Deliverable 6.2

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

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Consortium

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Executive Summary

A coherent funding strategy for Connected & Automated Driving (C&AD) will accelerate progress in its deployment. 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 along with Connecting Europe Facility funding amounts to approx. €240m per year altogether. This, in addition to, considerable funding from members states such as Germany (€60-80m), UK (€23m) and Sweden (€15m) exemplify Europe’s drive to become a C&AD leader. However, countries such as Japan, China, and the US have also been investing in C&AD technologies and there are numerous funding schemes and priorities to be aware of within these countries.

This deliverable provides an overview of EU, select European member states, and three non-European countries and their C&AD funding schemes and targets. The aim is not to provide a detailed analysis/comparison of every national C&AD funding opportunity available globally, but rather to provide a “big picture” through the analysis of the most relevant nations, which are identified as key players in the C&AD field. Included countries are: Germany, UK, Spain, Austria, Finland, France, Belgium, Netherlands, Sweden, Italy, Japan, China, and the United States.
1 Introduction

Connected & Automated Driving (C&AD) promises dramatic benefits and exciting competition. 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. Therefore, intense and useful competition arises not only between technologies or companies but as well between legal systems, countries or even multi-national markets. Additionally, global trends like urbanization, higher sustainability standards or an 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 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 activities.

2 Private and public investments in R&D

Europe has a very strong industrial basis of automotive technologies and systems. Some basic facts in the EU Industrial R&D Investment Scoreboard 2016 are:

- The automotive industry is the biggest R&D investor in the EU out of all industrial sectors. In 2016, EU companies increased significantly their share of global R&D in the Automobiles & other transport sector (from 36% to 44%)

- In contrast, US companies for example, decreased their contribution to the world R&D in the automotive sector (from 25% to 19%).

- Between 2007 and 2016, investments from the automotive sector in R&D increased from roughly 29 to 53 billion Euro and from 5.9 to 7.8 in the US.

- In 2016, the 50 largest automotive companies in the EU invested about €50 billion in R&D. An automotive company invests more than every fourth Euro invested in R&D.

- Four out of the TOP 5 European companies investing most in R&D are automotive companies: Volkswagen (the biggest investor in R&D worldwide), Daimler, Bosch and BMW (AstraZeneca is among the TOP 5 on 4th place).

- Overall R&D growth in the EU (at 6.7% in 2016) is mostly due to large companies, many of which are automotive companies, e.g. ZF (+40%), Renault (+20%), Daimler (+15%), Continental (+15%), and Robert Bosch (+7.4%).

Considering that information technology is a key competence for C&AD, it is noteworthy 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). In addition, 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: 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.

This huge private investment is accompanied by substantial public investments: For example, the US federal budget for public funding for Connected & Automated Driving (C&AD) will provide at least $180m to private and public sectors to demonstrate and deploy C&AD technologies.

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 20151.

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 increased 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 Activities2).

Overview of EU programs funding or connected to R&I activities and their respective budgets (in million Euros)3

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

*not entirely related to C&AD
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 programs available (via loans) like the European Fund for Strategic Investments managed by the European Investment Bank (not considered here)4.

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 bn 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 2018-2020 – released in October 2017 - by three Calls for proposals5:

- Mobility for Growth
- Automated Road Transport
- Green Vehicles

Four broad lines of activities serve as the foundation for the Work Programme:

1. Resource efficient transport that minimizes the transport's systems’ impact on climate and the environment by improving its efficiency in the use of natural resources, and by reducing its dependence on fossil fuels and energy imports.
2. Better mobility, less congestion, more safety and security with the aim of reconciling 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.
3. Global leadership for the European transport industry in order 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.
4. Socio-economic and behavioural research and forward looking activities for policy making aiming 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.

Synergies will be pursued within these initiatives as well as with other parts of Horizon 2020, namely 'Information and Communication Technologies' (ICT), 'Nanotechnologies, advanced materials, biotechnology and advanced manufacturing and processing' (NMBP), 'Secure, clean and efficient energy', 'Climate action, environment, resource efficiency and raw materials' and 'Secure societies'.

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The 2018-2020 Automated Road Transport call is part of the Focus Area "Digitising and transforming European industry and services". Demonstrations will look at testing the use of digital, connectivity as well as satellite navigation technologies for optimised connected and automated driving functions (including the EGNOS and Galileo). Digital technologies, such as Big Data, Internet of Things, and Artificial Intelligence techniques provide a great potential for developing innovative automated driving functions and mobility solutions for the future. Communication and cooperation of automated vehicles with other vehicles, infrastructure and other road users can increase the safety, comfort, productivity and the enabling of innovative business models of automated vehicles and improve the efficiency of the overall transport system.

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 activities 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. Key funding mechanisms are:

- **Automated Road Transport (ART) 2018-2020 - €103m**
  Four calls, covering various C&AD topics (e.g., automation pilots, shared mobility, safety & user acceptance, impact assessment, coordination, full-scale demonstration of C&AD vehicles, human centred design)

- **Mobility for Growth (MG), calls with road transport focus, 2018-2019 – App. €130m**
  Over 15 calls, covering various topics (e.g., transport impact on air quality, sustainable multi-modal transport, transport infrastructure, logistics, coordination, freight transport, acceptance of C&AD, driver behaviour, regulation, dissemination events)

- **ICT/5G for C&AD**
  Call ICT-17-2018: 5G End to End Facility - €60m*
  Call ICT-18-2018: 5G for cooperative, connected and automated mobility (CCAM) - €50m*

- **Artificial Intelligence**
  ICT-26-2018: Artificial Intelligence - Approx. €20m*

- **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 nine 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 2016 paper, the European Coordinators emphasized that TEN-T and its core network corridors could become a new “space of innovation”\(^6\). 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 an excellent base to deploy C&AD within the most important European transport networks.

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*not entirely related to C&AD*
3.3 Existing and Future Funding Structures

Overview of existing and potential funding instruments in Europe for the funding of C&AD.

3.4 European Union – Horizon 2020

Funding schemes

- Automated Road Transport (ART) 2018-2020 - €103m*
  Four calls, covering various C&AD topics (e.g., automation pilots, shared mobility, safety & user acceptance, impact assessment, coordination, full-scale demonstration of C&AD vehicles, human centred design)

- Mobility for Growth (MG), calls with road transport focus, 2018-2019 – Approx. €130m*
  Over 15 calls, covering various topics (e.g., transport impact on air quality, sustainable multi-modal transport, transport infrastructure, logistics, coordination, freight transport, acceptance of C&AD, driver behaviour, regulation, dissemination events)

- ICT/5G for C&AD
  Call ICT-17-2018: 5G End to End Facility - €60m*
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- Artificial Intelligence
  ICT-26-2018: Artificial Intelligence - Approx. €20m*

- Estimated annual funding budget related to Connected & Automated Driving: 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
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corridors by 2030. The vast majority will be used for cross border projects addressing main bottlenecks on the nine TEN-T multimodal core network corridors.

- Recommendation of the Corridor Managers for action:
  - 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 instruments at a 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. A selection of the most relevant examples from EU member states are below. They provide a broad picture of the available opportunities and possible applications.

To provide a more complete overview is difficult since precise information about the exact amounts of funding available is often not disclosed. In addition, funding for connected and automated driving is frequently not easily distinguishable from funding for other mobility topics in unspecific funding budgets dedicated to e.g. new mobility solutions.

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* not entirely related to C&AD
4.1 Germany

Funding schemes
- Federal Ministry of Education and Research
  o Self-determined and secure in the digital world (open program, 2015-2020) - €35m* annually
  o e.g. including 2016 call „IT-Security and autonomous driving“
  o Human Machine Interaction (open program, 2016-2020) - €70m* annually
  o 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
  o Automation and Connectivity in Road Traffic (open program with focus on digital test environments, 2016-2020) - €80m in total
  o mFUND/modernity fund (focus on digital innovations related to connected mobility using cloud data; program mainly for new business ideas and start-ups, 2016-2020) – €20m* annually
- Federal Ministry of Economic Affairs and Energy
  o New Vehicle and System Technologies (open program with 2 pillars: automated driving + innovative vehicles in general, 2015-2018) - €50m* annually
  o E.g. including 2015/16 call „Highly and fully automated driving for sophisticated driving situations“ (budget of €40m)
- German Research Agency (Deutsche Forschungsgesellschaft)
  o Priority Programme “Cooperative interacting automobile”
- Technology open funding programs and regional funding, e.g. “KMU Innovativ”*

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 focuses, including:
  - human-machine-interaction
  - microelectronic components
  - field operational tests on highways and urban scenarios
  - traffic management
  - IT-security
  - connectivity & communication
  - social acceptance

Estimated annual funding budget related to C&AD: €60-80m

4.2 United Kingdom

Funding schemes
- Department for Business, Energy and Industrial Strategy
  o 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)
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- Second competition 2016/17 (broad focus incl. C&AD test vehicle demonstrations in various environments, connectivity, safety & security) - up to £35m (€40m)

- Department for Transport
  - 2014 Autonomous vehicle competition: Four cities testing driverless cars – €15.6m

- Department for Business, Energy and Industrial Strategy and Department for Transport:
  - Connected corridor between London and Dover - €17.5 m

- PPP
  - 2015 Jaguar Land Rover and the Engineering and Physical Science Research Council (EPSRC): “Towards Autonomy – Smart and Connected Control” (TASCC) £11m (€12m) research programme

- UK Transport Research Laboratory part of this programme

- 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)
- Focus area

Estimated annual funding budget related to C&AD: At least £20m (app. €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

*not entirely related to C&AD
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)

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

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

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 centre), aC&ADemia & 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, since the funding for the particular topic of C&AD is difficult to extract

*not entirely related to C&AD
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 C&ADemia)
  - 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

5 Other countries

5.1 China

Funding schemes & targets
China has supported autonomous driving throughout its Five-Year-Plans over the past two decades and through the “863 Plan” since the 1980’s in several ways. Initially, the focus was on automation mainly for military purposes. During the Ninth Five-Year-Plan, the ITS framework was established and the foundation of public-private research evolved through the R&D of application systems. In the current initiative, “Made in China”, C&AD is a key priority to upgrade the Chinese industry. Implementing innovation and addressing the whole manufacturing process are key aspects. The major steps were:

  - establishing a national ITS framework
  - R&D of application systems lead to the foundation of public-private research
- Tenth Five-Year-Plan Period (2001-2005) and 11th Five-Year-Plan Period (2006-2010) the focus of ITS developed and in the
- 2000: Collaboration between the National University of Defence Technology NUDT and the FAW Group Corporation doing research on the automated vehicles system on the Chinese brand Hongqi car
- 2008 National Natural Science Foundation (NSFC)
  - key research programme - cognitive computing of visual and auditory information
- 2009: Annual “Future Challenge” National Automated Vehicles Competition
- 2013 NUDT: Automated Vehicles Key Technologies and Integrated Verification Platform
- Policy plan “Made in China 2025”

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- Key priority are self-driving cars
- uniting the stakeholder in the goals
- 2016 establishment of the first national test site for C&AD

5.2 Japan

Funding schemes & targets

- Program name: ITS Japan
  - Goal: creating new industries and markets through large investments
- Autopilot System Council
  - Concrete Goal: Deployment of C&AD on highways until 2020
- Automated Driving Systems (ADS)
  - ADS is part of the Japanese Cross-ministerial Strategic Innovation Promotion Program (SIP)
  - Members: Government, public authorities, aC&ADemia, research institutes, Japanese OEMs
  - Promoting R&D through funding, cooperation and standardization
  - C&AD had been prioritized as a funding topic
  - ¥2.32 billion approximately €17.3 million.

5.3 USA

Funding schemes & targets

Similar to Europe where C&AD policies/targets have to be coordinated at EU, national, and regional levels, the US is dealing with rule making at the federal level while also coordinating with state-level funding and laws. While this coordination process remains ongoing, the US federal government prioritizes R&D topics not currently being addressed by the private sector, “and have the strongest potential to advance the safe deployment” of advanced vehicles. Cybersecurity is also a main concern to the US government, and will be incorporated within the various funding schemes.

FY 2018 Omnibus Appropriations Bill – Department of Transportation (DOT) Funding

The bill contains funding for the various transportation safety programs and agencies within the DOT: Federal Motor Carrier Safety Administration (FMCSA), National Highway Traffic Safety Administration (NHTSA), Federal Highway Administration (FHWA), and Federal Transit Administration (FTA). Each office has different funding and technology emphasis, and funding will emphasize cross-agency collaborations. Not all funding is available to external partners, meaning it is available to agencies to fund their own C&AD R&D programs (through University Transportation Centres for example). Highlights of the FY 2018 appropriations bill are:

- Federal Motor Carrier Safety Administration (FMCSA)
  - Up to $100m (available until expended) for highly automated vehicle research and development program which will fund planning, direct research and demonstration grants.

8 https://www.reuters.com/article/us-autos-selfdriving-congress/u-s-spending-plan-include-100-million-for-autonomous-cars-research-testing-idUSKBN1GY074
9 FY2018 Omnibus Appropriations Bill passed March 2018. Funding has to be contracted/allocated within the fiscal year, but project duration will vary for each opportunity and can range from a few months to multiple years.

*not entirely related to C&AD
The bill specifies that at least $60m go to grants and cooperative agreements to fund demonstration projects that test the feasibility and safety of HAV and ADAS deployments.

- **Up to $38m** for direct agency research NHTSA, FHWA, FMCSA and FTA—of which no more than $5 million shall be used for ADAS research (ADAS refers to SAE level 1-2)
  - Remaining funds to be spent on HAV, referring to technologies capable of SAE level 3-5
  - $>1.5m of total amount: conducting a comprehensive analysis of the impact of ADAS and HAV technologies on drivers and operators of commercial motor vehicles

- Department of Transportation released its “Comprehensive Management Plan for Automated Vehicles” in July 2018, as required in the FY2018 Omnibus Appropriations Bill
  - Outlines holistic HAV and ADAS research plan that advances DOT’s understanding of HAV and ADAS technologies to the benefit of both commercial motor vehicle and light duty vehicle safety.

- **University Transportation Centres (UTC) - a total of $90m**
  - $15m of this funding is for competitive grants for two research centres (congestion research, infrastructure research)
  - Awarding no less than $3m for research on rural autonomous vehicles and connected vehicles to be conducted by existing UTC university

- **National Highway Traffic Safety Administration**
  - $48.9m*: research and analysis programs (>15m* for vehicle electronics and emerging technologies, which includes research of automated vehicle technologies)

Previously initiated funding programs, including state and federal opportunities:
- January 2016, the federal government requested **$4b** (€3.79 billion) to be invested over the next 10 years to finance research projects and infrastructure improvements
- 2016 Department of Energy: ARPA-E NEXT-Generation Energy Technologies for Connected and Automated on-Road-vehicles (NEXTCAR) Program (currently active)
  - $32m* in funding for 10 innovative projects
- Florida Department of Transportation (FDOTT): Florida Automated Vehicles (FAV) programme
- **US Department of Transportation (USDOT)**
  - September 2015 Connected Vehicle Pilot Deployment Programme (currently active)
  - **$40m (€37.9 million)** for three locations, up to 50 months in duration:
    - New York City Department of Transportation: V2V
    - Tampa Hillsborough Expressway Authority (THEA): measuring environmental benefits - $17m*
    - ICF/Wyoming: V2V, V2I
  - 2016 Smart City Challenge
    - **$50m* ($40m from US DOT, $10m from Vulcan, Inc.)** awarded to Columbus, OH to test, demonstrate, and deploy smart city technologies, including autonomous vehicles and truck platooning.

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* not entirely related to C&AD
6 Conclusion

Based on the global R&D investments by nations and organizations such as the EU, it is clear that C&AD promises to bring dramatic benefits and exciting competition. It has the potential to change our everyday life, but there is still a long way to go before level five technologies can be developed and introduced to the market. By understanding the global C&AD “big picture” the EU, and its member states, can strengthen its global position of developing advanced automotive technologies. As shown in this deliverable, the EU and select individual member states are well positioned to remain key players in the C&AD field, but countries such as Japan, China, and the US will continue to increase their R&D investments in hopes of attracting more talent and developing the next-generation of automobiles. However, the “big picture” also shows that not one actor is currently able to do it all on their own, and therefore cooperation among all involved stakeholders will remain essential.

To summarize, in order to best support the currently active initiatives and stakeholders on connected and automated driving, an overarching, coherent European funding strategy is required, e.g. facilitated by a dedicated public private partnership and an IPCEI on C&AD and with a sizeable budget. This strategy will also have to provide realistic incentives for key stakeholders (industry, academic, or non-profit organizations) to collaborate on connected and automated driving developments. Only through strong mechanisms will stakeholders be able to tackle the C&AD challenges of tomorrow together.