

Deliverable 6.1

Plans, targets and activities on EU and national level for implementing connected and automated vehicles



Authors:

Marko Häckel

Kosmas Knödler

marko.haeckel@de.bosch.com

kosmas.knoedler@de.bosch.com

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Executive Summary

A coherent funding strategy for Connected & Automated Driving will accelerate progress in deployment of Connected and Automated Driving (CAD). A prerequisite for this is an analysis of existing EU and national funding programmes for the development and implementation of connected and automated driving technologies. This report looks at the currently available funding budgets on national and European level in light of the global competition.

European funding in Horizon 2020 and the Connecting Europe Facility amounts to approx. €240 million per year together. On the level of the member states Germany (€ 80 million), UK (€23 million) and Sweden (€15 million) are quite strong.

The present report delivers input for the update of the ERTRAC Roadmap on Automated Driving.

1 Introduction

Connected & Automated Driving (CAD) promises dramatic benefits and exciting competitions. It will change our way of living as well as the entire nature of transportation but co-operation along the value chain and across sectors is a prerequisite for this. As a consequence intense and useful competition arises not only between technologies or companies but as well between legal systems, countries or even multi-national markets. Further global trends like urbanization, higher sustainability standards or ageing population increase the demand for innovation and strategic thinking. A coherent European public strategy for Connected & Automated Driving can accelerate progress and deployment through sharing of knowledge and resources. The basis for such a strategy is the “big picture” of existing strategies or at least initiatives on European and national level and an outlook on global activities in the most relevant regions. The objective of SCOUT and in particular of this report is to contribute to this big picture an overview of recent or current funding activities¹.

2 Private and public investments in R&D

Europe has a very strong industrial basis on automotive technologies and systems. Some basic facts are presented in the EU Industrial R&D Investment Scoreboard 2015:

The automotive industry is the biggest R&D investor in the EU out of all industrial sectors. In 2015, the 50 largest automotive companies in the EU invested about €50 billion in R&D. More than every fourth Euro invested in R&D is invested by an automotive company.

Four out of the TOP5 companies investing most in R&D are automotive companies: Volkswagen (worldwide No. 1), Daimler, Bosch and BMW (Sanofi is among the TOP 5 on 4th place).

In addition, the investment increased very significantly by approx. 8%. This R&D growth is mostly due to large companies that invested above the average rate, e.g. Peugeot (14.9 %), Continental (14.4 %), or Mahle (64.3 %).

However, companies outside the EU, US, and Japan showed an even more impressive R&D growth rate of nearly 40% in the automotive sector, led by a few large companies like for example, Tata Motors (108.9%), Hyundai (26.9%), and Saic Motor (16.0%).

Considering, that information technology is a key competence for CAD it is noteworthy that worldwide and in particular in the US, the Software & Computer Services sector shows the highest one-year growth rate (12.8% and 13.1%, respectively). This sector is clearly dominated by the US companies which account for 77% of the total world R&D. Large companies such as Facebook and Google, showed big changes in their R&D investments (88.4% and 24.3% respectively). Also many software companies from China showed double digit R&D growth, e.g. Baidu (69.9%) and Tencent (52.2%).

The financial resources for ongoing and increasing R&D investments are far from running dry: Just the five US companies Apple, Microsoft, Google, Cisco and Oracle are holding cash reserves of nearly € 500 billion together. Apple alone holds more than €200 billion: Much more than the stock market value of many European automotive core companies.

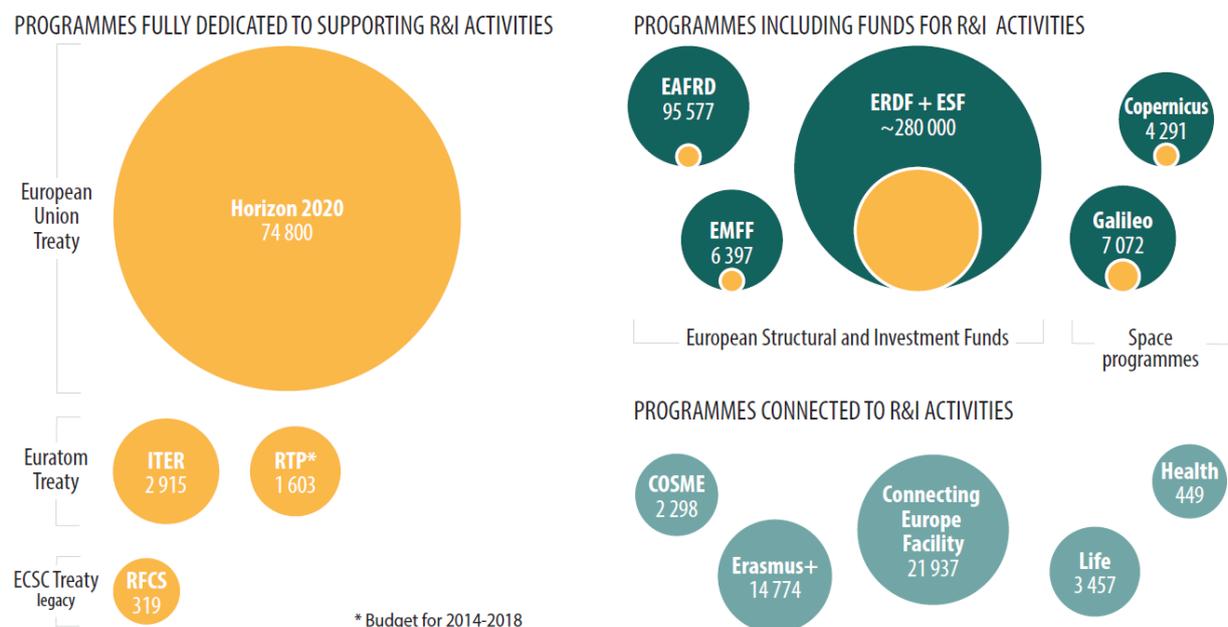
¹ An up-date of this report is scheduled in month 20 of SCOUT.

This huge private investment is accompanied, triggered and leveraged by substantial public investments: For example, the US federal budget for public funding for Connected & Automated Driving (CAD) is planned to be multiplied by four from \$90 million in 2015 to \$360 million in 2017 as part of the announcement to invest \$4 billion for Automated Vehicles in the next years.

In Japan, the Cross-Ministerial Strategic Innovation Promotion Program (approx. €350 million in 2014) has prioritized “Automated Driving System” as a funding topic. And the Japanese “Autopilot System Council” announced "roadmaps that will lead to practical employment of highly automated driving on Japanese highways until 2020", as stated in the EPoSS Roadmap on Smart Systems for Automated Driving from 2015².

3 European public funding

A look at the European funding landscape reveals a large complexity due to the very different funding schemes, timelines, rules, authorities, and procedures. This is even multiplied by corresponding national and multi-national schemes. It is an ongoing task to identify real synergies between these schemes (see e. g. the Smart Specialisation Activities³).



Overview of EU programs funding or connected to R&I activities and their respective budgets (in million Euros)⁴

The most important funding programs for Connected highly automated driving are Horizon 2020 and the Connecting Europe Facility (CEF). In addition, there are also financing

² EPoSS: EPoSS Roadmap "Smart Systems for Automated Driving" now published, <http://www.smart-systems-integration.org/public/news-events/news/eposs-roadmap-smart-systems-for-automated-driving-now-published>, accessed on November 23, 2016.

³ European Commission: Smart Specialisation Platform, <http://s3platform.jrc.ec.europa.eu/home>, accessed on November 23, 2016.

⁴ Reillon, V.: Overview of EU Funds for research and innovation, European Parliamentary Research Service, European Union, Brussels, 2015

programs available (via loans) like the European Fund for Strategic Investments managed by the European Investment Bank (not considered here)⁵.

3.1 Horizon 2020 – Work Program 2016/2017

Funding opportunities under Horizon 2020 are set out in multiannual work programmes, which cover the large majority of support available. The challenge "Smart, Green and Integrated Transport" is allocated a budget of €6 339 million for the period 2014-2020 across all transport modes and aims to boost the competitiveness of the European transport industries and achieve a European transport system that is resource-efficient, climate-and-environmentally-friendly, safe and seamless for the benefit of all citizens, the economy and society. These activities are addressed in the Work Programme 2016/2017 by three Calls for proposals⁶:

- Mobility for Growth
- Automated Road Transport
- European Green Vehicles Initiative

The main contribution of the Call on Automated Road Transport is to support the short term introduction of passenger cars automated driving at level 3 including e. g. truck platooning. Therefore, a focus is on demonstrations of automated driving systems for passenger cars, trucks and urban transport. Demonstrations will be complemented by further research on digital infrastructure to ensure the necessary level of safety, reliability and efficiency of automated driving systems and by a comprehensive analysis of safety aspects in relation to mixed traffic conditions and their influence on end user acceptance. The call includes also an action to assess road infrastructure requirements for higher levels of vehicle automation.

Cooperative systems and connectivity, based on communication of real-time vehicle data, as important means to increase the performance of automated driving are also addressed in other calls, such as Mobility for Growth. There is considerable complementarity between the development and deployment of Intelligent Transport Systems and that of Automated Road Transport. ICT components e.g. sensors and microsystems and data fusion which are important elements of automated road transport will be addressed in the LEIT/ICT Work Programme, as well as in the ECSEL Joint Undertaking. The 'Internet of Things' addresses a pilot on 'Autonomous vehicles in a connected environment' which focuses on technology research in a broader IoT context, including horizontal elements such as ethics and privacy, trust and security, validation, standards and interoperability, user acceptability and human factor, liability and sustainability. There is also complementarity with the LEIT/Space Work Programme part, in particular with the call 'Applications in Satellite Navigation – Galileo', topic 'Galileo-1-2017 – EGNSS Transport'.

Summary (figures not entirely related to CAD):

- Automated Road Transport (ART) 2016/17 - **€114m**
Seven calls, covering various C&AD topics (ICT infrastructure, automation pilots, platooning, safety & user acceptance, road infrastructure, coordination, full-scale demonstration of CAD vehicles)

⁵ European Commission: European Fund for Strategic Investments, http://ec.europa.eu/growth/industry/innovation/funding/efsi_en, accessed on November 23, 2016.

⁶ European Commission: Horizon 2020. Work Programme 2016 – 2017, https://ec.europa.eu/research/participants/data/ref/h2020/wp/2016_2017/main/h2020-wp1617-transport_en.pdf, accessed on November 23, 2016.

- **Mobility for Growth (MG) 2016/17 - €27m**
 - MG-6.1-2016 (Innovative concepts, systems & services for Mobility as a service)
 - MG-6.2-2016 (Large-scale demonstration(s) of cooperative ITS)
 - MG-6.3-2016 (Roadmaps, awareness raising, business models, support for roll-out of ITS)
 - MG-8-2-2017 (Big data in Transport)
- **Internet of Things (IOT) 2016/17 - Approx. €20m**
 - Call IoT-01-2016, Pilot 5 (Autonomous vehicles in a connected environment)
- **Information and Communication Technologies (ICT) 2016/17- €25m**
 - Call ICT-15-2016-2017(Large Scale Pilot actions in sectors best benefitting from data-driven innovation)
- **Applications in Satellite Navigation – Galileo 2017 - €14.5m**
 - GALILEO-1-2017 (EGNSS Transport applications)
- **Estimated annual funding budget related to Connected & Automated Driving: approx. €100m**

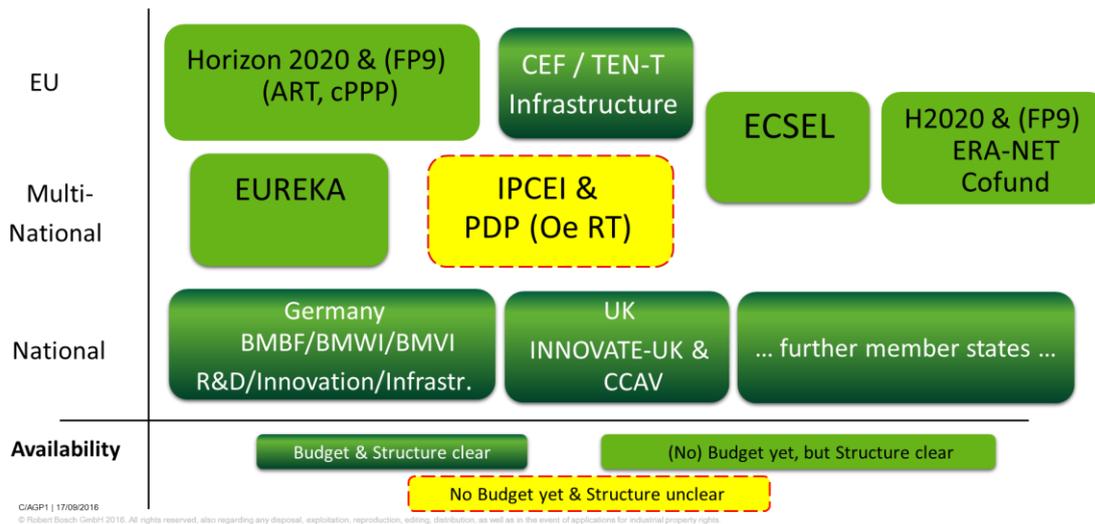
3.2 Connecting Europe Facility

The Connecting Europe Facility program provides funds to improve trans-European infrastructure in the fields of transport, energy and telecommunications. In the transport sector, CEF concentrates on co-financing TEN-T projects with €26.25 billion. The funding is mainly used to complete the TEN-T core network and its corridors by 2030. The vast majority will be used for cross border projects addressing main bottlenecks on the 9 TEN-T multimodal core network corridors which carry large amounts of goods and process a high amount of passenger flows. They connect international gateways and economic areas throughout all Member States and link TEN-T with regional infrastructure. European Coordinators facilitate and coordinate the identification, planning, and implementation of numerous projects of the network corridors.

In a recent paper the European Coordinators emphasized that TEN-T and its core network corridors could become a new “space of innovation”⁷. Recommendations include that new tailor-made instruments should also be evaluated which reflect a coordinated approach on R&I and deployment between Member States and the EU and to involve industry in this process because of their very critical role in innovation. Appropriate governance structures with public and private sector involvement could benefit, facilitate, and complement standalone industrial initiatives for the deployment of large-scale European innovation projects. In short, CEF could provide for an excellent base to deploy CAD on the most important European transport networks.

⁷ Balázs, P.; Cox, P.; Trautmann, C.; Wojciechowski, P.; Brinkhorst, L.-J.; Grosch, M.; Peijs, K.: TEN-T Corridors. Forerunners for a forward-looking European Transport System, Issue Paper TEN-T DAYS2016, Rotterdam, 2016

3.3 Existing and Future Funding Structures



3.4 European Union – Horizon 2020

Funding schemes

- Automated Road Transport (ART) 2016/17 - **€114m**
 - Seven calls, covering various C&AD topics (ICT infrastructure, automation pilots, platooning, safety & user acceptance, road infrastructure, coordination, full-scale demonstration of C&AD vehicles)
- Mobility for Growth (MG) 2016/17 - **€27m**
 - MG-6.1-2016 (Innovative concepts, systems & services for Mobility as a service)
 - MG-6.2-2016 (Large-scale demonstration(s) of cooperative ITS)
 - MG-6.3-2016 (Roadmaps, awareness raising, business models, support for roll-out of ITS)
 - MG-8-2-2017 (Big data in Transport)
- Internet of Things (IOT) 2016/17 - Approx. **€20m**
 - Call IoT-01-2016, Pilot 5 (Autonomous vehicles in a connected environment)
- Information and Communication Technologies (ICT) 2016/17 - **€25m**
 - Call ICT-15-2016-2017 (Large Scale Pilot actions in sectors best benefitting from data-driven innovation)
- Applications in Satellite Navigation – Galileo 2017 - **€14.5m***
 - GALILEO-1-2017 (EGNSS Transport applications)

Estimated annual funding budget related to C&AD: approx. **€100m**

3.5 European Union – CEF

The Connected Europe Facility (CEF) describes an initiative by the European Commission that provides funds for energy-, traffic-, and digital-networks. Financial support takes on two different forms, non-reimbursable grants and contributions to innovative financial instruments.

In the transport sector, CEF concentrates on co-financing TEN-T projects with €26.25bn (2014-2020). The funding is mainly used to complete the TEN-T core network and its corridors by 2030. The vast majority will be used for cross border projects addressing main bottlenecks on the 9 TEN-T multimodal core network corridors.

*not entirely related to C&AD

- Recommendation of the Corridor Managers for action⁸:
 - TEN-T corridors should become first implementers of R&I results
 - Improve coordination between H2020 and CEF Work Programmes
 - Enhance interaction between transport R&I and Corridor Coordinators
 - Establish a new process for clustering R&I and deployment projects
 - Develop a deployment progress map on the roll-out of new technologies and innovation
 - Identify an adequate budget for transport R&I, market-sided Innovation and deployment of R&I solutions

Funding schemes

- 2016 CEF Multi-Annual Work Programme - Intelligent Transport Systems for Road (ITS) - **€120m**
 - Main focus on Cooperative ITS (C-ITS) services and automation & Intelligent transport services for road

Estimated annual funding budget related to C&AD: approx. **€120m**

3.6 Multi-National

EUREKA

- Clusters
 - ITEA3 (Software Technologies): **€16m related to C&AD in 2016**
 - PENTA (Nano- and Microelectronics)*
 - EURIPIDES²: €3m related to C&AD in 2013
- Network Projects – **approx. €5m annually** related to C&AD

IPCEI for Microelectronics:

- Planned for 2017-2020
- Budget: €6,5bn*
- UK, FR, DE, AT, NL, IT...

IPCEI for C&AD, Automotive Telecom Alliance

Estimated annual funding budget related to C&AD: unknown

4 National Funding Schemes

Complementing the previous sections with funding and financing programmes and instruments at European level, this section presents a diversified sample of national funding structures. Countless small and mid-size funding programs and structures are available throughout Europe at national, regional, or even local levels. Therefore, the most relevant examples from EU member states are presented below. They provide a broad picture of the available opportunities and possible applications.

4.1 Germany

Funding schemes

- Federal Ministry of Education and Research
 - Self-determined and secure in the digital world (open program, 2015-2020) - **€35m* annually**
 - e.g. including 2016 call „IT-Security and autonomous driving“
 - Human Machine Interaction (open program, 2016-2020) - **€70m* annually**

⁸ Balázs, P.; Cox, P.; Trautmann, C.; Wojciechowski, P.; Brinkhorst, L.-J.; Grosch, M.; Peijs, K.: TEN-T Corridors. Forerunners for a forward-looking European Transport System Issue Paper TEN-T DAYS2016, Rotterdam, 2016.

*not entirely related to C&AD

- Reliable, intelligent and efficient electronics for E-Mobility (2017 call focusing on reliable and fail-operational systems for e-vehicles incl. with regard to automation) – **approx. €30m* in 2017**
- Federal Ministry of Transport and Digital Infrastructure
 - Automation and Connectivity in Road Traffic (open program with focus on digital test environments, 2016-2020) - **€80m in total**
 - mFUND/modernity fund (focus on digital innovations related to connected mobility using cloud data; program mainly for new business ideas and startups, 2016-2020) – **€20m* annually**
- Federal Ministry of Economic Affairs and Energy
 - New Vehicle and System Technologies (open program with 2 pillars: automated driving + innovative vehicles in general, 2015-2018) - **€50m* annually**
 - E.g. including 2015/16 call „Highly and fully automated driving for sophisticated driving situations“ (**budget of €40m**)
- German Research Agency (Deutsche Forschungsgesellschaft)
 - Priority Programme “Cooperative interacting automobile”
- Technology open funding programs and regional funding, e. g. „KMU Innovativ“*
Estimated annual funding budget related to C&AD: **€60-80m**

- **Funding priorities & targets**

- National Strategy on C&AD developed and steered by a Round Table
- Goal: Germany being the leading provider and leading market for C&AD technology
- Encompassing funding schemes with various foci, including:
 - human-machine-interaction
 - microelectronic components
 - field operational tests on highways and urban scenarios
 - traffic management
 - IT-security
 - connectivity & communication
 - social acceptance

4.2 United Kingdom

Funding schemes

- Department for Business, Energy and Industrial Strategy
 - UK-Connected and Autonomous Vehicles Research and development programme (2015-2020) with a **total budget of £100m**
 - Administered by the newly established *Centre for Connected & Autonomous Vehicles* and delivered by *INNOVATE-UK*
 - First competition 2015/16 (broad focus incl. connectivity, autonomy, customer interaction)- **£20m (€23m)**
 - Second competition 2016/17 (broad focus incl. C&AD test vehicle demonstrations in various environments, connectivity, safety & security) - **up to £35m (€40m)**
- Additional funding opportunities (e.g. autonomous systems in general)
- **Funding priorities & targets**
 - Shuttle systems (pods) for urban use cases
 - Field Operational Tests (in cooperation with local authority districts)

Estimated annual funding budget related to C&AD: At least **£20m (€23m)**

4.3 Spain

Funding schemes

- No dedicated C&AD calls/programs at the moment, but general funding instruments:
- Ministry of Economy and Competitiveness
 - Talent and employment in R&D&I - **€310m*** in 2016
 - Excellent technical and scientific research - **€183m*** in 2016
 - Industrial Leadership - **€494m*** in 2016
 - R&D&I to societal challenges - **€1.62bn*** in 2016
- Ministry of Industry, Energy and Tourism
 - Strategic Action Economy and Digital Society: funding of projects related to information and communications technologies - **€60m*** in 2016, **€20m*** in 2017
- Government of Catalonia – Agency for Business Competition
 - Nuclis (Among other topics: Industries of sustainable mobility) - **€4m*** in 2016
 - RIS3CAT (Among other topics: Industries of sustainable mobility) - **€24m*** in 2016
- Additional regional public authorities with tech-open funding programs

Estimated annual public funding budget related to C&AD: unknown

4.4 Austria

Funding schemes

- Ministry of Transport, Innovation and Technology
 - Mobility of the Future - **approx. €5m annually**
 - 2015/16 (infrastructure, connectivity and vehicle technologies)- €3.5m
 - 2016/17 (C&AD test environments) - €5-10m
 - 2017/18 (infrastructure, connectivity and vehicle technologies)- €5m
 - Information and Communication Technologies of the Future
 - Related to Connectivity & Communication in general
 - Variable budget, tentatively **up to €5m annually** on C&AD

Estimated annual public funding budget related to C&AD: **up to €10m**

4.5 Finland

Ministry of transport and communications

- AURORA: Automated driving, transport infrastructure and connected cars, intelligent infrastructure asset management: **€2m-3m** in 2017/2018

Estimated annual public funding budget related to C&AD: **€2m - 3m annually (in 2017/2018)**

4.6 France

Funding schemes

- National agenda “Nouvelle France Industrielle”: **>€30m** of public funding on C&AD
 - Programs “Investments for the future”
 - 2015/2016 Call “Future vehicles and transport” – **€250m***
 - 3 streams: vehicle performance improvement, connected and automated vehicles, innovative mobility services
 - 2015/2016 Call “The vehicle in its environment” - **€30m***
 - No dedicated C&AD focus, but related topics (smart traffic and vehicle control, environment data collection & share)
 - Funding via VEDECOM (PPP)
 - Main research fields: e-mobility, C&AD
 - Budget of €300m* over 10 years (funding: 1/3 public, 1/3 industry, 1/3 other)

Estimated annual public funding budget related to C&AD: unknown

- **Funding priorities & targets**

- National Roadmap on C&AD vehicles
 - Test fields, R&I-projects until 2018
 - Market introduction vehicles with automated driving functions by 2020 (highway & traffic jam pilot, automated parking assist, V2I infrastructure)
 - Market introduction of fully automated vehicles for various use cases by 2030
- Cooperative ITS (funding partially via CEF)
 - V2I infrastructure
 - Test fields for communication & connectivity technologies

4.7 Belgium

Funding schemes & targets

- Flemish Department of Economy, Science & Innovation
 - Autonomous vehicle and Infrastructure Cooperative Architecture (AVICA; 2015ff)– **€4.1m** (*It remains unclear to which period this budget refers*)
 - R&D pursued by *Flanders Make* (strategic research center), academia & industry
 - Focus on functional safety, path planning, GPS positioning

Estimated annual public funding budget related to C&AD: unknown

4.8 Netherlands

Funding schemes & targets

- Ministry for Infrastructure and the Environment + 12 regions
 - Intelligent Transport Systems (ITS) programs (2016-2018) - **€70m***
 - “Beter Benutten”/Optimizing Use (smart and efficient use of existing infrastructure and telecommunications capabilities, enhancing connectivity, merging & distribution of public and private data)
 - Large scale deployment of road communication & connectivity (V2I) infrastructure
- Dutch Automated Vehicle Initiative (DAVI): PPP with the goal of investigating and demonstrating C&AD on public roads

Estimated annual public funding budget related to C&AD: unknown

4.9 Sweden

Funding schemes & targets

- Swedish Transport Administration
 - DriveMe (Field Operational Tests with 100 vehicles) - **€10.5m annually**
- VINNOVA (innovation agency)
 - Drive Sweden (C&AD innovation program) - **€1.5m annually**
- Swedish Energy Agency, VINNOVA, Swedish Transport Administration
 - FFI (Strategic Vehicle Research and Innovation: partnership between the Swedish government and the automotive industry) - **€2.5-3.5m annually on C&AD**

Estimated annual public funding budget related to C&AD: **€15m**

4.10 Italy

None of the existing funding schemes is currently dedicated to C&AD

- **Funding priorities & targets**

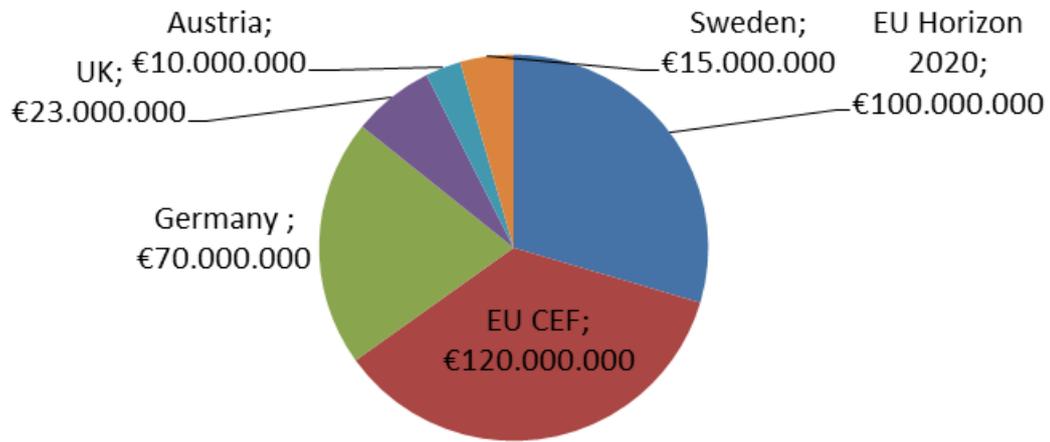
- Transporti Italia 2020 (Technology cluster comprising actors from the government, industry and academia)
 - C&AD has a high priority in the Strategic Research Agenda (SRA) 2014-2020
- Public funding instruments are under preparation

Estimated annual public funding budget related to C&AD: unknown

*not entirely related to C&AD

5 Conclusion

The following picture summarises the European funding landscape on connected and automated driving.



Concrete numbers for budgets on multi-national activities as well as Spain, France, Netherlands, Belgium and Italy are still missing.