets for road transport RTD

The UK government has produced a number of policy documents that lay out the strategy for RTD in the transport and energy sector. The most important strategies are shortly described below.

Industrial Strategy (2017): building a Britain fit for the future

The Industrial Strategy sets out a long-term plan to boost the productivity and earning power of people throughout the UK. The Strategy identifies four Grand Challenges to put the UK at the forefront of the industries of the future, ensuring that the UK takes advantage of major global changes, improving people's lives and the country's productivity. These four Grand Challenges are (1) Artificial Intelligence and Data, (2) Ageing Society, (3) **Clean Growth** and (4) the **Future of Mobility Grand Challenge**.

The **Clean Growth Strategy** is an ambitious blueprint for Britain's low carbon future.

This strategy sets out our proposals for decarbonising all sectors of the UK economy through the 2020s. It explains how the whole country can benefit from low carbon opportunities, while meeting national and international commitments to tackle climate change.

The Clean Growth Strategy set out a broad range of possible ultra-low emission vehicle uptake levels in 2030 (30-70% of new car sales and up to 40% of new van sales). The ambition is to reach the upper end of these ranges.

The overall objective of the **Future of Mobility Grand Challenge** is to put the UK at the forefront of the design and manufacture of zero emission vehicles and sets an ambition for all new cars and vans to be effectively zero emission by 2040. This will help improve air quality, support the shift to clean growth, and help the UK seize new economic opportunities.

This grand challenge is backed with:

- support for innovation in clean ways of powering vehicles, including £1 billion over 10 years for development of low carbon powertrains through the Advanced Propulsion Centre, and £246 million for the Faraday Battery Challenge to develop safe, cost-effective and high-performance batteries for electric vehicles

- grants to help people buy ultra-low emission vehicles, as part of a £1.5 billion investment between 2015 and 2021 to support the growth of this market
- investments in electric vehicle charging infrastructure and hydrogen vehicle refueling stations
- an Automotive Sector Deal setting out how government and industry will work together to achieve this strategic vision.

Road to Zero Strategy (2018)

Based on this strategy all new cars and vans should be effectively zero emission by 2040. As set out in this strategy and in the NO₂ plan¹⁰¹, the aim is to end the sale of new conventional petrol and diesel cars and vans by 2040. By then, it is expected that the majority of new cars and vans sold will be 100% zero emission and all new cars and vans should have significant zero emission capability. By 2050 almost every car and van on the road should be zero emission.

The government states in the document that this transition is expected to be industry and consumer led. The government approach will be technology neutral, as it is still premature to speculate precisely which technologies might and might not be able to deliver the long-term ambitions.

In order to fulfil the aims as set down in the strategy, the following conditions should be met:

- Adequate vehicle supply, now a key constraint on the market
- A strong consumer base and the right market conditions. Consumers are interested, but have concerns about the higher upfront costs of the vehicles and infrastructure provision
- A fit for purpose infrastructure network – vision is for electric vehicle drivers to be able to easily locate and access charging infrastructure

Among the planned activities within the strategy are

- Central government commitment to have 25% of car fleets to be ultra-low emission vehicles by 2022 (100% by 2030)
- Charging Infrastructure Investment Fund (£400 million)
- Go Ultra Low Campaign – This is a joint government and industry campaign which aims to increase purchase consideration of electric vehicles by helping motorists and fleets understand the benefits, cost savings and capabilities of the wide range of electric vehicles on the market. The campaign is funded by the Office for Low Emission Vehicles (OLEV) and eight vehicle manufacturers¹⁰² working in association with the Society of Motor Manufacturers and Traders (SMMT)

The Automotive Sector Deal (2018)

This Sector Deal builds on the government's long-standing partnership with the UK automotive sector¹⁰³. As a result of the Sector Deal, both government and industry will invest about £250 to develop and manufacture electric vehicles. This includes the Faraday Battery Challenge, which will drive the

¹⁰¹ The UK Plan for Tackling Roadside Nitrogen Dioxide Concentrations, in short, the NO₂ Plan

¹⁰² The vehicle manufacturers currently supporting the campaign are: Audi, Hyundai, Kia, Mercedes-Benz, Nissan, Toyota and Volkswagen.

¹⁰³ For more details about the sector deal, see: <https://www.gov.uk/government/publications/automotive-sector-deal>

technologies to power electric vehicles in the future, as well as £80 million for a new state-of-the-art automotive battery development facility in Coventry. This investment marks another step forward towards mass producing electric batteries and vehicles in the UK.

Other key policies of the Automotive Sector Deal include:

- An increase of total RTD investment in the UK to 2.4% of GDP by 2027
- Provide additional funding for technical education (addressing the shortage of science, technology, engineering and maths skills)
- Provide additional funding for charging infrastructure and grants for plug-in vehicles

Faraday Battery Challenge (2017)

The Faraday Battery Challenge was developed due to the growing demand for batteries for electrification, with the market estimated to be worth £5 billion to the UK and £50 billion to Europe by 2025¹⁰⁴. In the UK this is driven in part by government's plan to ban new conventional petrol and diesel vehicles by 2040 to be replaced by electric and zero emissions vehicles.

Through this challenge, the government will invest in research and innovation projects and new facilities to scale-up and advance the production, use and recycling of batteries. It will lower carbon and air pollution in the UK, while creating new opportunities and industries.

While the government investment will focus on the automotive sector initially to meet its commitment and the growing global demand for electric vehicles, this will also help advance battery development for other applications for an electrified economy.

2.7.2 Governance and funding system

The organisations involved in the UK funding system are shown below. The funding hierarchy is relatively complex, but with only a few sources of direct funding (mainly the Departments of BEIS and DfT).

The figure below shows the funding structure as of 2018. Innovate UK and EPSRC operate under a single strategic organisation, UKRI, but are retaining their individual identity. Innovate UK is focused on financing businesses to develop their innovative ideas. EPSRC is primarily funding university research.

¹⁰⁴ <https://www.ukri.org/innovation/industrial-strategy-challenge-fund/faraday-battery-challenge/#pagecontentid-0>

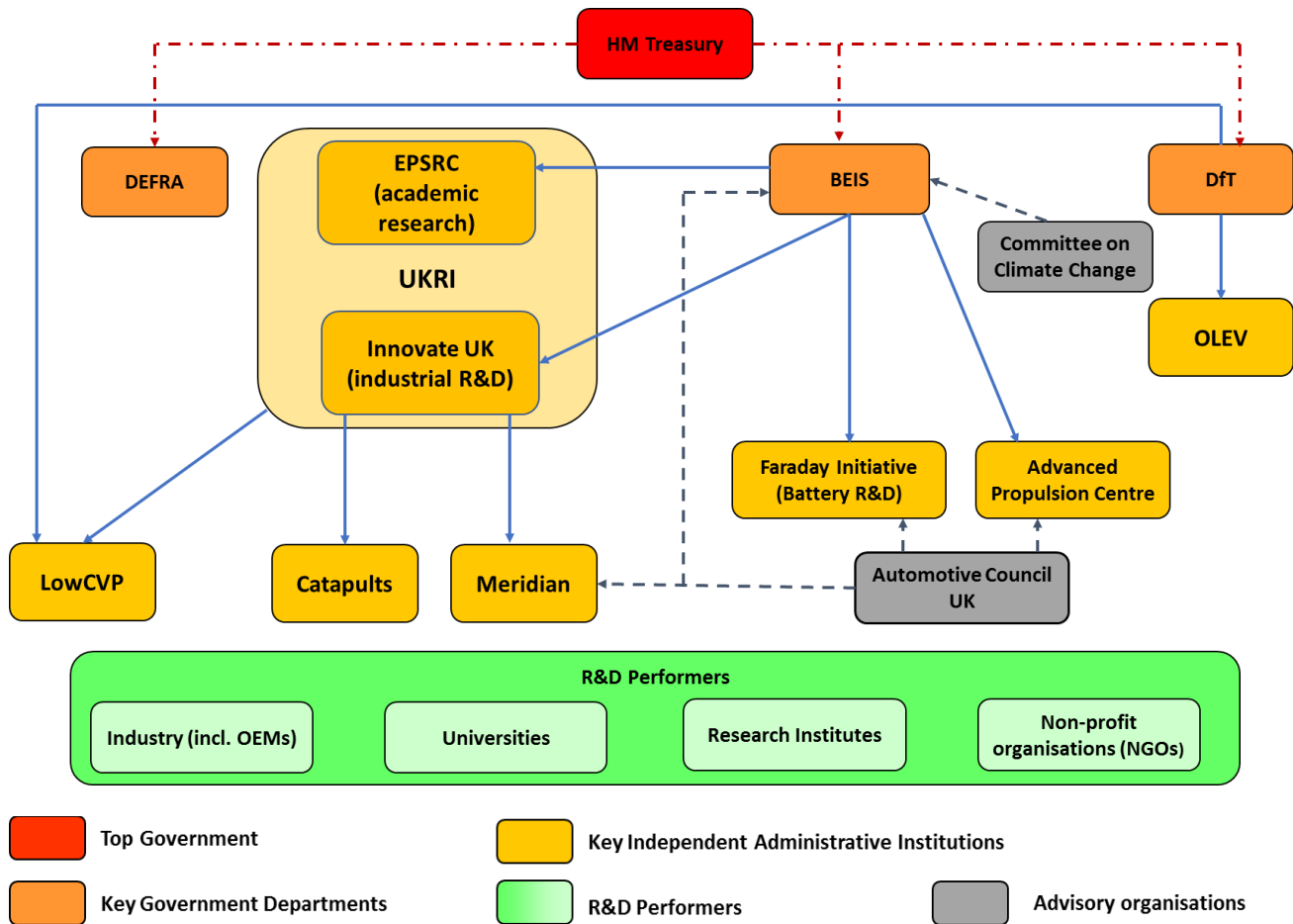


Figure 15 Funding landscape of RTD in the United Kingdom

2.7.3 Overview of RTD funding organisations and other key stakeholders

Department for Business, Energy & Industrial Strategy (BEIS)

The Department for Business, Energy and Industrial Strategy is responsible for policy in the field of Business, Energy & Industrial Strategy. This ministerial department is supported by 41 agencies and public bodies. It is the main department supporting transport related RTD.

Department for Transport (DfT)

The Department for Transport is responsible for planning & investment in transport infrastructure. Its responsibility covers all forms of transport in the UK. This ministerial department is supported by 22 agencies and public bodies. The DfT is supporting transport RTD through OLEV and LowCVP.

Department for Environment, Food and Rural Affairs

The Department for Environment, Food and Rural Affairs (DEFRA) is the UK Government department for natural environment, food, farming & rural economy. DEFRA is responsible for a clean, healthier

environment benefiting people and the economy. This ministerial department is supported by 33 agencies and public bodies.

UK Research and Innovation

UK Research and Innovation (UKRI) is a non-departmental public body funded through the Science Budget by BEIS and was established by the Higher Education and Research Act 2017. It has been set up by bringing together the seven research councils¹⁰⁵ (including EPSRC), Innovate UK, and a new organisation, Research England¹⁰⁶. UKRI operates across the UK with a combined budget of more than £6 billion. UKRI's main governance bodies are the UK Research and Innovation Board and the Executive Committee which provides strategy advice to the Board and is the day-to-day coordinating body for UKRI executive activity.

Engineering and Physical Sciences Research Council (EPSRC)

EPSRC¹⁰⁷ is the main funding agency for engineering and physical sciences research in the UK. Their portfolio covers a vast range of fields from healthcare technologies to structural engineering, manufacturing to mathematics, advanced materials to chemistry. EPSRC has an annual research budget of £800 million. This mainly includes university research funding with a TRL of 1 to 3.

Main plans and objectives of research funding are set out in the Strategic Plan 2015, setting out the direction of EPSRC policy for the next five years and in the Delivery Plan 2016/17-2019/20.

EPSRC is the single largest funder of doctorates in engineering and the physical sciences in the UK. EPSRC works with universities and companies to develop new ways of providing high quality research and postgraduate training, creating a new generation of world-class research leaders and a skilled workforce.

Research areas of EPSRC include more than 100 different themes. Research themes with an automotive/mobility component are the following:

- Artificial Intelligence (AI) technologies
- Bioenergy
- Combustion engineering
- Electrical motors and drives / electromagnetics
- Electrochemical science
- Fuel cell technology
- Hydrogen and alternative energy vectors
- Infrastructure and urban systems

¹⁰⁵ The seven research councils funded through UKRI are (1) Arts and Humanities Research Council (AHRC), (2) Biotechnology and Biological Sciences Research Council (BBSRC), (3) Economic and Social Research Council (ESRC), (4) Engineering and Physical Sciences Research Council (EPSRC), (5) Medical Research Council (MRC), (6) Natural Environment Research Council (NERC) and (7) Science and Technology Facilities Council (STFC).

¹⁰⁶ <https://www.ukri.org/files/about/ukri-framework-document-2018-pdf/>

¹⁰⁷ <https://epsrc.ukri.org/>



EPSRC does not support specific road transport research, but some of the research areas cover fundamental research that will have impact on the automotive sector. Information on funding can be found on the “Grants on the web” website: <https://gow.epsrc.ukri.org/>

Application for research funding at EPSRC is possible in two ways¹⁰⁸:

- *Unsolicited research proposals*, so-called Standard Research, submitted by anyone eligible to apply to EPSRC for funding at any time and in any field of research relevant to EPSRC’s remit. It includes workshops, overseas travel grants, networks and visiting researchers.
- *Calls for Proposals*, these are proposals submitted in response to targeted funding mechanisms and calls for proposals. They are generally characterised by closing dates and / or eligibility criteria. There is generally a preliminary outline stage, where full proposals are only invited from higher-ranked outlines, generally giving higher funding rates than in Standard Research.

Innovate UK

Innovate UK¹⁰⁹ was established in 2007 and is now the business-facing part of UK Research and Innovation. Innovate UK is also funded by the Department for Business, Energy and Industrial Strategy.

Innovate UK funds applied research, mostly carried out by industry with TRL 3 to 5.

Innovate UK has been helping industry to commercialise UK research for the last 10 years. Innovate UK helps businesses to identify the potential in new technologies and to turn them into the new products, processes and services that will significantly grow the UK economy.

Most of its staff come from a business background, so it offers relevant support to businesses in getting to market and scaling up. Support can be provided in 2 main ways:

- I. Funding – to help businesses to develop the new products, processes and services that will meet or define the markets of the future
- II. Connecting – to bring businesses together with the right partners, expertise, facilities, financiers and influencers that can help them bring their ideas to market

CATAPULT Network

The Catapult network addresses the 2nd form of support from Innovate UK, ensuring that UK researchers and businesses have access to state-of-the-art facilities wherever they are in the UK.

INNOVATE UK has set up and now oversees 10 CATAPULT centres. These independent centres bridge the gap between research and commercial success by providing state-of-the-art facilities for innovation.

¹⁰⁸ <https://epsrc.ukri.org/funding/applicationprocess/basics/faqs/>

¹⁰⁹ Innovate UK is the trading name of the Technology Strategy Board, which is an executive non-departmental public body sponsored by the Department for Business, Energy and Industrial Strategy.

2.7.3.1 Other organisations with a supporting role in transport RTD

Automotive Council UK

The Automotive Council of the UK is a Government / industry partnership supporting clean growth in the Automotive sector. The Council is organised into business & environment, skills and technology working groups. The Automotive Council is responsible for initiatives such as APC, Faraday and Meridian.

Meridian / Zenzic

Meridian is a joint Government / industry association to accelerate UK capability in the global Connected and Autonomous Vehicle (CAV) Sector. It includes RTD, validation, connected environments, data & cyber security & new services. The organisation was renamed Zenzic at the end of 2018.¹¹⁰

Low Carbon Vehicle Partnership

The Low Carbon Vehicle Partnership (LowCVP), established in 2003, is a UK Public / Private partnership. It has 200 UK members promoting sustainable shift to low carbon vehicles. The LowCVP is supported by UK Dept for Transport and membership subscriptions.

Office for Low Emission Vehicles

The Office for Low Emission Vehicles (OLEV) is part of the Department of Transport & Department for BEIS. OLEV works across government to support the early market for ultra-low emission vehicles. It is responsible for low carbon vehicle RTD funding and consumer grants

Highways England

Highways England are the government company charged with operating, maintaining and improving England's motorways and major A roads. As part of the Road Investment Strategy, the organisation was given funding to improve the surroundings of the Strategic Road Network.

A Designated Funds Programme was formed of five funds, including an Innovations Fund of £120 million for a period of 6 years (2015-2020). The purpose of the fund is to exploit the potential that innovation holds to transform transport through new technologies and techniques in road construction, maintenance and operation. The fund covers five sub-topics:

- Design, construction and maintenance
- Connected and Autonomous Vehicles
- Customer Mobility
- Energy and the Environment
- Operations

¹¹⁰ For more information see: <https://zenzic.io/about/from-meridian-to-zenzic/>

2.7.4 Overview of existing grant funding programmes and relevant calls

As can be seen in the graph below, the UK grant funding schemes are generally focused on specific technology readiness levels but with some overlap.

Technology Readiness Level (TRL):

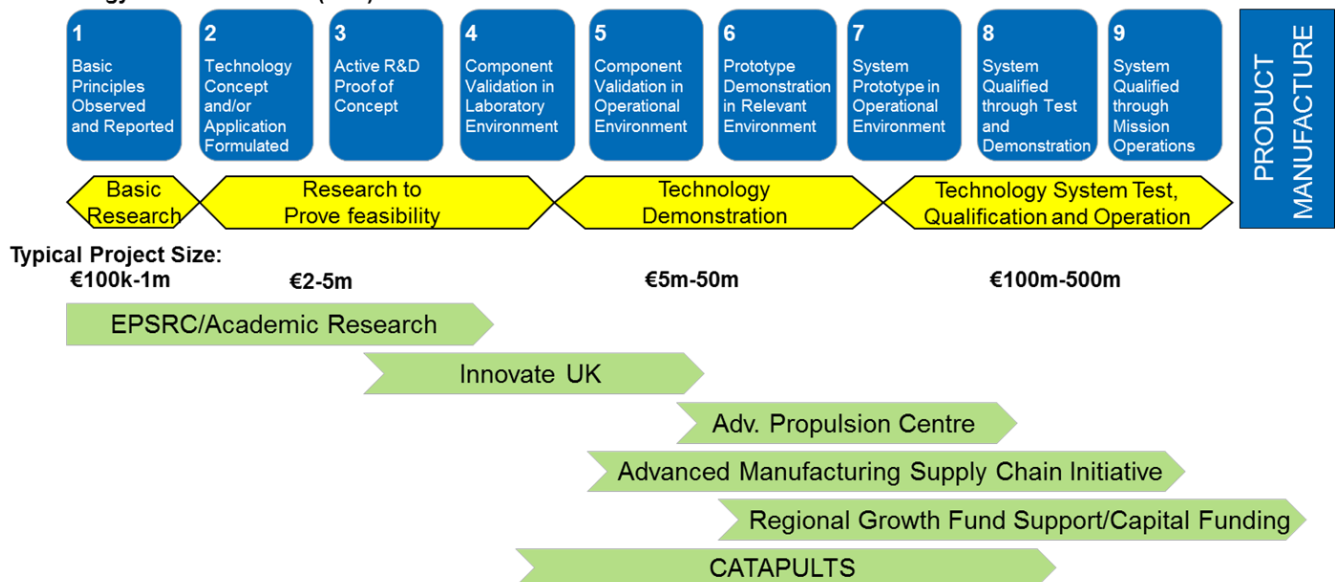


Figure 16 TRL for different funding programmes in the United Kingdom

2.7.4.1 Calls of the Engineering and Physical Sciences Research Council (EPSRC)

EPSRC provides funding for academic research, mainly for basic research of TRL 1 to 3. It is the main funding agency for engineering and physical sciences research. Their portfolio covers a vast range of fields from healthcare technologies to structural engineering, manufacturing to mathematics, advanced materials to chemistry.

EPSRC accepts open calls (unsolicited proposals) and specific calls for proposals. One specific transport research call is on “Decarbonising Transport Networks”¹¹¹. This two-phased call funds up to £4 million (£5M FEC¹¹²) 4-5 Networks plus concerned with aspects of decarbonising the UK transport system. Each Network should request funding to support of core research, flexible fund, and support staff (including a Hub Manager) as well as communications, engagement and networking activities.

EPSRC will look to fund proposals that collectively span the breadth of technological approaches to the challenge of decarbonising transport, outlined below.

¹¹¹ Full call text at: <https://epsrc.ukri.org/funding/calls/decarbonisingtransportnetworkplusfull/>

¹¹² FEC – Full Economic Costs

2.7.4.2 Innovate UK – Automotive research funding

Innovate UK works with the Office for Low Emission Vehicles (OLEV) investing between £15-25 million annually in research and development (RTD) projects for automotive research. This Integrated Delivery Programme (IDP) is one of the UK RTD programmes that enables industry-led research into on-vehicle technologies that accelerate the transition to zero emission vehicles in the UK and globally. End of 2018, the 15th competition in the Integrated Delivery Programme (IDP) series was published (with submission deadline on December 10, 2018).

2.7.4.3 APC (Advanced Propulsion Centre)

The Advanced Propulsion Centre (APC)¹¹³ was formed in 2013 from a commitment between the government and automotive industry to position the UK as a global centre of excellence for low carbon vehicle development and production. It is a central pillar of the Industrial Strategy created by the Automotive Council, supporting acceleration of the development of low carbon advanced propulsion systems and vehicle weight reduction.

The APC team brings together and supports those who have good ideas in the form of innovative technologies with those who can bring them to market as products. The scope of projects covered by the APC includes four of the five strategic technologies identified by the Automotive Council:

- Electric machines and power electronics
- Energy storage and management
- Internal combustion engines
- Lightweight powertrain structures

The APC manages a £1 billion investment fund, which is jointly supplied by the automotive industry – via the Automotive Council – and the UK government through the Department for Business, Energy and Industrial Strategy (BEIS) and managed by Innovate UK. Of this £1 billion research funding, £500 million is government funding from BEIS, the remaining £500 million is provided by companies.

The Advanced Propulsion Centre (APC) invests up to £30 million, 3 times a year, in collaborative research and development (RTD) projects. These are pre-production projects and must be match funded. In the current round of APC 11, the total invested amount is £20 million. APC 11 is seeking proposals for UK based RTD projects that significantly reduce carbon dioxide emissions and improve air quality.

In order to be funded, all projects must clearly demonstrate that they:

- Deliver significant reductions in vehicle CO₂ or other emissions compared to current best-in-class technologies
- Align with the Automotive Council Technology Group Roadmaps with respect to advanced propulsion solutions
- Develop the UK's supply chain in the field of low carbon vehicle propulsion technology

¹¹³ <https://www.apcuk.co.uk/>

Projects need to demonstrate the development of propulsion technologies based around one or more of the following technology areas:

- Internal combustion engines
- Lightweight vehicle and powertrain structures
- Electric machines and power electronics
- Energy storage and energy management
- Alternative propulsion systems

To be eligible for APC competitions, projects must primarily fall under either the industrial research or experimental development category.

Apart from these core competitions, there is a special programme for **SME support**. SMEs play a crucial role in the UK Automotive Industry. They are key to the supply chain and lead some of the most exciting innovation in the sector. The APC believes it is crucial to provide support for SMEs and offers a number of funding activities, international events and opportunities to grow, in a sector where traditionally they may not have been able to.

The **Technology Developer Accelerator Programme**, often shortened to TDAP, was created to provide support to UK SMEs helping to accelerate their low carbon technologies to the point of commercialisation. We recognise the UK has a wealth of knowledge and expertise in its SMEs, which are important in building a vibrant supply chain. The TDAP initiative helps overcome the challenge for SMEs of engaging in OEM or Tier 1 development programmes.

2.7.4.4 Faraday Battery Challenge

As part of the Industrial Challenge Fund, the **Faraday Battery Challenge** provides in total funding is £246 million and its focused on three areas:

1. Fundamental research
2. Industrial research - developing product
3. How to produce batteries on a large scale (BIG)

For this purpose, the **Faraday Institution** was founded in October 2017¹¹⁴. The Faraday Institution is the UK's independent institute for electrochemical energy storage science and technology, supporting research, training, and analysis.

The Faraday Battery Challenge was launched in July 2017 by the Department of Business, Energy and Industrial Strategy as part of the **Industrial Strategy Challenge Fund (ISCF)**. The ISCF provides funding

¹¹⁴ Website: <https://faraday.ac.uk/>



and support to UK businesses and researchers. The fund is designed to ensure that research and innovation takes centre stage in the government's Industrial Strategy.

The Faraday Battery Challenge is an investment of £246 million over 4 years. It was set up to help UK businesses seize the opportunities presented by the transition to a low carbon economy. It aims to ensure the UK leads the world in the design, development and manufacture of batteries for the electrification of vehicles. The fund is being administered by Innovate UK and the Research Councils.

The Faraday Battery Challenge is supporting battery research from fundamental research through development and innovation to industrial scale up via 3 elements:

1. £78 million for a new 'application-inspired' research programme co-ordinated at a national scale. A large part of this is being led by the newly established Faraday Institution.
2. £88 million innovation programme to stimulate collaborative research and development with co-investment from industry. This will de-risk and enable the steps to get from research through to manufacturing at scale. Calls for projects are managed by Innovate UK.
3. £80 million scale up programme to allow companies of all sizes to rapidly move new battery technologies to market through the creation of an open-access UK Battery Industrialisation Centre¹¹⁵

A consortium of Coventry City Council, Coventry and Warwickshire Local Enterprise Partnership, and WMG, at the University of Warwick, had been awarded £80 million, through a competition led by the advanced propulsion centre and supported by Innovate UK, to establish this new national facility for battery manufacturing development.

Examples of funded projects through Faraday are:

- **HSSMI:** tackling battery waste through reuse, remanufacture or recycling. Batteries that reach the end of their life in automotive could still have a lot of value in a different application. HSSMI's project aims to optimise battery design and increase use in second-life applications.
- **Brill Power:** improving the life of battery packs. Brill Power's battery control and management technology can make lithium-ion batteries live up to 60% longer. It individually manages every cell in a battery pack, to replace individual modules as needed rather than the entire battery.
- **Battery Industrialisation Centre:** new capabilities for the UK. The UK's first automotive battery centre will support high-volume production of innovative battery technologies - helping to rapidly develop and scale up manufacturing and commercialise new products.

2.7.4.5 Industrial challenges

In addition to the Faraday Battery Challenge, other industrial challenges have been established¹¹⁶. Of interest for automotive research are:

¹¹⁵ <https://www.ukbic.co.uk/>

¹¹⁶ The latest funding opportunities are available here:

<https://www.gov.uk/government/collections/industrial-strategy-challenge-fund-joint-research-and-innovation>

- **Driverless cars challenge** – the UK government will invest in industry and researchers to develop next-generation AI and control systems for driverless cars.
 - Funding of £38 million will be available to develop the next generation of artificial intelligence and control systems to ensure the UK is at the forefront of the driverless cars revolution
- **Manufacturing and future materials challenge** – the UK government will invest in industry and researchers to develop next-generation composite materials that are more affordable and lighter weight.
 - Funding of £26 million will be available to develop the next generation of affordable, lightweight composite materials for aerospace, automotive and other advanced manufacturing sectors

2.7.4.6 The Office for Low Emission Vehicles (OLEV)

The Office for Low Emission Vehicles (OLEV) is a team working across government to support the early market for ultra-low emission vehicles (ULEV). OLEV are providing over £900 million to position the UK at the global forefront of ULEV development, manufacture and use. This will contribute to economic growth and will help reduce greenhouse gas emissions and air pollution on UK roads. OLEV is part of the Department for Transport and the Department for Business, Energy & Industrial Strategy.

OLEV funds and manages a programme of industry-led research and development to support emerging technologies which the UK can exploit and lead globally, where full commercial funding is not otherwise available.

2.7.4.7 Low Carbon Vehicle Partnership (LowCVP)

The LowCVP which was established in 2003, is a public-private partnership working to accelerate a sustainable shift to lower carbon vehicles and fuels and create opportunities for UK business. Around 200 organisations are engaged from diverse backgrounds including automotive and fuel supply chains, vehicle users, academics, environment groups and others. The Partnership became a not-for-profit company limited by guarantee in April 2009. Main activities of the LowCVP are to:

- Develop initiatives to promote the sale and supply of low carbon vehicles and fuels
- Provide input and advice on Government policy
- Provide a forum for stakeholders to share knowledge and information
- Ensure that UK motor, fuel and related businesses are best placed to capitalise on the opportunities in the low carbon markets of the future
- Contribute to the achievement of UK Government targets for road transport carbon reduction

2.7.4.8 Zenzic

Zenzic (established as Meridian in 2017) was created by government and industry to focus on key areas of UK capability in the global Connected and Autonomous Vehicle (CAV) sector which is predicted to be

worth £907 billion by 2035. These include advanced development and validation, connected environments, data and cyber security and new service development.

Government and industry have committed an initial £100 million through Zenzic to develop a coordinated national platform of CAV testing infrastructure. The first £51 million was announced in October 2017 and the next funding competition was opened in 2018.

2.7.5 International collaboration in the field of RTD

Newton Fund

The UK's Newton Fund money is classed as official development assistance (ODA). Newton Fund activities need to demonstrate that they are aiming to contribute to a reduction in poverty and aim to further sustainable development (development that is likely to generate lasting benefits for the population of the country to which it is provided) or improve the welfare of the population of Newton Fund countries.¹¹⁷

There are three calls for tenders under the Newton Fund with a transport element:

- Newton Fund: UK-Malaysia urban innovation challenge £3m
- Newton Fund: UK-Guangdong urban innovation challenge £3m
- Newton Fund: India-UK innovation challenge £1.4m

EPSRC funding for International collaboration

As well as acting to further UK researchers' involvement in EU research programmes, we work proactively with partners in China, India, Japan and the US in targeted joint funding initiatives. In line with RCUK strategy to promote collaboration between the best UK and overseas researchers, these four countries are prioritised either because they are historically strong in engineering and the physical and mathematical sciences, or else they are rapidly growing their capabilities in our research areas. RCUK have established offices in China, India and the USA to facilitate collaborations.¹¹⁸

2.7.6 Assessment of funding programmes

For the United Kingdom, the following funding programmes have been selected:

- Faraday battery challenge of the Industrial Challenge Fund
- Advanced Propulsion centre (APC competitions)
- Two calls on Connected and Autonomous Vehicles from Innovate UK and Zenzic (formerly Meridian Mobility)
- Integrated Delivery Platform (IDP) – Innovate UK

¹¹⁷ <https://www.newtonfund.ac.uk/>

¹¹⁸ <https://epsrc.ukri.org/funding/applicationprocess/routes/international/>

2.7.7 United Kingdom – main findings

General findings:

- The UK government has produced a number of policy documents that lay out the strategy for RTD in the transport and energy sector
- Of key importance are the (1) Industrial Strategy, (2) Clean Growth Strategy, and (3) the Road to Zero Strategy
- These strategies target resp. the future of mobility, Britain's low-carbon future and zero vehicle emission by 2040
- These high-level strategies form the basis for the underlying RTD programmes

Findings from grant funding assessment:

- Automotive RTD throughout over the whole TRL scale. This means that a project that received funding in one programme and reached e.g. TRL 6, it may receive additional funding through another programme for e.g. market introduction.
- Strong focus on electric vehicles and battery research (Faraday Battery Challenge). Also automated driving is present (not included in the assessment)
- Relatively fast application procedures (e.g. APC managed three calls for proposals per year.
- Relatively well-defined exploitation strategies, e.g. within the Faraday Battery Challenge an Exploitation Plan is to be included
- Long-term budgets for programmes are known (e.g. APC, Faraday Battery Challenge)
- The funding hierarchy is relatively complex, but with only a few sources of direct funding (mainly the Departments of BEIS and DfT).
- There is a relatively large number of small calls through different organisations, but the majority of calls are managed by Innovate UK, which means a similar application procedure for all these calls.

3 Best practice analysis

3.1 Benchmarking of funding programmes against best practice

The following best practice sheet was developed in Deliverable 2.5 to benchmark funding programmes in the US, Japan, China and Brazil against a best practice.

NAME OF FUNDING ORGANISATION	
Name of programme / project	
Description of programme / project	Short description of main objectives
Covered sector within the programme	<p>Manufacturing sector, subsectors:</p> <ul style="list-style-type: none"> Automotive industry Electricity sector <p>Transport sector, subsectors:</p> <ul style="list-style-type: none"> Road transport Electric vehicles Intelligent transport systems <p>Technology subsectors, e.g.:</p> <ul style="list-style-type: none"> Battery development Next generation biofuels
Main objective(s) of the programme	<p>Environmental / climate change related:</p> <ul style="list-style-type: none"> Reduction of air pollution in cities Reduction of greenhouse gas emissions in the transport sector <p>Energy / resource efficiency:</p> <ul style="list-style-type: none"> Reduction of fossil fuel consumption <p>Economic:</p> <ul style="list-style-type: none"> Improve competitiveness of automotive industry
How are the targets / objectives defined?	<p>Quantitative:</p> <ul style="list-style-type: none"> Emission reduction targets (for e.g. PM, NO_x or CO₂) Targets for EVs Fully automated vehicles on the road by the year 202x <p>Qualitative:</p> <ul style="list-style-type: none"> Improve competitiveness of the automotive industry Move towards full EV by the year 202x
Eligibility of the programme	What type of organisations are eligible to participate and eligible to lead the RTD project? Programmes can be open to all participants (public / private) or have specific eligibility restrictions.
Financing of the programme	Programme to be financed with X% by own funding / no own funding needed

(% of funding, % of co-financing required) – programme open to public and/or private entities?	Share of % of private financing required
TRL addressed (or categorise fundamental research, applied research, commercialisation) ¹¹⁹ MRL addressed (concepts, prototypes, full production)	If TRL, Does the programme address fundamental research, applied research or support market entry? In case of research of higher TRL (e.g. 7 -9), the MRL is mentioned as well.
Examples of business cases and exploitation of projects results	Examples depend on programme, possible questions: <ul style="list-style-type: none"> Is exploitation of results required in the programme? Is the aim of the programme to develop a commercial product?
Verification of project results	Are / how are the project results compared / verified with the objectives
Openness / transparency of the funding process	To what extent is the information for applicants freely available, e.g. online.
Duration / flexibility of the application process	The duration of the application process, e.g. time for submission from call announcement to submission deadline. What is the duration of the evaluation process and the contract negotiation process?
Preliminary assessment of the programme	
Overview of strengths and weaknesses of the programme	Overview by the authors of Strengths: <ul style="list-style-type: none"> ... Weaknesses: <ul style="list-style-type: none"> ...
Comments	Comments to strengths and weaknesses by other experts
Main data sources	List of main literature

To enable comparison and ranking of different funding programmes, a pre-defined best practice example was developed. The best practice example is defined based on the analysis of the grant programmes in the study. The criteria in red are those that are measured, the ones in blue are compared but without awarding a score.

NAME OF FUNDING ORGANISATION	BEST PRACTICE
Name of programme / project	Name
Description of programme / project	Description
Covered sector within the programme	Covering more sectors is not necessary an example of best practice, but it has certain advantages. It generally attracts more applicants;

¹¹⁹ Information limited to TRL, as info on MRL was not available in any of the grant programmes and would have been based on rough estimates only.

	<p>research results are usually noticed by a larger group of stakeholders (increasing the exposure of results) and it enables cross-sectoral exchange of experience and know-how.</p> <p>However, there may also be an advantage of a more strictly specified (sub-)programme, e.g. for the automotive sector. This may attract a specific group of specialised stakeholders.</p>
Main objective(s) of the programme	A best practice funding programme has identified clear long-term targets for society. These can be social, economic or environmental targets, or a combination of these.
How are the targets / objectives defined?	Targets can be both qualitative as well as quantitative. Programmes should usually include a combination of both; qualitative targets that show the general objectives and direction of the programme and quantitative targets that enable evaluation afterwards.
Eligibility of the programme	Programmes can be open to all participants, independently on whether they are public or private or large or small (large enterprise vs. SME). Some programmes do have eligibility restrictions and are specifically aimed at private companies (either in a lead or partner role). Others are eligible for public research organisations only.
Financing of the programme (% of funding, % of co-financing required) – programme open to public and/or private entities?	<p>The possibility to co-finance research differs between public and private actors (e.g. more difficult for universities than for private enterprises), but in general, co-funding research may increase the commitment to utilise the research results afterwards.</p> <p>Applied research usually requires more co-financing from the applicant than basic research. ¹²⁰</p> <p>Related to this, programmes open to both public and private entities more likely facilitate the exchange of ideas between the research community and private actors.</p> <p>The percentage of support is not assessed as a higher funding percentage does not necessarily mean a better programme.</p>
TRL addressed (or categorise fundamental research, applied research, commercialisation)	Not so much a criterion of best practice as a way to categorise research funded by the programme.
Examples of business cases and commercialisation of projects results	This depends on the TRL / MRL that is addressed by the project, but it is important to mention how the research results are used afterwards (e.g. for follow-up research or commercialisation)
Verification of project results	Research results of the projects should be monitored and at regular intervals compared / verified with the objectives of the programme
Openness / transparency of the funding process	What is mentioned here is to what extent the information for applicants is freely available. The more information publicly available, the easier it is for a potential applicant to consider whether it is meaningful to prepare a project proposal.

¹²⁰ E.g. in the EC HORIZON 2020 programme, research and innovation actions do not require co-financing from private entities (100% funding of eligible costs) while innovation actions with higher TRL do (70% funding of eligible costs).

Duration / flexibility of the application process

A combination of enough time for application and fixed timeline (without delays) for the evaluation and contract negotiation process.

3.2 Assessment of research funding examples

This section includes an assessment of research funding examples based on the pre-defined best practice example from the previous section. For each country, at least four RTD funding programmes are presented¹²¹. The following table includes the summary of the funding assessment for those programmes where sufficient information was available, showing the score and key features of the respective programmes. Detailed descriptions of the funding programmes are shown in the Annex.

Country	Funding organisation	Programme	Key features	Score
Austria	KLIEN (Climate & Energy Fund)	Zero emission mobility	Programme addressing electric mobility. Focus is on the integration of electrified, automated and publicly accessible mobility in urban and rural transport. Projects need to contribute to national Climate & Energy Strategy	9+
Austria	FFG (Research Promotion Agency)	Basisprogramm	Thematically open programme that finances (industrial) development projects of private companies. Results should be commercially exploitable products, processes or services. Programme is open for calls at any time.	7+
Austria	FFG	Mobility of the Future – Automated driving	Specific R&I projects in the field of automated driving	7+
Austria	FFG	Mobility of the Future – Freight transport	Specific R&I projects in the field of freight transport	7+
Czech Republic	Technology Agency of the Czech Republic	TRANSPORT 2020+	First transport specific RTD programme in the Czech Republic	5+
Czech Republic	Technology Agency of the Czech Republic	TREND	Experimental development programmes with special attention for automotive and Industry 4.0	6+
Czech Republic	Technology Agency of the Czech Republic	EPSILON	Thematically open programme for the support of applied research and experimental development. Within programme monitoring of utilisation of results up to three years after project end	6+

¹²¹ The programmes from Italy are not included here as some key information is missing to make a complete assessment.

Czech Republic	Ministry of Industry and Trade	TRIO	Support for industrial research, lead organisation to be private company	6+
France	ADEME	Transport & sustainable mobility	Programme in line with national policy towards sustainable mobility. It promotes development of technologies, services and innovative solutions.	6+
France	ADEME	Experimentation for autonomous vehicles on road	Support the use of CAV, technologies marketable by 2022	6+
France	ADEME	Hydrogen mobility ecosystems	Practical (market introduction support) for hydrogen infrastructure	8+
France	ADEME	Experimentation for the development of MaaS	Experiments with MaaS concepts (replicability of solutions required)	8+
Germany	BMVI	Automated and Connected Driving	Application oriented research in the field of CAV and digitization	6+
Germany	BMU	Renewably Mobile	Programme funds electric mobility projects like coupling EVs to renewable energy, market launch of EVs with ecological standards, resource availability & recycling.	8+
Germany	BMW i	New Vehicle and System Technologies	Funding of technologies for CAV and for innovative technologies like light weighting.	6+
Germany	BMW i	ELECTRIC POWER II	Contribution to technical leadership in the field of EV production taking into account the whole value chain	5+
United Kingdom	Industrial Challenge Fund	Faraday Battery Challenge	Support for R&I projects (business led) that develop new and improved battery technologies that are more cost effective. Route to market included in proposal.	10+
United Kingdom	Advanced Propulsion Centre	APC competitions	Applied research up to market introduction. Detailed evaluation of ongoing / finalised projects	10+
United Kingdom	Innovate UK & Zenic	Connected & Autonomous Vehicles competitions	Financing for the UK testing ecosystem for CAV, wider impact of research to be described	7+
United Kingdom	Innovate UK	Integrated Delivery Platform	Funding for ultra-low emission technology, exploitation plan required.	8+

4 Main findings

4.1 Main findings from this study

The European countries studied have introduced specific research programmes (and calls) for automotive research in the field of electric vehicles, hydrogen fuelled vehicles and automated vehicles. In all countries there is a strong interest to support domestic industry (e.g. making it more competitive), become leader in one or more areas of automotive research and addressing environmental challenges. This section shows the combined results of the funding programmes with regards to TRL, topics addressed, budgets, RTD expenditures relative to (industrial) GDP.

4.1.1 Combined results of funding

The type of research funded in the different countries is shown in the graphs below. First the TRL addressed by the different funding programmes is shown in the figure below (for the 6 MS and the EU).

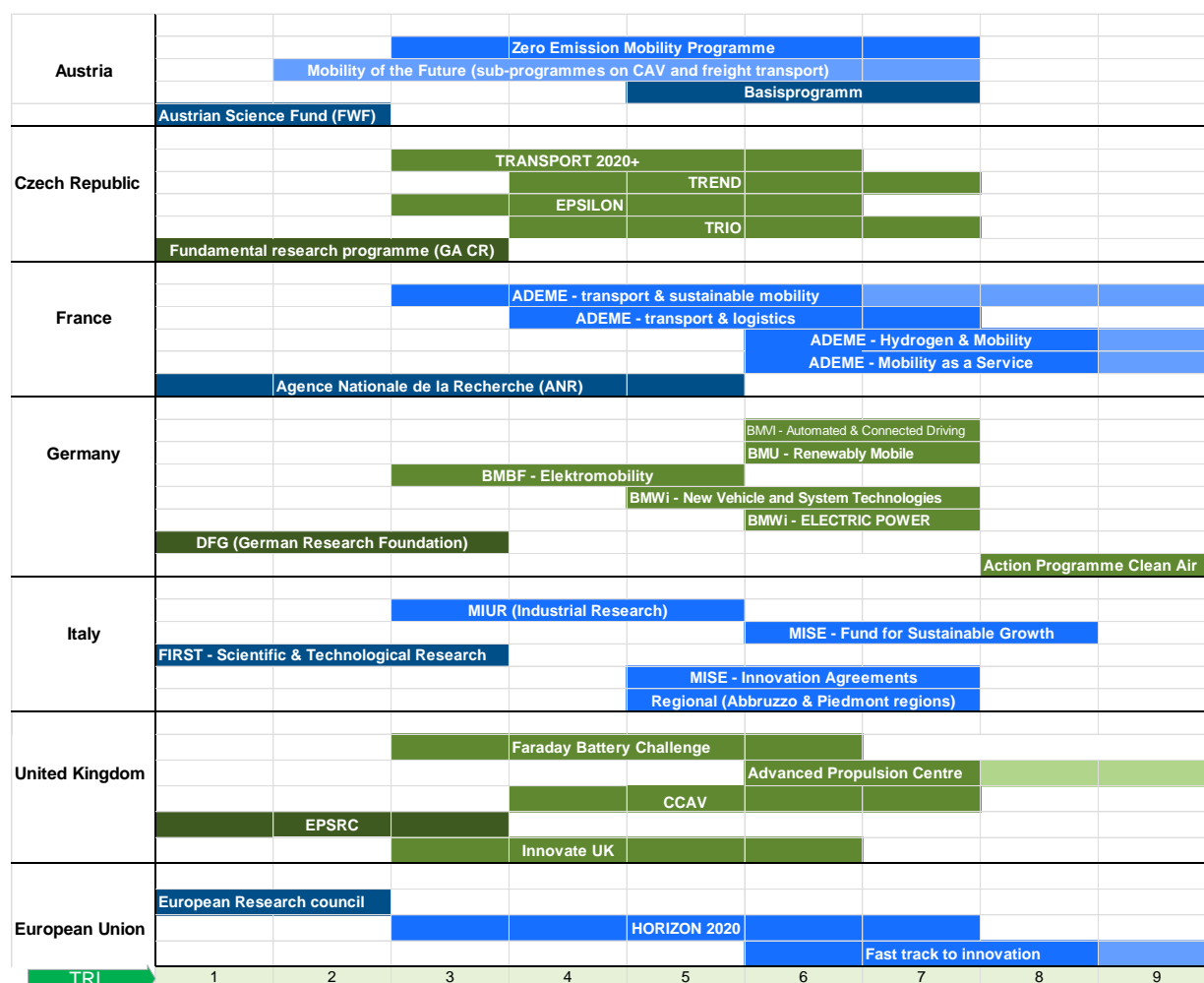


Figure 17 TRL for the transport RTD funding programmes in the six EU Member States and at the EU level

As can be seen from the figure, specific transport RTD programmes can be found in the range of TRL 3 to 7. In addition, all countries have programmes for fundamental RTD (TRL1-2, not transport related) and programmes for market introduction (TRL8-9).

When we compare the European approach towards RTD support, we see that these transport challenges are addressed primarily through thematic programmes in Austria, Germany, France and the United Kingdom. The approach to RTD support in the Czech Republic and Italy is mainly through funding in cross-sectoral programmes.

COUNTRY	ICE	Electric vehicles	Hydrogen / fuel cells	CAV	Infrastructure / logistics	Cross-sectoral
Austria		Zero emission mobility				
				Mobility of the Future		
					Mobility of the Future	
						Basisprogramm
Czech Republic				TRANSPORT 2020+		
			TREND			TREND
						EPSILON TRIO
France		ADEME - Sust. Mobility				
			ADEME - Hydrogen	ADEME - CAV		
					ADEME - MaaS	
						ANR
Germany				BMVI - CAV		
		BMU - Renewably Mobile		BMU - Renewably Mobile		
		BMW - New Vehicle and System Technologies		BMW - New Veh. & S.T.		
		BMBF - Elektromobility				
			Progr. H2 & Fuel Cells			
Italy					BMW - Electric Power II	
		MIUR - Industrial Research				
						MIUR
		Regional programmes				MISE - FCS MISE - Innov. Agreements Regional programmes
United Kingdom		Faraday Battery Challenge				
		APC Competition				
				CCAV		
		EPSRC				EPSRC
European Union						
			HORIZON 2020			Eur. Research Council Fast track to innovation

Figure 18 Research topics addressed by the different funding programmes

4.2 Funding budgets

In addition, funding budgets in the field of electric vehicles / battery research etc. could be compared, The figure below shows the funding amounts in the USA, Japan and China for programmes where data were available.

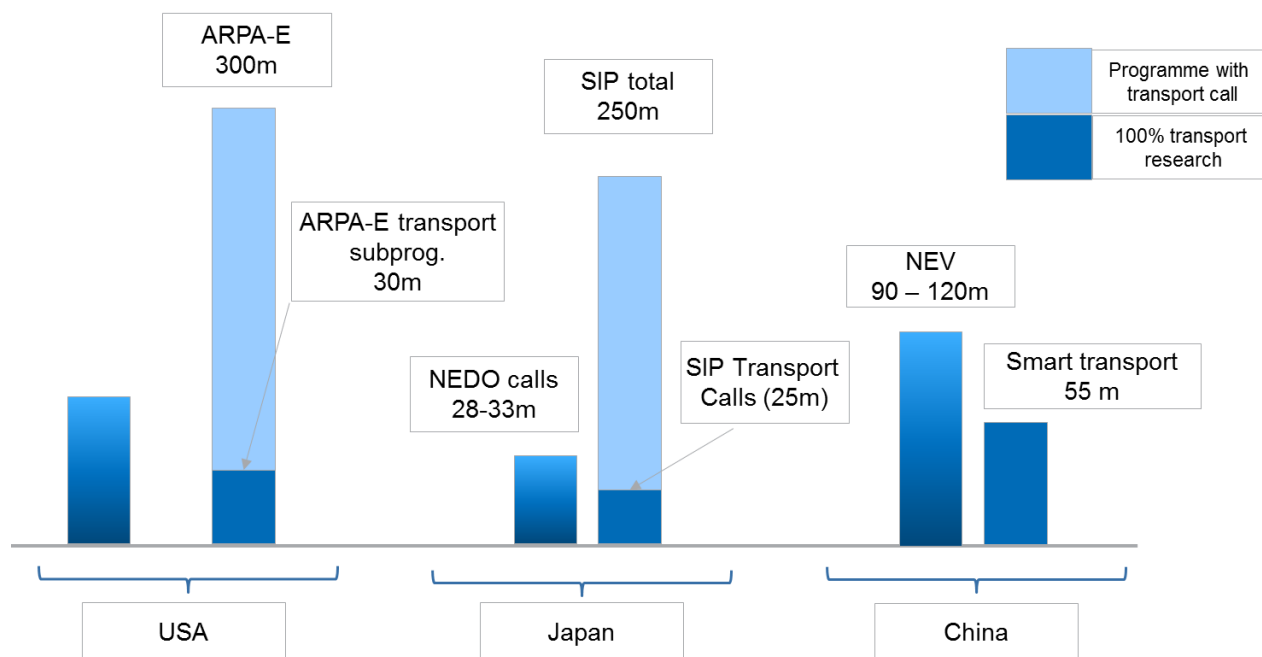


Figure 19 Research budgets – comparison of annual budgets (in €) in the US, Japan and China

To see if comparable funding amounts are provided in the EU and outside the EU, budget data have been collected for the six EU countries and for the Horizon 2020 programme. The following table shows the annual RTD funding in the transport sector. It shows the RTD programmes that (at least partly) fund automotive research including annual budgets and when available, call budgets and typical project budgets.

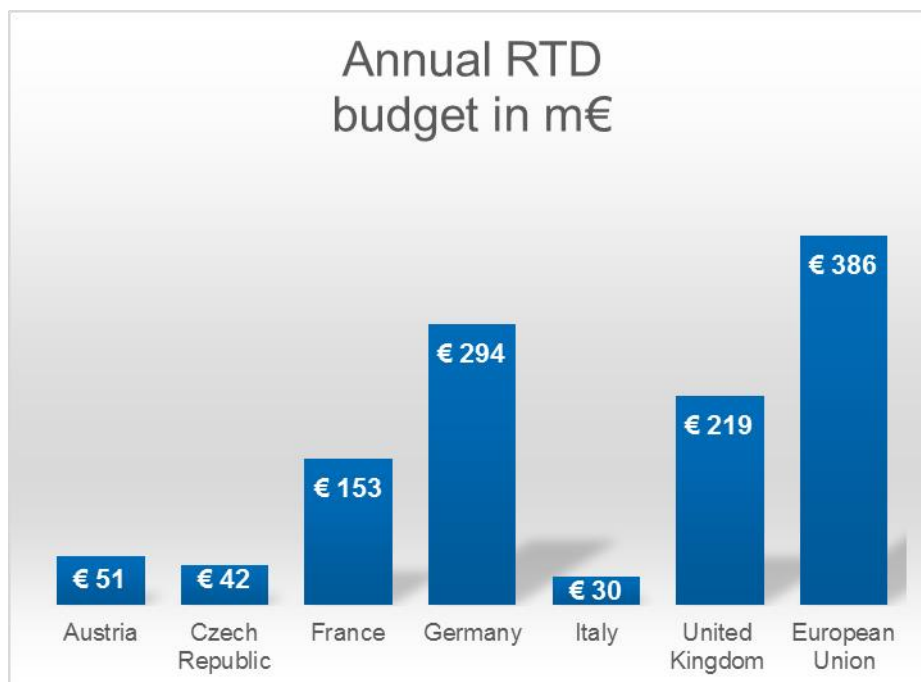
Table 20 shows the RTD budgets in the transport sector for the six European countries analysed. It has to be noted that some of the programmes in Austria and the Czech Republic are cross-sectoral, but based on expert estimates it was possible to estimate the share of transport related projects (usually between 10 to 20% of project budget). Budget figures are based on 2018 or 2019 calls for proposals. H2020 funding (annual budget average for 2018-20 calls) included for comparison.

Country	Organisation	Programme	Annual Budget (k€)	Share (%) of transport RTD projects	Annual RTD budget transport (k€)
Austria	KLIEN	Zero Emission Mobility	7,000	100	€ 51,450
	FFG	Basisprogramm	197,000	10	
	FFG	Mobility for the Future	18,000	100	
	FFG	ICT for the Future	11,000	30	
	FFG	Production of the Future	23,000	15	
Czech Republic	TA CR	TRANSPORT 2020+	19,600	100	€ 42,350
	TA CR	TREND	78,500	20	
	TA CR	EPSILON	20,000	5	
	TA CR	Nat. Centre of Competence	3,000	5	
	Min. Industry	TRIO	61,000	100	

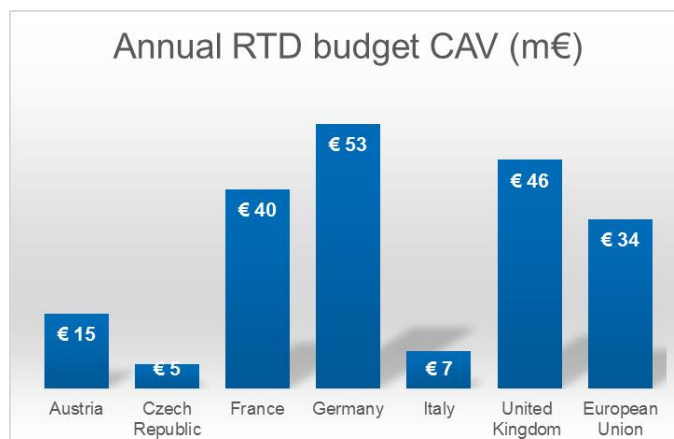
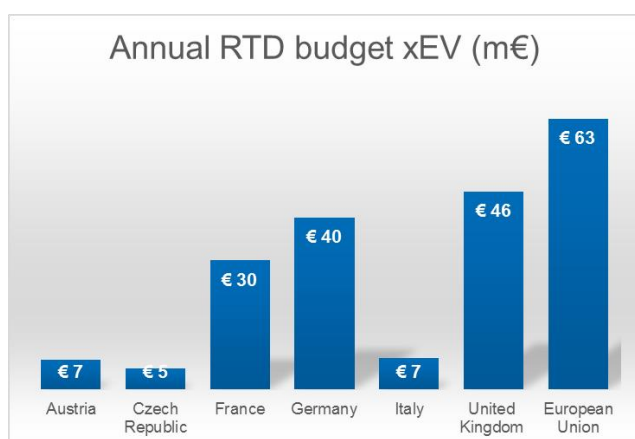
France	ADEME	Transport & Sust. Mobility	30,000	100	€ 153,000
	ADEME	Autonomous vehicles	40,000	100	
	ADEME	Hydrogen & fuel cells	50,000	100	
	ADEME	Mobility as a Service	15,000	100	
	BPI France	Transition from diesel	18,000	100	
Germany	BMVI	Automated & Connected Driving	25,000	100	€ 293,500
	BMU	Renewably mobile	40,000	100	
	BMBF	Elektromobility	40,000	50	
	BMBF	Mikroelektronik	27,000	33	
	BMBF	Sustainable Urban Mobility	8,500	100	
	BMVI / BMWi	Hydrogen & fuel cells	25,000	100	
	BMW i	New Vehicle & Syst. Tech.	56,500	100	
	BMW i	Battery Cell Research	23,000	100	
	BMW i	ICT for Electric Mobility	15,000	100	
	BMW i	Electric Power II	10,000	100	
	BAST	Road transport RTD	47,000	50	€ 29,500
Italy	MIUR	Industrial Research	29,500	100	
	MISE	FCS	-	-	
	MISE	Innovation Agreements	-	-	€ 218,500 (£190,000)
United Kingdom	Industrial Challenge Fund	Faraday Battery Challenge	£25,000	100	
	APC	Advanced Propulsion Centre	£65,000	100	
	Innovate UK	CCAV	£40,000	100	
	Innovate UK	Integrated Delivery Platform	£20,000	100	
	Innovate UK / OLEV	Electric vehicle charging	£20,000	100	
	Highways England	Road Transport RTD	£20,000	100	€ 386,000
European Union	INEA	Horizon 2020 – Transport, of which:	386,000		
	INEA	Mobility for Growth	95,000	100	
	INEA	Green Vehicles	63,000	100	
	INEA	Automated Road Transport	34,000	100	
	INEA	Batteries	60,000	100	

Figure 20 RTD budgets in the transport sector for the six European countries and the EU

From the six countries, the highest RTD budget is in Germany, followed by the United Kingdom and France. Austria and the Czech Republic have similar funding levels, while in Italy grant programme funding is the lowest. The annual RTD budgets for road transport are summarised in the figure below.



A comparison was also made of the RTD funding of xEV (hybrid and electric vehicles) and CAV (connected and automated vehicles). Figures are again based on 2018 or 2019 calls for proposals. Horizon 2020 funding calls (annual averages from 2018 to 2020) on GV (Green Vehicles) and ART (Automated Road Transport) are included for comparison. Budgets for xEV and CAV in France, Germany and the United Kingdom are similar to the funding of the latest call budget from the Horizon 2020 programme.



4.2.1 Comparing funding budgets – European / non-European funding

It was possible to compare total RTD funding in the field of road transport research, the total budget and the budget spend on electrified vehicles (xEV).

Country	Annual transport RTD budget in m€	Annual xEV RTD budget in m€
Austria	51	7
Czech Republic	42	5
France	153	30
Germany	294	40
Italy	30	7
United Kingdom	219	46
European Union (EU level funding only)	386	63
European Union (EU & MS level funding)	1,492	190
China	1,000 ¹²²	120
Japan	350 ¹²³	97
United States	750 ¹²⁴	140

The funding of the single member states and the funding provided on EU level is lower than that what is provided by China, Japan and the United States. But when adding up the funding of MS and EU, the RTD funding in Europe is significantly higher than in the other major economies.

4.2.2 Comparing funding budgets – RTD funding as % of GDP

Available RTD funding per country depends to a certain extent on the size of the economy. Therefore, the table below shows total RTD expenditures (public & private) in the countries addressed in the study and the RTD intensity (RTD expenditure as a percentage of GDP).

USA and Japan have a higher RTD intensity than the EU. China and the EU as a whole have similar spending %. Austria and Germany spend significantly more on RTD than is the EU average.

Country	RTD expenditures (m€) – 2017	RTD intensity as % of GDP
Austria	11,679	3.16
Czech Republic	3,433	1.79
France	50,099	2.19

¹²² Data from the EGVI 10 years impact assessment – an estimate of 1 bln € per year research funding in China

¹²³ Budget for Japan based on: sum of funding from METI (Ministry of Economy, Trade and Industry), Innovation agency NEDO and SIP inter-ministerial research programme

¹²⁴ Budget for USA based on: sum of funding from DOE (Department of Energy) that includes VTO, ARPA-E, National laboratories (vehicle research) and funding from DTO (Department of Transportation)

Germany	99,052	3.02
Italy	23,355	1.35
United Kingdom	38,898	1.67
European Union (EU28)	318,108	2.07
China	203,202	2.13
Japan	129,819	3.20
United States	453,261	2.80

Source: Eurostat, 2019

The following table shows the RTD intensity of *publicly* funded transport RTD, as % of industrial GDP (in PPP). Contrary to the previous table it only shows transport RTD and only public funding.

It is compared to industrial GDP, which varies between 20 to 40% of total GDP (based on the importance of the industry in each country).

According to this comparison, Austria, the Czech Republic and the United Kingdom have the highest RTD intensity, with Germany and France being on a similar level. RTD intensity is slightly lower in China, Japan and the US compared to the EU average.

Country	Transport RTD expenditure (k€) – 2018 or 2019	RTD intensity as % of industrial GDP (PPP)
Austria	51,450	0.046
Czech Republic	41,650	0.033
France	153,000	0.031
Germany	293,500	0.025
Italy	29,500	0.006
United Kingdom	218,500	0.041
European Union (EU28)	1,492,000	0.032
China	1,000,000	0.012
Japan	350,000	0.024
United States	750,000	0.022

4.3 Main findings from the Report on International Competition and Best Practices in Road Transport Innovation

Deliverable 2.5, the *Report on International Competition and Best Practices in Road Transport Innovation* included an assessment of the national funding mechanisms for road transport RTD in the USA, China, Japan and Brazil. These findings are repeated here as they are an important input to the recommendations for RTD funding in Europe.

The main findings from the United States are the following:

- There is strong attention for commercialisation of project results is of key importance as is shown by the large number of initiatives from research organisations in this field (e.g. NSF, DOE or DOT). Commercialisation is either addressed through separate programmes (e.g. in case of low TRL research from the NSF) or directly in the funding calls (e.g. in case of the SBIR programme)
- The ARPA-E Agency combines funding calls with a clear focus and objectives (based on e.g. national policy strategies or demands from the market) and open calls that fund potentially disruptive technologies not funded under any other call.
- The same agency has a strict merit review process. Although this is common in other US programmes as well, ARPA-E may terminate or redirect projects that fail to achieve predetermined go/no go decision points or technical milestones/deliverables
- The Small Business Innovations Research (SBIR) and Small Business Technology Transfer (STTR) programs – RTD initiatives across the federal government specifically targeting SMEs

The main findings from Japan are the following:

- National RTD strategies in Japan take into account other societal challenges, such as ageing of the population and energy security
- Apart from RTD programmes addressing specific themes, there is an integrated research approach through the SIP programme. This programme unites research, testing, demonstration and implementation in one single governmental programme.
- Japan's innovation agency NEDO actively analyses information on technology fields both inside and outside of Japan. This information is then used to formulate technology strategies.
- For a period of five years after a project ends NEDO carries out follow-up monitoring of project participants and impact of project results.

The main findings from China are the following:

- The National Key RTD Programmes (“NKPs”) in China address topics like “new energy vehicles” and “– Integrated and Intelligent Transportation” in annual tenders for periods of 3 to 5 years.
- There is a separate National Key Programme combining internet of things and smart cities, such a combination of funding not seen in other countries.
- There is a special Technology Innovation Guidance Fund whose aim is to stimulate the transfer & commercialisation of scientific technology results by supporting the activities of innovative start-ups & SMEs

5 Conclusions and recommendations

This section addresses the main findings from the funding programme analysis and the best practise criteria assessment. This is followed by messages and recommendations based on this analysis and on the findings from D2.5.

5.1 Main findings – funding programmes analysis

The in-depth analysis of the road transport funding landscape in the six European countries has led to the following key findings:

- The main transport challenges of the future are addressed in the RTD funding programmes of the six EU Member States. Support is available for topics like CAV, electrification (including charging infrastructure), hydrogen, improving ICEs and other vehicle technologies such as light weighting.
- Funding budgets differ per country, depending to a certain extent on the size of the economy. When comparing budgets of single funding programmes in European countries with those of e.g. the USA or Japan (e.g. funding calls for topics like xEV and CAV) we see that these are similar in size, at least in the larger economies (Germany or the United Kingdom).
- Transport challenges are addressed primarily through thematic programmes in Austria, Germany, France and the United Kingdom.
- The approach to RTD support in the Czech Republic and Italy is different. RTD funding is mainly provided through cross-sectoral programmes.
- Management of RTD funding programmes is by one or two dedicated agencies in Austria, the Czech Republic, France and the United Kingdom. A different approach is taken in Germany, with independent programme managers (“Projekträger”) selected for single RTD funding programmes.
- RTD funding programmes are often closely linked to other national policy initiatives, like action plans and roadmaps. Several such examples are:
 - The Zero Emission Mobility Programme that builds upon the Austrian Climate and Energy Strategy
 - The call Vehicles and Transport of the Future (testing of CAVs) builds upon the French Industrial Autonomous Vehicle Roadmap
 - The Faraday Battery Challenge, supporting battery research, is one of the “sectoral” strategies of the UK’s Industrial Strategy
- Funding calls are transparent, key information easy to find. Often the information is only available in national language, although applicants from other EU member states are often welcome to apply for funding as well.
- Large differences remain in the duration of funding calls (meaning the application & evaluation periods) from application procedures lasting four months (e.g. the UK’s APC managing three calls per year), to almost a year in other countries (due to either relatively long submission periods or evaluation periods)
- In addition to government funded RTD programmes, there are alternative ways of financing RTD that provide significant additional funding:

- PPP (Public Private Partnerships), e.g. in Germany the FVV (the Research Association for Combustion Engines) finances research through members' contribution (combined with public funding)
- RTD tax credits are available for private companies when carrying out RTD projects with own funding. RTD tax credits are primarily used in France and Italy

5.2 Main findings – best practice criteria assessment

Based on the best practice assessment of the RTD funding programmes in each of the six countries, we can conclude that in order to develop an RTD funding programme that resembles best practice, the following guidelines should be considered:

- RTD funding programmes should include clearly defined objectives and (performance) targets, such that the specifically envisaged results might be achieved. This also enables easier verification and evaluation after project end.
- Programme targets that are in line with the (long-term) objectives of the (automotive) industry have a better chance of exploitation of the results.
- Monitoring of the use of project results for a specific amount of time after the end of the funding could show if the research projects funded lead to the (long-term) results that were stated at the start of the work. Such monitoring may better identify lessons learned from existing funding practices and improve upcoming funding programmes.
- Promoting the use of research results by setting up a fund for exploitation (with financial contributions from both public and private actors) could be the right way of ensuring that RTD project results are adopted. In addition, exploitation or commercialisation of research results should be part of a funding process. This could be either through a separate programme or initiative that aims to use project results afterwards (often applied for lower TRL research) or through exploitation as part of the project (in case of medium to higher TRL).
- Openness and transparency of the application process helps applicants to orient themselves quickly in the different grant funding opportunities. All countries studied have developed web-based platforms for grant applications.

In addition to these findings from the best practice assessment, some additional guidelines can be given based on the country analysis:

- Specific programmes give better possibilities to evaluate the results of RTD funding. On the one hand it is easier to set sector specific targets, on the other hand the impact of different calls can be measured more easily.
- If there is no specific research question or specific research priorities, then it is easier to set up more generic programmes. When the general aim is to support RTD in the industry and give applicants the freedom of submitting any type of breakthrough technology, then such a programme may be more suitable. But detailed evaluation will be more difficult with such a programme.
- Not all countries should necessarily support all research. E.g. in the situation that there are European funding programmes and national funding programmes, Member States could better

support research in technologies where they excel, preventing a large set of small programmes with potentially only small impact.

- At least four of the countries view that it is more efficient when RTD is directed through a few organisations only (usually one or two). This leads to similar grant application procedures for all programmes, making the procedure more transparent for applicants.
- The German approach with the appointment of independent project managers, could be copied in other countries as well. Outsourcing this work could be a good alternative when the grant agencies themselves cannot cope with the administration, e.g. in case there are a number of ad hoc programmes established that will not have a long duration.

5.3 Key messages and recommendations

When we compare the research challenges in Europe with that of the major economies outside Europe (the United States, China and Japan), we can conclude the following:

- In the USA, Japan, China and in the EU, there is a strong interest to remain world leader in one or more fields of automotive research (such as batteries, xEV or CAV)
- Other long-term objectives that drive transport RTD slightly differ: environmental concerns (addressing air pollution and climate change) prevail in Europe, China & Japan, increasing energy security (USA and Japan), improving road safety (USA and EU), prepare for ageing of the population through CAV (Japan) are other important objectives.

The main reason for studying the transport research landscape in the United States, China and Japan was to find out what Europe can learn from funding practices abroad. Although there is ample experience with grant funded research in Europe, some lessons could be learned in the field of exploitation and commercialisation of project results as well as from follow-up activities.

Therefore, the following general recommendations are suited for new RTD funding programmes both at national as well as on European level:

- There is strong attention to commercialization in e.g. the US and Japan. Specific programmes exist for addressing commercialization of project results. It would be good to compare research results of commercialisation between US, Japan on one hand and the EU and single Member States on the other hand.
- In Japan, RTD project results are monitored up to five years after projects ends. This should be done more systematically in EU funded programmes as well. Some examples already exist:
 - In Austria there is a form of post-project follow-up: a self-evaluation via questionnaire of success/impact of funded RTD projects: new turn-over, new employment, strengthen/new co-operations, new IPR, new licences, follow-up projects 2-3 years after end of funded RTD project. But this monitoring has certain limits because of confidentiality of some data.
 - The United Kingdom evaluates the APC projects after project end and again 18 to 24 months later to assess what the impact of each project has been.

Possibilities should be studied to see what chances there are for monitoring project results but at the same time safeguarding data confidentiality.

- In China, an Innovation Fund exists that enables 1) commercialising results of other funding programmes and 2) supporting the establishment of start-ups. Combination of these two activities is an example to follow.
 - Need to compare this with examples of commercialisation of project results in e.g. the UK (Advanced Propulsion Centre).

Other recommendations

- An RTD grant programme is only one pillar of a strategy towards e.g. zero emission transport. Grant programmes should be combined with other activities into integrated larger action plans (e.g. a national strategy for CAV). When taking e.g. CAV, supporting activities could be the development of standardisation and legislative framework for automated driving systems.
- Presently, the European countries all undertake their own research. This leads to the funding of a relatively small number of projects per country. It could be more effective if (e.g. neighbouring) countries agreed to coordinate their funding initiatives through joined RTD programmes. A first step in this direction could be to open national programmes to organisations from other Member States as well. This is now only the case in a very few programmes.
- In order for programmes to be effective in terms of impact, minimum thresholds in programmes should be considered related to:
 - funding rates: below a certain funding percentage (e.g. < 40%) there will be little interest of private parties to apply for RTD funding and would rather finance RTD from own funding
 - funding size per project: below a certain size, e.g. € 500,000 a research project may have little impact on European level
 - Funding budget per programme: should at least enable a minimum number of projects to be funded (e.g. 3 to 5) creating enough critical mass from the research afterwards.
- A barrier often addressed by both private and public project applicants is the administrative burden. In an attempt to reduce the administrative burden, the EC has recently started a pilot with lump sum funding, where the final funding amount is only dependent on successful project completion and not on cost claims based on timesheets etc.
 - The benefit of such an approach is reducing administrative burden through “cost tracking” during the project period. It may require a different approach in preparing project related documents like proposals, technical annexes to grant agreements etc. The lump-sum approach might suit projects where the outcome can be estimated with some certainty, but not for high-risk low TRL research.
- A remaining issue is how to deal with uncertainty in research as the success of research projects is not guaranteed upfront. There are different ways to deal with this issue, with each of the approaches suiting different types of research.
 - One example is from the US. The merit review process used here includes several go/no-go points during the course of the project. This may lead to termination of a project before the project ends when it becomes clear that project results will not be reached.
 - The approach taken often in Europe is that there are regular evaluation sessions (e.g. every 3 to 6 months) and terminating a project before regular end is a theoretical possibility. This is only the last possible option when other options like scope change are not seen as feasible.

- An alternative possibility would be to split RTD projects in two phases with the second one phase only starting after certain milestones have been reached.

It has to be taken into account that research of lower TRL is generally of a higher risk, i.e. the chance that research results will not be reached is higher. Therefore, a less strict approach would be more suitable here.

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Annex A – Assessment of research funding examples

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Grant programme assessment – scoring table

The table below shows the definition of the scoring from -2 to +2 related to best practice (as defined in section 3.1). Based on these descriptions, a scoring per criterion is provided.

Criteria	2 + score	1 + score	0 score	1 – score	2 – score
Covered sector of the programme	No scoring, only descriptive assessment				
Main objectives of the programme	No scoring, only descriptive assessment				
How are targets / objectives defined	Both specific qualitative & quantitative targets of call included in line with programme objectives	Only qualitative targets of call included in line with programme objective	Lack of data	Only general objectives, related to project call	No information on call targets apart from overall programme objectives
Eligibility	No scoring, only descriptive assessment				
Financing of the programme	Clear co-financing guidelines, information about expected programme size	Information about financing guidelines, expected programme size available	Lack of data	Only general information about expected project size or call budget available	No information about expected project size or call budget available
TRL addressed	No scoring, only descriptive assessment				
Commercialisation of project results	Commercialisation or results is directly mentioned in call text	Commercialisation of results is among main objectives of the programme, not the call	Lack of data	Commercialisation of results is only vaguely mentioned in programme	No mention of commercialisation of results
Verification of project results	Quantitative and qualitative verification process in place	Qualitative verification process in place	Lack of data	Verification is possible based on performance targets set	No indication that project could be verified based on targets

Openness of the funding programme	All required information for funding application / selection process and earlier selections online	All required information for funding application online	Lack of data	Contact details for more information online	Basically, no information about funding programme available online
Duration of the application process	Fixed timeline for proposal submission (with sufficient time) and for evaluation / contract negotiation	Published timeline for proposal submission and for evaluation / contract negotiation, but subject to changes depending on call	Lack of data	Fixed timeline, but often subject to changes, delays in evaluation	No fixed timeline, time for submission is surprise with each call

Austria

For **Austria**, the following funding programmes have been selected:

- KLIEN – Zero Emission Mobility – supporting research and demonstration in the field of sustainable mobility, energy supply – 1st [call for proposals](#) 2018, 2nd [call for proposals](#) in 2019
- The [Basisprogramm](#) from the Austrian Research Promotion Agency (FFG). A thematically open programme, supporting experimental development projects for SMEs and industry
- The programme Mobility of the Future, also from the FFG. This programme supports research related to mobility-related societal challenges; specific calls for proposals in the field of transport in 2019 are the following:
 - [13th call automated driving](#) (Spring 2019)
 - [13th call Freight Transport](#) (Spring 2019)

AUSTRIA – funding programme assessment				
Name of funding organisation	Austrian Climate & Energy Fund	FFG	FFG	FFG
Name of Programme	<i>Zero Emission Mobility programme</i>	<i>13th call Freight Transport</i>	<i>13th call Automated Driving</i>	<i>Basisprogramm</i>

Covered sector within the programme	<i>Electric mobility</i>	<i>Mobility: People, Freight, Vehicle Technologies, Transport Infrastructure</i>	<i>Mobility: People, Freight, Vehicle Technologies, Transport Infrastructure</i>	<i>Cross-sectoral</i>
Main objective(s) of the programme	100 % electrification (batteries, fuel cells, high-performance capacitors) of vehicles and the development and testing of intelligent e-mobility infrastructure.	'mobility-related societal challenges; stimulate existing markets through innovation; generate new markets	Cross-border development and testing of automated systems in European / international initiatives. Specific bilateral and multilateral cooperation with neighbouring countries (e.g. HU & SL) will be strengthened with joint calls for tenders).	Main objective is to strengthen the competitiveness of companies based in Austria.
How are the targets / objectives defined?	2 + Qualitative & quantitative targets. Program should contribute to Climate and Energy Strategy	1 + Qualitative targets.	1 + Qualitative targets.	1 + Qualitative targets.
Eligibility	No limits, both companies and research institutes can apply.	No organisations are excluded. In the "Lead Project", covering at least half of the call budget, specific requirements are set related to the composition of the consortium	No organisations are excluded.	Private companies, SMEs and Start-ups are encouraged to apply.
Financing of the programme	2+ Info on cost sharing & budget per project	2+ Info on cost sharing & budget per project (100,000 - 2 million €, 35-85% funding)	2+ Info on cost sharing & budget per project (max 100,000 €), 35-85% funding	2+ Info on cost sharing & budget per project
TRL addressed	<i>Applied research & development up to demonstration TRL 3-7</i>	2-7	2-7	5-7

Commercialisation of projects results	1+ Detailed dissemination and exploitation plans in the proposal	1+ Detailed dissemination and exploitation plans in the proposal Involving end-users in the proposal	1+ Detailed dissemination and exploitation plans in the proposal	1+ Detailed dissemination and exploitation plans in the proposal
Verification of project results	2+ Project to be verified against stated objectives (methodology available). Self assessment after approx. 1 year of the end of the project	1+ Self assessment after approx. 1 year of the end of the project	1+ Self assessment after approx. 1 year of the end of the project	1+ Self assessment after approx. 1 year of the end of the project
Openness/transparency of the funding programme	1+ Required info on website	1+ Required info on website	1+ Required info on website	0 Required info on website Re-evaluation of project after one year gives uncertainty
Duration of the application process	1+ Fixed duration	1+ Fixed duration	1+ Fixed duration	2+ Submission at any time.
Scoring	9+	7+	7+	7+

General findings of grant programmes in Austria:

- The programme calls analysed target specific areas and are relatively small in size (e.g. 5-7 mln €). But multiple calls exist (e.g. two per year for the Mobility of the Future programme)
- Detailed dissemination and exploitation plans are requested in the proposal.



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- Information on call available after registering on FFG website
- The smaller calls have a fixed duration. The General Programme enables submission at any time. Evaluation rounds are 7 times per year. This gives the applicant maximum flexibility.
- Financing, the transport related calls have similar grant percentages, up to 80-85%. The Basisprogramm combines relatively low grant percentages (20-30%) with low-interest loans, leading to a total support of 50 to 70%.
- Regarding verification of project results, all projects require self-assessment, larger projects within the Future of Mobility programme (above 2m €) an independent assessment. Within the Zero Emission Mobility programme, the proposal must specify the quantifiable targets to be met by the end of the project. This suggests a very thorough evaluation, that's why the full score of 2+ was given.

Czech Republic

For the Czech Republic, the following funding programmes have been selected:

- TRANSPORT 2020+ programme – Technological Agency of the CR) – a new programme, with a [first call](#) launched in 2019 for transport related applied research – low to medium TRL
- TREND programme – Technological Agency of the CR – another new programme with a [first call](#) launched in 2019 supporting industrial research and experimental development. Thematically open programme, but preference is stated for RTD projects in the sector of automotive and Industry 4.0. medium to high TRL
- The [EPSILON Programme](#) of applied research and experimental development (Technological Agency of the CR) *and*
- [TRIO programme](#) – managed by the Ministry of Industry and Trade, a programme for so-called key enabling technologies (KETs)

CZECH REPUBLIC – funding programme assessment				
Name of funding organisation	Technological agency of the CR	Technological agency of the CR	Technological agency of the CR	Ministry of Industry and Trade

Name of Programme	TRANSPORT 2020+	TREND	EPSILON	TRIO
Covered sector within the programme	<i>Transport sector</i>	<i>Industry-wide, transport identified as a priority sector</i>	<i>Industry, priority sectors environment and energy sectors</i>	<i>Industry, Key enabling Technologies (defined in the programme)</i>
Main objective(s) of the programme	<i>Develop transport sector based on societal needs, 4 specific objectives</i>	<i>Increase international competitiveness of Czech enterprises by supporting RTD</i>	<i>Support of applied research projects with high potential for rapid application in new products, production processes and services</i>	<i>Support for industrial research</i>
How are the targets / objectives defined?	1 + Qualitative targets	1 + Qualitative targets	1+ Qualitative targets	1+ Qualitative targets
Eligibility	Programme open to private companies, research organisations and other natural & legal persons.	Lead organisation of a consortium needs to be a private company.	Programme open to private companies, research organisations and other natural & legal persons.	Lead organisation needs to be a private company, with at least one research organisation as partner.
Financing of the programme	2+ Info on cost sharing & budget per project	2+ Info on cost sharing & budget per project	2+ Info on cost sharing & budget per project	2+ Info on cost sharing & budget per project
TRL addressed	<i>Applied research TRL 3-6</i>	<i>Experimental development up to prototype, TRL 4-7</i>	<i>Applied research - TRL 3-6</i>	<i>Experimental development up to prototype, TRL 4-7</i>
Commercialisation of projects results	1+ Application Guarantor (stakeholder that utilises project results) to be identified	2+ Plan for commercialisation to be developed	2+ Application Guarantor (stakeholder that utilises project results) to be identified. Monitoring utilisation of results up to three years after project end	2+ Exploitation plan required Develop “products” that have market potential

Verification of project results	1+ New programme, no verification yet. But possible to verify against stated performance targets	1+ New programme, no verification yet. But possible to verify against stated performance targets	1+ Project to be verified against stated objectives (methodology available)	1+ Project to be verified against stated objectives (methodology available)
Openness/transparency of the funding programme	1+ Required info on website	1+ Required info on website	1+ Required info on website, list of previously funded project	1+ Required info on website, list of previously funded project
Duration of the application process	-1 Fixed duration, short proposal application period	-1 Fixed duration, short proposal application period	-1 Fixed duration, short proposal application period	-1 Fixed duration, short proposal application period
Scoring	5+	6+	6+	6+

Due to the ongoing developments in the Czech RTD environment and the recent increased support for transport RTD, specifically new programmes have been chosen for assessment. This gives the option to address programmes that have a clear transport component, but unfortunately provide little information about programme evaluation yet. The programme documents have stated performance targets, so this should enable verification of the programme results later on. On paper, all four programmes have a relatively high score:

- Information on financing of the projects is clearly stated
- All necessary information on tender procedures is online
- All programmes give particular attention to commercialisation of project results, although the TRANSPORT programme is less specific. All programmes give particular attention to commercialisation and exploitation of project results, with a special role for the so-called application guarantor (a stakeholder that declares its interest to utilize the results).
- All four programmes have very short application periods while the evaluation period is quite long. This requires strong flexibility from the side of the applicant and is viewed as a minus. Especially if we take into account that the evaluation period is almost three times as long (6 months vs. 2 months)

- All programmes support a relatively broad set of topics, in contrast to research programmes in other European countries that are specifically aimed at specific transport topics. The programmes with the exception of the TRANSPORT+ programme do not state any preference for specific technologies. Targets / objectives are, therefore, relatively broadly stated. No reference at all to transport sector targets.
- Financing guidelines are relatively clear. There is one striking feature, co-funding rules are less attractive for private companies. Not only the lower %, but also the fact that there is an additional limit on co-funding per project. Public organisations can receive a higher funding percentage than the maximum funding per project. This means partners have to agree on an internal distribution of funding. Lower financing percentages for private firms means that they may be less interested to participate
- Openness/transparency of the funding programme, information on the funding calls is openly available.

France

For France, the funding programmes selected are all financed by ADEME, the national Environment & Energy Management Agency. The following transport related funding calls have been assessed:

- Transports et Mobilité durable (transport and sustainable mobility) – funding calls in [2018](#) and [2019](#)
- Expérimentation du véhicule routier autonome (Experimentation of autonomous road vehicles) – two-stage funding call in [2018](#)
- H2mobilité 2019 – projects supporting the establishment of "hydrogen mobility ecosystems", defined as areas where hydrogen production and distribution logistics are simultaneously organized. Calls for proposals were published in [2018](#) and [2019](#).
- Experimental development for the Development of Mobility as a Service – funding call in [2018/2019](#)

France – funding programme assessment				
Name of funding organisation	ADEME	ADEME	ADEME	ADEME
Name of Programme	<i>Future Investments (PIA) - transport and sustainable mobility</i>	<i>PIA – Experimentation of the autonomous road vehicle</i>	<i>PIA - Hydrogen mobility ecosystems</i>	<i>PIA - Experimentation for the Development of Mobility as a Service</i>

Covered sector within the programme	<i>Transport, logistics and sustainable mobility.</i>	<i>Transport and logistics</i>	<i>Hydrogen & mobility</i>	<i>(public) transport and logistics</i>
Main objective(s) of the programme	<i>Developing technologies, services and / or ambitious, innovative solutions and sustainable transport (passengers or goods), logistics and mobility</i>	<i>Support pilot projects for the use of autonomous vehicles, marketable by 2022, in the field of individual, shared or collective mobility, freight and logistics</i>	<i>Support for the deployment of territorial ecosystems for hydrogen mobility Setting up of fleets of hydrogen vehicles (cars, buses, light and HD vehicles) or the establishment of hydrogen distribution stations and production facilities.</i>	<i>Create, develop and experiment with mobility as a service concepts carried out by companies (transport supply operators, IT sector) in specific territories</i>
How are the targets / objectives defined?	1 + Qualitative targets, applicants need to be specific in what they address projects should be in line with national policy	1 + Qualitative targets, applicants need to be specific in what they address	1+ Qualitative targets Targets according to the national Hydrogen Deployment Plan	1+ Qualitative targets Lay the foundations for MaaS business models
Eligibility	Project coordinator to be a private company and project to include one or more research organisations as partner	Projects to include at least one or more companies and at least one territory. Consortium may include industry, transport companies, local authorities, research organisations.	Call open to public and private entities.	Consortium to include at least one private company, a research organisation and a territory that will function as pilot area
Financing of the programme	2+ Info on cost sharing & budget per project	2+ Info on cost sharing & budget per project	2+ Info on cost sharing & budget per project	2+ Info on cost sharing & budget per project

TRL addressed	<i>Applied research TRL 3-6 Demonstration projects also financed (TRL 6-9)</i>	<i>Applied research up to development of prototype, TRL 4-7</i>	<i>Experimental development, pilot projects – TRL 6 - 9</i>	<i>Experimental development / pilot projects TRL 6-9</i>
Commercialisation of projects results	1+ Exploitation Plan ("route to market") to be included in proposal	2+ Future commercial exploitation plan required. Results should be replicable	2+ Future commercial exploitation plan required. Results should be replicable	2+ Replicability of the solutions is required
Verification of project results	0 No public evaluation yet (new programme)	0 No public evaluation yet (new programme)	0 No evaluation yet of this competition	1+ The expected impacts of the experiments should be described and quantified during the project
Openness/transparency of the funding programme	1+ Required info on website	1+ Required info on website	1+ Required info on website	1+ Required info on website
Duration of the application process	1+ Fixed duration, relatively long application period	0 Two-phase procedure Fixed duration, relatively short first phase.	2+ Fixed duration, multiple calls during a short time	1+ Fixed duration, relatively long application period
Scoring	6+	6+	8+	8+

Main findings:

- The funding programmes assessed addressed a broad selection of topics (electric vehicles, hydrogen/fuel cells, automated driving, mobility of the future). Each programme is focused on one of these topics and sets specific objectives
- Some of these programmes support projects from medium TRL (applied research) to high TRL (demonstration)
- As all programmes are from ADEME, financing rules are similar (e.g. different funding percentages for different legal entities)

- The objectives of the Transport and Sustainable Mobility call are in line with national policy objectives in that field (e.g. with the Mobility Orientation Law)
- Specific feature is that there is a minimum project size in tow of the four programmes (not often seen). This means that less and larger projects are preferred.
- Application period is relatively long, which is on one hand positive for the applicants, but on the other hand means long process duration.
- Two-phased call (for autonomous vehicles) makes the application process even longer. Reason for doing so is the wish to select limited number of projects of sufficient critical mass
- Future commercial exploitation required in many programmes (especially higher TRL)
- Verification of results not fully clear, but ADEME regularly presents publications with results of previous projects.

Germany

For Germany, the following four funding programmes have been selected:

- [Automated and Connected Driving](#) (AVF) - Federal Ministry of Transport and Digital Infrastructure (BMVI)
- [Renewably mobile](#) - Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)
- [ELECTRIC POWER II](#): Electric Mobility – Positioning the Value Chain - Federal Ministry for Economic Affairs and Energy (BMWi)
- [New Vehicle and System Technologies](#) - Federal Ministry for Economic Affairs and Energy (BMWi)

Germany – funding programme assessment				
Name of funding organisation	Federal Ministry of Transport & Digital Infrastructure (BMVI)	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)	Federal Ministry for Economic Affairs and Energy (BMWi)	Federal Ministry for Economic Affairs and Energy (BMWi)
Name of Programme	<i>Automated and Connected Driving</i>	<i>Renewably Mobile (4th funding announcement)</i>	<i>New Vehicle & System Technologies</i>	<i>ELECTRIC POWER II</i>

Covered sector within the programme	<i>Funding for projects in the field of automated and connected driving</i>	<i>Projects in the field of electromobility</i>	<i>Funding in the field of automated driving and system technologies</i>	<i>RTD projects that contribute to efficient, flexible, robust, reliable and scalable production in electromobility</i>
Main objective(s) of the programme	<i>The aim of the funding is the implementation of application-oriented research projects in the field of digitization, including automation and networking in road transport and interfaces to other modes of transport</i>	<i>Environmental and climate aspects of electric mobility addressed, coupling of electric vehicles to renewable energies and grid integration, market launch of electric vehicle, and on resource availability and recycling.</i>	<i>General targets set in the programme documents</i>	Contributing to technical leadership in the field of electric vehicle production and lightweight construction
How are the targets / objectives defined?	1 + Qualitative targets	1 + Qualitative targets	1+ Qualitative targets	1+ Qualitative targets
Eligibility	Private companies, local / regional authorities and research institutions are eligible to apply.	Commercial enterprises, universities and non-university research and development organisations in Germany as well as regional authorities and public administrations. (SMEs) are encouraged to submit applications.	Programme open to private enterprises, universities and research organisations.	Commercial enterprises (in Germany, in particular, the participation of small and medium-sized enterprises (SMEs) is desired. Scientific institutions and local authorities are entitled to apply.
Financing of the programme	1+ Info on cost sharing & budget per project to project applicants	1+ Info on cost sharing & budget per project to project applicants	1+ Info on cost sharing & budget per project	1+ Info on cost sharing & budget per project to project applicants

TRL addressed	<i>Demonstration up to concept phase TRL 6-7</i>	<i>Applied research and demonstration up to concept phase TRL 6-7</i>	<i>Applied research, TRL 3-5</i>	<i>Applied research and demonstration up to concept phase TRL 6-7</i>
Commercialisation of projects results	1+ Dissemination of project results	2+ dissemination of project results and accessibility to public is mandatory, exploitation plan after project end	1+ Dissemination of project results	1+ Dissemination of project results
Verification of project results	1+ Post programme evaluation	1+ Post programme evaluation by different institutions	1+ Mid-term evaluation available	1+ Post programme evaluation (of ELECTRIC POWER I)
Openness/transparency of the funding programme	1+ Required info on website, only for applicants	1+ Required info on website, only for applicants	1+ Required info on website, only for applicants	1+ Required info on website, only for applicants
Duration of the application process	1+ 2-3 months for assessment of project idea, further 3-4 months for granting	2+ 2-3 month assessment	1+ typically less than one year from submission of proposal to start of projects	0 No info
Scoring	6+	8+	6+	5+

Main findings:

- Broad selection of programmes in the field of electric vehicles and automated driving
- Relatively high project budget
- Some parts of information not easy to access (e.g. info on co-financing), only accessible after direct inquiry

- Information on already funded projects is available, providing useful information to potential applicants.
- Important role of dissemination / exploitation of project results in all programmes. Accessibility to the public is also mandatory, same as having an exploitation plan after the end (projects are also promoted on the websites of the ministries)
- Programme of BMU has the highest score due to mandatory exploitation and short assessment period for application.
- Strong participation of private firms (incl. SMEs) in research projects
- Often more than 1 tender per year, proposal evaluation is usually 2 to 3 months, which is relatively short

Italy

For **Italy**, the following programmes have been selected:

- Programme of the Ministry of Education, University and Research (MIUR)
- Programme of the Ministry of Economic Development (MISE)
- Innovation agreements of the Ministry of Economic Development (MISE)
- Programme of the Piedmont region

A regional programme has been included here due to the lack of specific automotive programmes on national level

Italy – funding programmes assessment				
Name of funding organisation	Ministry of Education, University and Research (MIUR)	Ministry of Economic Development (MISE)	Ministry of Economic Development (MISE)	Piedmont region
Name of Programme	<i>Industrial research programme</i>	<i>Fund for Sustainable Growth (FCS)</i>	<i>Innovation Agreements</i>	<i>Programme of the Piedmont region</i>

Covered sector within the programme	<i>Sustainable mobility, energy</i>	<i>Industry wide programme with specific topic on transport (but no specific budget)</i>	<i>Relevant RTD projects on H2020 topics, linked to industrial plans</i>	<i>Powertrains, new materials, energy</i>
Main objective(s) of the programme	<i>Support for research infrastructures, public private collaboration</i>	<i>RTD projects in the technological areas identified by H2020</i>	<i>Industrial impact and fallouts, innovation at international level</i>	<i>Call for tenders to support industrial research projects and / or development in the scientific-technological area of automotive</i>
How are the targets / objectives defined?	General objectives defined in NRP 1+	Same targets as H2020 0	Targets related to H2020 programme 0	Innovation in the region 1+
Eligibility	Private enterprises and public research organisations.	Private enterprises and public research organisations.	Private enterprises and public research organisations.	Just for enterprises and universities located in Piedmont Region.
Financing of the programme	Info on cost sharing & budget per project to project applicants 1+	Info on cost sharing & budget per project to project applicants 1+	Info on cost sharing & budget per project to project applicants 1+	Info on cost sharing & budget per project to project applicants 1+
TRL addressed	<i>TRL 3 - 5</i>	<i>TRL 6 – 8</i>	<i>TRL 5 – 7</i>	<i>TRL 5 - 7</i>
Commercialisation of projects results	Not fully clear from programme. The NPR does consider dissemination, demonstration etc. as being of key importance. 0 / +1	Demonstration level product, obligation to take on new employees 1+	0	Dissemination and cross fertilization (public events organized by Piedmont Region) 1+
Verification of project results	Evaluation of the NPR 0 / +1			

Openness/transparency of the funding programme				
Duration of the application process	Long duration of tendering process 0	Long duration of tendering process 0	0	Long duration of tendering process 0
Scoring	3+	2+	1+	3+

Based on the relatively limited information available on Italy, when preliminary conclude the following:

- Tendering procedure is long for all programmes, identified as a major disadvantage for applicants.
- National programmes are broadly defined, no specific transport RTD programmes as in other EU MS
- Dissemination and exploitation requirements differ pe programme, more elaborated in regional programmes
- NPR states a number of high-level objectives, not sure how this is adopted into the several programmes.
- Regional programmes have been included here due to the lack of specific automotive programmes on national level.

United Kingdom

For the United Kingdom, the following funding programmes have been selected:

- Faraday battery challenge of the Industrial Challenge Fund
- Advanced Propulsion centre (APC competitions)
- Call on Connected and Autonomous Vehicles – Innovate UK and Zenzic (formerly Meridian Mobility)
- Integrated Delivery Platform (IDP) – Innovate UK

United Kingdom – funding programme assessment				
Name of funding organisation	Industrial Challenge Fund	Advanced Propulsion Centre	Innovate UK & Zenzic	Innovate UK
Name of Programme	<i>Faraday Battery Challenge</i>	<i>APC Competitions</i>	<i>Connected & Autonomous Vehicles</i>	<i>Integrated Delivery Platform</i>
Covered sector within the programme	<i>Batteries for EVs</i>	<i>Low carbon propulsion technologies in automotive</i>	<i>Support for the UK's testing ecosystem for Connected and Autonomous Vehicles</i>	<i>Funding for ultra-low and zero emission on-vehicle technology development (call: IDP 15: the road to zero emission vehicles)</i>
Main objective(s) of the programme	<i>The aim is to support business led RTD in the design and development of batteries for electric vehicles</i>	<i>To support the UK's long-term capabilities in the design, build and manufacture of zero-emission vehicles</i>	<i>To enhance the UK's testing ecosystem through simulation and modelling</i>	<i>Funding for ultra-low and zero emission on-vehicle technology development</i>
How are the targets / objectives defined?	2 + Qualitative targets, applicants need to be specific in what they address (e.g. cost reduction, energy/power density of new batteries)	1 + Qualitative targets, applicants need to be specific in what they address	1+ Qualitative targets, clear expectations of what the project must focus on	1+ Qualitative targets
Eligibility	For UK based business, academic organisation, charity, public sector organisation or research and technology organisation (RTO). Lead organisation to be a UK based business.	Lead organisation needs to be an UK based business. At least one SME to be included in the project. Contribution of research organisations < 30% of budget.	Lead organisation needs to be an UK based business. Contribution of research organisations limited to 30% of budget.	For UK based business, academic organisation, charity, public sector organisation or research and technology organisation (RTO). Lead organisation to be a UK based business.
Financing of the programme	2+	2+	2+	2+

	Info on cost sharing & budget per project	Info on cost sharing & budget per project	Info on cost sharing & budget per project	Info on cost sharing & budget per project
TRL addressed	<i>Applied research TRL 3-7</i>	<i>Applied research up to development of prototype, TRL 5-8</i>	<i>Applied research TRL 3-7</i>	<i>Applied research TRL 3-6</i>
Commercialisation of projects results	2+ Exploitation Plan ("route to market") to be included in proposal	2+ Dissemination and exploitation strategy to include in proposal	2+ Develop detailed plans for further commercial exploitation. Route to market and wider impact of project to be described in detail	2+ Exploitation Plan required
Verification of project results	1+ Possible to verify against stated performance targets (e.g. programme baseline)	2+ Evaluation of APC funding programmes took place. Evaluation of each project at the project end and after 18-24 months of project end	1+ No public evaluation yet (new programme), but common in all UK programmes	1+ Regular evaluations of Innovate UK programmes
Openness/transparency of the funding programme	2+ Required info on website, list of funded projects to date published	1+ Required info on website	1+ Required info on website	1+ Required info on website
Duration of the application process	1+ 5 months (from competition announcement until notification of applicants), 3 month application, 2 month evaluation	2+ Fixed duration, 4 months (from competition announcement until notification of applicants). Three calls per year	1+ Call duration 5.5 months (3.5 month application period, 2 month evaluation)	1+ 6 months (from competition opening until notification of applicants), evaluation itself 3 months
Scoring	10+	10+	7+	8+



EGVI
European Green
Vehicles Initiative

The main findings for the UK are the following:

- Automotive RTD throughout over the whole TRL scale. A project that received funding in one programme and reached at least TRL 6, it may receive additional funding through another programme (e.g. market introduction through APC)
- Strong focus on electric vehicles and battery research (Faraday Battery Challenge) and strong multi-annual support for automated driving (aiming to create unique testing infrastructure).
- Relatively fast application procedures (e.g. APC managed three calls for proposals per year) as compared to other countries.
- Well defined exploitation strategies in all programmes, e.g. within the Faraday Battery Challenge an Exploitation Plan is to be included. APC includes specific programme for SME support.
- APC included project evaluation at the end and an impact report after 18 to 24 months as well. Therefore the highest score is provided for this programme.
- Long-term budgets for programmes are known (e.g. APC, Faraday Battery Challenge, Innovate UK)
- The calls from the Faraday Battery Challenge and the Advanced Propulsion Centre received the highest score due to a strong attention for dissemination and exploitation, strong attention for project evaluation (APC) and specific target setting (Faraday).



Annex B – Details of national funding programmes

This project has received funding from the European Union's Horizon 2020 research and innovation Programme under grant agreement No 723970"

This section includes an assessment of research funding examples based on the pre-defined best practice example from the previous section. For each country, at least four examples are presented.

Austria

The first programme is a funding initiative of the Climate and Energy Fund in support of the implementation of the e-mobility initiative of #mission2030 – the Climate and Energy Strategy of the Austrian Federal Government. The aim of the programme is to contribute to the #mission2030 objectives, including reduction of transport emissions to 15.7 million tonnes CO₂eq by 2030 and fossil-free mobility by 2050. The Climate and Energy Fund programme constitutes the research core required to implement the Austrian Federal Government's e-mobility initiative and plays a key role in transforming the automotive sector in Austria.

NAME OF FUNDING ORGANISATION	Austrian Climate and Energy Fund (KLIEN)
Name of Programme	Zero Emission Mobility programme 1 st Call for proposals, end of 2018. 2 nd Call for proposals, mid-2019 (deadline October 8, 2019).
Description of the programme / project	The programme invites proposals for addressing current electric mobility topics in the three specified pillars – vehicles, infrastructure and users – and tenders for targeted RTD services.
Covered sector within the programme	The 1 st call of the Zero Emission Mobility programme focuses on 100 % electrification (batteries, fuel cells, high-performance capacitors) of vehicles and the development and testing of intelligent e-mobility infrastructure. The focus is on the integration of electrified, automated and publicly accessible mobility in urban and rural transport services.
Main objective(s) of the programme	The 1 st call focuses on 3 thematic areas to achieve this goal: a) Zero-Emission Vehicles b) Zero-Emission Infrastructure c) Zero-Emission Logistics & Public Transport The 2 nd call copies the first two thematic areas but has <i>Zero-Emission Logistics & Public Transport</i> as 3 rd thematic area instead.
How are the targets / objectives defined?	Qualitative objectives of the programme. The Zero Emission Mobility Programme contributes to national targets, which are quantitative (such as reducing emissions from transport by 7.2 million tonnes CO ₂ eq by 2030 and achieving fossil-free mobility by 2050). More specific objectives: - Promote 100% electrification of vehicles

	<ul style="list-style-type: none"> - Enable the development and testing of intelligent e-mobility and hydrogen infrastructure
Eligibility (target groups)	<p>No limits, both companies and research institutes can apply.</p> <p>As the call focuses on Industrial Research and/or Experimental Development, private companies could be slightly more interested to apply. In addition, the call text states that SMEs / start-ups are actively encouraged to participate.</p>
Financing of the programme	<p>An amount of 7 million euros in funding was available for the 1st Zero Emission Mobility call and the same budget is available for the second call (2019).</p> <p>Funding rate differs per category of project: Flagship project (80%), cooperative RTD project (60%), RTD service (100%).</p> <p>In the first two categories it is the maximum funding that differs for different cost categories.</p>
TRL addressed (or categorise fundamental research, applied research, commercialisation)	<p>Applied research up to demonstration, estimated TRL addressed: 3-7</p>
Business cases and commercialisation of projects results	<p>The cooperative RTD and flagship projects submitted are required to complement the research and development work with a demonstration component.</p> <p>Detailed dissemination and exploitation plans in all proposal and a market introduction strategy.</p>
Verification of project results	<p>The proposal must specify the quantifiable targets to be met by the end of the project</p>
Openness / transparency of the funding process	<p>All documentation for proposal submission is available online</p>
Duration / flexibility of the application process	<p>Duration of the procedure is fixed</p> <p>2nd call opened: April 29, 2019</p> <p>Deadline for proposals: October 8, 2019 (in 5 months)</p> <p>Funding decision: December 1, 2019 (in 2 months)</p>
Preliminary assessment of the programme	
Overview of strengths and weaknesses of the programme	<p>Strengths:</p> <ul style="list-style-type: none"> • Focus on e-mobility topics • Fast evaluation period (time needed for funding decision) <p>Weaknesses:</p>

	<ul style="list-style-type: none"> Relatively small calls with three instruments for a total budget of 7 million €
Sources of information	<p>Official documents and website of Zero Emission Mobility programme, available in German & English at:</p> <p>https://www.ffg.at/zero-emission-mobility/1.Ausschreibung</p>

Basisprogramm – General Programme

The funding strategy of General Programme is based on the bottom-up principle. It is open to all branches of industry and research topics and eligible to companies and projects of all sizes. The General Programme aims to strengthen the competitiveness of companies based in Austria by funding the development of new products, processes and services. Funding is up to 50 % (for Start-ups up to 70 %) of total eligible project costs. The FFG uses a combination of several financing instruments - such as grants as well as low-interest loans. With a permanently open call, submission of an application is possible at any time. All projects are analysed and assessed in terms of the technical and economic aspects for funding. Technical funding criteria include the degree of innovation and the technical challenge of the planned project. Economic assessment focuses on the commercialisation potential and the applicant's economic performance. Main target groups of the General Programme are SMEs & Start-ups and large enterprises.

NAME OF FUNDING ORGANISATION	Austrian Research Promotion Agency (FFG)
Name of Programme	Basisprogramm
Description of the programme / project	The programme finances (industrial) development projects of (private) companies, which are carried out alone or in cooperation with development partners and which as a result have commercially exploitable products, processes or services.
Covered sector within the programme	Thematically open, experimental development projects
Main objective(s) of the programme	<p>Main objectives:</p> <ul style="list-style-type: none"> Increasing the research, technology and innovation activities of Austrian companies Exploitation, dissemination and optimization of research and development results <p>Specific objectives:</p> <ul style="list-style-type: none"> For SMEs: broadening their R&I base, supporting start-ups For large companies: strengthening international competitiveness
How are the targets / objectives defined?	Specific targets for SMEs, start-ups or large companies.

Eligibility (target groups)	<p>Programme is primarily focused on private enterprises, but participation of research institutes not excluded.</p> <p>Every natural person or organization outside the federal administration can apply.</p>
Financing of the programme	<p>The amount of the grant depends on the size of the company and is usually for:</p> <ul style="list-style-type: none"> • Large companies: 19% • Medium Enterprises: 25% • Small businesses: 28% • Start-up: 31% <p>Projects may have a size of up to 3 mln €.</p> <p>In addition, FFG provides low-interest loans, and in combination with the abovementioned grant percentages, total support can be up to 50% (up to max. 70% for start-ups)</p> <p>Annual budget of the Basisprogramm was 197m € in 2017.</p>
TRL addressed (or categorise fundamental research, applied research, commercialisation)	<p>Experimental development: TRL 5-7</p>
Business cases and commercialisation of projects results	<p>Market potential / market exploitation of the project proposal is an important selection criterion</p>
Verification of project results	<p>Projects to include interim report which includes a self-assessment of the results so far.</p> <p>Annual evaluation of the whole programme.</p>
Openness / transparency of the funding process	<p>All documentation for proposal submission is available online</p> <p>Detailed information on selection criteria online.</p>
Duration / flexibility of the application process	<p>Applications for funding can usually be submitted on an ongoing basis through eCall.</p> <p>There are 7 jury (evaluation committee) meetings per year, so duration depends on timing of these meetings.</p>
Preliminary assessment of the programme	
Overview of strengths and weaknesses of the programme	<p>Strengths:</p> <ul style="list-style-type: none"> • Submission possible at any time • Thematic openness, single firm funding

	Weaknesses: <ul style="list-style-type: none"> • One-year contracts (to be renewed annually); relatively low funding rate • Competition for the same budget among all economic sectors • Relatively low funding percentages (between 19 and 31%), may not be attractive to all companies to participate.
Sources of information	https://www.ffg.at/programm/basisprogramm (in German, partly in English)

Mobility for the Future – specific calls

The Mobility for the Future programme includes a number of specific calls, two of them are presented below.

NAME OF FUNDING ORGANISATION	FFG
Name of Programme	Mobilität der Zukunft (Mobility of the Future):
Description of the programme / project	Two specific calls: <ol style="list-style-type: none"> 1. Automatisiertes Fahren – Automated Driving 2. Gütermobilität – Freight Mobility
Covered sector within the programme	Specific R&I projects in the field of Automated Driving and Freight Mobility
Main objective(s) of the programme	Call Priorities of the <u>Freight Transport Call</u> : <ol style="list-style-type: none"> 6. Cooperative logistics networks 7. Transport chains and networks 8. Cross-company cooperation 9. lateral thinking in transport logistics 10. Development of new job descriptions Call objectives of the <u>Automated Driving Call</u> : <ul style="list-style-type: none"> • "Enable cross-border development and testing of automated systems and drive participation in European and international initiatives. • Specific bilateral and multilateral cooperation with neighbouring countries (such as Hungary and Slovenia) will be strengthened and stimulated with concrete actions (for example joint calls for tenders). (...)"
How are the targets / objectives defined?	Qualitative targets only

Eligibility (target groups)	No organisations are excluded. In the “Lead Project”, covering at least half of the call budget, specific requirements are set related to the composition of the consortium (at least 5 industrial enterprises of which one SME and at least two research institutions).
Financing of the programme	<u>Freight transport:</u> <ul style="list-style-type: none"> • 5m€ call budget, projects between 100,000 to 2m € • Up to 85% financing of project costs. <u>Automated Driving:</u> <ul style="list-style-type: none"> • 300,000 € call budget, projects up to 100,000 € • Up to 80% financing of project costs <p>The annual Mobility of the Future budget is approx. 10 – 11m €</p>
TRL addressed (or categorise fundamental research, applied research, commercialisation)	Depending on type of project, between TRL 2-7 in total
Business cases and commercialisation of projects results	Detailed dissemination and exploitation plans in the proposal. Potential end-users to be included as early as the grant application phase (e.g. through LoI)
Verification of project results	For so-called “lead projects” an independent impact analysis to be published. For all project types a self-assessment after approx. 1 year of the end of the project
Openness / transparency of the funding process	All documentation for proposal submission is available online
Duration / flexibility of the application process	Duration of the procedure is fixed. For both calls: <ul style="list-style-type: none"> • Publication of call: May 22, 2019 • Call deadline: September 25, 2019 (4 months) • Evaluation completed: December 2019 (3 months)
Preliminary assessment of the programme	
Overview of strengths and weaknesses of the programme	Strengths: <ul style="list-style-type: none"> • Programme specifically states what it needs • Possibility to discuss proposal draft (Projektskizze) with FFG Weaknesses: <ul style="list-style-type: none"> • Specialised, relatively small calls enable financing of only a few projects
Sources of information	Freight transport (in German):

	https://www.ffg.at/mobilitaetderzukunft_call2019as13 Automated driving (in German): https://www.ffg.at/mobilitaetderzukunft_call2019as13_AT-HU
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Czech Republic

The first example presented is the new TRANSPORT 2020 programme.

NAME OF FUNDING ORGANISATION	Technological agency of the Czech Republic
Name of Programme	TRANSPORT 2020+ (<i>DOPRAVA 2020+</i>)
Description of the programme / project	A programme for applied research in the transport sector
Covered sector within the programme	All transport modes are covered, majority of research topics are related to road transport
Main objective(s) of the programme	<p>The research topics identified are</p> <ul style="list-style-type: none"> • Sustainable transport – including alternative fuels and electrification • Promotion of safe and durable transport and transport infrastructure – mainly aimed at safety of traffic and resilience of infrastructure • accessible and interoperable transport – accessibility of citizens, smart cities • Automation, digitization, navigation and satellite systems – among others funding for automated driving.
How are the targets / objectives defined?	<p>Quantitative:</p> <ul style="list-style-type: none"> • At least 80 projects supported through the programme • Rate of successfully completed projects (70%) – projects are judged separately according to specific criteria • The degree of achievement of program objectives (80%) <p>Qualitative:</p> <ul style="list-style-type: none"> • Develop the transport sector in the CR in such a way that reflects the needs of society, accelerates the development of technology and know-how and increases competitiveness of the Czech economy. • This general objective is split into four specific objectives along the research topics above (promoting sustainable transport etc.

Eligibility (target groups)	The programme is open to private companies, research organisations and other natural and legal persons.
Financing of the programme	<p>Support will be provided in the form of grants, the financial contribution will depend on the type of organisation applying. Universities / public research organisations may receive 100% funding of their eligible costs, SMEs 70-80% and large companies 50-65%.</p> <p>The maximum budget per project is 50m CZK (2 m€)</p> <p>So far, a budget of 1,950m CZK (77 m€) has been allocated for the programme. There will be 4 calls for proposals, meaning around 500m CZK (19.6 m€) budget per call.</p>
TRL addressed (or categorise fundamental research, applied research, commercialisation)	<p>The programme addresses “applied research, experimental development and innovation” in the transport sector.</p> <p>TRL is not specifically mentioned in call texts, but based on TRL categorisation of e.g. the EU H2020 programme, we estimate the TRL to be between 3 and 6.</p>
Business cases and commercialisation projects results	<p>The programme introduces the role of a so-called “Application Guarantor”, a legal entity that officially states its interest to apply and use the planned outputs of the proposed research and development project. It is not sure yet if this applicant guarantor has to state after project end that he/she used the project results. Some form of statement is needed in older projects.</p> <p>Dissemination of project results is also mandatory.</p>
Verification of project results	<p>Programme has just started, little can be said of the success of the programme.</p> <p>Qualitative targets of the programme have been set</p> <p>Expectations specified related to the outcome of the programme.</p>
Openness / transparency of the funding process	Funding process appears to be transparent, all necessary call documents available online (ToR, etc.)
Duration / flexibility of the application process	Relatively long duration of the evaluation process (more than 5 months), but a relatively short application time (2 months), so not very flexible
Preliminary assessment of the programme	
Overview of strengths and weaknesses of the programme	<p>Strengths:</p> <ul style="list-style-type: none"> • First programme in its sort that promotes transport related applied research only • One phase call for proposals <p>Weaknesses:</p>

	<ul style="list-style-type: none"> • Short duration of application procedure, 2 months, especially in comparison with 5-month evaluation procedure • There is a max. grant percentage per project and a different max. grant percentage per type of participant. Most likely partners have to agree on an internal distribution of funding. Lower financing percentages for private firms means that they may be less interested to participate.
Sources of information	<p>Programme website (Czech only): https://www.tacr.cz/index.php/cz/programy/program-doprava2020.html</p> <p>Workshop to the first Call for Proposals 2019 (Czech only) https://www.youtube.com/watch?v=_MmZblWNNwo</p>

The next example is the new TREND programme, with first call in 2019.

NAME OF FUNDING ORGANISATION	Technological agency of the Czech Republic
Name of Programme	TREND
Description of the programme / project	A programme for industrial research and experimental development
Covered sector within the programme	In principle, all industrial sectors. But preference for research & development projects in the sectors automotive and Industry 4.0
Main objective(s) of the programme	<p>General objective of the programme is “increase international competitiveness of enterprises. More specific objectives are related to the support for RTD in the following sectors:</p> <ul style="list-style-type: none"> • Increasing the use of modern production methods, planning, managing and distributing products according to the principles of Industry 4.0. • Development of new areas of digitization and its use in industry and services. • Using new technologies in Automotive and other key application industries identified strategic documents and initiatives of the Czech Republic and the EU. • Application of the principles of circular economy by introducing innovations in the area of obtaining secondary raw materials fully usable in industry and construction. <p>There is a specific MoU on the Future of the Automotive Sector in the Czech Republic – Automotive priorities are set in this document</p>

How are the targets / objectives defined?	<p>Quantitative:</p> <ul style="list-style-type: none"> <p>Qualitative:</p> <ul style="list-style-type: none"> Increase the capacity of Czech firms in doing RTD, thereby increasing their competitiveness. Related to transport related projects: Support for sustainable and safe transport
Eligibility (target groups)	No exclusion criteria, but lead organisation of a consortium needs to be a private company.
Financing of the programme	<p>Max. 70% financing per project</p> <p>70 mil CZK per project max. (2.75 m€)</p> <p>2,000 mil CZK during the first call in 2019 (78.5 m€)</p> <p>Total budget of the programme is 9,700 mil CZK (380 m€)</p> <p>On average, project applicants will bring into the programme another 5,220 mCZK (205 m€) as co-financing, 35% of the total budget.</p>
TRL addressed (or categorise fundamental research, applied research, commercialisation)	<p>No TRL mentioned in the programme. As the programme addresses industrial research, experimental development, estimated TRL is slightly higher than the previous TRANSPORT programme. Main applicant also has to be a private company.</p> <p>Additional bonus to be received when “prototype level” is reached.</p> <p>TRL is estimated at 4 to 7 (based on H2020 TRL definition and expert estimate of similar earlier programmes)</p>
Business cases and commercialisation of projects results	<p>Projects should be prepared for commercialisation</p> <p>Marketing study is mandatory annex. In call for proposal, a structure of a marketing study explains what should be included.</p>
Verification of project results	<p>Programme has just started, little can be said of the success of the programme.</p> <p>Projects will be regularly monitored.</p>
Openness / transparency of the funding process	Funding process appears to be transparent, all necessary call documents available online (ToR, necessary annexes, etc.)
Duration / flexibility of the application process	Relatively short application time (2 months), so not very flexible
Preliminary assessment of the programme	

Overview of strengths and weaknesses of the programme	Strengths: <ul style="list-style-type: none"> • Programme addresses innovation in private companies • One phase call for proposals Weaknesses: <ul style="list-style-type: none"> • relatively short application period (2 months) and compared to relatively long evaluation period (5 months) • There is a max. grant percentage per project and a different max. grant percentage per type of participant. Most likely partners have to agree on an internal distribution of funding. Lower financing percentages for private firms means that they may be less interested to participate
Sources of information	Programme website (Czech only): https://www.tacr.cz/index.php/cz/programy/program-trend.html Workshop to the first Call for Proposals 2019 (Czech only) https://www.youtube.com/watch?v=x5rVaIOY3_0

The EPSILON programme for applied research was established in 2014.

NAME OF FUNDING ORGANISATION	Technological agency of the Czech Republic
Name of Programme	EPSILON
Description of the programme / project	A programme for the support of applied research and experimental development (2015 – 2025) Calls in 2014, 2016, 2017, 2018
Covered sector within the programme	Priority areas: <ul style="list-style-type: none"> • Competitive knowledge-based economy • Sustainability of energy and material resources • Environment for quality of life <i>Energy included in the Theta programme (not in 4th call of 2018)</i> Specific subprogrammes exist for poorer regions (northern and eastern regions)
Main objective(s) of the programme	To support applied research projects whose results have high potential for rapid application in new products, manufacturing processes and services. The research topics should be in one of the priority areas.

How are the targets / objectives defined?	<p>Qualitative targets, defined in general:</p> <p>The aim of the program is to support applied research projects whose results have a high potential for rapid application in new products, production processes and services.</p> <p>In addition, more specific targets per priority area.</p>
Eligibility (target groups)	Both private companies and research organisations are eligible to apply for funding.
Financing of the programme	<p>Each project may receive max. 60% for the whole project. As single entities may have different max. support levels, up to 100% for universities, participants need to agree on internal division of co-funding.</p> <p>Budget for the 4th call is 500m CZK (the 2018/2019 budget). Total programme budget is 16,150m CZK (635 m€) – the state budget will cover 9,690m CZK (380 m€), the remainder will be co-financed by the project applicants.</p>
TRL addressed (or categorise fundamental research, applied research, commercialisation)	The programme addresses applied science, so TRL range from 3 to 6
Business cases and commercialisation of projects results	<p>The programme includes the role of a so-called Application Guarantor, a legal entity that is interested in applying and using the planned outputs of a research and development project in practice.</p> <p>Exploitation of project results is also mandatory – proof of exploitation of project results to be shown to grant agency before project end.</p> <p>Monitoring utilisation of results up to three years after project end.</p>
Verification of project results	<p>Projects will be regularly monitored during project life.</p> <p>Qualitative targets of the programme have been set</p> <p>Expectations specified related to the outcome of the programme</p>
Openness / transparency of the funding process	Funding process appears to be transparent, all necessary call documents available online (ToR, etc.)
Duration / flexibility of the application process	Relatively short application time (1.5 months), so applicants must be able to react to call
Preliminary assessment of the programme	
Overview of strengths and weaknesses of the programme	<p>Strengths:</p> <ul style="list-style-type: none"> • Specific programme for economically weaker regions <p>Weaknesses:</p>

	<ul style="list-style-type: none"> • Short application period (1.5 months), especially compared to the evaluation period (5.5 months) • Co-funding rules, less attractive for private companies. Not only the lower %, but also the fact that there is an additional limit on co-funding per project. • Time consuming administration (concrete experience from RTD applicants) • Application guarantor may lose interest in project results during the course of the project. In that case a new AG has to be found
Sources of information	<p>Programme website (CZ and EN):</p> <p>https://www.tacr.cz/index.php/en/programmes/epsilon-programme.html</p> <p>Workshop to the fourth call for proposals 2018 (Czech only)</p> <p>https://www.youtube.com/watch?v=Y79nOlwmfKI</p>

The TRIO programme from the Ministry of Industry and Trade running from 2016.

NAME OF FUNDING ORGANISATION	Ministry of Industry and Trade
Name of Programme	TRIO
Description of the programme / project	<p>This program focuses on the development of the Czech Republic's potential in the field of key enabling technologies (KETs) such as photonics, micro- and nano-electronics, nanotechnology, industrial biotechnology, advanced materials and advanced manufacturing technologies. KETs are knowledge and qualified labour demanding technologies that require a crucial share of research activities and have fast innovation cycles.</p> <p>These technologies can be applied in new products and services with high value added and they will enforce the economic growth and increase the competitiveness of the Czech Republic and the European Union.</p> <p>The program also focuses on encouraging effective collaboration in research and development between enterprises and research organisations as its low intensity belongs to main weaknesses of the national research system.</p>
Covered sector within the programme	Industry – specific key industries, including automotive
Main objective(s) of the programme	Objectives are in line with the “National priorities of oriented (targeted) research, experimental development and innovations 2012-2020”

How are the targets / objectives defined?	Qualitative targets, in line with national strategies.
Eligibility (target groups)	The lead organisation of a consortium needs to be a private company, with at least one research organisation as partner. Four organisations max. are allowed in each project.
Financing of the programme	Each project may receive max. 80% for the whole project. As single entities may have different max. support levels, up to 100% for universities, participants need to agree on internal division of co-funding.
TRL addressed (or categorise fundamental research, applied research, commercialisation)	The programme addresses industrial research, so TRL range from 3 to 6
Business cases and commercialisation of projects results	Exploitation of project results is mandatory. Each project must reasonably foresee at least one binding outcome that will contribute to the achievement of the programme's objectives. This must be one of the following types of results: <ul style="list-style-type: none"> • utility or industrial design, • prototype, functional sample, • patent, • software, • pilot plant, proven technology.
Verification of project results	Qualitative targets of the programme have been set Expectations specified related to the outcome of the programme
Openness / transparency of the funding process	Funding process appears to be transparent, all necessary call documents available online (ToR, etc.)
Duration / flexibility of the application process	Relatively short application time (2 months), so applicants must be able to react to call
Preliminary assessment of the programme	
Overview of strengths and weaknesses of the programme	<p>Strengths:</p> <ul style="list-style-type: none"> • Relatively high financing rate <p>Weaknesses:</p> <ul style="list-style-type: none"> • Short application period (2 months), especially compared to the evaluation period (5 months) • Co-funding rules, less attractive for private companies. Not only the lower %, but also the fact that there is an additional limit on co-funding per project.

	<ul style="list-style-type: none"> Time consuming administration (concrete experience from RTD applicants)
Sources of information	Programme website (CZ only): https://www.mpo.cz/cz/podnikani/podpora-vyzkumu-a-vyvoje/vyhlaseni-ctvrte-verejne-souteze-v-programu-trio--239644/

France

For France, the funding programmes selected are all financed by ADEME, the national Environment & Energy Management Agency. First is the Transport and Sustainable Mobility Programme.

NAME OF FUNDING ORGANISATION	ADEME
Name of Programme	<i>Transports et Mobilité durable</i> (transport and sustainable mobility) Calls in 2018 and 2019
Description of the programme / project	Call for Projects (AAP) "Accelerate the development of innovation ecosystems Performance / Transport and Sustainable Mobility »
Covered sector within the programme	Transport, logistics and sustainable mobility.
Main objective(s) of the programme	The AAP aims to select projects developing technologies, services and / or ambitious, innovative solutions and sustainable transport (passengers or goods), logistics and mobility.
How are the targets / objectives defined?	Projects should contribute to (future) Mobility Orientation Law (LOM) – help to improve everyday mobility for all citizens in all territories through more efficient, cleaner and efficient transport solutions. more accessible.
Eligibility (target groups)	Project coordinator has to be a private company and needs to include one or more research organisations as partner (max. 5 partners in total). All partners to be located in France
Financing of the programme	Funding percentages: <ul style="list-style-type: none"> Research projects from 50 to 70% depending on size of company Demonstration projects from 25 to 45% depending on size of company The share of public intervention in the financing of a private entity cannot exceed 50% (at least one euro of private financing for one euro of public funding). The programme only finances projects from a certain size: > 2m €

TRL addressed (or categorise fundamental research, applied research, commercialisation)	Industrial research at TRL 3-5 Demonstration at TRL 6-9
Business cases and commercialisation projects results	Among the eligibility criteria is: <i>One of the final objectives of the project is to demonstrate the bearer's ability to commercialize the solutions thus developed (either directly to end consumers or to other companies)</i>
Verification of project results	No public evaluation yet (new programme)
Openness / transparency of the funding process	Information on funding (e.g. submission docs) available online. Online submission
Duration / flexibility of the application process	Fixed duration, relatively long application period
Preliminary assessment of the programme	
Overview of strengths and weaknesses of the programme	Strengths: <ul style="list-style-type: none"> • Call is open for relatively long time (calendar year 2018 and 2019 resp.) Weaknesses: <ul style="list-style-type: none"> • Limited to large size projects (min. project costs > 2m €) • Relatively low funding percentage for demonstration projects
Sources of information	Call for proposals 2018 (in French): https://appelsaprojets.ademe.fr/aap/ADEIP2018-2 Call for proposals 2019 (in French): https://appelsaprojets.ademe.fr/aap/ADEIP2019-25

Expérimentation du véhicule routier autonome (Experimentation of autonomous road vehicles) – Expression of Interest & Call for Projects

The second programme is the two-phase call “Experimentation of autonomous road vehicles”. Projects need to be selected in the Expression of Interest to be eligible for the call for projects (but may integrate new partners during the second phase).

NAME OF ORGANISATION	FUNDING ADEME
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Name of Programme	<p><i>Expérimentation du véhicule routier autonome</i> (Experimentation of autonomous road vehicles)</p> <p>Expression of interest & call in 2018</p>
Description of the programme / project	Call for Projects (AAP) "Vehicles and Transport of the Future / Experimentation of autonomous road vehicles »
Covered sector within the programme	Transport and logistics
Main objective(s) of the programme	<p>The AAP EVRA aims to support pilot projects for the use of autonomous vehicles, marketable by 2022, in the field of individual, shared or collective mobility, freight and logistics. These projects will contribute to the development of safety validation methodologies and the improvement of knowledge on uses and acceptability.</p> <p>The projects respond to one or more of the application areas defined in the context of the New France Industrial Autonomous Vehicle Roadmap:</p> <ul style="list-style-type: none"> • Private Vehicle; • Collective and shared transport system; • Freight transport system.
How are the targets / objectives defined?	Qualitative, need to contribute to the overall objective of having autonomous vehicles on the road by 2022.
Eligibility (target groups)	<p>Projects are partnership-based and involve at least one or more companies and at least one territory. Consortium may include:</p> <ul style="list-style-type: none"> • Automakers, manufacturers of trucks or shared and shared vehicles; • Transport operators for the application areas "public and shared transport of persons" and "transport of goods"; • Local authorities or EPCI concerned; • Infrastructure managers, especially when an infrastructure need is identified for the experiments; • Laboratories involved in the design of the methodology and / or the analysis of the results of the experiments, in particular for the "use and acceptability" component.
Financing of the programme	<p>Financing percentages depending on the size of company, large companies (25%), medium-size companies (35%), small-size companies (50%)</p> <p>The 2018 call had a budget of € 40m. Under this call two projects were approved: SAM (PFA – € 15 million of expenditure and 19 partners) and ENA (IFSTTAR - € 20 million in expenditure and 14 partners);</p>

TRL addressed (or categorise fundamental research, applied research, commercialisation)	The minimum level of initial technological maturity expected by the candidate projects in this AAP corresponds to TRL 6-7.
Business cases and commercialisation of projects results	<p>Future commercial exploitation required. <i>The experimentation carried out has an appropriate scale (in terms of the duration of the experimentation, size of the fleet of vehicles, frequentation of the route by potential users ...) to obtain results in sufficient quantity to be representative and exploitable.</i></p> <p>The experiments are aimed at achievements that can be industrialized or reproduced in the field of the deployment of automated vehicles and associated services.</p>
Verification of project results	
Openness / transparency of the funding process	Information on funding (e.g. submission docs) available online. Online submission
Duration / flexibility of the application process	
Preliminary assessment of the programme	
Overview of strengths and weaknesses of the programme	<p>Strengths:</p> <ul style="list-style-type: none"> • Specific call for autonomous vehicles <p>Weaknesses:</p> <ul style="list-style-type: none"> • Two-phase call with short first phase (5 weeks) • Relatively low funding percentage
Sources of information	<p>Call for proposals 2018 (in French):</p> <p>https://appelsaprojets.ademe.fr/aap/EVRA2018-21</p>

The call for projects “Hydrogen mobility ecosystems”

Two calls of projects have been published, one in 2018, the other in 2019. These calls for projects are part of the Hydrogen Deployment Plan for the Energy Transition announced on 1 June 2018. It is established in application of the measures to deploy territorial ecosystems of hydrogen mobility, on the basis of deployment of fleets of professional vehicles. It also responds to the desire to support the development of a range of heavy vehicles, whether road or other modes (boats, trains, aeronautics).

NAME OF FUNDING ORGANISATION	ADEME
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Name of Programme	H2mobilité 2019 – Ecosystèmes de mobilité hydrogène (H2 Mobility – Hydrogen Mobility Ecosystems) Expression of interest & call in 2018 and in 2019
Description of the programme / project	Call for Projects (AAP) "Hydrogen mobility ecosystems"
Covered sector within the programme	Transport and logistics
Main objective(s) of the programme	Support for the deployment of territorial ecosystems for hydrogen mobility These projects concern the setting up of captive fleets of hydrogen vehicles (cars, buses, light and heavy goods vehicles, refuse collection trucks) or the establishment of hydrogen distribution stations and production facilities.
How are the targets / objectives defined?	Targets based on national Hydrogen Deployment Plan for the Energy Transition
Eligibility (target groups)	Call open to public and private entities.
Financing of the programme	Financing percentages depending on the size of company, large companies (35%), medium-size companies (45%), small-size companies (55%) Total support for hydrogen projects is 100 m€, part of this is support for RTD.
TRL addressed (or categorise fundamental research, applied research, commercialisation)	TRL estimated at 7 to 9
Business cases and of commercialisation projects results	Future commercial exploitation required. <i>The experimentation carried out has an appropriate scale (in terms of the duration of the experimentation, size of the fleet of vehicles, frequentation of the route by potential users ...) to obtain results in sufficient quantity to be representative and exploitable.</i> The experiments are aimed at industrializable or reproducible achievements for the deployment of automated vehicles and associated services.
Verification of project results	
Openness / transparency of the funding process	Information on funding (e.g. submission docs) available online. Online submission
Duration / flexibility of the application process	
Preliminary assessment of the programme	

Overview of strengths and weaknesses of the programme	Strengths: <ul style="list-style-type: none"> • Specific call for hydrogen infrastructure Weaknesses: <ul style="list-style-type: none"> • Relatively low funding percentage (at least for large companies)
Sources of information	Call for proposals 2019 (in French): https://appelsaprojets.ademe.fr/aap/H2mobilit%C3%A92019-57

Call for Projects - Investments for the Future - Experimentation for the Development of Mobility as a Service

This Call is also part of the Program of Investments of Future (PIA) and aims at financing development and experimentation projects of mobility of services supported by companies (operators of offer of transportation, IT companies) and / or territories.

NAME OF FUNDING ORGANISATION	ADEME
Name of Programme	Expérimentation pour le Développement de la Mobilité Servicielle – Experimentation for the Development of Mobility as a Service Expression of interest & call in 2019
Description of the programme / project	Call for Projects (AAP) " the Development of Mobility as a Service"
Covered sector within the programme	Transport and logistics
Main objective(s) of the programme	This call aims to finance projects for the development and experimentation of mobility as a service concepts carried out by companies (transport supply operators, IT sector) and / or territories, related to the following: <ul style="list-style-type: none"> - Provision of multimodal information before and throughout the journey, - Multimodal reservation systems - Multimodal ticketing service - Improved interfaces
How are the targets / objectives defined?	Lay the foundations for MaaS business models Contribute to structuring of "MaaS" on a significant territorial scale and make it possible to test, to evaluate and validate the relevance and replicability in other territories solutions experienced in real operating conditions, while pointing out possible difficulties or barriers.

Eligibility (target groups)	Consortium to include at least one private company, a research organisation and a territory that will function as pilot area (can be an area operated by a transport company that is part of the consortium)
Financing of the programme	<p>Financing percentages depending on the size of company, large companies (25%), medium-size companies (35%), small-size companies (45%).</p> <p>Research agencies and (local) public organisations may receive higher financing percentages</p> <p>The projects are accompanied by mixed grants (1/3 of the aid) and repayable advances (2/3 of the aid). For each partner, the minimum amount of the repayable advance granted is € 100,000. No aid of less than € 200,000 will be awarded to a large business partner.</p> <p>The AAP only finances projects from a certain size: > 1.5m €</p> <p>The call has a budget of € 15m (<i>ADEME progress report 2018</i>)</p>
TRL addressed (or categorise fundamental research, applied research, commercialisation)	TRL estimated at 6 to 9
Business cases and commercialisation of projects results	Replicability of the solutions is required
Verification of project results	The expected impacts of the experiments should be described and quantified during the project
Openness / transparency of the funding process	Information on funding (e.g. submission docs) available online. Online submission
Duration / flexibility of the application process	Fixed duration (6-month application period)
Preliminary assessment of the programme	
Overview of strengths and weaknesses of the programme	<p>Strengths:</p> <ul style="list-style-type: none"> • Specific call for practical applications in the field of MaaS <p>Weaknesses:</p> <ul style="list-style-type: none"> • Only relatively large projects funded (> 1.5m €) • Two-stage procedure • Relatively low funding percentage (e.g. 25% for large companies)
Sources of information	<p>Call for proposals 2019 (in French):</p> <p>https://appelsaprojets.ademe.fr/aap/EDMS2018-77#resultats</p>

Germany

For Germany, the following funding programmes have been selected:

- [Automated and Connected Driving](#) (AVF) - BMVI
- [Renewably mobile](#) - BMU
- [ELECTRIC POWER II](#): Electric Mobility – BMWi
- [New Vehicle and System Technologies](#) – BMWi

NAME OF ORGANISATION	FUNDING	Federal Ministry of Transport and Digital Infrastructure (BMVI)
Name of Programme		Automated and Connected Driving (AVF) - <i>“Ein zukunftsfähiges, nachhaltiges Mobilitätssystem durch automatisiertes Fahren und Vernetzung”</i>
Description of the programme / project		The aim of the funding is to implement application-oriented research projects in the field of digitization, including automation and networking in road transport, and interfaces to other modes of transport to further develop mobility and the overall transport system in urban and rural areas.
Covered sector within the programme		Transport and logistics
Main objective(s) of the programme		Clarifying questions related to higher driving functions beyond partial automation. Supporting connectivity and communication between different traffic participants and with infrastructure.
How are the targets / objectives defined?		Qualitative (see above)
Eligibility (target groups)		Private companies, local / regional authorities and research institutions are eligible to apply.
Financing of the programme		100m € budget (a total of 41 projects have been funded so far) Average funding rate is 70% (Scientific organisations may receive up to 100% of funding, SMEs up to 80%, large companies up to 40%) For demonstration projects there are lower funding rates than for research projects
TRL addressed (or categorise fundamental research, applied research, commercialisation)		TRL estimated at 6 to 7. Projects include investments like test beds

Business cases and commercialisation of projects results	<p>BMVI strives for dissemination, but no dissemination plan yet due to no impact assessment issued yet – final report (<i>VDI/VDE will share</i>)</p> <p>Projects have to publish final results</p>
Verification of project results	<p>VDI/VDE-IT (internal evaluation)</p> <p>Interim evaluation of the programme is not yet finished</p>
Openness / transparency of the funding process	<p>Information on funding to be found after registering. Relatively difficult to navigate through the websites.</p>
Duration / flexibility of the application process	<p>2-3 months for assessment of project idea, further 3-4 months for granting</p> <p>There have been 4 calls published so far. First in Sep. '16, 2nd early 2017, 3rd end 2017, last one April 2019 (open until June 2019)</p>
Preliminary assessment of the programme	
Overview of strengths and weaknesses of the programme	<p>Strengths:</p> <ul style="list-style-type: none"> high rate of submitted sketches for approved projects, good funding rate. Success factor: projects take place in the public space, application proximity, scalability and transferability of the results, consideration of social aspects, broad thematic listing of the projects in the context of automated and connected driving (e.g. software development, vehicle development, V2x communication), therefore broad distribution of actors. <p>Weaknesses:</p> <ul style="list-style-type: none"> short period between project assessment and granting: missing of qualification phase, as for projects for fine-tuning their projects, i.e. adjusting the project objectives and planning with the targets and intentions of the funding programme.
Sources of information	<p>Programme description (in German): https://www.bmvi.de/SharedDocs/DE/Artikel/DG/forschungsprogramm-automatisierung-vernetzung-strassenverkehr.html</p> <p>List of projects already funded (in German): https://www.bmvi.de/DE/Themen/Digitales/AVF-Forschungsprogramm/Projekte/avf-projekte.html</p> <p>Information about project calls available on the website of the programme manager: VDI/VDE Innovation + Technik GmbH - https://vdivde-it.de/de</p>

NAME OF FUNDING ORGANISATION	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)
Name of Programme	Renewably mobile – Erneuerbar Mobil
Description of the programme / project	<p>Research projects in the field of electric mobility are funded with the aim to reach the climate and energy policy objectives for the road transport sector.</p> <p>The goal is to increase the potential of electric mobility for climate, environmental and resource protection, as well as contributing to improving the quality of life and sustainable urban development. Focus in this funding programme is on environmental and climate aspects of electric mobility, the coupling of electric vehicles to renewable energies and grid integration, market launch of electric vehicles with ecological standards, and on resource availability and recycling.</p>
Covered sector within the programme	Transport
Main objective(s) of the programme	'Striving for achievement of national climate protection targets. Public and private procurement of electric vehicles. 'Test and deploy electric mobility concepts in order to reach climate protection goals. Focus is on logistics, heavy load, catenary systems etc.
How are the targets / objectives defined?	Qualitative (see above)
Eligibility groups (target groups)	<p>Eligible for application are commercial enterprises, universities and non-university research and development organisations in Germany as well as regional authorities and public administrations.</p> <p>In particular, small and medium-sized enterprises (SMEs) are encouraged to submit applications.</p> <p>In principle, the promotion of joint projects with foreign partners is also possible. The foreign partner has to finance his expenses without federal subsidy.</p> <p>Research institutions, which are jointly funded by the federal government and the federal states, can only be granted project funding for their additional expenses under special conditions.</p>
Financing of the programme	<p>35-40% on average</p> <p>30m € budget per call</p>
TRL addressed (or categorise fundamental research, applied research, commercialisation)	<p>TRL estimated at 6 to 7 (up to proof of concept)</p> <p>Demonstration projects</p>

Business cases and commercialisation of projects results	Dissemination of project results and accessibility to public is mandatory, exploitation plan after project end (answering the question: what will you do after the project ends)
Verification of project results	
Openness / transparency of the funding process	
Duration / flexibility of the application process	4th call from Dec 2017, with BMWi, still possible to submit proposals. Call open for more than a year. Gives opportunity to be flexible for applicants.
Preliminary assessment of the programme	
Overview of strengths and weaknesses of the programme	Strengths: <ul style="list-style-type: none"> Focus on climate protection, orientation towards contribution of project to achievement of climate protection goal Relatively long time for proposal submission Weaknesses: <ul style="list-style-type: none"> It is often not possible to fund every component/part of a good concept due to restriction by subsidy guidelines. If there is a good concept that would have a significant contribution to reduce CO₂ or toxic emissions in transport there might be only a part of it be funded in one funding programme, since there are too many different funding programmes with detailed focuses.
Sources of information	Programme description (in German): https://www.erneuerbar-mobil.de/en/node/873

NAME OF FUNDING ORGANISATION	Federal Ministry for Economic Affairs and Energy (BMWi)
Name of Programme	ELECTRIC POWER II: Electric Mobility – Positioning the Value Chain <i>"ELEKTRO POWER II: Elektromobilität - Positionierung der Wertschöpfungskette"</i>
Description of the programme / project	The programme is currently supporting 15 projects with partners from industry, research and science. Funding is available for RTD projects that contribute to efficient, flexible, robust, reliable and scalable production in electromobility
Covered sector within the programme	Transport

Main objective(s) of the programme	<p>Specific objectives:</p> <ul style="list-style-type: none"> • Electric vehicles are to be integrated in the energy systems in an intelligent and economic manner • Reduction of production costs through the application of efficient production technologies • Increase added value share through digitisation of production • Reduce total system cost of electric mobility by using new technologies • Increase the competitiveness of German e-vehicles through norms and standards.
How are the targets / objectives defined?	Qualitative
Eligibility groups (target groups)	Programme open to private enterprises, universities and research organisations.
Financing of the programme	The programme is providing around €29 million to a current total of 15 research and development projects.
TRL addressed (or categorise fundamental research, applied research, commercialisation)	<p>TRL estimated at 5 to 8</p> <p>Projects include standardisation, charging infrastructure, production technologies for batteries</p>
Business cases and commercialisation of projects results	
Verification of project results	<p>An evaluation report of the programme ELECTRIC POWER I was published in 2017.</p> <p>A preliminary valuation of ELECTRIC POWER II is available</p>
Openness / transparency of the funding process	
Duration / flexibility of the application process	
Preliminary assessment of the programme	
Overview of strengths and weaknesses of the programme	<p>Strengths:</p> <ul style="list-style-type: none"> • <p>Weaknesses:</p>

Sources of information	<p>Programme description (in English), of all programmes of the BMWI:</p> <p>https://www.bmwi.de/Redaktion/EN/Artikel/Industry/electric-mobility-r-d-funding.html</p>
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NAME OF FUNDING ORGANISATION	Federal Ministry for Economic Affairs and Energy (BMWi)
Name of Programme	New Vehicle and System Technologies
Description of the programme / project	<p>Focus is primarily on the development of new vehicle and system technologies, which should be safe, convenient, efficient, low-emission and resource-friendly. At the end of each project, a prototype test should be carried out. Funding under this program is provided for product and application-oriented research measures in the field of vehicle and system technologies, with strong industrial relations. The two main pillars of the program are "Automated Driving" and "Innovative Vehicles".</p> <p><i>The programme was originally running until the end of 2017, with an amendment announcement on 19.11.2018, the funding was extended by four years, until 31.12.2022.</i></p>
Covered sector within the programme	<p>1) Automated Driving and 2) Innovative Vehicles (electric/hybrid), incl. projects for light weighting</p> <p>About 90% of the projects in automotive sector, remainder in rail</p>
Main objective(s) of the programme	<p>Strengthening of the innovative power of German enterprises in the field of vehicle and system technologies, in particular small and medium sized companies (SMEs). Proof of principle of the fundamental usability of new technologies in the vehicle sector and initiating pre-serial development processes</p>
How are the targets / objectives defined?	
Eligibility groups) (target groups)	<p>Eligible for application are commercial enterprises with a permanent establishment in Germany, in particular, the participation of small and medium-sized enterprises (SMEs) is desired. Furthermore, scientific institutions (universities and non-university research institutions) and Local authorities are entitled to apply.</p>
Financing of the programme	<p>Until today, the programme has provided funding of 13 projects (started between 2014 and 2019) with a total budget of 282.6 m€.</p> <p>Expected funding from 2019 onwards is € 60 million per year.</p> <p>Financing of up to 50 of eligible costs. Projects should not last longer than 3 years.</p>
TRL addressed (or categorise fundamental research, applied research, commercialisation)	<p>TRL estimated at 5 to 8</p> <p>Projects include standardisation, charging infrastructure, production technologies for batteries</p>

Business cases and commercialisation of projects results	
Verification of project results	There is a mid-term review of the whole programme (published Nov. 2017) http://www.tuvpt.de/fileadmin/pdf/FP_Fahrzeug_Systemtechnologien_barrierefrei.pdf
Openness / transparency of the funding process	Information about project calls available on the website of the programme manager TÜV Rheinland Consulting GmbH - http://www.tuvpt.de/
Duration / flexibility of the application process	
Preliminary assessment of the programme	
Overview of strengths and weaknesses of the programme	Strengths: <ul style="list-style-type: none"> • Weaknesses:
Sources of information	Programme description: http://www.tuvpt.de/index.php?id=fahrzeugundsystemtechnologien

United Kingdom

For the United Kingdom, the following funding programmes have been selected:

- Faraday battery challenge of the Industrial Challenge Fund
- Advanced Propulsion centre (APC competitions)
- Call on Connected and Autonomous Vehicles – Innovate UK and Zenzic (former Meridian Mobility)
- Integrated Delivery Platform (IDP) – Innovate UK

Faraday Battery Challenge

NAME OF FUNDING ORGANISATION	Industrial Challenge Fund
Name of Programme	Faraday Battery challenge

Description of the programme / project	<p>Programme provides grants for feasibility studies and collaborative research and innovation projects that develop new and improved battery technologies that are more cost effective.</p> <p>Funded projects address improving battery lifespan and range and the reuse and recycle of batteries at their end-of-life</p>
Covered sector within the programme	Battery research
Main objective(s) of the programme	The aim of this competition is to support business led RTD in the design and development of batteries for electric vehicles
How are the targets / objectives defined?	Overall objectives of the call are qualitative. Project applicants need to specify what they address in figures <i>and the proposal must demonstrate how the project will improve the manufacturing readiness level (MRL) of the technology.</i>
Eligibility groups (target groups)	<p>For UK based business, academic organisation, charity, public sector organisation or research and technology organisation (RTO). Lead organisation to be a UK based business.</p> <p>Project work to be carried out in the UK, intend to exploit the results from or in the UK.</p> <p>Applicants are encouraged to include a partner with expertise in the scaling of battery technologies, for example UKBIC for cell manufacture.</p>
Financing of the programme	<p>Up to £25 million (third call – open between September 17 and December 12, 2018), of which £23m for industrial research and experimental development and £2m for feasibility studies.</p> <p>Total budget for all funding calls is £88 million. At the time of writing £82 million already committed.</p> <p>Between £500,000 and £15 million per project</p> <p>Funding percentages:</p> <ul style="list-style-type: none"> • 50 to 70% for industrial research • 25 to 45% for experimental development projects
TRL addressed (or categorise fundamental research, applied research, commercialisation)	Projects funded in the range of TRL 3 to 7
Business cases and commercialisation of projects results	<p>Exploitation Plan ("route to market") to be included in proposal. Route to market and wider impact of project to be described in detail.</p> <p>Failure to exploit may lead to exclusion from future funding. In this specific call it is stated that:</p>

	<i>"If you were awarded funding by Innovate UK but did not make a substantial effort to exploit that award, we will award no more funding to you, in this or any other competition"</i>
Verification of project results	Evaluation did not take place yet. Baseline is set, interim evaluation is prepared.
Openness / transparency of the funding process	All documentation for proposal submission is available online. Details of funding process described (e.g. applications that are successful at the written stage will be invited to attend an interview and need to give a presentation)
Duration / flexibility of the application process	5 months (from competition announcement until notification of applicants), 3 month application, 2 month evaluation. In addition, 1 to 2 months for contract preparation.
Preliminary assessment of the programme	
Overview of strengths and weaknesses of the programme	<p>Strengths:</p> <ul style="list-style-type: none"> Strong focus on exploitation of results. "Route to Market" to be described in detail. Relatively short application period. Applicants need to be very specific in what they plan to achieve <p>Weaknesses:</p> <ul style="list-style-type: none"> Failure in previous calls to exploit results leads to exclusion in this call and any future calls with no possibility for applicant to contest this decision
Sources of information	<p>Programme website:</p> <p>https://www.ukri.org/innovation/industrial-strategy-challenge-fund/faraday-battery-challenge/</p>

Advanced Propulsion Centre

NAME OF FUNDING ORGANISATION	Advanced Propulsion Centre
Name of Programme	APC competitions
Description of the programme / project	Collaborative RTD projects that demonstrate the development of on vehicle technologies for on or off-road vehicles. These must accelerate the development of low and zero emission technology.
Covered sector within the programme	Vehicle technologies

Main objective(s) of the programme	Financing of projects that support the UK's long-term capabilities and supply chain in the design, build and manufacture of zero-emission vehicles
How are the targets / objectives defined?	Qualitative targets. Each competition includes a detailed scope that applicants need to stick to.
Eligibility groups) (target groups)	Lead organisation needs to be an UK based business. At least one SME to be included in the project. Contribution of research organisations limited to 30% of budget.
Financing of the programme	c.£1 billion over a period of 10 years, meaning up to £ 100 million per year in 3 calls of £ 30-35 million each. Some calls are smaller, e.g. APC 11 and APC 14 are £ 20m each. Funding percentages (may differ per call) for APC11: <ul style="list-style-type: none"> • 50 to 60% for industrial research • 25 to 45% for experimental development projects
TRL addressed (or categorise fundamental research, applied research, commercialisation)	TRL 7 / MRL4-5 according to recent evaluation report
Business cases and commercialisation of projects results	Dissemination and exploitation strategy to include in proposal (including a detailed description of the route to market)
Verification of project results	External evaluation of APC projects has taken place (Evaluation report published March 2018)
Openness / transparency of the funding process	All documentation for proposal submission is available online. Details of funding process described (e.g. applications that are successful at the written stage will be invited to attend an interview and need to give a presentation)
Duration / flexibility of the application process	Fixed duration, 4 months, including 2 months for application and 2 months for evaluation (from competition announcement until notification of applicants). Three calls per year.
Preliminary assessment of the programme	
Overview of strengths and weaknesses of the programme	Strengths: <ul style="list-style-type: none"> • Multiple calls per year • Short applicant and evaluation procedure Weaknesses: <ul style="list-style-type: none"> • Relatively low funding percentages, especially for experimental development projects

Sources of information	Programme website: https://www.apcuk.co.uk/
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Innovate UK and Zenzic (formerly Meridian Mobility)

Two calls on Connected and Autonomous Vehicles

NAME OF FUNDING ORGANISATION	Innovate UK & Zenzic (formerly Meridian Mobility)
Name of Programme	<p>Two specific calls on "Connected and Autonomous Vehicles"</p> <p>1) Connected and autonomous vehicles simulation: collaborative RTD: https://apply-for-innovation-funding.service.gov.uk/competition/103/overview</p> <p>2) Meridian 3: autonomous highway, rural and parking test facilities: https://apply-for-innovation-funding.service.gov.uk/competition/172/overview</p>
Description of the programme / project	Support for the UK's testing ecosystem for Connected and Autonomous Vehicles
Covered sector within the programme	Connected and Autonomous Vehicles
Main objective(s) of the programme	<p>Simulation:</p> <p>This competition is for collaborative research and development (RTD) projects. It is the first stage of CCAV's approach to enhancing the UK's testing ecosystem through simulation and modelling. Project teams should consider how their proposal will enhance the UK's testing ecosystem.</p> <p>Test facilities:</p> <p>The aim of the Meridian competitions is to continue to create the world's most effective CAV testing 'ecosystem'.</p>
How are the targets / objectives defined?	<p>Qualitative objectives, but clear expectations of what projects must focus on, e.g.:</p> <ul style="list-style-type: none"> develop a holistic simulation and modelling system that tests and stretches VCS capability support the development of solutions for the simulation of level 4 automation and above <p>Overall goal of all CAV related RTD projects is included in UK Industrial Strategy: "In its industrial strategy, the government outlined its ambition to have self-driving vehicles on UK roads by 2021".</p>
Eligibility groups (target groups)	Lead organisation needs to be an UK based business. Contribution of research organisations limited to 30% of budget.

Financing of the programme	<p>1) CAV simulation technologies – up to £15 million budget</p> <p>Industrial research projects – funding rates between 50 and 70% (SMEs receiving the highest percentage)</p> <p>Experimental development projects – funding rates between 25 and 45%</p> <p>2) autonomous highway, rural and parking test facilities</p> <p>CCAV have allocated up to £25 million to fund up to 6 infrastructure projects in this competition</p> <p>Funding rates are up to 100% financing for non-profit organisations and up to 50% for businesses of any size.</p>
TRL addressed (or categorise fundamental research, applied research, commercialisation)	TRL 3 to 7
Business cases and commercialisation of projects results	<p>Projects must develop detailed plans for further commercial exploitation of the results</p> <p>Route to market and wider impact of project to be described in detail in proposal.</p>
Verification of project results	No public evaluation yet, new programme
Openness / transparency of the funding process	All documentation for proposal submission is available online. Details of funding process described (e.g. applications that are successful at the written stage will be invited to attend an interview and need to give a presentation)
Duration / flexibility of the application process	Call duration 5.5 months (3.5 month application period, 2 month evaluation)
Preliminary assessment of the programme	
Overview of strengths and weaknesses of the programme	<p>Strengths:</p> <ul style="list-style-type: none"> • Call text clearly specifies what is required. <p>Weaknesses:</p> <ul style="list-style-type: none"> • Relatively low funding percentages, especially for experimental development projects
Sources of information	<p>Call website – Connected and autonomous vehicles simulation</p> <p>https://apply-for-innovation-funding.service.gov.uk/competition/103/overview#scope</p> <p>Meridian 3: autonomous highway, rural and parking test facilities:</p> <p>https://apply-for-innovation-funding.service.gov.uk/competition/172/overview#scope</p>

Integrated Delivery Platform

NAME OF FUNDING ORGANISATION	Innovate UK
Name of Programme	Integrated Delivery Platform (IDP) - the road to zero emission vehicles, RTD
Description of the programme / project	<p>Innovate UK is part of UK Research and Innovation, a non-departmental public body funded by a grant-in-aid from the UK government. Innovate UK is the UK's innovation agency supporting businesses to realise the potential of new technologies, develop ideas and make them a commercial success.</p> <p>The road to zero emission vehicles, focus of the programme:</p> <ol style="list-style-type: none"> 1.Zero emission passenger cars. 2.Significant electrification of conventional engines to bring emissions as close to zero as possible.
Covered sector within the programme	Electrification / automotive
Main objective(s) of the programme	Funding for ultra-low and zero emission on-vehicle technology development
How are the targets / objectives defined?	<p>Qualitative, specific themes are:</p> <ol style="list-style-type: none"> 1. Zero emission passenger cars. 2. Significant electrification of conventional engines to bring emissions as close to zero as possible
Eligibility groups (target groups)	For UK based business, academic organisation, charity, public sector organisation or research and technology organisation (RTO). Lead organisation to be a UK based business.
Financing of the programme	<p>Budget £20 - 23m for IDP</p> <p>Between £250,000 (feasibility studies) and £4 million per project</p> <p>25-100% dependent on business size and type of research</p> <p>Up to £16 million to fund collaborative RTD projects</p> <p>A separate £2 million is available for feasibility study projects</p> <p>Up to £4 million to support one high value, exceptional large research and development (RTD) project.</p> <p>Funding percentages (collaborative RTD):</p> <ul style="list-style-type: none"> • 50 to 70% for industrial research (and feasibility studies) • 25 to 45% for experimental development projects

TRL addressed (or categorise fundamental research, applied research, commercialisation)	Estimated at TRL 3-5
Business cases and commercialisation of projects results	Route to market and wider impact of project to be described in detail in proposal. Call text states that “ <i>projects must develop on-vehicle technology, speeding up its introduction to the market</i> ”.
Verification of project results	Regular evaluations of Innovate UK programmes
Openness / transparency of the funding process	All documentation for proposal submission is available online. Details of funding process described (e.g. applications that are successful at the written stage will be invited to attend an interview and need to give a presentation)
Duration / flexibility of the application process	7 months (from competition opening until notification of applicants), application period 3 months, evaluation period 4 months (including the stage interviews).
Preliminary assessment of the programme	
Overview of strengths and weaknesses of the programme	Strengths: <ul style="list-style-type: none"> • Strong focus on exploitation of results. “Route to Market” to be described in detail. • Weaknesses: <ul style="list-style-type: none"> • Relatively long application period in comparison to other UK programmes.
Sources of information	Innovate UK website https://www.gov.uk/government/organisations/innovate-uk

Italy

For **Italy**, the following programmes have been selected:

- Programme of the Ministry of Education, University and Research (MIUR)
- Programme of the Ministry of Economic Development (MISE)
- Innovation agreements of the Ministry of Economic Development (MISE)

- Programme of the Abruzzo region
- Programme of the Piedmont region

Regional programmes have been included here due to the lack of specific automotive programmes on national level.

Programme from Ministry of Education, University and Research

NAME OF FUNDING ORGANISATION	Ministry of Education, University and Research (MIUR)
Name of Programme	MIUR – Industrial research
Description of the programme / project	Call for industrial research and experimental development projects in the 12 specialization areas identified in the National Research Programme-NRP 2015-2020
Covered sector within the programme	<p>Industry wide programme – those research activities related to transport RTD are:</p> <p>Sustainable Mobility - road, railway and maritime transport, distribution logistics and related production chains.</p> <p>Energy - components, technologies and innovative systems for sustainable energy and low CO₂ emissions</p> <p>Smart, Secure and Inclusive Communities - technological solutions for the implementation of innovative models integrated in the management of urban and metropolitan areas</p> <p>Design, Creativity and Made-in-Italy - Areas connected to the distinctive character of the Made-in-Italy products, characterized by the adoption of new process and product technologies and by advanced design activities, digital crafts and cultural and creative industries</p> <p>Green Chemistry - Product and process innovations related to biorefineries, production and use of bio-based products, biomaterials and new or innovative fuels</p>
Main objective(s) of the programme	Programme includes environmental targets, targets for EVs
How are the targets / objectives defined?	
Eligibility groups (target groups)	Private enterprises and public research organisations.
Financing of the programme	€ 29,5 M for each area of research 25-50% dependent on business size and type of research

	Project size typically up to 4m €
TRL addressed (or categorise fundamental research, applied research, commercialisation)	Estimated at 3 to 5
Business cases and commercialisation of projects results	Not fully clear, no report-based dissemination demanded. The NPR does, however, consider dissemination, demonstration etc. as being of key importance.
Verification of project results	The NPR itself will be monitored and evaluated
Openness / transparency of the funding process	
Duration / flexibility of the application process	November 2017 was deadline for proposals (new projects started Jan. 2019) Long duration of tendering process
Preliminary assessment of the programme	
Overview of strengths and weaknesses of the programme	Strengths: <ul style="list-style-type: none"> 12 specialization areas (transport included), Cooperative projects between industry and universities Weaknesses: <ul style="list-style-type: none"> Long times for proposal evaluation; High levels of bureaucracy
Sources of information	www.miur.gov.it

Programme from Ministry of Economic Development – Fund for Sustainable Growth

NAME OF FUNDING ORGANISATION	Ministry of Economic Development (MISE)
Name of Programme	Fund for Sustainable Growth (FCS)
Description of the programme / project	RTD projects in the technological areas identified by Horizon 2020 – Call PON (National Operational Programme) I&C 2014-2020

	October 2016 Large RTD projects call – PON (National Operational Programme) I&C 2014-20 December 2016
Covered sector within the programme	Part of the programme is priority area 7.4 <i>Implementation of an intelligent, ecological and integrated transport system</i>
Main objective(s) of the programme	
How are the targets / objectives defined?	Targets derived from the H2020 programme
Eligibility (target groups)	Private enterprises and public research organisations.
Financing of the programme	No budget directly reserved for road transport Project funding is 25-50% dependent on business size and type of research Project size typically up to 3m €
TRL addressed (or categorise fundamental research, applied research, commercialisation)	Estimated at 6 to 8
Business cases and commercialisation of projects results	Programme with higher TRL, means demonstration level product, obligation to take on new employees
Verification of project results	
Openness / transparency of the funding process	
Duration / flexibility of the application process	November 2017 was deadline for proposals (new projects started Jan. 2019) Long duration of tendering process
Preliminary assessment of the programme	
Overview of strengths and weaknesses of the programme	Strengths: <ul style="list-style-type: none"> • Flexibility of themes Weaknesses:

	<ul style="list-style-type: none"> Programme has no specific focus, long evaluation period
Sources of information	www.mise.gov.it

Programme from Ministry of Economic Development – Innovation Agreements

NAME OF FUNDING ORGANISATION	Ministry of Economic Development
Name of Programme	Innovation Agreements
Description of the programme / project	Projects concerning industrial research and experimental development activities aimed at the creation of new products, processes or services or the significant improvement of existing products, processes or services, through the development of one or more of the technologies identified by the European Union Framework Program for research and innovation 2014 - 2020 "Horizon 2020"
Covered sector within the programme	Relevant RTD projects on H2020 topics, linked to industrial plans, funding by MISE and involved Regions.
Main objective(s) of the programme	<i>Industrial impact and fallouts, innovation at international level (?)</i>
How are the targets / objectives defined?	
Eligibility (target groups)	Private enterprises and public research organisations.
Financing of the programme	Funding rate of 30% Project size € 1,5m < x <€ 12m
TRL addressed (or categorise fundamental research, applied research, commercialisation)	Estimated at 5 to 7
Business cases and commercialisation of projects results	
Verification of project results	

Openness / transparency of the funding process	
Duration / flexibility of the application process	
Overview of strengths and weaknesses of the programme	Strengths: <ul style="list-style-type: none"> Strategic RTD Projects with high regional and national involvement Weaknesses: <ul style="list-style-type: none">
Sources of information	www.mise.gov.it

Programme of the Abruzzo region (regional programme)

NAME OF FUNDING ORGANISATION	Abruzzo region
Name of Programme	Programme of the Abruzzo region
Description of the programme / project	Aid for industrial research projects and experimental development for automotive / mechatronic companies, implementing the 2007-2013 PAR FSC of the Abruzzo Region November 2015
Covered sector within the programme	RTD projects on automotive/mechatronic components, 30% of budget to demonstration
Main objective(s) of the programme	'Projects must have main repercussions on products or processes within the regional territory.
How are the targets / objectives defined?	
Eligibility groups (target groups)	Private enterprises and public research organisations registered in the region.
Financing of the programme	Programme budget of 8.8m € Funding percentage 40 to 70% dependent on business size and type of research

	Project budgets are below 1m €
TRL addressed (or categorise fundamental research, applied research, commercialisation)	TRL estimated at 5 to 7
Business cases and commercialisation of projects results	Main benefits for Abruzzo Region to be shown - Dissemination mandatory
Verification of project results	
Openness / transparency of the funding process	
Duration / flexibility of the application process	Proposal assessment process around 8 to 12 months
Overview of strengths and weaknesses of the programme	Strengths: <ul style="list-style-type: none"> • Focus on automotive / mechatronic Weaknesses: <ul style="list-style-type: none"> • High level of bureaucracy, no feedback about mid-term reviews and linked payments
Sources of information	www.regione.abruzzo.it

Programme of the Piedmont region (regional programme)

NAME OF FUNDING ORGANISATION	Piedmont region
Name of Programme	Programme of the Piedmont region
Description of the programme / project	<p>Call for tenders to support industrial research projects and / or development in the scientific-technological area of AUTOMOTIVE according to the line of activity I.1.1. "Innovative platforms" POR ERDF 2007/2013 ex REG EC n. 1083/2006</p> <p>April 2012</p>

Covered sector within the programme	Support for research in the field of: <ul style="list-style-type: none"> • Powertrains with low environmental impact • New Materials • Loss reduction and energy recovery
Main objective(s) of the programme	Just for enterprises and universities located in Piedmont Region.
How are the targets / objectives defined?	
Eligibility (target groups)	Private enterprises and public research organisations registered in the region. SME budget allocation should be more than 30%.
Financing of the programme	Programme budget of 30m € Public-Private Partnership (SME>30% of total costs) Typical project size: € 5m <x<€ 10m Financing percentages are 40-60% dependent on business size and type of research
TRL addressed (or categorise fundamental research, applied research, commercialisation)	TRL estimated at 5 to 7
Business cases and commercialisation of projects results	Dissemination and cross fertilization (public events organized by Piedmont Region)
Verification of project results	
Openness / transparency of the funding process	
Duration / flexibility of the application process	Proposal assessment process around 10 months
Overview of strengths and weaknesses of the programme	Strengths:

	<ul style="list-style-type: none"> At regional level, a big integration between LE (also competitors), universities and suppliers, in order to contribute to the growth of the automotive cluster <p>Weaknesses:</p> <ul style="list-style-type: none"> big presence of Small Enterprises (30% of the total costs) with no experience in managing public funding projects (at administrative level)
Sources of information	www.finpiemonte.it