Towards zero emission road transport

20th April 2020

1 General information

1.1 Draft title of the European Partnership

2Zero: Towards zero emission road transport

1.2 Lead entity (main contact)

EGVIA

1.3 Commission services (main contact)

DG RTD
DG MOVE
DG ENER
DG CLIMA

Additional services
DG JRC
DG CNECT
DG GROW
DG ENV

1.4 Summary (max 500 characters)

The partnership will set an ambitious research programme to accelerate the development of zero tailpipe emission transport in Europe with a system approach, will develop a common vision and deliver a multi-stakeholders roadmap for a climate neutral and clean road transport system. It will improve air quality, mobility and the safety of people and goods, hence ensure future European leadership in innovation, production and services. By paving the way to a climate-neutral road transport system, the partnership will make a key contribution to the success of the European Green Deal.

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List of acronyms

2Zero	*Towards zero emission road mobility*
ALICE	*Alliance for Logistics Innovation through Collaboration in Europe*
BEV	*Battery Electric Vehicle*
CBA	*Cost Benefit Analysis*
CCAM	*Cooperative, Connected and Automated Mobility*
CEF	*Connecting Europe Facility*
CPO	*Charging Point Operators*
DSO	*Distribution System Operators*
DUT	*Driving Urban Transition*
EC	*European Commission*
ECSEL-JU	*Electronic Components and Systems for European Leadership Joint Undertaking*
EFFRA	*European Factories of the Future Research Association*
EGCI	*European Green Cars Initiative*
EGVI	*European Green Vehicle Initiative*
EGVIA	*European Green Vehicle Initiative Association*
eMaaS	*Electric Mobility as a Service*
EIC	*European Innovation Council*
EMSP	*Electric Mobility Services Providers*
EPoSS	*European Technology Platform on Smart Systems Integration*
ERTRAC	*European Road Transport Advisory Council*
ETIP-SNET	*European Technology and Innovation Platform - Smart Network for Energy Transition*
ETP	*European Technology Platform*
EU	*European Union*
EV	*Electric Vehicle*
FCEV	*Fuel Cell Electric Vehicle*
FCH-JU	*Fuel Cell and Hydrogen Joint Undertaking*
FP7	*7th Framework Programme for R&D*
GHG	*Green House Gas*
LCA	*Life Cycle Analysis*
MaaS	*Mobility as a Service*
NGOs	*Non-Governmental Organisations*
NMS	*New Mobility Services*
OEM	*Original Equipment Manufacturer*
PHEV	*Plug-in Hybrid Electric Vehicle*
PPP	*Public Private Partnership*
RTO	*Research and Technology Organisation*
SDG	*Sustainable Development Goals*
SME	*Small and Medium Sized Enterprise*
SRA	*Strategic Research Agenda*
SRIA	*Strategic Research and Innovation Agenda*
SSM	*Safe and Sustainable Mobility partnership*
TCO	*Total Cost of Ownership*
TRL	*Technology Readiness Level*

TSO	*Transmission System Operators*
V2G	*Vehicle to Grid*
V2X	*Vehicle to Infrastructure*

2 Context, objectives and expected impacts

2.1 Context and problem definition

The mobility of people and goods is the lifeblood of an integrated European single market, territorial cohesion, and an open and inclusive society: it is the backbone of economic growth across the continent, enabling prosperity and employment. However, transport, mobility and their related services still need to improve their environmental performances. Indeed, all transport is responsible for nearly one quarter of the European GHG emissions today, with road transport being accountable for approximately 72% of these emissions[1]. In addition, road transport is one of the major sources of pollutant emissions in cities, generating increasing concerns about the impact of road transport on human health.

In 2019, the European Commission presented its integrated strategy to reduce GHG emissions, including those from road transport, and make Europe the first climate neutral continent by 2050: the European Green Deal[2].
The impact of road transport on the environment is a challenge the European Commission already addressed in the Communication, the Transport White Paper[3], revised in 2011, setting the ambition shared by the 2Zero partnership of realistic and achievable goals for a pathway to "*Halve the use of 'conventionally fuelled' cars in urban transport by 2030; phase them out in cities by 2050; achieve essentially CO_2-free city logistics in major urban centres by 2030*". In addition, as a complementary approach to the White Paper, the European Commission presented a Strategy for Low Emissions Mobility[4] and 'Europe on the Move', a set of legislative initiatives within the Mobility Packages, whilst the Strategic Transport Research and Innovation Agenda (STRIA[5]) proposed research priorities along with measures for the deployment of innovative solutions, with particular emphasis on transport electrification and the use of alternative clean and renewable fuels.
Aiming at improving the urban transport situation, making cities cleaner and more liveable, the European Commission has presented the Urban Mobility Package (UMP) in 2013, currently under revision. It included the Communication 'Together toward competitive and resource-efficient urban mobility'[6], in which the EC has proposed a set of measures to include the scope of urban logistics, urban access regulations, road safety and urban ITS solutions. The package also includes the idea of the Sustainable Urban Mobility Plans (SUMPs), wherein citizens, stakeholder engagement and changes in mobility behaviour are central. In line with this approach, the revised SUMP guidelines[7] have endorsed the approach of Low Emission Zones (LEZs) as one of the ways to curb local air pollution[8]. The number of LEZs is expected to grow considerably in the coming years[9]. The concept may include more ambition in the future

[1] https://op.europa.eu/en/publication-detail/-/publication/f0f3e1b7-ee2b-11e9-a32c-01aa75ed71a1
[2] https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en
[3] 'Roadmap to a single European Transport Area — towards a Competitive and Resource-efficient transport system' (COM (2011) 144 final)
[4] 'A European Strategy for Low-Emission Mobility '(COM (2016) 501)
[5] https://ec.europa.eu/transport/sites/transport/files/swd20170223-transportresearchandinnovationtomobilitypackage.pdf
[6] 'Together toward competitive and resource-efficient urban mobility' (COM (2013) 913 final)
[7] https://www.eltis.org/sites/default/files/sump-guidelines-2019_mediumres.pdf
[8] Linking transport and health in SUMPS, Sept. 2019: https://www.eltis.org/sites/default/files/linking_transport_and_health_in_sumps_0.pdf
[9] Low-Emission Zones are a success -but they must now move to zero-emission mobility, Sept. 2019: https://www.transportenvironment.org/sites/te/files/publications/2019_09_Briefing_LEZ-ZEZ_final.pdf

looking to Zero-Emissions Zones (ZEZs). ZEZs could become an enabling factor to encourage the integration of clean vehicles into the transport system. This includes the management of spaces and infrastructures in a more sustainable way, from an environmental but also economic and social points of view.
In the upcoming years, the European Commission will revise two provisions potentially supporting a carbon neutral and zero impact emission road transport in Europe: the TEN-T Guidelines[10] and the Alternative Fuel Infrastructure Directive[11]. These updated provisions could be opportunities to develop the infrastructure needed for the transition towards a climate-neutral and zero tailpipe emission road transport, and, ultimately, improve the attractiveness for and the acceptance of new solutions by end-users. The European Commission is also considering to revise the legislation on CO_2 emission performance standards[12]. The regulatory framework, and related targets might act as an accelerator to the transition towards zero tailpipe emissions vehicles.

Despite the significant improvements achieved over the past 10 years, particularly in road transport technology, the European Union is committed to going further and delivering on the Paris Agreement targets[13] "*to avoid dangerous climate change by limiting global warming to well below 2°C and pursuing efforts to limit it to 1.5°C*".
On 11th December 2019, European Commission President Ursula von der Leyen presented the new European growth strategy: the European Green Deal, a plan to make Europe the first climate-neutral continent by 2050 and to achieve a 50 % emissions reduction by 2030. The Green Deal attempts to make environmental policy mainstream by bringing together and improving several existing policies, initiatives and funding programmes that are dedicated to addressing sustainability and climate change. In addition, it includes a variety of new proposals, such as reinforcing air pollutant emissions standards for combustion-engined vehicles, legislative options to boost the production and supply of alternative fuels in different transport modes, or a funding call to support the deployment of public recharging and refuelling points (as part of the alternative fuels infrastructure directive). Since making sustainability mainstream in all EU policies, the Green Deal also addresses research and innovation needs.
As stated by Commission president Ursula Van der Leyen, "*The European Green Deal is our new growth strategy. It will help us cut emissions while creating jobs*". Transforming the energy and transport sectors whilst preserving economic growth and strengthening the competitiveness of EU industry will be one of the key challenges for the European Green Deal to succeed. In order to do so, a balanced approach between profound changes offering a new road mobility system (including its infrastructure) and innovations which have immediate impact on the transition towards zero emissions will be needed. To support the transition, the priority for EU funding will be the support of research and innovation activities related to zero tailpipe emissions. In order to cover the transition period, and to develop sustainable solutions for all use cases, since sustainable solutions developed for the EU market will also need to be suitable and competitive in other parts of the world (to achieve a reduction of GHG emissions at a global scale), the counterpart of the EC in the partnership will continue to investigate all renewable energy carriers and zero-impact emission options. The sustained EU global leadership in the road transport sector is now challenged, not only by Asia and the USA but also by new contenders from the digital services sector entering the arena with disruptive innovations. Building on existing European knowledge and leadership will be the way to remain at the forefront of the international competition and take the lead on new pathways to a global, sustainable, road mobility.

[10] https://ec.europa.eu/transport/themes/infrastructure/ten-t_en
[11] 'Directive 2014/94/EU on the deployment of alternative fuels infrastructure' (JO L307/1)
[12] The European Green Deal (COM(2019) 640 final)
[13] https://ec.europa.eu/clima/policies/international/negotiations/paris_en

Although zero tailpipe emissions technologies are available in the market in some vehicle segments, their initial purchase price within the current business models, limited range, an insufficient recharging infrastructure (leading to higher travel time for longer trips) and lack of services is preventing faster deployment. A system perspective, considering the necessary push for the infrastructure development and the cost competitiveness aspects of European solutions, is needed to accelerate the transition towards the large scale uptake of cleaner mobility solutions.

When defining the research and innovation priorities for the coming years, several trends and objectives should be considered:

- As of today, more than 70% of passenger journeys are made by car, and 75% of all the goods transported across Europe are delivered by road freight transport. Estimates suggest that passenger transport will increase by 42% and freight transport by 60%[14] by 2050, making it even more difficult to achieve Europe's environmental targets. As road transport will continue to be the backbone of mobility of people and goods in the future, a particular attention should also be paid to develop affordable mobility solutions for all use cases.
- Growing urbanization will be another key societal trend to be taken into account: by 2050, it is expected that more than 84% of the European citizens will live in urban areas[15]. This will generate new challenges related to local (urban) air pollution and noise, including their impacts on health, but also logistics and the delivery of goods in cities, urban space occupation and parking possibilities, traffic congestion and many more. This trend will also have important impacts on the rural and inter-urban transport systems.
- Europe is striving for resource efficiency and sustainable productivity, to decouple economic growth from the exploitation of resources, and to transform itself towards a green economy. Resource efficiency needs to be increased by a factor of 4 to 10 to meet demand for e.g. raw and scarce materials in 2050. Already today, essential raw materials are scarce and their price volatility has a negative impact on the economy.[16] Circular economy approaches need to be applied in the road transport sector, not only for sustainability reasons but also to reduce the dependency on raw and scarce materials (coming from politically unstable regions) and promoting raw materials extraction in Europe.

[14] *Transport in the European Union. Current Trends and Issues.* European Commission. DG Mobility & Transport (2019) https://ec.europa.eu/transport/sites/transport/files/2019-transport-in-the-eu-current-trends-and-issues.pdf

[15] https://ec.europa.eu/knowledge4policy/foresight/topic/continuing-urbanisation/developments-and-forecasts-on-continuing-urbanisation_en

[16] Roadmap to Resource Efficient Europe, European Commission (COM(2011) 517 final)

- Europe needs to achieve climate neutrality by 2050. This implies, among other measures, phasing out the use of fossil energy carriers, such as conventional fuels. This is also supported by the Green Deal, targeting that the transport sector as a whole would need to reduce its GHG emissions by 90% compared to 1990 levels[17]. In order to meet its complete future energy needs, Europe will still partly rely on renewable energy imports, which will necessitate chemical energy carriers, e.g. hydrogen, as well as non-fossil-based hydrocarbon gaseous and liquid fuels. The use of these "carbon-neutral" fuels might also, to a certain extent, extend to road transport in order to achieve sufficient economies of scale. To ensure climate neutrality, use of carbon-neutral fuels should also limit other GHG (i.e. methane, nitrous oxides) with high global warming potential.
- Europe also aims at achieving zero pollutants, covering not only the current regulated tailpipe pollutants but also any health-impacting pollutant that might result from current or future technologies. Furthermore, reducing non-tailpipe related transport vehicle emissions is a target.

With these trends and objectives in mind, the 2Zero partnership will need to investigate those different R&I concepts and solutions that are necessary to achieve a zero tailpipe emission road transport in urban and rural areas, by developing a multi-technology portfolio of solutions to fulfilling user needs.
Since no single sector will be able to solve all of these issues independently, a strong and coordinated initiative, focusing on research and innovation for truly sustainable, zero tailpipe emission road transport, is required at the European level, building on the existing, highly successful EGVI partnership.

[17] A Clean Planet for all (COM (2018) 773 final)

2.2 Common vision, objectives and expected impacts

A climate-neutral and clean road transport system is possible by 2050. The 2Zero partnership will be strongly committed to achieve the use of 100% renewable energy carriers in road transport and share the vision of Europe becoming the first climate-neutral continent by 2050. A high introduction rate of zero tailpipe emission powertrains (BEV and FCEV) is one of the key elements for climate neutrality within the transport sector.
To make this vision a reality, all stakeholders within road transport have to bring substantial contributions: the automotive industry, the energy providers, the TSO and DSOs, RTOs and universities, the public and private (charging) infrastructure, and public authorities.

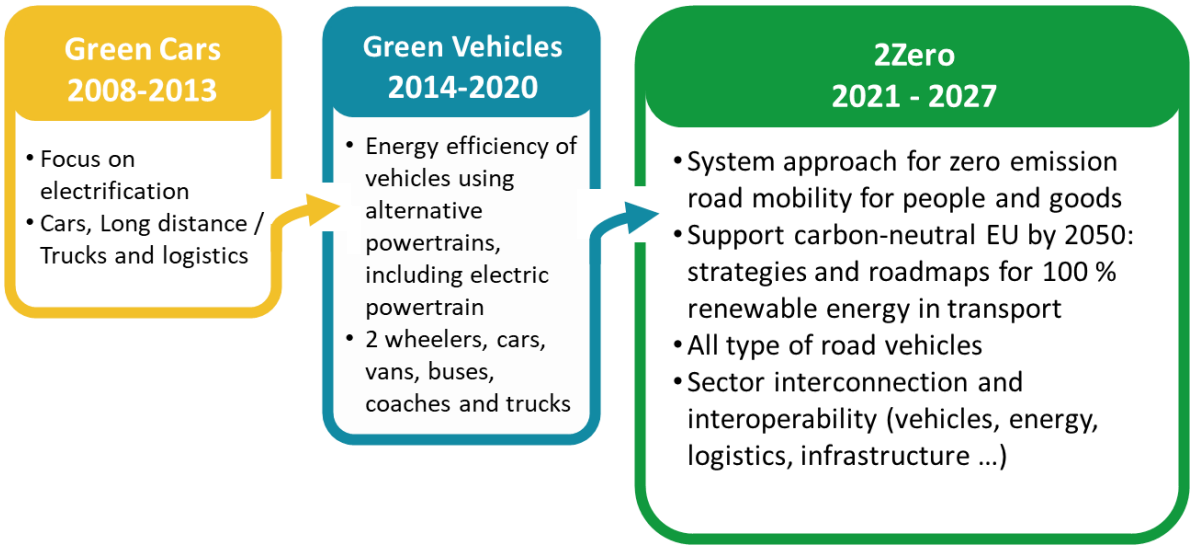


Figure 1 - From the European Green Cars Initiative to 2Zero partnership: the evolution of the partnership

As illustrated in the figure above, the Public Private Partnerships (PPP), the European Green Cars Initiative (EGCI) under FP7 and its successor the European Green Vehicle Initiative cPPP (EGVI) under Horizon 2020, strongly supported the development of green vehicles and innovative mobility solutions for the future.
Since 2008, over Euro 1 billion of European funds has already been invested into research and innovation aspects of green vehicles, reflecting the importance of reducing the environmental impact of road transportation in Europe, and leading to a major transformation of European transport research and innovation priorities. Many aspects of vehicle energy efficiency improvement and emission reduction have been investigated, including the development of batteries for use in electric road vehicles.

Whilst pursuing the improvement road vehicles, future research will have to tackle the systemic and cross-sectoral nature of the challenges: therefore, a multi-stakeholders collaboration, sharing a joint commitment towards climate neutrality of road transport, is needed. Technology development will remain a strong driver but success can only be achieved by developing system-level solutions, covering multiple mobility aspects, recharging infrastructure development and reinforcing the user acceptance of any new solutions. New paradigms will require a careful consideration of various aspects, such as territorial planning, behavioural patterns of the users, user-friendliness and social inclusion, particularly when rolling-out charging infrastructure or when implementing MaaS solutions.

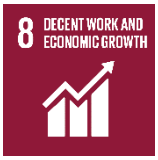
The results of research and innovation under the 2Zero partnership will accelerate the transition towards a climate-neutral and clean road transport system. In Horizon Europe, 2Zero will be allocated in Pillar 2 "Global challenges and industrial competitiveness of Europe" and in the Cluster 5 "Climate, Energy and Mobility", reinforcing the cross-sectoral links with the energy sector and highlighting 2Zero's contribution to the European economy by establishing better recycling of used goods and waste, creating jobs and economic growth, reinforcing strategic independence and environmental friendliness from saving natural resources and consuming less energy in mobility and industry. Therefore, 2Zero will be an integral part of the strategy for making Europe the first climate neutral continent by 2050 and of the European Green Deal.

The 2Zero partnership will make a significant contribution to achieving the following Sustainable Development Goals[18] (SDG):

By drastically reducing CO_2 and other GHG emissions from road transport, thanks to its focus on zero tailpipe emission vehicles, it will make a decisive contribution to the SDG 13 – Climate Action

By supporting the development of multiple solutions, alternatives to conventional vehicles, and the related recharging / refuelling infrastructure, whilst leading the way to the use of 100% renewable energy carriers in road transport, the partnership will contribute to the SDG7 "Affordable and clean energy"

By improving air quality in cities and limiting noise it will bring the SDG11 "Sustainable cities and communities" a step closer to reality



By reinforcing European competitiveness, it will support sustainable economic growth across the continent, whilst improving the quality of jobs in the road transport area, and will contribute to SDG8 "Decent work and economic growth"

The improvements in production processes and materials will also support the achievements of SDG12 on "Responsible consumption and production" (energy efficient and environmentally-friendly production processes such as sustainable use of water, increased use of secondary or bio-based materials, fit-for-purpose approaches as well as increased use of raw material coming from recycled sources …)

[18] https://ec.europa.eu/info/strategy/international-strategies/sustainable-development-goals/eu-approach-sustainable-development-0_en

Correspondingly, considerable additional research and development is needed at different scales, from the individual components up to the vehicle and system integration, covering all different types of vehicles and their innovative powertrain options, the charging infrastructure, and renewable energy carriers along with innovative mobility solutions for passenger (such as Mobility-as-a-Service) and freight transportation.
This partnership will address programme objectives stated in the proposed framework programme (Article 3) of Horizon Europe:

- to support the creation and diffusion of high-quality new knowledge, skills, technologies and solutions to global challenges;
- to strengthen the impact of research and innovation in developing, supporting and implementing Union policies, and support the uptake of innovative solutions in industry and society to address global challenges;
- to foster all forms of innovation, including breakthrough innovation, and strengthen market deployment of innovative solutions.

The objectives of the partnership are shown in the figure 2 below and listed here.

General objectives of the partnership:

- Contribute to Europe having the first carbon-neutral road transport system by 2050 thanks to collaborative research and innovation activities;
- Technology leadership supporting economic growth and job creation all over Europe;
- Ensure European competitiveness thanks to solutions for an integrated carbon neutral road transport ecosystem;
- Improve the quality of life of EU citizens and ensure mobility for people and goods.

Specific objectives of the partnership:

- Develop zero tailpipe emission, affordable user-centric solutions (technologies and services) for road-based mobility all across Europe and accelerate their acceptance to improve air quality in urban areas and beyond;
- Develop technologies and solutions to reduce non-powertrain related emissions and transport related noise;
- Develop affordable, user-friendly charging infrastructure concepts and technologies that include vehicle and grid interaction;
- Demonstrate innovative use cases for the integration of zero tailpipe emission vehicles and infrastructure concepts for the road mobility of people and goods;
- Support the development of life-cycle analysis tools and skills for the effective design, assessment and deployment of innovative concepts in products/services in a circular economy context.

Operational objectives of the partnership:

- To have a broad stakeholder coverage over the different sectors involved;
- Number of SMEs in projects funded by the partnership;
- To support standardisation activities;
- Number of patent applications;
- Number of publications;
- To provide scientific input for informed regulation;
- To ensure a wide dissemination of activities and results.

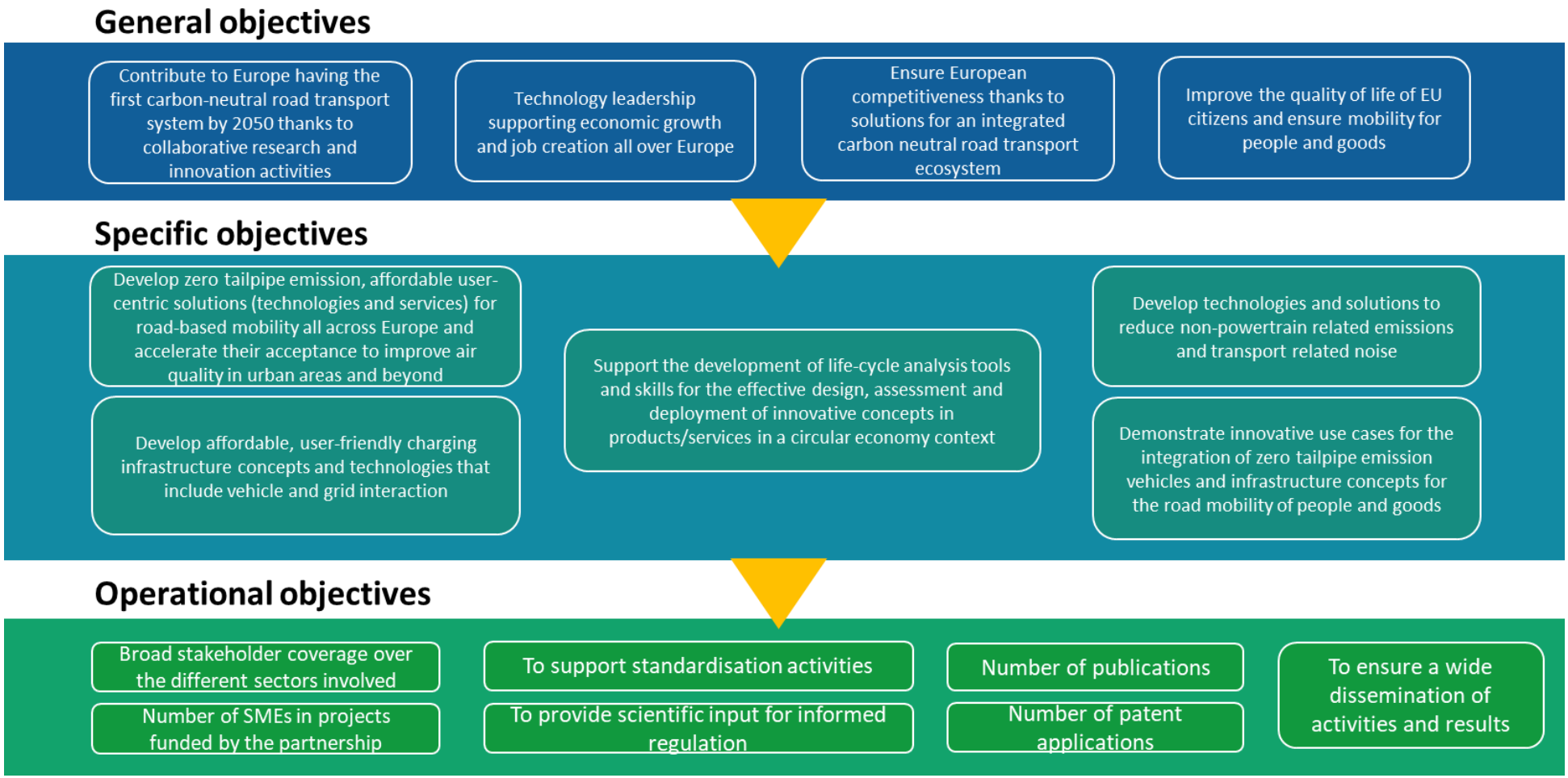


Figure 2 – The hierarchy of objectives of 2Zero

To achieve these short and medium-term objectives, the partnership will focus on the required research and innovation for the development and substantial penetration of next generation energy-efficient and affordable zero tailpipe emission road vehicles (battery electric vehicles and heavy-duty fuel cell electric vehicles) mobility solutions and their cost-effective recharging infrastructures (from slow to fast /ultra-fast). It will also ensure a strong link with other support measures to facilitate the above vehicle technology deployment through effective mobility and logistics solutions for urban, peri/inter-urban and rural mobility.
Hence, the partnership will address several layers of research and innovation activities: technologies, process, operational and business model innovation, in order to truly take a system approach to tackle the decarbonisation of road transport.

The transformation towards zero tailpipe emission road mobility will deliver tangible benefits including, at the local scale, pollutant emission reductions, cleaner air (including unregulated pollutants, nanoparticles and secondary pollutants), reduced noise and more liveable urban, peri-urban spaces. Further, major benefits for citizens' health, quality of life will be generated and European economic growth supported, hence a solid base for new business opportunities. On a global scale, the reduction of CO_2 and other GHG emissions will contribute to mitigating climate change.

All types of road transport vehicles shall be included (e.g. micro vehicles, two-wheelers, passenger cars, vans, trucks, coaches and buses) as well as system integration with infrastructures and services (i.e. micro-mobility services, logistics …). Zero tailpipe emission solution remain particularly challenging for HDV and the 2Zero partnership will make a substantial contribution to make long haul zero tailpipe emission a reality in the future. All types of applications and especially the integration and interaction of these will be covered: urban, suburban, interurban, rural areas and long haul. In order to reach affordable mobility and improve the quality of life for all the EU citizens (air quality, choice, comfort …), the cost of the proposed solutions is a key parameter and will be addressed all along the process (development, manufacturing …).

The following items will be funded under the scope of the 2Zero partnership funding:

1. **Vehicle technologies and vehicle propulsion solutions for BEV and FCEV;**
2. **Integration of battery electric vehicles into the energy system and related charging infrastructure;**
3. **Innovative concepts and services for the zero emission mobility of people and goods;**
4. **LCA approaches and circular economy aspects for sustainable and innovative road mobility solutions.**

The relationship of these items to other aspects of the partnership are shown in the figure 3 below

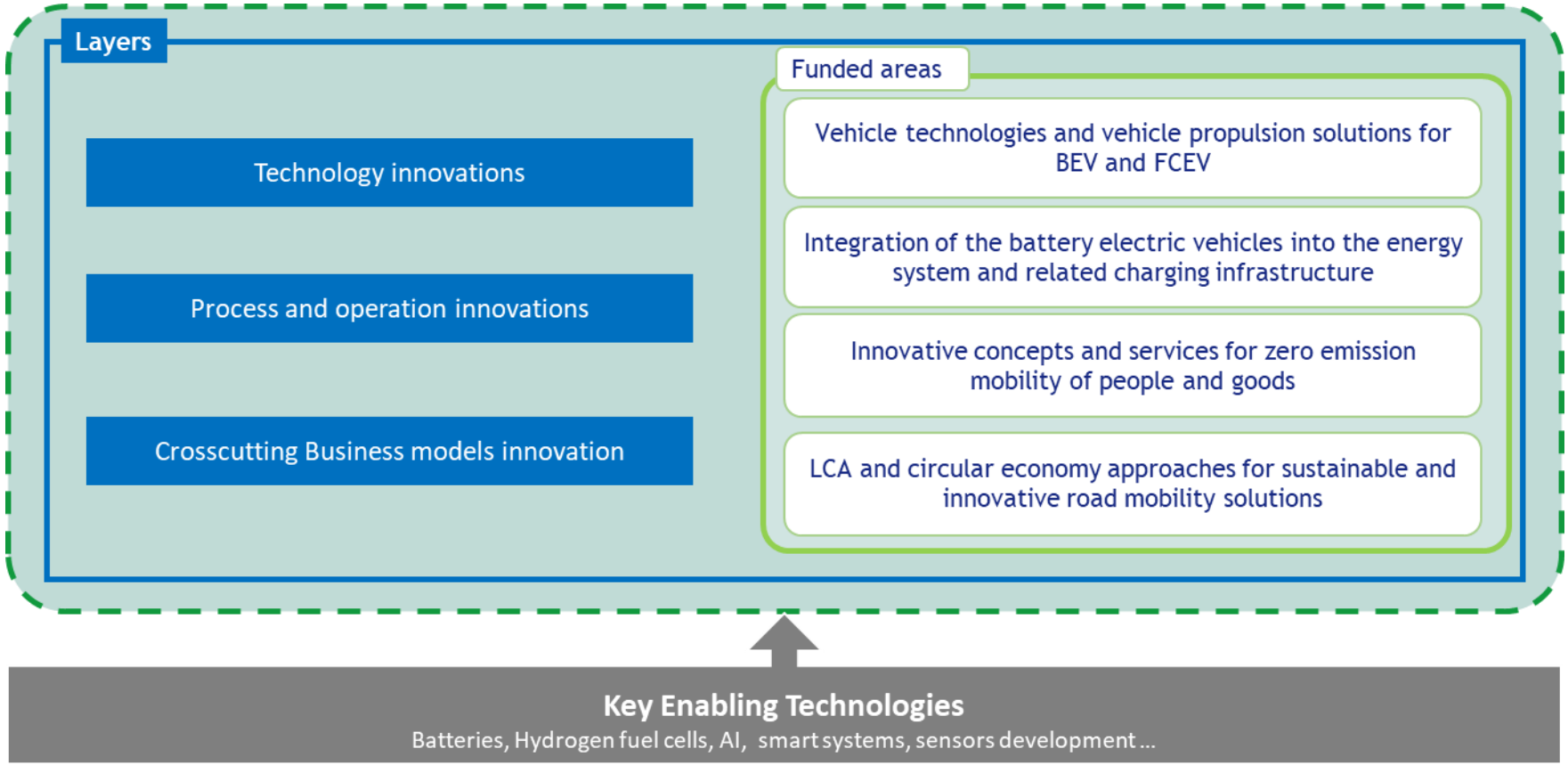


Figure 3 - 2Zero partnership funded activities and their interactions

Vehicle technologies and vehicle propulsion solutions for BEV and FCEV.

Technologies for future road transport vehicles will be developed in the partnership in order to improve the range of vehicle options for end-users and reduce the cost of BEV and FCEV. BEV intervention area shall cover all type of road vehicles, whilst the FCEV intervention area, in collaboration with the Clean Hydrogen Partnership, will focus on Heavy Duty, long haul vehicles.
Thanks to both the improvement of BEV and FCEV performance (improvement of the range, shorter charging time, cost reduction and user-friendliness at a level similar to conventional vehicles) and the development of a portfolio of zero tailpipe emission vehicle solutions, users will find an alternative to current vehicles suitable to their specific needs and expectations.
In order to achieve this goal, the following areas will be investigated:

- Affordability of the innovative solutions;
- Battery integration into the vehicle;
- Integration of hydrogen fuel cell technologies into the vehicles, focusing on heavy duty, long-haul vehicles;
- Total vehicle energy management, including thermal management aspects, comfort and climatisation management system, battery, power electronics …;
- Vehicle charging technologies and the connection to the grid;
- Reduction of the use of rare earth materials in electric motors and power electronics and improvement of their re-use and recyclability (in a circular economy approach);
- Lightweight, functional material components and systems, to support the optimisation of the vehicle architecture;
- Advanced, digital development processes and manufacturing technologies suitable for cost-efficient zero tailpipe emission vehicles;
- Safety issues specifically related to zero tailpipe emission road vehicles (the crash safety of vehicles fuelled with hydrogen, rescue from crashed electrified vehicles, fire extinction …). Specific safety issues related to personal light electric vehicles will also be investigated.
- Digital technologies relevant for energy efficiency. Some of these will be covered in collaboration with the CCAM partnership (see section “Link and collaboration opportunities with other partnership candidates” below): assessment of electric power consumption of CCAM vehicles and their infrastructures, control strategies related to non-powertrain emission reduction, energy and thermal management of CCAM vehicles, tyre wear or thermal braking thereof.

There will be no “one solution fits all”, therefore the fundamental elements of rightsizing and fit-for-purpose approaches will be the drivers when developing solutions, in order to maximise the benefit of every innovations.

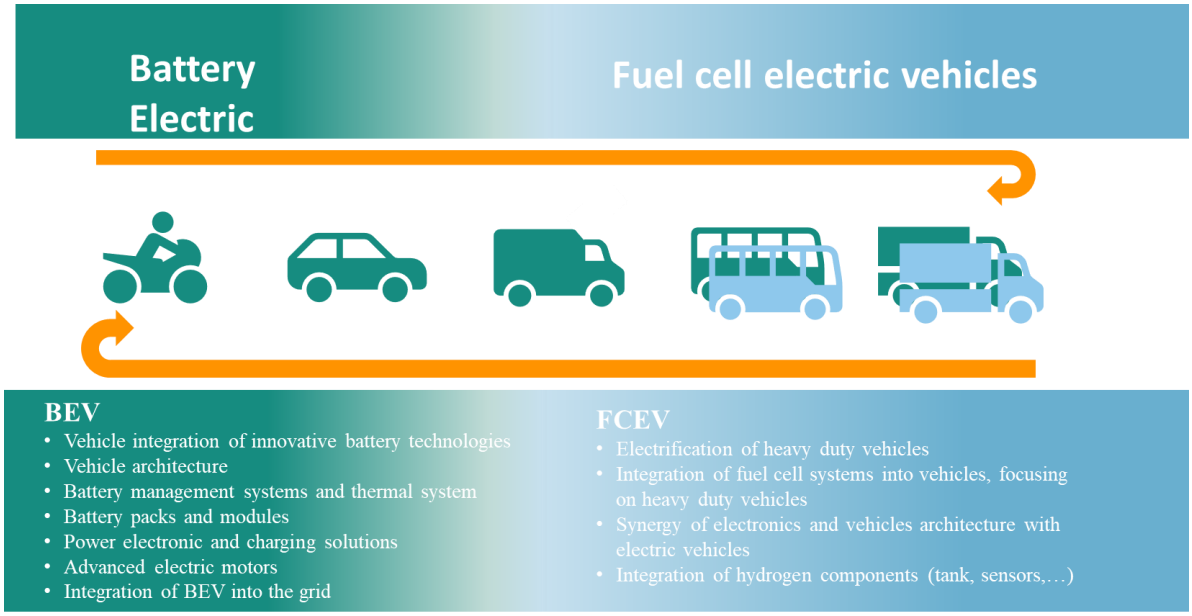


Figure 4 – Outline of the propulsion technologies and vehicle types covered by the 2Zero partnership funding

Whilst BEV might be suited to several use cases, a 100% battery electric scenario does not seem an appropriate option, especially for heavy duty extra-urban and long-distance travels when taking an integrated approach, with a life cycle perspective (high environmental impact of oversized batteries (high consumption of rare earth materials, vehicle weight …) or the cost of the charging infrastructure network and isolated local power peak demand). For some use cases, other solutions may bring a higher benefit over their lifetime. Therefore, only a portfolio of different solutions can answer the various mobility needs.
The 2Zero partnership will focus its funding on zero tailpipe emission technologies, namely BEV (with a focus on passenger cars, vans, buses and heavy vehicles) and FCEV (with a focus on fuel cell integration for long-distance heavy-duty vehicles and coaches). When relevant, synergies might be exploited between different vehicle types.

Integration of the battery electric vehicle into the energy system and related charging infrastructure

When taking a system approach, the vehicle development cannot occur without covering aspects of the integration into the energy and related infrastructures.
The electromobility value chain will modify the traditional roles of Distribution and Transmission Operators (DSOs / TSOs) and of Energy Retailers; new actors will enter this market, namely Charging Point Operators (CPO), in charge of the deployment and operation of the charging infrastructure, and Electric Mobility Services Providers (EMSP), who will offer a whole suite of services to drivers, from payment to charging spot reservation, bringing a decisive contribution to increase the user acceptance of electric mobility.
Different levels of EV integration into the electric grid must be addressed, targeting different objectives and referring to different requirements.

1. **Smart charging** should become the solution by default, to accommodate a large number of EVs whilst avoiding unnecessary high network investments, and preparing for Vehicle to Grid (V2G) market uptake in 2025. This requires charging time management to avoid increase in peak demand or new, unexpected peak demands, since uncontrolled power demand could create network overloads or grid undervoltage problems.

a. Smart charging involves the application of advanced, centralised and decentralised control techniques, having to deal with different interfaces and management levels, namely battery / vehicle, vehicle / charging point and charging point / grid, in order to control and optimise the load curve for optimal exploitation of the network infrastructure
b. Smart charging could provide many advantages[19], both to the energy provider (e.g. cut of electricity infrastructure investments by a factor of two compared to a situation with no smart charging), and for the EV owners (reduction of cost of electricity purchase for the driver) and could reduce the peak load for the generation plant and grid by 25%.

2. **Dynamic charging**, integrating more parameters, both on drivers' side (pricing options, level of charge needed …) and electricity system needs (renewables production, flexibility, ancillary service needs …) will need to be developed in a second stage.
3. **Bi-directional** power exchanges, enabling **Vehicle to Grid** (V2G) functions could provide multiple benefits to the electricity system given that the right incentives and proper market operation are put in place.

In order to achieve the abovementioned integration levels of EVs into the grid, the following aspects will be covered in the 2Zero partnership:

- Daily low power charging solutions (charging at home / charging at work);
- High power charging / fast charging options for longer trips and as a solution for EV drivers benefiting from weekly / non-daily opportunity charging for short daily trips (meeting facility, shops, restaurants …);
- Specificities of power charging systems addressing different kind of fleets such as buses, delivery vans and trucks for different segments (i.e. parcel delivery, service trips, waste, construction, retail etc.) and application areas (private depots, shopping malls, historic centres and hyper/supermarket);
- Electrified road systems;
- Charging management and bidirectional charging (including Peak-Management);
- Blockchain trading through smart nodes embedded at various levels of the grid and active distribution grid hierarchical control to manage local needs to safeguard quality of supply to end users;
- To comprehensively address the impact of EV diffusion paths, the following must be used and considered:
  - an articulated mix of user's affordable solutions;
  - the planning of the impact on power grid
  - vehicles technological options.

  The 2Zero partnership will elaborate this matrix through a set of well-defined use cases, to be properly modelled in order to make a comparative assessment of costs and benefits (Cost Benefit Analysis, CBA).

Cities and regions could serve as testbeds for the integration of innovative charging solutions in urban areas, where new concepts, such as V2X or bi-directional charging for various types of vehicles, will be demonstrated in the controlled yet real-life environment.

[19] Smart charging and electricity system, by the French TSO, published in May 2019, https://www.rte-france.com/sites/default/files/electromobilite_synthese_9.pdf

When it comes to fuel cell vehicles, the 2Zero partnership will be responsible for the integration of the fuel cell technology at vehicles level, whilst the development of refuelling infrastructure will be in the scope of the Clean Hydrogen partnership (see the section "Link and collaboration opportunities with other partnership candidates" below); a close cooperation will be organised to ensure a smooth coordination of vehicle related activities and infrastructure development.

The 2Zero partners will also exploit synergies with other relevant partnerships and initiatives, including e.g. the ETIP Bioenergy to bring its expertise and knowledge to external communities regarding e.g. fuel composition.

Innovative concepts and services for the zero emission mobility of people and goods

The 2Zero partnership will aim to seamlessly integrate technological and non-technological advancements, speeding up the transition towards an affordable zero tailpipe emissions road transport system that includes the appropriate infrastructure.
Whilst zero tailpipe emission road vehicles are more available on the market, the cost of these solutions, their performance (i.e. autonomy, managing slopes etc.) as well as the lack of the required supporting infrastructure (charging stations etc) is currently preventing a large-scale adoption by end-users, public and private transport operators, freight operators and logistics companies. Cities and regions are regulating access to cities more to ensure local air quality. Low Emission Zones, Ultra Low Emission Zones and even Zero Emission Zones are already practice or foreseen in the medium to short term. One of the challenges is to identify and develop innovative mobility and logistics concepts, services, solutions and business models to make zero tailpipe emission vehicles affordable and usable in a wide range of applications. For example, electric vehicles can offer advantages to operators when they are heavily used as their operational cost is lower than conventional vehicles: collaborative approaches can accelerate their adoption by meeting the requirements of both city and transport / logistics operators (i.e. access time windows for off peak deliveries avoiding congestion …). These strategies and business models need to be further developed and tested. A systemic approach considering all stakeholders and aspects, such as urban planning and behavioural patterns, is needed.
As one of its priorities, 2Zero will develop zero tailpipe emission technology solutions for long haul. The challenge is to achieve the same performance and a lower total cost of ownership (TCO) compared to current market solutions, and develop the access to the required charging infrastructure. Roadmaps show that from a solely vehicle perspective, the competitiveness of zero tailpipe emission vehicles with current business models can only be achieved in the medium-long term. New mobility and logistics concepts and services need to be developed to overcome these constraints, by providing a holistic system approach to accelerate the use of new types of vehicles.
Business/operational models will be developed to accelerate urban and long-haul e-mobility hubs, where different sustainable electric transport options and charging infrastructures are combined for the shared use of both citizens and companies. Demonstrations should go hand-in-hand with the development of business models as well as deployment strategies, allowing quick and efficient roll-out and upscale of the technology and operational models, once the concepts have been proven.
The partnership will also address the development of dynamic parking management, including smart use of multipurpose usage of parking / charging spaces for urban operations. A particular attention will be paid to the interoperability of solutions and price transparency as a key enabler for affordability and usability of solutions.

The 2Zero partnership will investigate efficient, long-term testing and pre-deployment strategies for extended application of new zero emission mobility services, public transport, freight transport and logistics covering:

- Identification and development of innovation concepts, use cases, business model opportunities and required framework conditions to accelerate the adoption of zero tailpipe emission mobility solutions in an affordable, safe and competitive way.
- Identification and analysis of requirements for different freight and logistic flows as well as potential operational benefits of zero tailpipe emission vehicles. Development of new freight and logistics innovative concepts and services overcoming the current and short-term performance and cost constrains of zero tailpipe emission vehicles as well as boosting their potential operational benefits in different segments (urban and long haul).
- Increase the understanding of, and further develop the system requirement, in terms of shared public charging infrastructure for the different kind of applications (people, mobility, city services …), including the modelling of charging infrastructure roll-out strategies for different types of vehicles. Capacity-building activities and harmonised decision-making tools for the usage of charging infrastructure.
- Consensus and capacity building across stakeholders, cities, regions and national public authorities on the approaches for harmonization of:
  - Data management and the exchange of information;
  - Smart access to Zero Emissions Zones;
  - Enforcement;
  - Booking of charging spots;
  - Trip planning;
  - Pathways for interoperability and charging prices transparency.
- User centric integration of innovative eMaaS (through digital platform) and zero tailpipe logistics as a service/physical internet solution.
- Development of planning and decision-making tools and stakeholder engagement practices, to support and facilitate the uptake of zero tailpipe emission vehicles, innovative solutions, concepts and framework conditions encompassing safety (including regulatory framework).
- Testing and demonstration of innovative concepts, services, use cases and business models in controlled but real-life implementation environments with the wide participation of stakeholders (cities, vehicle manufacturers, infrastructure, service and logistics providers …) to accelerate the transition towards zero tailpipe emission mobility and logistics.
- Development of a medium to long term roadmap of deployment strategies for new zero emission mobility services (NMS), public transport and urban freight, including procurement operation and maintenance.

In close cooperation with the CCAM partnership, the 2Zero partnership will also investigate the effectiveness of the non-technological measures that are being taken to reduce emissions: such as the impact of new ownership models on the traffic network use, user behaviour and related emissions.

LCA and circular economy approaches for sustainable and innovative road mobility solutions

Our mobility system is evolving quickly, major trends are disrupting the road transport system (new propulsion systems will take a bigger market share, there is a need for strong investment in infrastructure, there will be new ownership models …). In order to make the best choices, and considering the many challenges still ahead, it is of upmost importance to have the right tools to assess technologies (and non-technical measures) in a holistic way. In selecting the right technologies for a clean and sustainable mobility at the vehicle and at the system level, the ecological footprint and the impact of technology on society should be assessed at an early stage of development and planning. Thus, research and innovation based on a LCA approach is needed, to assess the environmental and societal impact of solutions in a holistic way (from component to system integration, from cradle to cradle (to reflect the needs for a circulate economy) etc.). Research and Innovations is needed to:

- Advance and adapt existing methods and tools, in particular to include infrastructure data and effects, and to integrate them into the technology development and mobility planning tools;
- Devise methods, tools and processes, supporting the design for circular economy of materials and their production (cradle to cradle i.e. including second life and recycling); this should also incorporate material flow and supply chain management and production;
- Identify areas of high potential for new technologies having a significant leverage on emission reduction;
- Identify suitable, harmonised methods, data and define of use-cases adapted to mobility segment so as to include fleet and system aspects in the assessment;
- Access performance and emission data, as input into the assessment and in real use for improved technology decision making related to zero emission vehicles.
- Assess actual and future (road) mobility scenarios, including CCAM. In the future, road transport will be more and more "cooperative, connected and automated". The development of the relevant technologies will be supported by the CCAM partnership. The impact of CCAM solutions will need to be considered in the 2Zero partnership, as well as the overall energy needs and related emissions generated by their integration in the road transport system.

By addressing and combining these four topics in a system approach, the 2Zero partnership will make a significant contribution to the Green Deal, as shown in the figure 5 below.

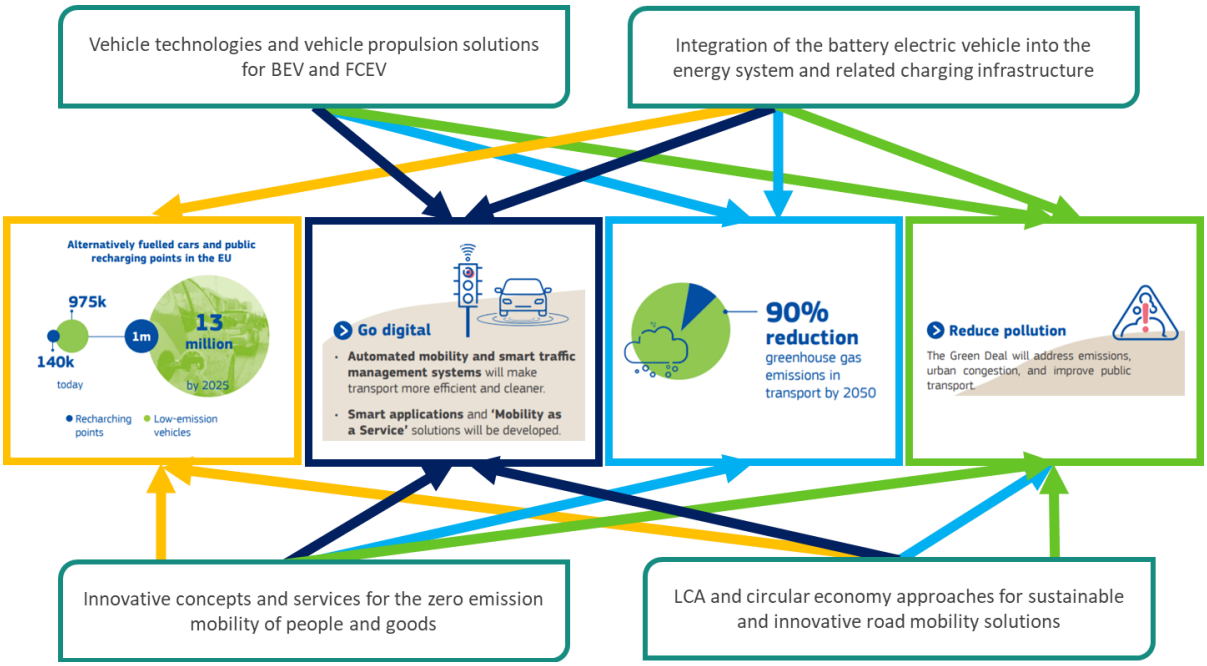


Figure 5 - Contribution of the 2Zero partnership to the Green Deal targets

The links between the individual R&I areas and the specific outcomes, or strategic objectives will be part of a later and more detailed exercise, including milestones and timeline definition (see section "Description of the planned process for developing SRIA below)

What will be new with respect to the current EGVI scope?

The 2Zero system approach will considerably strengthen and extend the scope of activities compared to previous initiatives. Considering the vehicle and the system perspective, the partnership can bring a decisive contribution to the decarbonisation of road transport and acceleration of the introduction of zero tailpipe emission vehicles. This will require new partners to be involved and will generate new topics of research and innovation to be investigated.

Link to and collaboration opportunities with other partnership candidates

Based on the successful experience of the Green Cars and Green Vehicles initiatives, several links have already been established with other European initiatives, including partnerships. Contacts and the exchange of information previously launched with EFFRA (involved in the "***Made in Europe***" partnership), through common workshops dealing without various topics such as advanced manufacturing, advanced materials for automotive applications, robotics and digitisation in manufacturing, will continue therefore. These common workshops, involving various expertise across the value chains, have proven to be a good way forward in ensuring the exchange of information between communities.
Similar coordination activities will be organised with other partnership or platforms, depending on the respective needs.

The coordination with co-programmed and institutional partnerships funded under Horizon Europe and having a direct impact to 2Zero will continue, to ensure exchange of information and avoid duplication of activities.

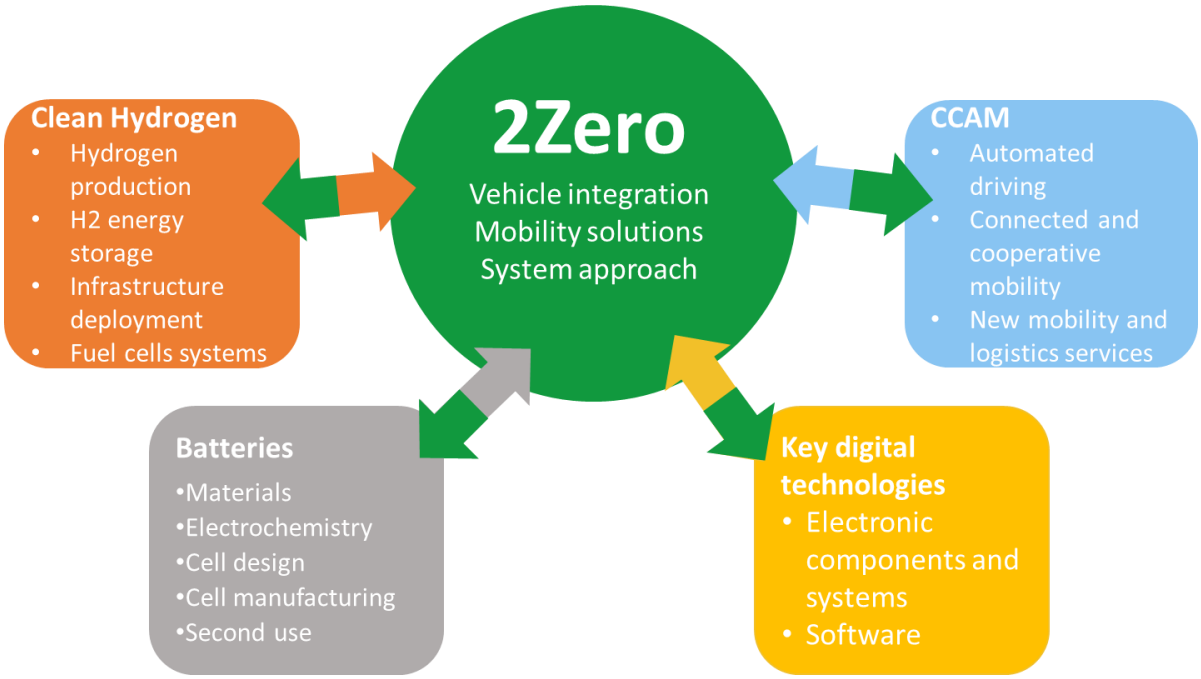


Figure 6 - The interaction of the 2Zero with other partnerships

- Reinforcement of the existing links with "***Key Digital Technologies***" (former ECSEL-JU). A "soft" coordination between EGVI and the ECSEL-JU is already existing, relying on common members, the support from the European Technology Platform to both partnerships (namely EPoSS), as well as EGVI participation in the ECSEL lighthouse, Mobility.E.
  This coordination of activities will continue, using a similar way forward: closer exchange could be organised depending on each community's need along the way.

- The digitalisation of road transport, enabling connected and automated mobility, offers opportunities to further improve transport efficiency (both at general traffic level and at the vehicle level), improved logistics operations and the development of new public and / or private mobility services. Since the impact of digitalisation on road transport's energy consumption and related emissions should be further investigated, the 2Zero Partnership should work closely with the future ***CCAM*** partnership to develop solutions to minimise the impact of such potential rebound effects.

Considering the level of integration needed with the Batteries and Clean Hydrogen partnerships, specific attention will be paid to reinforcing the exchange of information along the value chains of these two enabling technologies (see figure 7 below).

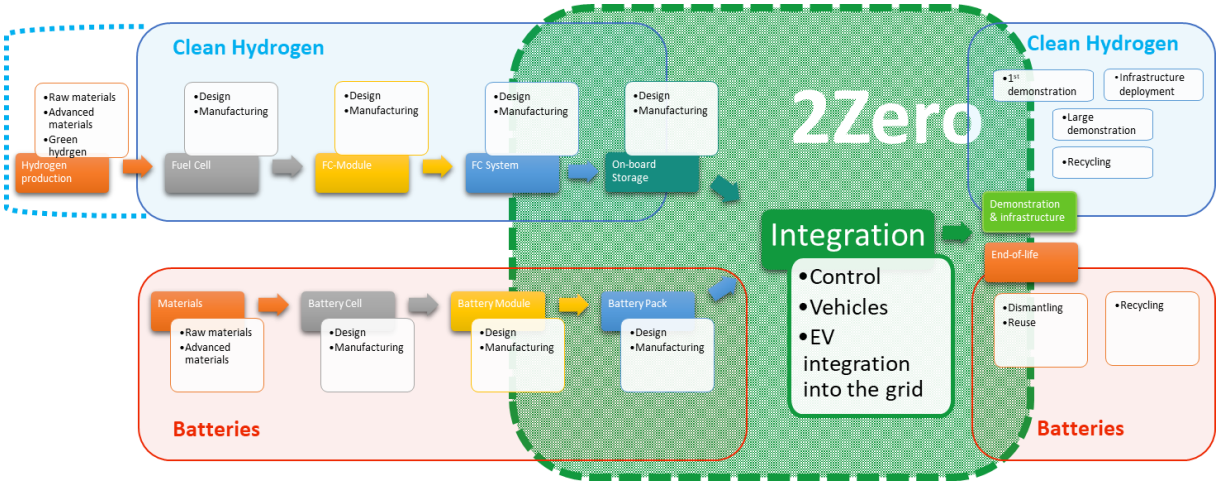


Figure 7 - The detailed interaction of 2Zero with the Clean Hydrogen and Batteries partnerships[20]

- Existing links (common statement paper published in 2017[21]) with the "***Clean Hydrogen***" (former FCH-JU) will need to be reinforced and reorganised, to ensure a smooth transfer of information between the two initiatives and avoid any duplication of activities. Indeed, the Clean Hydrogen initiative will enlarge its activities to clean hydrogen production pathways, technologies for safe and cost-efficient distribution and storage, as well as demand-side technologies (including fuel cells) to produce power and / or heat for mobile and stationary applications. This will bring an important technological contribution to the 2Zero partnership for integration into the transport and mobility system. A strong coordination of efforts and activities will be needed to ensure a smooth transfer of information between the two partnerships, both for the integration at a vehicle level and for the interface between the vehicle and infrastructure, and for deployment activities.
- The batteries landscape and structures in Europe evolved very quickly following the launch of the Battery Alliance by Commissioner Šefčovič in 2017. Several new initiatives have been launched to support battery production in Europe: road transport is one of the main applications of this enabling technology. Hence, a strong coordination with the proposed ***Batteries*** partnership will be needed. While the Batteries partnership would cover material and cell level activities, the 2Zero partnership will be responsible for topics related to the integration of batteries at vehicle

[20] This graph is a first attempt to sketch the coordination between 2Zero, Clean Hydrogen and Batteries partnerships and reflects the first discussions between the three partnerships. Further exchange will be needed to reach a final agreement.

[21] https://egvi.eu/mediaroom/battery-and-hydrogen-electric-vehicles-for-zero-emission-transport/

level. A close cooperation will be organised, to ensure a smooth transfer of information and avoid duplication of activities.

The cooperation between the three partnerships will be needed to investigate the potential benefit of their interactions.

Representatives from relevant partnerships (e.g. Batteries, Clean Hydrogen, CCAM …) will interact with 2Zero partnership in a lean and efficient way, in order to share results and technical advances, and to ensure that R&I roadmaps will be drawn-up in a coordinated approach.
Cooperations, as described above, are still at the proposal stage and will be detailed appropriately for each of these partnerships in due course, according to the specific targets and objectives.

The co-programmed and institutional partnerships are not the only ones where collaboration will be ensured. Co-funded partnerships and other types of partnerships will also be considered. The Driving Urban Transition partnership (DUT) addresses the complex set of urban challenges with an integrated approach, to offer decision makers in municipalities, companies and society the means to act and enable necessary urban transformations. Even though the scope of the DUT partnership will be much broader than (road) transport related activities, a close cooperation with 2Zero will be needed, particularly regarding the activities to be carried out therein in relation to the pillar "Innovative concepts and services for the zero tailpipe emission mobility of people and goods".
A better coordination with the Safe and Sustainable Mobility (SSM) partnership initiated under the Smart Specialisation Platform for Industrial Modernisation (S3P-Industry) led by DG GROW will also be investigated. Created by several regional authorities, to promote a bottom-up approach to industrial innovation in the automotive sector, the SSM partnership's main objectives are to strengthen the regions' innovation capacity beyond the automotive industry and to facilitate investments based on open innovation infrastructure and new technologies. Further links with 2Zero could be established, to identify and exploit synergies when possible, including those between the Cohesion policy and European Structural and Investment Funds.

Links to the "missions" as identified in Horizon Europe will be ensured, particularly with the following:

- Climate neutral and smart cities mission;
- Cancer mission when it comes to the impact of non-powertrain related emissions.

Links are also foreseen with the following areas of the programme:

- Cluster Digital, Industry and Space, linking vehicle manufacturing with Key Enabling Technologies, technological and industrial capacities for industrial competitiveness, and a digitised, circular, low-carbon and low-emission economy;
- Cluster Health, analysing and reducing the impacts of existing and future transport emissions, such as air polluting transport emissions and noise emissions, also influencing vehicle and users' behaviour.
- Other research areas in Horizon Europe, such as innovative materials, advanced manufacturing and circular economy.

Exit strategy and measures for phasing out

The proposed type of partnership is considered to be a particularly lean and flexible tool, both for its set-up and day-to-day management. The same principle applies with respect to its termination; as the partnership will be signed for a pre-defined duration – i.e. the same as the Horizon Europe programme – the termination of this partnership is planned for 2027, even though projects will run for a longer time.
An early termination of the partnership, in case the parties no longer agree on the objectives and means of the initiative, will also be possible. The process, to be clarified by the European Commission services, will also be lean, as financial commitments are taken on a bi-annual basis (Work Programmes).
The renewal of such an initiative after the end of Horizon Europe (2027) be subject to an exchange of information with the relevant public authorities and, as such, there will be no automatic renewal of the PPP.

Description of the planned process for developing SRIA

In order to power green road vehicles, different technologies will be used and developed in the coming years. The need for complete decarbonisation and climate neutral road transport covering all technologies will be the basis for prioritising funding of 2Zero from the Horizon Europe budget. In concrete terms:

- As to propulsion technologies, Horizon Europe funding allocated to 2Zero will support only R&I for zero tailpipe emission technologies (i.e. BEV and FCEV).
- Within 2Zero, one of the priorities will be to develop drivetrains for zero emission heavy-duty long-haul vehicles.

Nevertheless, the members of the 2Zero partnership can undertake cooperative research in areas that go beyond the scope of Horizon Europe funding for 2Zero. This means in particular:

- The vehicle manufacturing industry will be open to all technologies in order to stay competitive and support the transition to the goals of the European Green Deal.
- The 2Zero partners will continue developing strategies and roadmaps covering other propulsion technologies (e.g. PHEV with renewable / synthetic fuels), without EU funding.
  Only the designated areas of the strategies and roadmaps that belong to the scope of the 2Zero partnership will be taken into consideration for funding by the partnership.

Private and national funding sources could be used to support areas not funded under the 2Zero Partnership.

With regard to renewable/synthetic fuels, R&I will be taken forward in other parts of Horizon Europe.

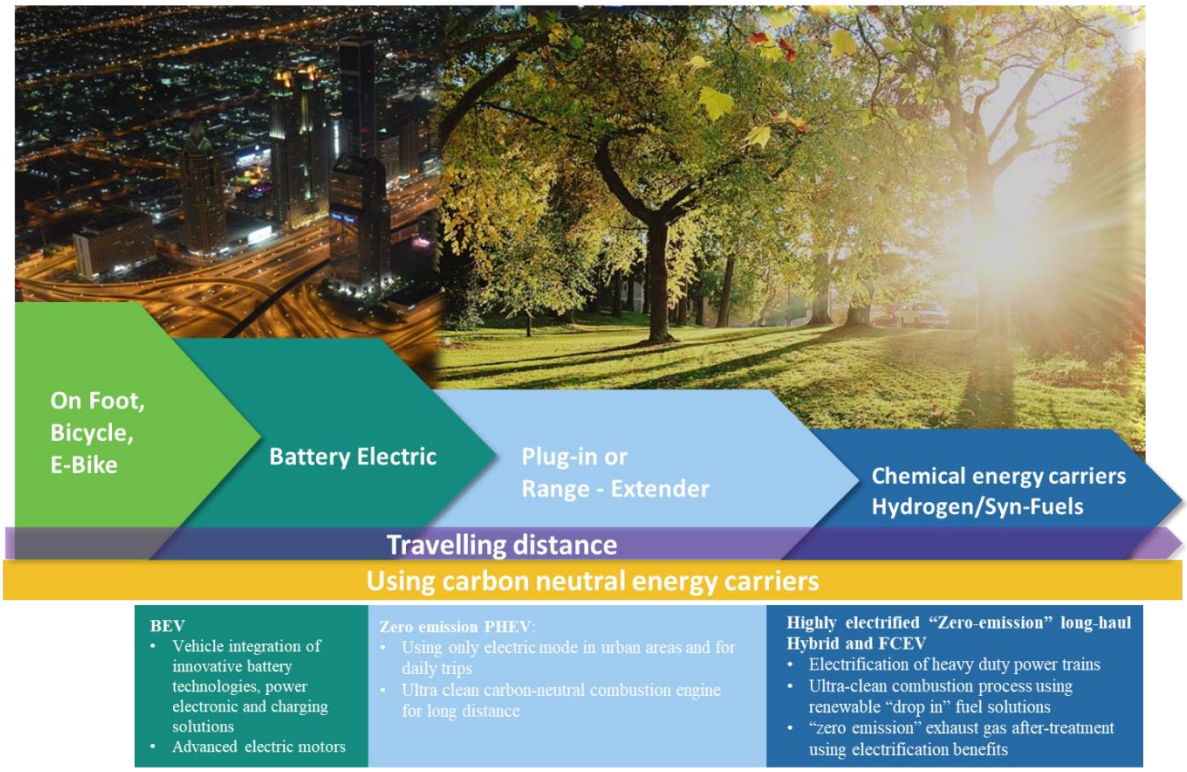


Figure 8 - The 2Zero Partnership roadmap areas

The 2Zero SRIA will include a description of research and innovation activities needed to achieve a climate neutral road transport. It will further detail the technical and specific objectives, set milestones and provide a timeframe for R&I activities and their expected outcomes. As abovementioned, the EU funding will be limited to zero tailpipe emission vehicles.

The roadmap preparation will be open to any stakeholder along the value chain interested to contribute with its expertise to the discussions and drafting of the document. The 2Zero partnership received support from various European Technology Platforms, namely ERTRAC[22], EPoSS[23], ETIP-SNET[24] and lately ALICE[25]. EGVIA members will be invited to contribute to this exercise and a particular attention will be paid to include all stakeholders along the value chain, including, among others, TSO, DSO, public authorities, end user association, transport operators and logistics related industry. Several contacts have been made with associations representing these stakeholders' categories (i.e. Polis, UITP …) to ensure the invitation to join the 2Zero SRIA preparation will reach out their members.
When relevant, representatives of other partnership will also be invited to contribute.

[22] European Road Transport Research Advisory Council (https://www.ertrac.org/)
[23] European Platform on Smart Systems Integration (https://www.smart-systems-integration.org/)
[24] ETIP Smart Networks for Energy Transition (https://www.etip-snet.eu/)
[25] Alliance for Logistics Innovation through Collaboration in Europe (https://www.etp-logistics.eu/)

The 2Zero SRIA might use as inputs several documents recently published or under finalisation, including:

- A new ERTRAC roadmap entitled "Sustainable Energies and Powertrains for Road Transport - Towards Electrification and other Renewable Energy Carriers"[26];
- Urban mobility roadmap[27];
- Long Distance Freight Transport roadmap[28];
- Towards Zero Logistics Emissions 2050[29];
- The joint ETPs common paper published in 2019.

A first consolidated draft is expected mid-2020 and will be used by the European Commission for the Horizon Europe strategic planning. This multi-stakeholder roadmap will be the basis for the identification of the priorities to be covered by the partnership and the definition of annual research priorities.

[26] The document is still under preparation – a first draft is expected in June 2020

[27] ERTRAC – ERRAC – ALICE - Integrated Urban Mobility Roadmap, 2017

[28] ERTRAC – Long-duty Freight Transport Roadmap, 2019

[29] ALICE - A framework and process for the development of a roadmap towards zero emissions logistics 2050, 2019

2.3 Necessity for a European Partnership

The fundamental change needed in the road transport sector, to achieve the targets of the European Green Deal, requires a system approach with a clear commitment from several stakeholders covering different sectors (automotive industry, energy suppliers, infrastructures, logistics …) and at different levels (industry, research community, public authorities …). All these actors need to collaborate to properly tackle this challenge and achieve a complete decarbonisation of road transport. However, they are not always used to work together, particularly not across sectors. Research and demonstration efforts are still occasionally fragmented and there is an insufficient exchange of information or reuse of promising results from projects that have been completed. In order to increase the impact of investment and the efficient use of the funds available in Horizon Europe, a better coordination of research and innovation agendas amongst all stakeholders, but also at local, regional, national and European levels, as well as between the public and private sector, is strongly needed.

Building on previous successful PPPs under FP7 and Horizon 2020, the new partnership will bring all the relevant stakeholders together in order to draft a common vision and define research priorities. The partnership will seek consensus on the research and innovation roadmap and the priorities amongst the many different stakeholders of the road mobility system (namely OEMs, equipment suppliers, research centres, universities, SMEs and start-ups, TSOs and DSOs, charging point operators, transport and logistics operators, local and regional authorities, highway authorities etc). Member States will be encouraged to be actively involved, in a lean and efficient way in order, to facilitate the direct exchange of knowledge and best-practice, to support the deployment of research results, as well as to exploit opportunities for synergies across Europe.
The transformation of the road transport system is also a relevant issue at local and regional levels, especially considering that public transport is a regional and/or local competence. To address the challenges related to mobility, such as pollution (air or noise), road congestion, mobility costs, accidents and to make cities more sustainable and healthier than today, a strong public-private cooperation is needed to provide the proper environment for innovation testing, experimentation, exchange of best practices and scale-up. Involving regional and local authorities in the programming activities will allow better consideration of the expectations of local players, ahead of the publication of the calls for proposals. This will certainly increase the interest of local stakeholders in being involved in European funded projects, and activities and will contribute to accelerate the uptake of innovations. Hence, the Partnership would offer the ideal opportunity for multi-level collaboration.

The 2Zero partnership will build the ecosystem needed to properly connect the road transport community to the energy system and innovative mobility solutions providers (both for people and goods), in order to develop a truly integrated mobility landscape.
It will allow the development of the needed synergies to support disruptive and incremental innovation, and facilitate the full exploitation of all innovative solutions across the entire value chain. This public / private collaboration is extremely advantageous for the creation of sustainable solutions that work throughout Europe and beyond.
Today, European stakeholders are challenged all around the world by competitors, coming from the automotive value chain, and also emerging from the digital sector. The EU is a world leader in some technologies, but to remain at the forefront of the global competition and take the leadership position in zero tailpipe emissions technologies, extra financial and coordination efforts will be needed.
Whilst traditional calls may not ensure the contribution of all the partners, the proposed partnership approach also allows 2Zero to act as a catalyst, to support and leverage commitments from the private side, facilitating clustering and technology transfer,

disseminating knowledge and promoting the new skills required for the development and uptake of the technologies.

Since a co-funded partnership is not suitable for industry partners, and the institutionalised approach is not deemed appropriate to be able to adapt to a flexible and fast changing sector, the co-programmed partnership is the most suitable option.
This co-programmed partnership will bring together all relevant Horizon Europe R&I activities so to develop a coherent and strategic programme for zero tailpipe emission road mobility. This approach is the best to achieve the expected improvements in mobility and GHG emissions reduction.
Thus, 2Zero will contribute to the implementation of the EU Green Deal to tackle climate and environmental-related challenges.

2.4 Partner composition and target group

To achieve the objectives, the partnership will build on a broad stakeholder base, so to stimulate synergies across the sectors and the technologies.
The non-exhaustive list of targeted members is as follows:

- OEMs;
- Automotive suppliers;
- Electronic components and system manufacturers;
- RTOs and universities;
- TSO's and DSOs;
- Electricity and energy suppliers;
- Charging point operators;
- Logistics related industry (operators, retail and solutions providers);
- Battery manufacturers;
- Local and regional authorities;
- Transport operators;
- NGOs and end-user associations

Additional members can be included during the course of the partnership, depending on the evolution of the priorities.
In addition, citizen engagement activities could be carried out if relevant to achieve the objectives of the partnership.

The open membership policy, its inclusiveness and transparency shall act as catalyst for the integration of the complete value chain. Possible reviews of the strategic research and innovation roadmap shall increase the needed dynamic ecosystem, support effectiveness and efficiency, and the openness of the partnership to newcomers.

Stakeholders willing to become member of the 2Zero partnership will be invited to join a non-for-profit association, created under the Belgium law (see its proposed structure in figure 9 below). This association will rely on the existing association engaged with the European Commission in the European Green Vehicles Partnership, EGVIA, which will extend its membership to additional stakeholders, as listed above, to properly cover all areas of the 2Zero scope. The current status of EGVIA membership is as follow:

- ***OEMs***: 16 members;
- ***Automotive suppliers***: 22 members;
- ***Smart systems industry***: 2 members;
- ***Smart grids industry***: 2 members;
- ***Research centre***: 13 members;

- ***Universities***: 18 members;
- ***Associate members***: 9 members.

Particular attention will be paid to include stakeholders from the energy, charging and logistics sectors, either by direct membership or by the involvement of sectoral associations into the non-for-profit association engaged in the partnership. Regional and local authorities will also have a rôle to play because of their ability to mobilise various actors in their local innovation ecosystem including, SMEs and cluster organisations, thus integrate EU-funded projects into the broader innovation ecosystem. Moreover, they could provide valuable knowledge and perspective of their territory, its resources and infrastructures. This will ease the connection between technology and mobility needs and constraints (from a user / operator point of view) and will provide opportunities for testing, demonstration and co-creation.
Whilst no membership category is specifically foreseen for SMEs, their participation is expected to increase in 2Zero, particularly in relation to the development of new business models, where more disruptive innovations could come from smaller players and would represent an asset for the partnership. Most importantly, additional efforts will be launched to reach out SMEs and promote their participation in the funded project, so they could liaise with other entities all across Europe and benefit even more from the European innovation eco-system.
The efforts launched towards EU-13 Member States (through Board visit to local stakeholders and actions to increase their awareness towards the partnership activities) will be continued to improve the geographical balance and increase European cooperation.

Membership fees will be defined taking into account the different financial capacity of private and public, large and small organisations, to ensure fairness.
The criteria for membership, and the related fees, will be detailed in the association statutes and should guarantee that all members will:

- Perform research activities in EU Member States (and countries associated to Horizon Europe) to ensure direct benefit of the partnership for the European citizens;
- Share the vision and the objectives of the partnership;
- Support collaborative research activities at EU level.

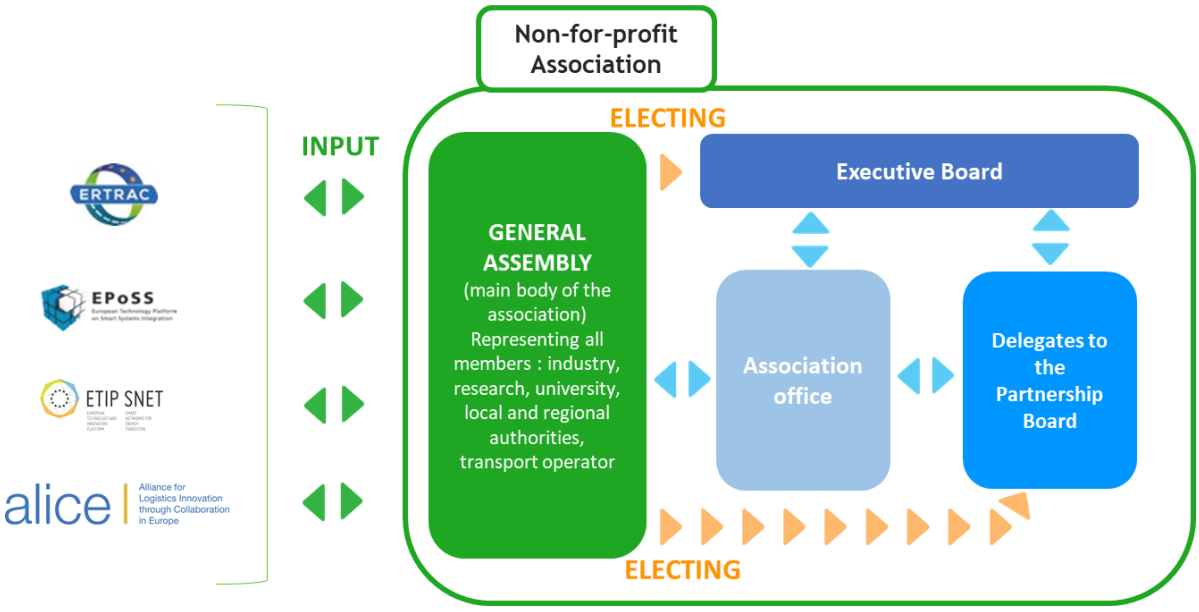


Figure 9 – Non-for-profit association structure and supporting technology platforms

Gathering all members, the **General Assembly** will be the main decision body of the association, endorsing publication of documents, electing the Executive Board members as well as members of the Delegation to the Partnership Board (see below Section 3.3 on Governance). It approves the general policy of the association on the basis of proposals from the Executive Board.

The **Executive Board** will be responsible for the management of the association, chairing the meetings and representing the association in various public events, conferences and towards policy makers at European and national levels. It will be supported by the association office in its daily activities.

Delegates to the partnership board will be elected by the General Assembly. This group of experts will reflect the different sectors represented in the association (automotive, energy and logistics) as well as the type of members (industry, research and public authorities). The specific breakdown will be detailed in the statutes of the association. Its rôle will be to exchange on priorities for the calls for proposals with the European Commission services; in doing so, it will ensure a continuous exchange with the General Assembly to guarantee that all association members have a similar level of information regarding the partnership activities and ensure transparency.

All members will contribute to the association activities on an equal basis, independently to their size or activity domain. Consultation processes will be organised within the association to gather member's views for the preparation of the different inputs to be transferred to the European Commission.

3 Planned Implementation

3.1 Activities

The 2Zero partnership is expected to make a significant contribution to the transition towards a carbon-neutral mobility system. Funded under the Horizon Europe programme, the 2Zero partnership will focus its activities around research and innovation in all areas involved in the transition towards carbon-neutrality, from low TRL (3-4) up to demonstrations activities in real life environment (TRL 6-7) and, up to TRL 8 where appropriate. This includes identifying, assessing, confirming and updating technical areas and topics where action is needed. Thanks to the involvement of different stakeholders (from industry to R&I, Member States and local authorities), the partnership shall also foster training, the development of skill and reskill of workers; promote standardisation activities to enable the development of innovative infrastructures and support new business models and services.

As illustrated in figure 10 below, the 2Zero partnership will:

- Provide recommendations for calls for proposals to the European Commission services, with a set of ambitious but yet realistic recommendations for topics to be published in the Work Programme.
- Deliver a roadmap identifying the research priorities in the coming years to achieve zero tailpipe emission solutions and carbon-neutrality by 2050. This roadmap shall be revised during the course of the partnership to take into account advancements from research activities and identify new priorities.
- Monitor the advancements of research and innovation activities performed at European level in this field and adjust its recommendation according to the latest developments.
- Ensure close connection with the pillars 1 and 3 of the Horizon Europe programme.
    - Pilar 1 – "**Excellent science**" aiming at reinforcing and extending the excellence of the Union's science base. The partnership will consider knowledge generated at lower TRL (1-3) so that frontier research developments are taken-up to the next level. This could include exchange of information with other funding schemes at EU level (i.e. European Research Council or Marie Skłodowska Curie Actions).
    - The partnership will support the dissemination of project results towards the Pilar 3 – "**Innovative Europe**" which will contribute to stimulating market-creating breakthroughs and ecosystems conducive to innovation. A particular attention will be paid to turn results from research and innovation projects into products; a particular link could be established with the European Innovation Council (EIC) to provide the necessary support to innovations with market creating potential.
- Align stakeholders along the priorities identified in the roadmap and support coordination of research efforts at national and regional levels in line with the partnership objectives.
- Ensure good collaboration with other activities performed at European level that will have an impact on the development of zero tailpipe emission mobility in Europe. That will include both a reinforced collaboration with other partnerships (as described in Section 2.2) as well as better coordination and exchange of information with other funding programmes, such as structural funds. A particular attention will be paid to those related to the support of (charging points) infrastructure deployment, i.e. Connecting Europe Facility (CEF) and InvestEU. This will allow the promotion of synergies between the transport, energy and digital sectors, and will reinforce the leverage of private investment.

- Support projects in putting forward the results from EU-funded projects towards relevant standardisation bodies.
- Build close links with non-R&I activities, particularly to support the large-scale deployment of the innovations developed in the funded projects and cooperation with living labs.
- Ensure that the activities performed at European level and the outcomes of EU-funded research are both widely disseminated and exploited to / by the stakeholders across Europe.

Figure 10 - The 2Zero activities

To the best of its knowledge and capacity, the partnership will also support:

- Advancement in technological readiness of components, systems and solutions accelerating innovation;
- Standardisation activities by putting forward results from EU-funded projects to the standardisation bodies;
- The identification of future skills, support new training schemes and reskilling of workers;
- Exchange of information with activities performed at national level;
- The involvement of and technology transfer towards SMEs;
- Reinforce the participation of stakeholders from EU-13 Member States in order to reduce the East-West innovation gap;

- Reinforce collaboration with non-European stakeholders and support the development of innovative clean mobility solutions in developing and emerging economies.

3.2 Resources

Achieving climate-neutrality will be one of the biggest challenges faced by the European Union in its recent history. Achieving the carbon-neutrality in the road transport sector will be a condition sine qua non to be successful. Pooling European strengths and capabilities together and incentivising stakeholders from different sectors to work collaboratively in the partnership will only be the first step to achieving this objective.

Providing the necessary resources at the EU level to fulfil the roadmap objective will be the second step. To properly address the challenges identified in this partnership proposal and, considering the extension of the scope compared to previous initiatives, the resources to be allocated to the 2Zero partnership cannot be less than what has been allocated to the European Green Vehicles Initiative.

The third step will be the direct contribution from stakeholders, who are expected to further deploy and transfer successful concepts into industrial products and services, demonstrating impact from the R&D&I industrial spending of the concerned sectors. This scale-up phase will require investments estimated at around 5 times the overall partnership budget. Important additional investments will be done in areas not covered by the EU funding (hybridisation, powertrain adaptation to carbon-neutral fuels), representing an important additional external contribution to the achievement of climate neutrality in road transport.

Members of the 2Zero partnership will commit to invest the necessary resources to make the partnership itself a success whilst continuing to invest in higher TRL developments to accelerate the market uptake of the innovations developed within the European collaborative projects. They will also facilitate the needed cross-disciplinary integration and widely disseminate the activities of the partnership.

3.3 Governance

The governance of the 2Zero partnership will be similar to that currently applied in EGVI and other co-programmed public private partnerships, ensuring a lean and flexible organisation. Various services of the European Commission will be involved, under the leadership of DG RTD, and the stakeholders representing the counterpart of the EC will be represented by a non-for-profit association, as shown in the figure 11 below

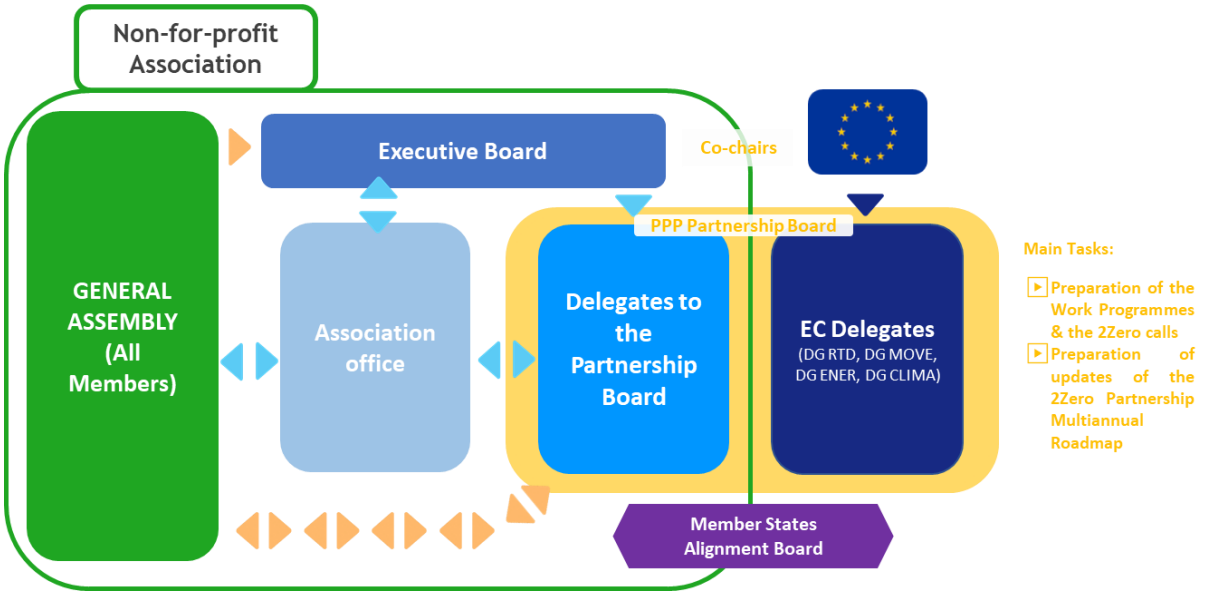


Figure 11 - The 2Zero Governance structure

A Partnership Board (or equivalent body) will be created as the governing body and the official mechanism for dialogue between the European Commission and the not-for-profit association. The Partnership Board will be the body discussing research priorities and call recommendations, and ensuring that priorities identified to feed the Work Programme are:

- coherent with the state-of-the-art (avoiding duplication of funding and remaining at the forefront of the international competition);
- consistent with the partnership scope (contributing to achieving the objectives of the partnership);
- in the best interest of European citizens (added value of acting at EU level).

Specific attention will be paid to ensure a good coordination with other EU-funded partnerships (as detailed in Section 2.3). The partnership board will meet on a regular basis (and at least once a year).

To properly cover the different aspects covered by the 2Zero partnership, the EC delegates will be represented by several of the DGs directly involved in the partnership under Horizon Europe Cluster 5 (DG RTD, DG MOVE, DG ENER and DG CLIMA), along with other services, such as DG ENV, DG GROW, DG CNECT and DG JRC. The delegates from the association will also reflect the different sectors (automotive, energy and logistics) and type of members involved in the association (industry, research and public authorities); the specific breakdown of representatives will be detailed in the statutes of the association. Members of the delegation will be elected by the General Assembly (as main decision body of the association) and will represent the association as a whole. The Delegation will be in constant contact with the office to ensure a good coordination and to reflect the discussions of the General Assembly.

Member States will play a key role in several areas essential to make 2Zero partnership a success: supporting complementary research and innovation activities, implementing the "Alternative Fuels Directive", developing the necessary infrastructures, promoting the development of needed new skills, supporting standards and business models. Therefore, their involvement has to be ensured. An "Alignment Board" gathering representatives of the ministries and / or national agencies could be set-up as a side-body to avoid any duplication of activities with the Programme Committee. This "Alignment Board" could have two different objectives:

- To align European and national priorities, avoid duplication of funding and disseminate information towards national stakeholders;
- To identify outcomes of EU-funded projects of direct interest to national activities and offer demonstration possibilities to innovative solutions.

The involvement of Member States would be organised on a voluntary basis. Several configurations of this "Alignment Board" could be planned according to the specific needs.

3.4 Openness and transparency

The 2Zero partnership is committed to operate on principles of openness and transparency. It shall be open for any stakeholder active in sectors which contribute to achieving the goals and objectives of the partnership, including, but not limited to transport, energy and logistics.

The partnership will follow the standard rules of participation of Horizon Europe and no specific criteria (nor administrative or financial) shall restrain an organisation from submitting a project proposal for funding. Being a member of the association engaged with the European Commission in the partnership will not be a pre-requisite for selection for funding. The evaluation of the proposals submitted and projects selected will be organised by the European Commission services and executive agencies, in order to ensure fairness and independence.

As stated in Section 2.4, membership in the association engaged with the European Commission will be open to any type of institutions (industry, research, sector association and public authorities) representing the stakeholders active in the partnership target groups. The association will rely on the existing membership of EGVIA, and extend it to additional stakeholders to properly cover all areas of the 2Zero scope. A particular attention will be paid to include stakeholders from the energy, charging and logistics sectors, either by direct membership or by the involvement of sectoral associations into the not-for-profit association engaged with the European Commission. Membership fees will be defined taking into account the different financial capacity of private and public, large and small organisations, to ensure fairness.

The criteria for membership and related fees will be detailed in the association statutes and should guarantee that all members will:

- Perform research activities in EU Member States (and countries associated to Horizon Europe) to ensure direct benefit of the partnership for the European citizens;
- Share the vision and the objectives of the partnership;
- Support collaborative research activities at EU level.

All members will contribute to the association activities on an equal basis, independently of their size or activity domain. Consultation processes will be organised within the association to gather member's views for the preparation of the different inputs to be disseminated towards the European Commission.

The association will ensure a broad dissemination of results from funded projects; this will be organised by different means:

- Sharing of information on the partnership website and using other digital means (i.e. social media …);
- Support projects in their communication and dissemination activities by offering them free of charge dissemination opportunities (publication of articles, information about events …);
- Organisation of public events to disseminate outcomes from 2Zero-funded projects. These could be either specific workshops to investigate more in depth a particular research area or more general events or conferences to present a global picture of the latest achievements.

Funded projects will commit to publicise their activities, via websites and any other means that would seem appropriate.