

EGVI YEARLY MONITORING REPORT 2018

EUROPEAN GREEN VEHICLE INITIATIVE

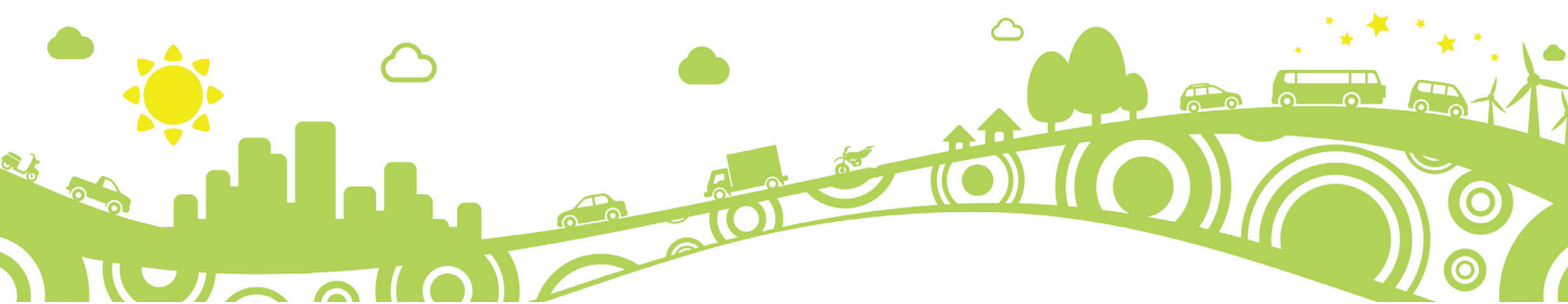


EGVI
European Green
Vehicles Initiative



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1. Introduction: The EGVI cPPP

On 17th December 2013, 8 contractual Public Private Partnerships (cPPPs) were signed, including the European Green Vehicle Initiative, co-signed by Máire Geoghegan-Quinn, European Commissioner for Research, Innovation and Science and Mr Wolfgang Steiger, Director for Future Technologies of the Volkswagen Group.

The EGVI cPPP has been launched to take over from the successful European Green Cars Initiative launched in 2009 by the European Commission as part of the European Economic Recovery Plan. All parties (public and private sides) expressed their willingness to continue their close collaboration to tackle the challenges of decarbonisation of road transport. Following the success of this first collaboration between the European Commission and the automotive sector, a specific contractual PPP has been launched with even more ambitious targets in terms of reduction of CO₂ emissions, reduction of energy consumption and development of alternative powertrains.

With a total budget of €750 million from the Horizon 2020 programme, and an expected adequate amount from private investments, the EGVI cPPP covers topics which contribute to reaching the goal of energy efficiency of vehicles using alternative powertrains, in particular the electrification and hybridisation of powertrains and their adaptation to renewable fuels.

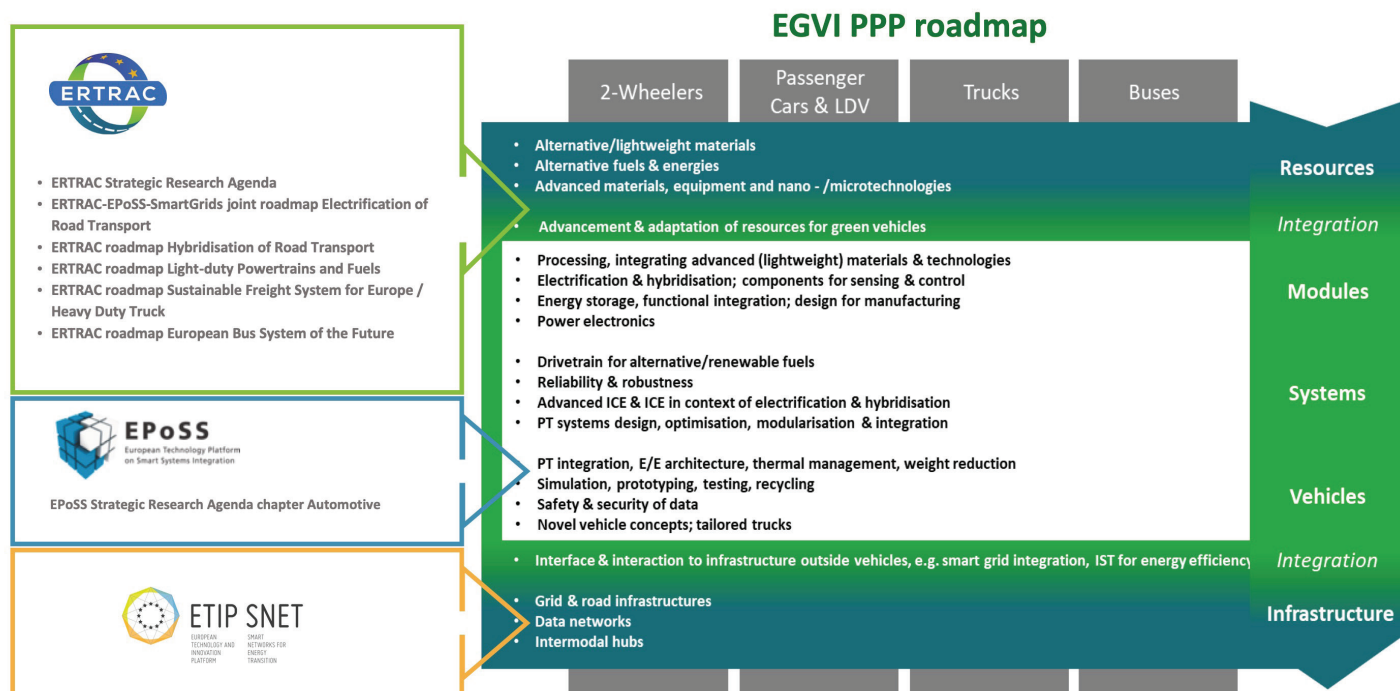
The “electrification” pillar of the European Green Cars Initiative has been extended from passenger cars to all types of vehicles (2 wheelers, passenger cars, trucks & buses and new vehicles concept) focusing on the improvement of energy efficiency of vehicles using alternative powertrain. The integrated R&D&I programme and added value of a cPPP was supported both by the European Commission and the automotive sector as a way to achieve the targets set by the European Transport, Energy, Environment and Climate protection policies.

The cPPP roadmap is based on roadmaps published by the three supporting European Technology Platforms (ETPs), namely ERTRAC¹, EPoSS² and Smart Grids³ (now merged into the newly ETIP-SNET), especially the “European Roadmap Electrification of Road Transport” jointly published by the three ETPs, which is promoting a cross-sector and integrated approach to achieve its ambitious goals. This technical roadmap was updated in 2017 and its revised milestones correspond to the expected market developments for electric vehicles. The roadmap emphasizes that in order to reach the milestones, technological improvements have to be achieved, including the improved performance and availability of next generation of batteries, the development of advanced alternative drivetrain technologies, the exploitation of synergies thanks to efficient system integration as well as the integration of electric vehicles into the electricity grid.

1. <http://www.ertrac.org/>

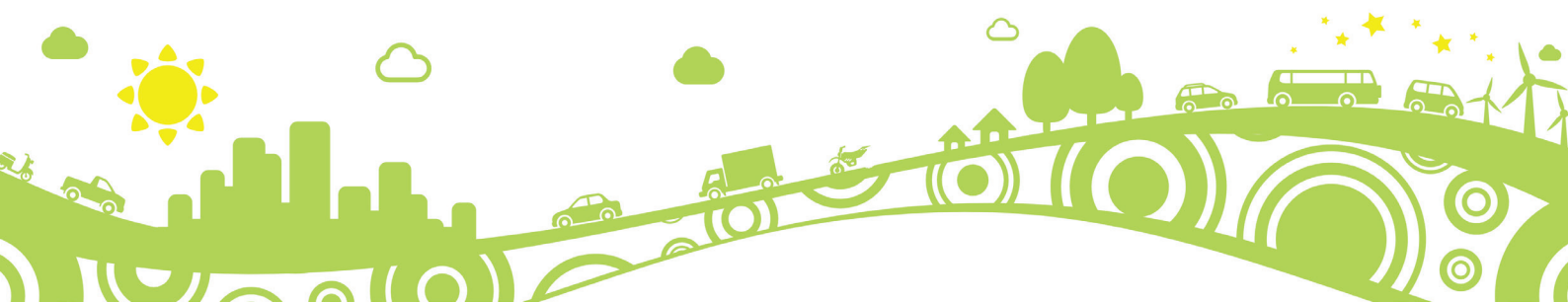
2. <https://www.smart-systems-integration.org/public>

3. <https://www.etip-snet.eu/>



By addressing various product layers - from the module to packaging and electronic control and ensuring the interlinks with the grid - the integrated approach of EGVI allows to cover the entire process chain from resource application to demonstration and creation of services and from extended research and development to innovation and market uptake.

Following an integrated approach, by including inputs from the automotive (*via ERTRAC*), the smart systems (*via EPoSS*) and the smart grid (*via ETIP-SNET*), the European Green Vehicles Initiative is proposing a system approach to tackle the challenge of decarbonisation of road transport. Integrating different perspectives under a single umbrella in a common system approach is a unique opportunity to meet the CO₂ emissions reduction objectives set at European level.



2. Main activities and achievements during 2018

2.1 Implementation of the calls for proposals evaluated in 2018

The Green Vehicles topics published in the 2018 Work Programme of Horizon 2020 have been defined in accordance with the EGVI cPPP Roadmap.

The topics opened in the 2018 calls for proposals were the following:

- Integrated, brand-independent **architectures, components and systems** for next generation **electrified vehicles optimised for the infrastructure** (GV-01)
9 projects selected for funding
- **Virtual product development and production** of all types of electrified vehicles and components (GV-02)
4 projects selected for funding
- **Materials** for future **highly performant electrified vehicle batteries**
3 projects selected for funding

The 2018 calls have been drafted following the integrated approach promoted by the EGVI cPPP: different types of vehicles have been addressed by the two topics, and several areas of the process chain from resources up to vehicles have been covered by the topics, including some for the first time in the EGVI programme as described in the cPPP roadmap.

Table 1 - Breakdown of topics per vehicles type and roadmap areas

2018	2 wheelers	Passengers cars & LDV	Trucks	Buses
Resources integration		LC-NMBP-30-2018		
Modules		GV-01 GV-02	GV-01	
Systems		GV-01 GV-02	GV-01	
Vehicles		GV-02		
Vehicles integration		GV-01	GV-01	

2.2 Mobilisation of stakeholders, outreach, success stories

EGVIA has organised two **General Assembly meetings** (for its members only) – one in spring and one in autumn, coupled with the visit of the Politecnico di Milano as well as a visit of the Joint Research Center in Ispra.

A workshop has been organised on **28th February 2018**, in collaboration with ETRAC and EFFRA, to provide an opportunity for the Automotive Research & Innovation community to gain insights into key European projects being conducted within the context of **Factories-of-the-Future PPP**, the results of which could be exploited in the Automotive Industry. In the two technical sessions, the outcome or actual results of a total of 20 individual FoF projects, either on-going or recently completed, were presented, encompassing wide range of technical areas of significant relevance to the automotive sector.

The [press release](#) is available on the website.

From 16th to 19th April, EG VIA participated to the Transport Research Arena (TRA) in Vienna. A common booth has been set together with ERTRAC and EARPA, just next to the European Commission one. Over the four days, several roadmaps have been distributed – include the electrification of road transport one. In addition, EG VIA distributed its latest project portfolio presenting in a nutshell the 52 projects funded under Green Vehicles from 2014 to 2017. Many participants to the TRA conference stopped by the booth and requested more information about the initiative and its achievements. It has also been the occasion for ERTRAC to disseminate its updated Strategic Research Agenda (SRA) presenting research priorities up to 2050. No specific session was organised by EG VIA in the 2018 TRA, but a full day was dedicated to the decarbonisation topic during which the topics covered by the partnership were well covered.

On 20th June, a one-day workshop was organised entitled “EVs and their integration into the grid - State of play and challenges”. Organised in Brussels, the objective of this event was to gather representatives from the road transport, the energy and the local authorities in order to exchange perspective on the activities needed to ensure the large-scale uptake of electromobility across Europe. Several EU-funded projects have been presented, from EG VIA of course, but also from the energy side, aiming at better understand where are the upcoming needs for enhanced collaboration among the two communities. Representatives from London and Barcelona also presented activities carried out at local level to ensure the proper integration of EVs to the local network. The workshop ended by a panel discussion on the “chicken and egg” issue of electromobility. A summary of the event, as well as all presentations are available [online](#).

Upon invitation from the European Commission, EG VIA participated to the **conference “industry, partnerships – a new impetus” organised on 26th September in Brussels**. Stephan Neugebauer, EG VIA chairman, has been invited to join the Panel 3: Future technologies and their impact for society and EG VIA host a stand during the whole day of the conference.

With support from the European Commission, DG Research and Innovation and DG Mobility and Transport, INEA and ERTRAC, EG VIA has organised, on 29th and 30th November 2018, the second **European Conference on Results from Road Transport Research in H2020 projects**. Over the two days, 79 projects funded under the H2020 transport programme – including 30 EG VIA funded projects - have presented their results to an audience of about 280 participants from all across Europe. Various technological challenges were covered in order to highlight the contribution of ongoing EU-funded research projects to meet EU policy goals. Hosted by the Commission at CCAB building, the whole conference was available via web stream and all sessions have been recorded, all of them are still [available for replay](#). As a follow-up of the conference, and thanks to the contribution of sessions moderators, a report has been drafted to summarise the main outcomes of each session, main achievements of projects and their potential contribution to achieve EU policy objectives. The report is available on the [website](#).

In order to reach a wider audience, EG VIA has also decided to be more active on social media, via the creation of a Twitter account, a YouTube channel and the relaunch of the LinkedIn page. A quarterly newsletter is also sent to almost 1000 stakeholders, both from the public and the private side. Interested parties can register directly via the website – in full compliance with the GDPR.

EG VIA and its members have been actively contributed to the ongoing batteries related activities, particularly to the Action 7 of the SET-Plan dealing with “Fast charging” for which EG VIA took the lead to launch discussions and prepare the draft of a research paper, identifying future research needs in this specific area. Based on the successful experience of the SET-Plan and following the decision of the Commission, this work will be continued in the framework of the ETIP-Batteries, in which EG VIA will also be active.

Thanks to FUTURE-RADAR, the support action to ERTRAC and EG VIA activities, international contacts have been initiated. More activities related to international collaboration in the field of electromobility are expected in the near future based on this first experience.

At the end of 2018, EGVI had gathered 84 members among which 17 OEMs, 22 automotive suppliers, 2 representatives of the smart systems industry, 1 representative of the smart grid industry, 14 research organisations, 20 universities and 8 associated members, mainly other European association active in this area. However, the association is attracting new members and is on a developing path. A particular attention is given, within EGVI, to get a consensus among its members in the prioritisation of decision, especially thanks to an appropriate consultation processes and the organisation of conferences and workshops. The strategy prepared for EGVI by the Executive Board is validated by the General Assembly (gathering all EGVI members) which meets at least twice a year.

More information about the EGVI PPP activities and the association can be found on <https://egvi.eu/>.

Green Vehicles funded projects targets and achievements are covering many different areas and vehicles type:

The three projects funded under the GV-01-2014 topic (**FIVE-VB**, **eCAIMAN** and **SPICY**) have been working on new cell materials for lithium-ion batteries for automotive applications. They achieved promising results in different chemical solutions while offering opportunities for important cost reduction and their intense exchange and discussion led also to the **submission of a joint white paper on standardization of test standards** presented during the TRA in Vienna last April 2018 and submitted to the standardisation committee at the end of the projects.

HELIS and **ALISE** projects have achieved promising results on future chemistries for automotive batteries, particularly on **lithium sulfur** batteries, with promising developments at **cell level, weight reduction and second life / recycling options** (recycling in the industrial environment with >50% efficiency and 5 different components separated).

A number of additional projects selected in 2017 and 2018 calls (**i-HeCoBatt**, **iModBatt**, **ACHILES**, **GHOST**, **IMAGE** ...) will also bring a great contribution to the **advancement of knowledge in the field of batteries performance**; their ambitious targets will surely deliver promising results in the coming years.

Thanks to its newly developed CNG engine technologies, **GasON** project demonstrated a **18% CO₂ emissions** reduction compared to the 2014 best in class CNG engines.

One of the main targets of the **EVERLASTING** project is to reduce the cost over the full lifetime of an EV battery by 20% by proposing a standardized architecture, improving the energy use and increasing the lifetime of the battery.

DEMOBASE, **FIVE-VB**, **HELIS**, **iModBatt** and **EVERLASTING** set targets for **recycling of batteries** after the end of life of vehicles – which will become a critical topic with the large-scale uptake of electromobility across Europe and beyond.

The **PaREGEN** project aims at establishing a solid basis for model-supported engine design and control based on an **in-depth understanding of the Cause and Effect Relationship (CER) of particle formation during the in-cylinder processes**. 3 more projects have been selected in the GV-02-2016 topic in addition to PaREGEN to deal with technologies for low emission light duty powertrains with promising results **DiePeR**, **UPGRADE** and **EAGLE**, which has already demonstrated that, in some operating conditions at mid load and speed, **fuel consumption and CO₂ emissions can be reduced by more than 12% compared to usual spark-ignition engines** running at lambda 1.

Projects from GV-2-2016 topic dealing with **improvement of particle measurement (DownToTen, SUREAL-23 and PEMs4Nano)**, **sampling system development**, and **PN-Portable Emission Measurement System demonstrator**, could have a significant impact on **improving air quality**, particularly in urban areas and **positively impacting human health on a mid to long term perspective**. Activities developed in these 3 projects, and in relation with the other GV-02-2016 projects, are expected to generate new skills and methodologies that could be used in all types of road transport vehicles.

Thanks to the development of novel injector concept for direct high-pressure gas injection (HPGI) into the cylinder and ignition by small pilot quantities of diesel, the **HDGAS** project demonstrated a **21 % lower CO₂ emissions than the comparable state of the art Diesel technology**. In parallel, the project has started a standardisation procedure for fuelling interface which has been submitted to ISO standardisation office.

XERIC's new hybrid climate control system (CCS) for EVs is proving good performance at TRL6 in **reducing by more than 50% the energy used all over the year for passenger comfort and by 30% the energy used for air cooling/dehumidifying in extreme summer conditions**.

OPTEMUS achieved **75 % reduction of energy consumption for passenger comfort** in cold environment (-10 °C ambient temperature) and **35 % reduction of energy consumption for component cooling** in hot environment (+35 °C ambient temperature) thanks to the integration of a CRU, **a water-to-water (W2W) heat pump system** that uses a two-plate type heat exchangers with a water-glycol mixture as the working fluid and natural refrigerant.

Beyond the obvious benefit of weight reduction of vehicles, particularly for electric vehicles, a number of EGVI projects are working toward a **drastic reduction of the use of rare earth materials**, among which **ModuLED**, **DRIVEMODE** and **ReFreeDrive**. Thanks to a new concept of motor mixing transversal-flux, magnet-free and switched reluctance motor, **WEEVIL** was able to produce a motor with zero use of rare earth materials.

Aerodynamics has been optimised in **EU-LIVE** project, allowing a compromise between thermal requirements and the optimal aerodynamics; this development led to a **battery and in-wheel motors fully air-cooled**.

During the 3 years of the project, **RESOLVE** developed **4 prototypes** as well as an integrated, scalable, modular range of fully electric LV drivetrains; this 4kW drivetrain management module (DMM) is expected to cost €500 for 2000 volume per year compared to €800 at the launch of the project.

Evaluation of energy and cost efficient wireless charging solution up to 100kW for an electric light-duty vehicle will be investigated by the **ASSURED** project.

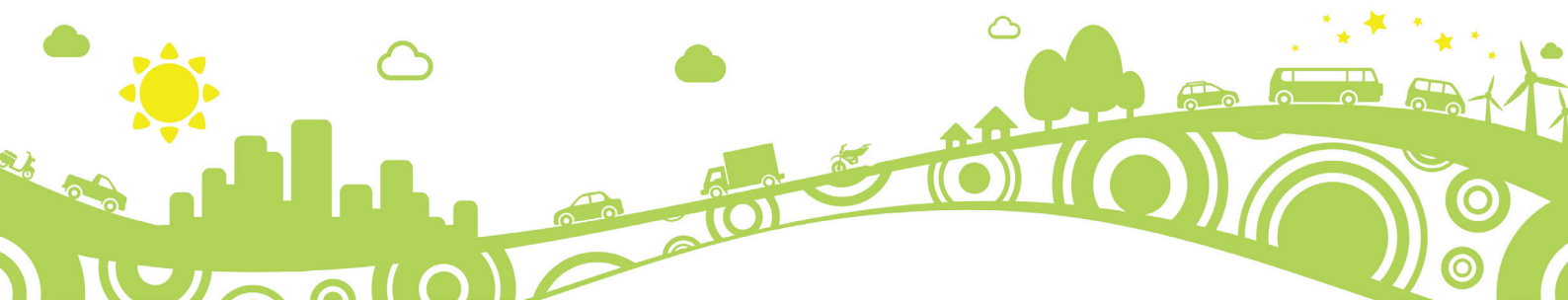
19 of the EGVI-funded projects which replied to the questionnaire listed **"user acceptance"** indicator (Noise, Vibration and Harshness, performance, comfort) as one of the priority in the projects, testifying the strong user-centric approach of the initiative.

2.3 Governance

The EGVI cPPP was established through a contractual arrangement, based on article 25 of the Horizon 2020 regulation. The private side of the cPPP is represented by the European Green Vehicles Initiative Association (EGVIA), an international non-profit association based in Brussels aiming at coordinating the activities from the private side and engaging in the EGVI contractual PPP with the European Commission, represented by DG RTD.

The EGVI cPPP Partnership Board is the governing body of the partnership gathering representatives of the private side appointed by EGVIA (Industry Delegation) and the European Commission services (under the leadership of DG RTD).

One partnership board meeting has been organised in 2018, on 27th February, mainly to discuss the EGVIA recommendations for the upcoming Work Programme (2018-2020).



3. Monitoring of the overall progress since the launch of the cPPP

3.1 Achievement of the goals of the cPPP

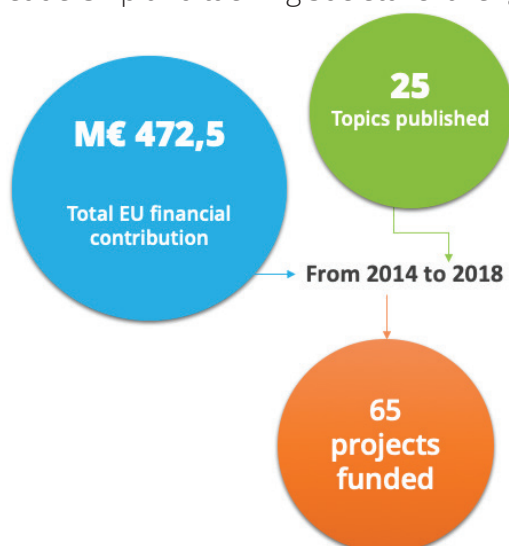
The main goal of the Horizon 2020 programme is to support research and innovation activities, achieving excellence in science, strengthening industrial leadership and tackling societal challenges.

The EGVI roadmap states that *“by developing energy efficient road vehicles and alternative powertrains (“green vehicles”), the initiative will address the societal challenge of sustainable transport, and at the same time have a major impact on the innovative strength and global competitiveness of the European industry”*.

Considering the very good coverage of the EGVI roadmap areas over the 5 years existence of the initiative (see the tables below), it makes no doubts that the 65 selected projects for funding in the 25 topics published between 2014 and 2018 will contribute to achieve the ambitious goals set at the launch of the initiative.

The new edition of the EGVI project portfolio published in April 2018 is listed all projects funded from 2014 to 2017 and is presenting objectives and first results from the selected projects (status – March 2018). To download the publication, please visit: <https://egvi.eu/wp-content/uploads/2018/09/egvia-project-portfolio-2018.pdf>

From the resources integration (battery materials, lightweight ...) up to the vehicles integration (grid integration of EVs, electric buses in urban areas ...) via research and innovation activities in modules and systems, but also modelling and testing activities to accelerate the deployment of green innovations on the market, all areas have been covered and promising results are expected from the funded projects.



2014	2 wheelers	Passengers cars & LDV	Trucks	Buses
Resources integration	NMP17	NMP17 GV1	NMP17	NMP17
Modules	NMP17	NMP17 GV1 GV2 GV3 GV4	NMP17 GV4 GV7	NMP17 GV4 GV7
Systems	GV5	GV2 GV3 GV4	GV4 GV7	GV4 GV7
Vehicles	GV5	GV2 GV4	GV4 GV7	GV4 GV7
Vehicles integration	GV5	GV2		

2016	2 wheelers	Passengers cars & LDV	Trucks	Buses
Resources integration	NMBP-08	NMBP-08		
Modules	NMBP-08	GV2 GV3 NMBP-08	GV3	GV3
Systems		GV2 GV3	GV3	GV3
Vehicles		GV2 GV3	GV3	GV3
Vehicles integration				

2015	2 wheelers	Passengers cars & LDV	Trucks	Buses
Resources integration				
Modules		GV8	GV6	GV6
Systems		GV8	GV6	GV6
Vehicles		GV8	GV6	GV6
Vehicles integration		GV8		

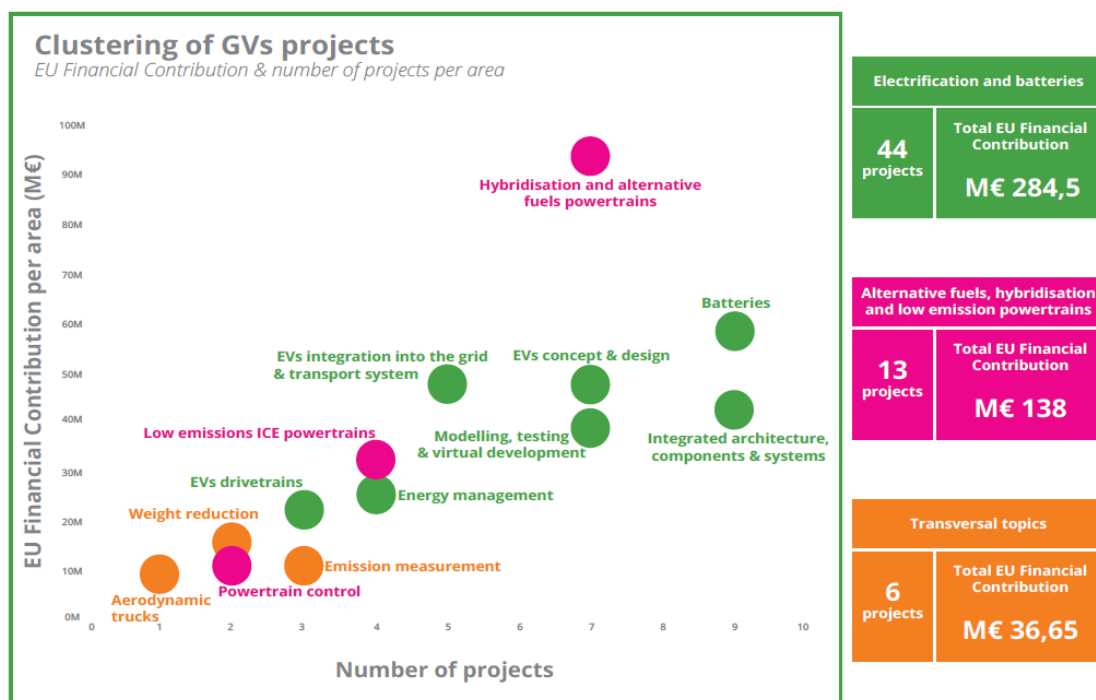
2017	2 wheelers	Passengers cars & LDV	Trucks	Buses
Resources integration	GV-13	GV-06 GV-13	GV-01	
Modules	GV-04 GV-05 GV-07	GV-04 GV-05 GV-06 GV-07		
Systems	GV-04 GV-05 GV-07	GV-04 GV-05 GV-07		
Vehicles	GV-10	GV-04 GV-08	GV-01 GV-09	GV-08
Vehicles integration	GV-10	GV-08		GV-08

2018	2 wheelers	Passengers cars & LDV	Trucks	Buses
Resources integration		LC-NMBP-30-2018		
Modules		GV-01 GV-02	GV-01	
Systems		GV-01 GV-02	GV-01	
Vehicles		GV-02		
Vehicles integration		GV-01	GV-01	

The launch of the EGVI cPPP contributed to the submission of a remarkable number of competitive projects, among which 65 have been selected for EU funding and to the emergence of even more innovative ideas. Key contributions have been developed in many technological areas such as:

- Battery performance improvement (energy density, power density, lifetime ...)
- Recycling and second life of batteries
- Charging time reduction
- New charging modes
- Grid integration optimisation
- Advanced ICE
- Reduction of materials used (lightweight ...)
- Thermal & energy management in vehicles
- Non-CO₂ emissions reduction i.e. noise, particulates ...
- Aerodynamics
- Vehicle components
- Power electronics integration
- Architectures, components and systems integration
- Cost reduction
- User acceptance
- Safety improvement
- Vehicle integration into the transport system (urban areas, improvement of freight transportation)
- Virtual product development and production for EVs
- Life cycle assessment
- New methodologies development

A financial support of the collaborative activities performed in EGVI funded projects is one of the most important driving force towards world-class science and technology developments in Europe.



In each area covered by the roadmap, EGVI projects have contributed to strengthen the innovation eco-system between universities, research centres, SMEs and industry, thus leading to a stronger research and innovation, as proven by the success stories examples previously mentioned.

3.2 Progress achieved on KPIs.

With 25 topics funded under both the Sustainable Transport Work Programme (Green Vehicles chapter) and NMBP, the European Green Vehicles Initiative projects have provided significant contribution to the key performance indicators as listed in the Annex 1 of this document.

Common key performance indicators⁴:

MOBILISED PRIVATE INVESTMENTS:

Based on a methodology defined by the European Commission, the level of mobilised private investments has been assessed using 4 levels of information:

- A1) **Direct leverage 1:** financial and/or in-kind contributions by partners to support project execution
- A2) **Direct leverage 2:** other investments mobilised with the initial investment from the partnerships' partners in the project to support project execution
- B) **Indirect leverage:** investment mobilised to exploit or scale-up FP results (i.e. generated thanks to the projects, but not supporting the projects themselves)
 - B1) Follow-up of the project
 - B2) Beyond (overall industry effort)

Out of 39 projects which replied to the online questionnaire, only 9 managed to provide some figures regarding the additional investments triggered thanks to the EU-funding. Considering that EGVI has funded 65 projects so far, the results are not considered reliable enough to be used in the report.

4. Information included in this section are partly based on inputs received from 39 projects to the online questionnaire sent in April 2019 (status June 6th 2019). Part of the information reflects feedback received by those projects only and not the overall figures of the initiative.

Assessing what have been the additional private investments complementing the EU funding in the area covered by the EGVI cPPP is an extremely challenging task, due to the complex automotive research and innovation landscape. Sometimes information is limited due to confidentiality reasons, and often additional investments follow only after the completion of EU-funded projects. However, some global figures demonstrate that there is a continuous growing investment in Research and Development activities in the automotive sector since the launch of Green Cars Initiative:

- In the 2009 Innovation Scoreboard published by the JRC⁵, investments in R&D activities from Automobiles and Parts was estimated to €30 bn a year.
- In the edition from 2018, the total estimated yearly investment of automobiles and parts in R&D is about €60 bn⁶.

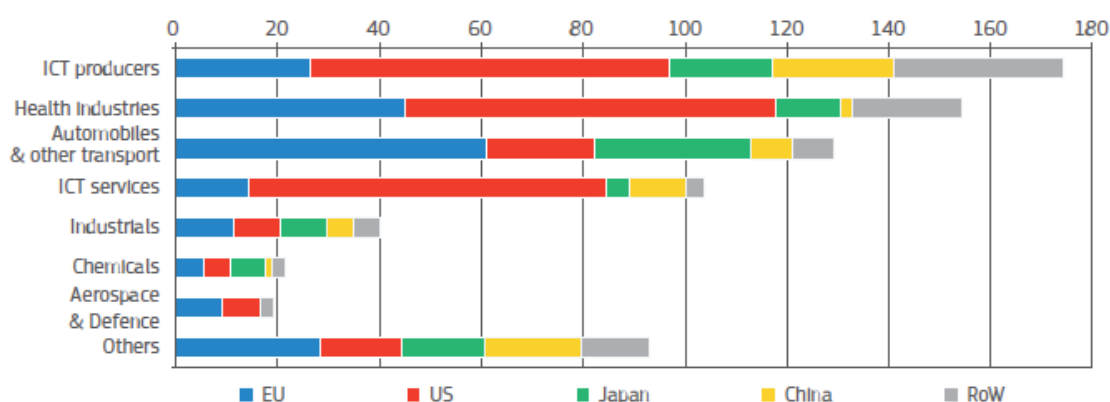


FIGURE 1.5: R&D INVESTMENT BY THE 2500 COMPANIES BY INDUSTRY AND MAIN COUNTRY/REGION (€bn).
Source: The 2018 EU Industrial R&D Investment Scoreboard, European Commission, JRC/DG RTD.

The indicative share of private investment is as follows:

- 1/3 for Research activities, i.e. about €20 bn per year
- 2/3 for Development activities
- About 30% - 35% dedicated to topics related to the area covered by the EGVI PPP i.e. about €7 bn for 2018.

Since 2014, according to the JRC innovation Scoreboard, the total investment in R&D activities from Automobiles and Parts has always be in the range of € 50 bn per year, and the indicative breakdown mentioned above is applicable to each year.

Among the 39 projects which provided feedback to the online questionnaire, 37 expect their project's results to be taken up at higher TRL levels, which will require important additional investments from private stakeholders. The two projects which did not express any plan to take-up results at higher TRL have just started, hence they might generate additional private investments as well.

NEW SKILLS AND / OR JOBS PROFILE:

28 projects out of the 39 which provided feedback to the online questionnaire stated that their activities contributed to develop new skills for consortium members.

Among the skills to be developed, the following main categories haven been identified:

5. <http://iri.jrc.ec.europa.eu/scoreboard09.html>

6. <http://iri.jrc.ec.europa.eu/scoreboard18.html>

- Simulation and new testing methods
- Model guided application
- Virtual engineering, multi physical modelling
- Batteries technology:
 - Cell manufacturing and electrical engineering for integration.
 - Swelling issue in terms of cell manufacturing
 - Electrochemistry knowledge of ASS
 - Thin multi-layered thermal spray coatings
 - Battery System design and optimisation
 - Li-Sulfur batteries, including materials preparation, electrodes preparation, cells assembly, safety test and recycling
- Measurement methodology
 - Measurement of some of the particular size and number temporal responses down to below 10nm
 - Measurement procedure to provide the molecular analysis of combustion particles
 - Understanding of the particle losses (for smaller particles)
- Design and optimisation of innovative refrigerant and cooling cycles
- Design optimisation - Target Weighing Approach (TWA)
- Vehicle dynamics expert for tilting 3/4 wheelers
- Injector technologies and SiC in power converters
- Composite materials
- Digitalisation and connectivity (ICT) for advanced control strategies

Among those, 11 projects are planning to develop new curricula in universities after the end of the project. The potential new curricula or new skills to be developed are, but not limited to:

- Advanced material manufacturing and modelling (including for e-motor)
- Electric vehicle motor technologies, power electronics, e-Drive integration design
- Combined approaches of material testing - cell testing - electrochemistry - coupled with mechanical phenomena on micro- and macroscopic level
- Lithium sulphur electrochemistry of battery
- Design and optimisation of Battery Systems
- Battery manufacturing processes
- Energy management specific case study
- Systems Engineering and classes on simulation technologies
- Target Weighing Approach and multi-parameter design optimisation
- Electric vehicles / Automated vehicles
- Applied thermal engineering for mobile applications
- FPGA development
- Second life assessment

At the time of the report, only 7 projects do not expect to have a direct impact either on job saving or job creation in a 2 years' timeframe after the end of the project. Most of these projects either started very recently and are facing difficulty to assess the potential for jobs creation or are still too far to market to have a significant impact on jobs. However, some projects being lower TRL than the others, jobs impact might occur in a longer timeframe.

IMPACT OF THE CPPP ON SMES:

Out of the 1098 participants, 176 are SMEs (16% of EGVI participants, gathering 13% of the total EU-funding allocated to beneficiaries), including at least 66 SMEs participating for the very first time in an H2020 project (i.e. 37% of the total number of participating SMEs).

24 projects mentioned that the activities will lead to opening up new research fields for the participating SMEs and 29 that the project will lead to new business opportunities / new business collaborations for the participating SMEs.

100% of the participating SMEs expressed their interest to join more H2020 projects in the future which is testifying the attractiveness of Green Vehicle initiative for this specific category of stakeholders.

Specific technological knowledge has been developed by SMEs during the projects' course, but many respondents also mentioned that SMEs gained knowledge in the following items, in addition to R&D related benefits:

- **Meeting specific demands and needs of OEMs and Tier 1 suppliers as well as city planners and transport operators**
 - **Added value for SMEs:** better integration into the value chain and development of opportunities for future business collaborations as well as a more targeted orientation for future R&D activities
- **Getting a better understanding about the EU funding landscape**
 - **Added value for SMEs:** opportunity for future EU-funded project application in other areas. Gaining experience in submitting an H2020 proposal could also be a strong asset, as the drafting and submission process can be very time consuming.
- **Developing new partnerships**
 - **Added value for SMEs:** future collaboration opportunities, at European, national or regional levels and a better integration into the value chain.
- **Complexity of a big multidisciplinary project**
 - **Added value for SMEs:** gaining experience in view of future projects submission
- **Possibility to use their current products portfolio or their knowledge for other sector and technologies applications**
 - **Added value for SMEs:** developing new business opportunities and identify new business partners for the development of their technologies
- **New funding opportunities**
 - **Added value for SMEs:** gaining experience in view of future projects submission and enlarging the financial support opportunities of their activities.

Non-financial benefit should also be taken into account as these could contribute to a higher success rate of SMEs in future EU-funded projects and because getting involved at an earlier stage of the technological developed could turn out to be a critical competitive advantage for SMEs in a few years.

Moreover, gaining knowledge in H2020 projects and creating new collaboration opportunities is an important factor of development for SMEs.



SIGNIFICANT INNOVATIONS:

The following information has been extracted from the 41 responses to online questionnaire received from project coordinators:

- **253 innovations** have been developed.

The typical TRL covered by these 253 innovations, is between 3 and 6.

On average, EU financial support provided through the European Green Vehicles Initiative allowed to jump from 1 to 2 TRLs in about 3 years (typical duration of EGVI projects).

Innovations cover the following topics:

- Technical applications (industrialisation of new materials, sensors, integration)
- Future engines
- Development of new cell chemistries
- Reduction of the use of critical raw material (with a strong focus on cobalt and rare earth materials)
- Innovative fuel storage systems
- Energy and thermal control systems
- Non-CO₂ emission reduction technologies
- Cost reduction
- Efficiency improvements (powertrains and subsystems levels)
- Robustness and reliability

- **181 demonstrators** (including 100 battery cells for a single project) have already been developed by the projects.

Demonstrators include vehicles or components which offer new functionalities allowing testing activities.

More demonstrators will be developed in the years to come.

On average, **about 23 months have been saved in research and development cycle thanks to the EU-funded projects.**

Specific indicators⁷:

NUMBER OF ELECTRIC AND HYBRID VEHICLES:

According to ACEA, in 2017, 5,8% of the new passenger cars registered in the EU-15 are running on alternative fuel (electric vehicles, hybrid vehicles and other alternative fuels). **Figures are promising as 11% of the new passenger cars in the EU emits less than 95g CO₂ / km in 2016; back in 2010, it was only 1%.**

The updated version of the joint ETPs roadmap on electrification of road transport⁹ has provided an updated version of the EVs and PHEV sales forecast from 2020 to 2030 which is using many reports already published as a basis for its analysis. Two scenarii have been drafted:

- Under a perseverant market scenario based on CO₂ targets achieved with a focus on technology improvements and hybridisation of ICE-based vehicles, a market share of about 10% could be envisaged by 2025
- Under the assumption of major technological breakthroughs for EVs (mainly considering battery capacity and cost), market share could be of about 40% by 2025.

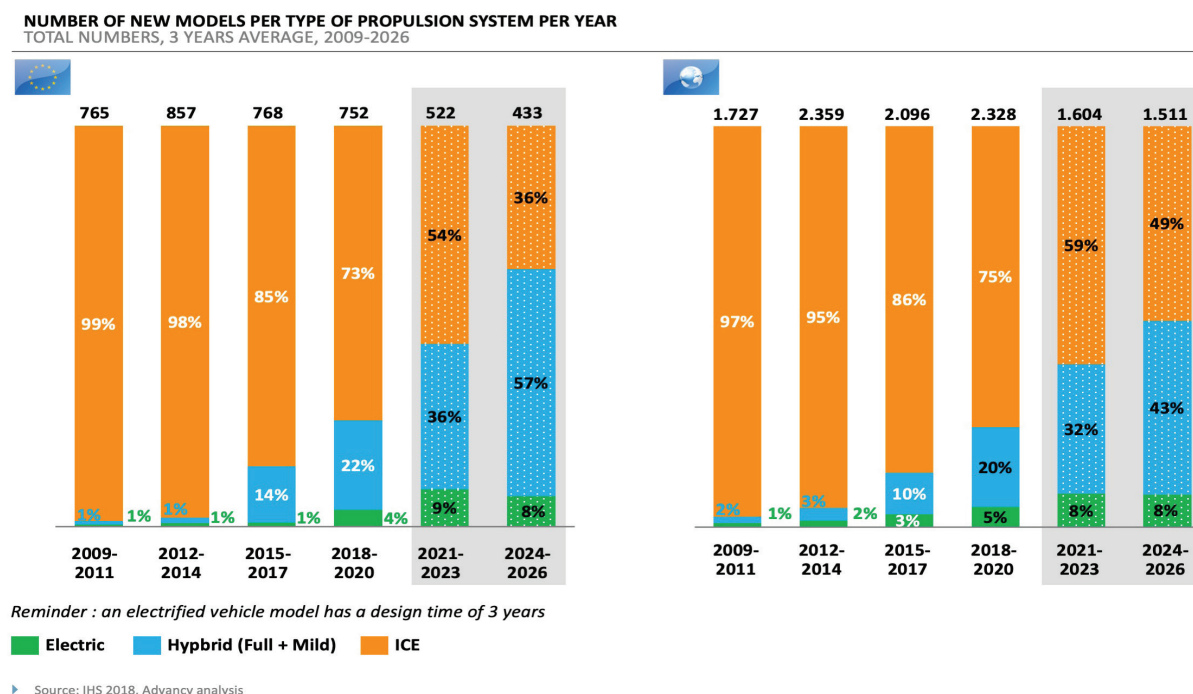
By the end of the year, we expect more than 100 models of hybrids and electric cars to be available on the market. As the European OEMs and the whole value chain are reorganising their production lines, more EVs are likely to be produced in the future compared to today's situation.

7. Information included in this section are partly based on inputs received from 41 projects to the online questionnaire sent in April 2019 (status June 6th 2019) and to the excel technical monitoring document. Part of the information reflects feedback received by those projects only and not the overall figures of the initiative.

8. https://www.acea.be/uploads/publications/ACEA_Pocket_Guide_2018-2019.pdf

9. See page 37: https://egvi.eu/wp-content/uploads/2017/09/ertrac_electrificationroadmap2017.pdf

A few months ago, EGVI published its 10 years impact assessment, which includes global analysis of the trends related to green powertrains solutions. According to the analysis performed, the number of models available for customers will drastically increase in the coming years; this is expected to contribute to increase the market share of more energy-efficient vehicles. Efforts developed in EGVI-funded projects regarding cost reduction of a wide range of technologies will also contribute to increase the deployment of new vehicles on the market, by making them more affordable.



CONTRIBUTION TO THE REDUCTION OF ENERGY USE: the reduction of energy use is targeting in many EGVI funded projects via different areas as identified in the roadmap:

- **Grid integration optimisation** (grid stability and reliability, integration of renewable energy sources into the grid ...)
- **Advanced ICE developments** both for passenger cars and Heavy-Duty Vehicles will contribute to drastically reduce the fuel consumption.
- An improved **thermal & energy management in vehicles** will contribute to avoid losses of energy within the vehicles. Ambitious targets are defined in this area by the 25 projects which identified this area as 1 of the key performance indicator they will contribute to.
- A better **aerodynamics** of vehicles will also have an impact on the fuel consumption reduction, and consequently on the CO₂ emissions.
- The benefit of a **higher integration of electronic components** is also an area explored by several EGVI-funded projects as a way to contribute to the reduction of energy use in road vehicles.

CONTRIBUTION TO THE REDUCTION OF CO₂ EMISSIONS: most of the innovations developed in the projects will have a **direct contribution to the reduction of CO₂ emissions** from road transport, according to the inputs provided by the projects which responded to the excel monitoring document sent in April 2018.

The range of CO₂ emissions saved thanks to the project is depending on too many factors to be able to provide a single figure (targeted level of the innovation i.e. module, vehicles ...; potential market share; timeline for the large-scale deployment of the innovations ...).

However, with an important focus on the electrification of powertrains (via purely electric powered vehicles and hybrid vehicles), more than 30 projects will bring a significant direct contribution to the CO₂ emissions reduction.

Reduction of non-CO₂ emissions (noise, various pollutants - NO_x, PM, ...) which is becoming a high topic on the political agenda is also addressed by 10 EGVI funded projects.

The average of CO₂ emissions from new passenger cars is continuously decreasing since the launch of the initiative in 2009; today, 11% of the new passenger cars in the EU emits less than 95g CO₂ / km in 2016, compared to only 1% in 2010.

ERTRAC is currently finalising a CO₂ evaluation study aiming at assessing the potential contribution of three different types of measures (better vehicles, better traffic conditions and traffic reduction technologies) in different use case and according to each vehicle types. This analysis will be of up-most importance to identify the future research needs in order to achieve the 60% CO₂ emission reduction by 2050 compared to 1990 levels. The first outlook is available in the [Strategic Research Agenda](#) of the platform.

CONTRIBUTION TO THE REDUCTION OF USE OF MATERIAL RESOURCES: reducing the use of material resources is one of the key objectives of many EGVI funded projects: in the battery related projects funded by the initiative, the raw materials is almost always one of the key aspects of the projects; in particular, the reduction of the use of cobalt in batteries has been a key challenge for several projects.

Reducing the materials used is also on the key area of the partnership roadmap and 16 projects are directly contributing to this Key Performance indicator, i.e. via weight reduction activities, reducing the use of rare earth material, use of composites ...

It is also important to note that cost reduction and user acceptance are also driving factors for most EGVI-funded projects, in order to ensure that innovations will indeed be competitive on the European market while fulfilling the users' requirements.

3.3 Evolution over the years

Taking into consideration the remarkable interest in the EGVI call from very diverse organisations, it can be concluded that the objective of ensuring the excellent science and technology base in Europe is being well promoted through the EGVI partnership.

Progress achieved in the European Green Cars Initiative (EGCI)

The EGVI cPPP is the successor of the previously launched European Green Cars Initiative (EGCI). EGCI was set up under the 7th Framework Programme for Research & Development (FP7) in response to the global economic crisis of 2008, as part of the European Economic Recovery Plan. In the period 2010 – 2013 four calls were launched and a total of 113 projects funded.

It became an efficient tool for the funding of research, development and innovation in the field of sustainable mobility around three main pillars: electro-mobility, long distance trucks and logistics.

The 113 research and innovation projects have covered strategic areas such as:

Battery Technologies

Several breakthroughs and incremental innovations haven been achieved in this area thanks to the 54 projects covering those topics. Significant advancements have been made in the improvement of battery lifetime (increase of life time of the battery by up to 30% in realistic driving situations) and energy density (148 Wh/kg at system level demonstrated), contributing to reduce range anxiety for end users; reduction of the Total Cost of Ownership of electric vehicles, reduction of the cost of cell production; development of wireless charging solutions.

Lightweight design

The 13 Green Cars projects covering this area allowed significant improvement in the introduction of lightweight materials such as hybrids, CFRPs or thermoplastics, cost reduction thanks to volume savings. The Life Cycle Analysis (LCA) was also taken into account under this particular area.

Safety systems

Funded projects will contribute to achieve a similar level of safety as the one of conventional vehicles. Among the 30 projects covering this item, several improvements have occurred in the pedestrian warning and detection systems, new procedures for testing (also thanks to modelling and simulation tools) as well as the interlink with scarce materials and lightweight of electric vehicles.

Smart grid development

The 10 projects funded under Green Cars allowed development of the Vehicle to Grid and Vehicle to Infrastructures common interfaces as well as development of pre-normative standards for interoperability.

Drivetrain technologies.

Covering both passenger cars and heavy-duty vehicles, promising results have been achieved in engine downsizing, hybridisation, and optimisation of electric drivetrain.

Energy management and recovery

Significant improvements have been achieved both for passenger cars and heavy-duty vehicles in steady heat recovery potential, development of vehicle individual energy consumption model that considers specifics of electric drives including recuperation, improvement of energy efficiency of auxiliaries ...

Due to the high degree of satisfaction from both private and public sides, a continuation of the collaboration launched under the EGCI has been formalised with the launch of the EGVI cPPP.

Although the scope of the two initiatives slightly differs – the EGVI cPPP specifically focuses on the energy efficiency of vehicles using alternative powertrains and covers additional vehicle types – the approach and targets developed are similar.

Additional facts and figures on the impact of the EGCI at EU level are available on [EGVIA website](#).

EGVI cPPP over the years

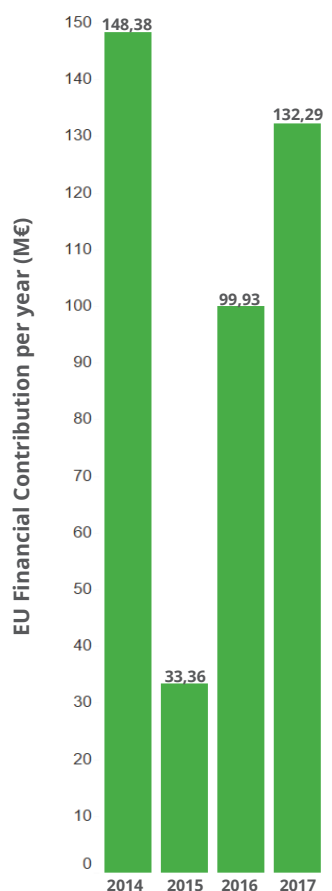
Since the launch of the EGVI in 2014, the attractiveness of the initiative remains very high: seven calls covering 25 topics have been successfully closed and evaluated. In total 65 projects were funded receiving a total EU contribution of € 468 million.

2014	2015	2016	2017	2018	2019-2020
<ul style="list-style-type: none">•17 projects•€ 150 million•Average funding per project: €8.8 million•Success rate: 18%	<ul style="list-style-type: none">•5 projects•€ 34 million•Average funding per project: €6.8 million•Success rate: 12%	<ul style="list-style-type: none">•14 projects•€ 100 million•Average funding per project: € 7.14 million•Success rate: 34%	<ul style="list-style-type: none">•16 projects•€ 132.3 million•Average funding per project: € 8.27 million•Success rate: 29%	<ul style="list-style-type: none">•13 projects•€ 58 million•Average funding per project: € 4.4 million•Success rate: 42%	<ul style="list-style-type: none">•~ € 133 million available

There is still a high interest in the EGVI topics: in total, 283 proposals have been received, out of which 268 were identified as eligible and evaluated. As a result of evaluations, 130 proposals were above threshold and (only) 65 were selected for funding i.e. about 50% of the most qualitative proposals submitted.

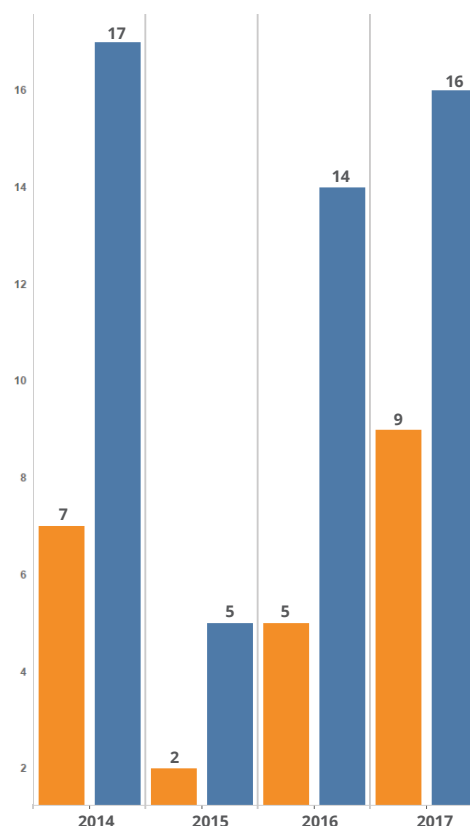
The high interest in Green Vehicles topics combined with a limited budget per year led to an **average success rate of EGVI in the first 4 years of 24%**; the success rate dropped in 2015, but that could be explained by the fact that only 2 topics have been published that year, leading to a higher number of projects submitted for a lower amount of money. In 2018 success rate was 42% since only two quite specific topics with relatively large budget were published.

The overall success rate in EGVI is almost twice as high as the general one of H2020 (11,6% according the mid-term evaluation of the programme¹⁰).



EU Financial Contribution per year in GV projects

Number of published topics vs Number of signed Grant Agreements

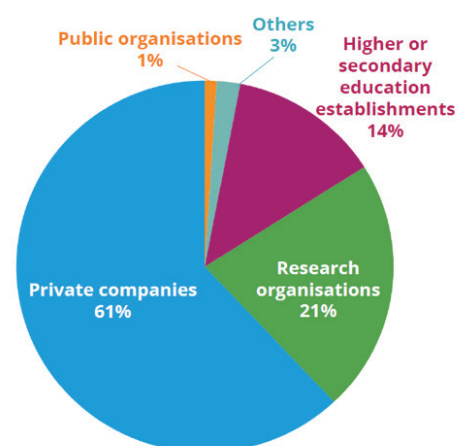


Number of topics published
Number of signed Grant Agreements

Breakdown of participation in EGVI projects (2014-2018)

EGVI being an industry-driven initiative, the share of participants coming from private companies is important (60%). The high participation rate of private companies should be analysed in line with the one of research organisation (17%) and higher or secondary education establishments (18%); representatives from these group of stakeholders are active in all EGVI funded projects and bring an important added value to the knowledge advancement and technological developments pursued in the projects.

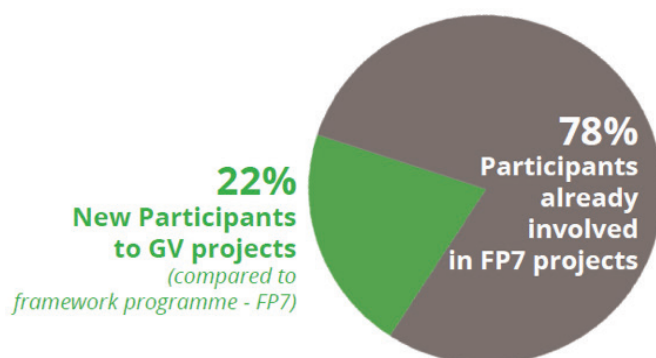
Moreover, the collaboration within EGVI-funded projects between private and public entities has proven benefit of the strengthening of the overall value chain at EU-level, contributing to reinforcing the competitiveness of the industry and developing skills of all participants.



10. Please refer to: <https://ec.europa.eu/research/evaluations/index.cfm?pg=h2020evaluation>

Despite a high number of participants, 22% of the total number of participants are new comers to H2020 projects – compared to FP7 participation. SMEs account for more than a quarter among these new comers.

This testifies the attractiveness and openness of the initiative to new participants.



4. Outlook and lessons learnt

The EGVI cPPP offers the possibility for numerous innovative & research projects to be carried out. It is important to monitor the contribution of all projects to the progress towards the general objectives on a regular basis. Therefore, this yearly monitoring report aims at giving a clear and straightforward insight for the evaluation of the progress not only on the individual project basis but also to perform an assessment at programme level.

Decarbonisation is one of the key societal challenge faced by the European Union and the contribution of road transport activities in overcoming this challenge will be of an utmost importance. The European Green Vehicles Initiative is bringing direct and important contribution to the objective of reducing CO₂ emissions in the EU by accelerating the deployment of alternative powertrains (electric, plug-in hybrids, alternative fuel use) and contributing to achieving a higher energy efficient transport system, both for passenger cars and long-distance freight transportation.

Thanks to the €468 million of financial support distributed to the 65 selected projects, a broad range of topics have been covered:

- Batteries technologies, both at cell and pack level
- Hybrid and low emissions ICE powertrains development and alternative fuel
- Modelling and testing
- Weight reduction
- Aerodynamics trucks
- Powertrain control
- Energy management
- Electric vehicles drivetrain
- Vehicle concept and design
- EVs integration into the grid and the transport system
- Emission measurement

Beyond the valuable financial support from the European Union, the EGVI partnership is also a unique opportunity to strengthen the value chain by integrating SMEs, RTOs and universities at early TRL stage and bringing them in direct contact with OEMs and tier 1 suppliers.

On average, 23 months have been saved thanks to the activities carried out in EGVI projects; considering the high degree of competition at worldwide level, this is a key benefit for European competitiveness and will contribute to create (high skills) jobs in Europe.

The European Green Vehicles Initiative has proven to be a successful tool to foster a lean collaboration among the private stakeholders and the various European Commission services involved. Putting all actors together allowed to properly tackle the different challenges at the right time to reach our common objectives of CO₂ emissions reduction.



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