FUTURE-HORIZON

FINAL BROCHURE: New implementation concepts for sustainable mobility

2023-06-26

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This project has received funding from the European Union's Horizon 2020 research and innovation Programme under grant agreement No 101006598. This document reflects only the author's view. The Commission and CINEA Agency are not responsible for any use that may be made of the information it contains.

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Abbreviations

Clarified within the document.

1. Introduction

This brochure, formally D4.2 of FUTURE-HORIZON, will provide an overview of the activities and learnings throughout the project which can also be used to inform future initiatives and roadmaps. Topics covered include EU research in a global context, global mapping, international cooperation, visibility, and funding. **The final brochure of the project provides wayfinding toward all key results of the project.**

The EU research and action chapter provides the ERTRAC research roadmaps, strategic research agendas, centres of excellence, and success stories.

The elements of the document present the path through defining partnerships, agendas, and timelines, setting future goals, analysing past accomplishments, identifying active expert research centres, and presenting advances in knowledge, transport, and innovation from within the projects.

With the assessment of Road Traffic Research (RTR) strategies in Europe, other established markets and emerging markets are analysed in the next chapter on EU research in a global context. This provides a baseline and comparison for EU research and an example of capacity-building for local and national policymakers and practitioners, to generate and implement innovative sustainable mobility solutions.

The next chapter examines funding mechanisms supporting transport specialists and projects moving forward. Finally, there is a chapter on visibility, as promoting and sharing the learnings and best practices is important. Visibility also provides evidence, attracts new partners, and provides support and a new starting line for future initiatives.

This final brochure provides an overview of the process of FUTURE-HORIZON and the creation of its roadmaps!

In essence, the final brochure provides an overview of the process of FUTURE-HORIZON and the creation of roadmaps: building the community, completing research (success stories), scaling globally, and deployment through funding.

1.1. About ERTRAC

The European Road Transport Research Advisory Council (ERTRAC) is the European technology platform that brings together road transport stakeholders. ERTRAC develops a common vision for road transport research in Europe and roadmaps outlining how to achieve it.

ERTRAC brings together organisations from different sectors – the automotive industry, road transport authorities, international organisations, and academia – to identify the needs of European road transport research and make current and future funding programmes and policies more effective.

1.2. About FUTURE-HORIZON

FUTURE-HORIZON supported ERTRAC, Horizon Europe road transport partnerships, and the European Commission in identifying future research needs for upcoming R&I programmes to further facilitate a sustainable and efficient road transport system in Europe, while also extensively fostering international cooperation. Preceded by FOSTER-ROAD (2013-2016) and FUTURE-RADAR (2017-2020), FUTURE-HORIZON started in February 2021 and ended in May 2023.

Image to the right:

A centric road in Paris city centre.

J.Shim, Unsplash.

2. EU research in action

The following chapter presents ERTRAC contributions from the perspective of the cycle of EU research. The first section presents the roadmaps, which identify research and innovation developments and priorities. The next section presents recent Strategic Research and Innovation Agendas, which provide comprehensive approaches to connect partners and define measured goals and objectives. Next, the section on EU Centres of Excellence provides an analysis of the active researchers, organisations, and expertise within various transport categories. The chapter concludes with success stories in EU Road Transport Research (RTR) and projects.

2.1. Which R&I priorities? Roadmaps for RTR

ERTRAC working groups, with the support of FUTURE HORIZON, recently established several road transport Research and Innovation (R&I) roadmaps, which identify research priorities and address recent developments in road transport. These include road safety, Connected, Cooperative and Automated Mobility (CCAM), resilience, and new mobility services.

- **Safe Road Transport Research Roadmap (2021): Towards Vision Zero: Following the Safe System Approach**

In this update of its Safe Road Transport Research Roadmap published in 2019, ERTRAC proposes a set of high-priority road safety research needs with their suggested timing for inclusion in Horizon Europe, the EU's key funding programme for research and innovation.

- **Urban Mobility Resilience Roadmap (2021)**

This document aims to support the preparedness of the urban mobility ecosystem for future shocks by identifying the research gaps currently conducted on periods of crisis and the mitigation of the impacts of these crises.

- **New Mobility Services Roadmap (2021)**

This roadmap addresses diverse innovations with different potential impacts on urban mobility: services providing physical vehicles like shared micromobility or car-sharing schemes, but also fully digital services such as MaaS applications or ride-hailing platforms, as well as technological innovations like automated vehicles, and drones.

- **Connected, Cooperative and Automated Mobility Roadmap (2022)**

The main objective of the ERTRAC Roadmap is to provide a joint stakeholder view on the long-term development of Connected, Cooperative and Automated Mobility in Europe.

2.2. Establishing a strategic view: Strategic R&I Agendas

ERTRAC members recently contributed to substantial Strategic Research and Innovation Agendas (SRIAs) of the road transport partnership. These are comprehensive roadmaps for implementing partnerships and objectives. These included the 2Zero and CCAM SRIAs.

- **2ZERO PARTNERSHIP 2021-2027**

The partnership will set an ambitious research programme to accelerate the development of zero tailpipe emission road transport in Europe with a system approach, it will develop a common vision and deliver a multi-stakeholders roadmap for a climate-neutral and clean road transport system. 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.

- **CCAM European leadership in safe and sustainable road transport through automation 2021-2027**

The CCAM partnership is a public private partnership, which aligns all stakeholders' R&I efforts to accelerate the implementation of innovative CCAM technologies and services in Europe. It aims to exploit the full systemic benefits of new mobility solutions enabled by CCAM: increased safety, reduced environmental impacts, and inclusiveness. The CCAM SRIA is the basis for the CCAM Partnership under the Horizon Europe Programme.

2.3. Who carries the R&I activities: EU Centres of Excellence

In the framework of FUTURE-HORIZON, an analysis was conducted on European H2020 projects. The results provide the basis for recommendations to strengthen ERTRAC-related research excellence.

Our hope is that by establishing a means to identify centres of excellence we also give other organisations an idea about what to look for and thus, how to improve.

The starting point was the ambition of developing a methodology to find "*hidden champions*" as a practical aspect of identifying the centres of excellence. The question was: are there organizations that we would like to get more involved in? We used examples that we know well with the four topics since we are focussing on the methodology.

Our hope is that by establishing a means to identify centres of excellence we also give other organisations an idea about what we are looking for and that would help them to also *"improve",* which may also be of particular interest to expanding Member States. So not just a long list of publications, but also practical work that is relevant for the ERTRAC work: Involvement in funded (European) projects and patents (we were looking for additional factors that can be quantified). At the same time, our ambition is also to strengthen the European Research Network as a whole.

An analysis was completed in the following categories:

- Internal combustion engine (ICE) for Hybrid electric vehicles (HEV).
- Batteries for xEV (any electric vehicle).
- Advanced Functional Materials.
- Automotive Power Electronics.

As the original report contains comprehensive details of the above categories, only a sample from one of the categories will be provided (see box below).

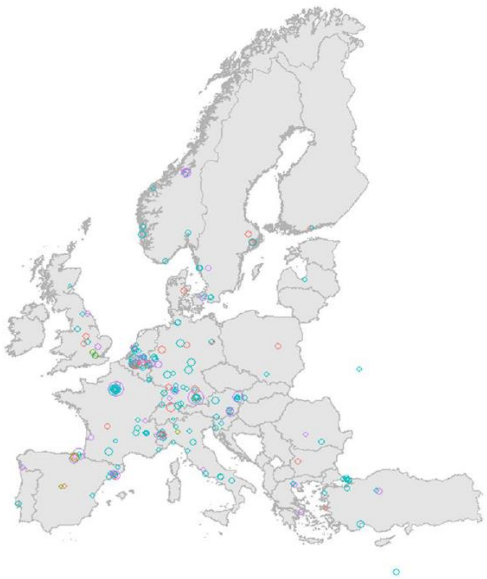
Batteries for xEV (Any electric vehicle)

The dataset contains 27 research projects funded by H2020 between January 2015 and December 2024, with the total EU contribution being €206.76 million. Of these, €29.3 million (14,17%) were directed to higher education institutes and €74.28million (35.92%) to research organisations. The 27 projects constitute a network of 226 participants (150 private companies, 30 higher education institutes and 38 research organisations, 8 other) from 26 countries.

From the map and the table in Figure 1 it is evident that although 77% of the EC contribution was awarded to entities in Germany, France, Belgium, Spain and Italy, there is a rather wide geographic diversity in the ecosystem. Regarding geographical coverage, we note that 19 of the 27 EU member states are represented in this innovation ecosystem, five of them with a single project.

By examining the average node measures per activity type in Table 1 we conclude that research organisations (REC) are the most influential, network-wise, since their average positional indicators are above the global average in all four measures.

Figure 1 The territorial dimension of the Battery ecosystem. Circle diameter indicates EC contribution.



GEO	Unique participants	Project participations	EC Funding (M€)
DE	42	76	**48.72**
FR	30	59	**34.42**
BE	18	40	**25.71**
ES	23	46	**23.28**
IT	21	36	**15.08**
AT	13	24	**11.51**
NO	9	11	**8.33**
TR	12	14	**7.00**
GB	11	11	**6.64**
NL	13	17	**6.38**
SE	8	10	**5.35**
CH	4	6	**4.41**
DK	3	3	**1.79**
GR	3	4	**1.39**
IL	1	2	**1.08**
CA	1	2	**0.84**
RO	2	2	**0.79**
FI	2	2	**0.75**
PL	2	2	**0.64**
PT	1	1	**0.53**
SK	1	1	**0.50**
BG	1	1	**0.40**
LU	2	2	**0.33**
UA	1	1	**0.31**
LV	1	1	**0.29**
SI	1	1	**0.27**

- **Key insights from the study**

The underlying assumption was that the research and innovation ecosystems created by EU policy in the four research areas of interest, namely the research consortia funded under Horizon 2020, form good examples of networks of institutions and organisations, whose activities and interactions initiate, import, modify and diffuse such innovations. These

good examples demonstrate how research consortia create a network of relationships that make up the research and innovation ecosystems at the European level.

In this context, **our results confirm the existence of networks that both underpin and emerge from the relevant projects.** All four ecosystems examined form fully connected networks. These networks are responsible for promoting the diffusion and collaboration between institutions and firms in the example areas of internal combustion engines for hybrid electric vehicles, batteries, advanced functional materials, and power electronics for the automotive sector. This also clearly shows the success of European funding to network research consortia, particularly in the framework of the 15+ year-long ERTRAC and EGCI/EGVI technology platform and partnership research guiding activities.

The European Innovation Systems (EIS) and their impact on the achievement of the objectives of the EU's research and development policy were analysed. We assume that the research consortium is the mechanism that the EU uses for the development of its research and development policy, which is creating a network of relationships between projects and partners forming the EIS.

Our modelling of the exemplary research and innovation ecosystems as networks verifies that these ecosystems consist of diverse actors, both in terms of typology and geographic dispersion, interacting to share information and collaborate. **This modelling allows us to consider the effectiveness of the ecosystems** in terms of a better understanding of the network structure and properties.

- In three cases, we have identified good examples of highly centralised networks whose main cores comprise the same few organisations. In one case, power electronics, we have identified a concentric network where some of the nodes provide information access to peripheral groups of nodes.

- However, if we analyse the cohesion of the networks, an attribute that shows the ease and accessibility to information in the network, we see that the results are not as positive. Practically, this may suggest that more efforts are necessary to support the diffusion of information between research ecosystems and consortia.

➢ This might be explained by the fact that research consortia are repeatedly established by the same core of key partners. Thus, it is vital to continue encouraging consortia to attract and incorporate newcomers of high quality.

Our analysis of the typology of nodes was carried out using the self-declared activity type**. In all four networks:**

- Private companies constitute the majority of the participants, compared to the technology providers. However, the average centrality measures for this type of actor are

always lower than those of the technology providers since the priority is on product development and not research. Research organisations are on average closer to the core in three of the four networks, while the same holds for higher education in the fourth (Power Electronics). This suggests that the four ecosystems under study follow a model where private companies of any size are indirectly linked to the most successful technology providers, either research organisations or universities.

Beyond the network structure, we have also examined **the territorial distribution of the participants in the four ecosystems considered in this case.** These were the findings:

- A rather good match between project participation and the headquarters of the automotive industry. However, participation from Eastern Europe, where a considerable part of manufacturing is located, is limited.

- We have matched our analysis with some bibliometric indicators for scientific publications and patents by research/academic organisations that were carried out by the FUTURE-RADAR project in 2020, capturing data from the period from 2011 to 2018. Our results indicate that of the top-15 research performers in Europe that were identified by FUTURE-RADAR for the four fields of interest, participation in the networks of EU-funded research projects varies from 23.5% (advanced power electronics) to 40% (internal combustion engines for xEV).

- In the areas ICE for HEV, batteries, and automotive power electronics, several research organisations and universities have been identified who show excellent performance in scientific publishing and hold patents in the respective areas but have not taken part in the analysed portfolio of H2020 projects.

We could not establish any statistically significant relationship between the research output (i.e., number of publications), the impact of the research (i.e., number of citations), or the number of relevant patents and the intensity of their participation (i.e., number of projects and EC contribution awarded), or their relative position in the network (i.e., centrality measures). This suggests that there is a rather loose connection between research output, research impact, and HES/REC intellectual property on the one hand and participation in H2020 projects on the other hand. The emphasis given by the EU for open publications and patents should continue.

For the complete analysis and comprehensive details, please see FUTURE-HORIZON Deliverable D1.3 '*Report on identifying European academic centres of excellence*'.

2.4 EU Networks of Excellence

The second report on identifying European academic centres of excellence within the project expands the relevance beyond isolated champions or centres of excellence to describe the more important findings in this work, and that is the networks of excellence that result from funding European projects. The data gathered in the previous section was extended to support a type of reference model that would have the potential to identify true KPIs.

The original analysis in the previous section makes a snapshot of what the data from projects can show us at one point in time, and what can be derived from that network as scientific activity in Europe in the specific, exemplary selected research areas. The second report built on this work to add an updated analysis of one selected area to assess the impact that funding has had on that strategic area, namely battery technologies. The ambition was to move beyond the academic realm and look at how industry relevance has increased to strengthen potential bridges between research and innovation. This also being an important ambition of ERTRAC, as well as spotlighting the relevance of high-quality data.

Additionally, the report reflects on a workshop with battery experts participating in strong national battery research networks and found that the one snapshot in time is not sufficient for concluding the effectiveness of funding and its impact on creating a network of excellence, but continuous monitoring can shed valuable light on the success of funded research. This analysis also serves as a basis for future work that would demonstrate how true KPIs could be systematically investigated and set in the future, and possibly useful for steering future research strategies.

- **Objectives and scope**

The objective of this work and report is to show how the original analysis (snapshot in 2022) can be continued with a deep dive in one specific exemplary area to gain further insight into what impact funding can have in achieving the goals of ERTRAC and associated partnerships. The work and report are not limited to analysing the projects of only a specific partnership, but namely relevant to known challenges in the area of battery technologies.

Networks of excellence are crucial for achieving technologic leadership, which is, at the same time, fundamental for securing, maintaining, and improving European competitiveness.

This specific area is of particular importance because European know-how for battery development and production is vital for the future success of electrification in Europe and for attaining sovereignty in this area. A huge effort is needed here to attain this goal, especially in comparison to areas where technology leadership has been achieved by evolutionary or *"organic"* means and over a much longer period. The following question thus arises: what needs to be done to achieve a similar state in a much shorter period?

It is postulated that the networks of excellence (not just the centres of excellence) are beneficial/essential for achieving technology leadership that is fundamental for securing, maintaining, and improving European competitiveness. These networks of excellence are especially vital to tackling the highly innovative fields of action that require both a better fundamental understanding of basic physics and a substantial improvement in active and passive materials. It is also essential to successively increase the involvement of industrial partners to secure the pathway to exploitation.

Strongly increasing investments even over a short period can be visualised with an approach to create the first basis for the reference model (based on the snapshot presented in the report from the previous section, '*Report on identifying European academic centres of excellence*'). This is done by analysing the current state of the EU-funded projects now that the funding for batteries has been significantly increased - by a factor of 3 - since the original analysis covered 27 EU projects funded until the end of 2020.

The funding of 61 new projects funded in 2021/2022 has already had a huge impact on the network even in this short period. At the same time, national funding has been increased massively in some Member States and affiliates. The impact of funding in the UK has been added as an example, and potential links between EU-funded projects and nationally funded projects investigated.

Finally, the example of ICE for HEV is included to represent a network that reflects both technology leadership and European competitiveness, even if this topic is not aligned with the needs for achieving the Green Deal. The intention here is only to demonstrate what would characterise a reference target network structure, especially in an area that has organically developed over a period of decades.

Hence what is referred to as the reference model is made up of comparing the state of the network of excellence before the infusion of much more significant funds, to how the network of excellence is massively strengthened (towards the reference target network structure) by the resulting projects and as a reference point for a future potential resulting network if funding is further strengthened.

This report extends the original analysis both geographically and in terms of time, and most importantly highlights what potential exists even with basic project data as long the data is sufficiently differentiated. It should be noted that this approach/methodology does not look

into the actual quality of specific project results. This is generally an inherent "consequential" limitation since nearly all projects are bound by confidentiality in their networks. The aspect of quality could only be reflected by scientific publications and corresponding citations, as well as patent production, that go beyond the scope of this work.

In summary, this report extends the original analysis presented in the previous section and provides some a basis for recommendations for strengthening ERTRAC-related research excellence with the ambition also to strengthen the European Research Network as a whole.

Outcomes	
1.	The sound methodological approach has been further developed and applied to determine the impact of funding on building up networks of excellence for research and innovation.
2.	The investigations have been carried out for an exemplary topic, batteries, where the Euro-pean Member States have to make huge efforts to catch up with other industrialized regions of the world.
3.	The results of the investigations clearly show an initial impact on creating structure compared to the previous analysis that reflected more of a loose thinly spread network of primarily research organisations.
4.	An investigation of the direct impact of national funding found that similar structuring of the network could be achieved with similarly significant funding investments.
5.	Funding that targets the involvement of industry has been successful in networking industrial partners with each and with the research organizations.
6.	In both national and EU example cases a few partners stand out as central network nodes and may be playing an important role in connecting partners and projects.
7.	Carrying out a workshop with experts to discuss the significance of the network analysis approach and areas of action was extremely beneficial for developing this approach.

Overall, **the results of the analysis seem to confirm the previous result that the Green Vehicle activities now followed by EGVIAfor2Zero have resulted in strong networks** highly adaptable to the ever-evolving research needs and able to attract and incorporate newcomers of high quality.

A limitation of this network analysis approach is the fact that the ultimate quality of the research results can only be assessed by going into much more detail with an in-depth assessment of the projects. This could partially be covered by publications in this area, especially by the citations. Even more important is the adoption of results by industrial partners. This could on one hand partially be assessed by patent filing but also by the consistent presence of the industrial partners in multiple projects indicating possibly a better chance of implementation/exploitation.

- **Discussion and Conclusions**

As with the initial report in the previous section, '*Report on identifying European academic centres of excellence',* the underlying assumption of this report was that the research and innovation ecosystems created by EU policy funding form good examples of networks of institutions and organisations, whose activities and interactions initiate, import, modify and diffuse such innovations as reflected by the resulting Networks of Excellence.

From the perspective of that report, the results reflect again how these networks are responsible for promoting the diffusion and collaboration between institutions and firms in the example areas of battery research and innovation with an increased number of projects over time, as well as confirming this hypothesis for the impact of national funding and funding policies.

In this context, the approach and methodology confirm the impact that increasing funding in strategic areas will result in the desired Networks of Excellence that serve as the basis for ensuring European Technology Leadership and support achieving/maintaining European Competitiveness. This is reflected by the increased involvement of industrial partners in the funded projects. From the workshop, it was learned that the industry, until recently, has primarily invested in direct proprietary research.

It could be concluded that **the significant increase in funding and funding policy strengthened not only the research network but also the willingness of the industry to participate in collaborative projects**. The zoom-in analysis (looking at selected nodes) hence looked at how networks are forming in and around industrial partners, an OEM and a tier 2 supplier, as well as key stakeholders from the academic side; those organisations were found to be involved both in European funded projects and the UK (with policies favourable to encourage industry participation in funded projects) representing nationally funded projects.

Strong local networks of excellence are evolving in Member States and/or regions, and in terms of overall European technology leadership and competitiveness, it was of particular interest to see the results of the European Horizon funding and what links may be appearing

between national and EU funding. This is an excellent combination to accelerate the technological advances in a shorter period; however major efforts are still needed to fully understand the mechanics of this analysis and to come up with concrete guidelines regarding the improvement of some indicators such as the low density, which appears to play a role in the effectiveness of the network.

The report analysed the European Innovation Systems (EIS) and their impact on the achievement of the objectives of the EU's research and development policy. We assume that the research consortium is the mechanism that the EU uses for the development of its research and development policy, which is creating a network of relationships between projects and partners forming and supporting the EIS. The industry seems to also be becoming more "*visible*" in the network which is an indicator of the potential exploitation of research results. As industry involvement increases, the chance of exploitation is also expected to increase accordingly. These are the bridges that could be incorporated into the targets of future networks.

Many observations need to be confirmed, also to use the analysis to **make clear recommendations on how to proceed based on these results. In this context:**

- Further evaluate and confirm the validity of the fundamental assumption that strengthening the research and innovation network is advantageous for Technology Leadership and in turn for European competitiveness.

- Address one clear limitation: The network analysis cannot give any information on the actual quality of the research results (even publications are limited here - the number of citations may reflect the effectiveness of dissemination).

- It would be highly recommended to discuss the results (further) with some of the key stakeholders in the network:
    - What are their overarching goals in such a collaboration?
    - Are they aware of the networks that have resulted from the collaboration?
    - Can they confirm the network? Even if just subjective feedback.
    - Are they aware of the role(s) they have in the network?

- After understanding the network in more detail, it should be possible to make clear concrete recommendations on what could/should be done to strengthen the network:
    - Elements to add to calls that would ensure a network will be supported.
    - Communicating the network characteristics to stakeholders and key stakeholders.
    - Instructing reviewers on the significance of networks.

For the complete analysis and comprehensive details, please see FUTURE-HORIZON Deliverable D1.4 '*Report on identifying European academic centres of excellence - Part 2*'.

2.5. What has happened: success stories in EU RTR

These factsheets provide an overview of European projects that can be considered "*success stories*" in road transport research. The projects included represent a wide range of sectors and have been selected to represent the work of the thematic working groups of ERTRAC, the European Technology Platform for Road Transport - namely Urban Mobility, Long-Distance Freight Transport, Energy and Environment, Safety and Security, Competitiveness, Connected and Automated Driving, Electrification.12 projects were selected among many successful, long-lasting contributions.

The following projects are detailed in the full '*Success Stories*' document:

CoEXist: Enabling Cities to get "Automation-Ready"

CoEXist is a European project which prepared the transition phase during which automated and conventional vehicles will co-exist on cities' roads. It bridges the gap between automated vehicles (AVs) technology, transportation, and infrastructure planning, by strengthening the capacities of urban road authorities and cities to plan for the effective deployment of AVs.

CoEXist's macroscopic modelling tools provide extensions to PTV Visum. The tools can be integrated into the software to replicate the impacts of CAVs on capacity and demand. They allow the model developer or model user to test various assumptions, extending the capabilities of Visum to enable the consideration of CAVs in travel demand simulations. Whilst the choice of procurement procedures is dependent on the solution to procure (high or low-tech number of potential suppliers, maturity level, etc.), the choice of different procurement approaches depends on how you want to design the competition, for example, opening the competition for small and medium-sized enterprises (SMEs) or yet unknown solutions.

Project website: www.h2020-coexist.eu

HANDSHAKE: Enabling the Transferability of Cycling Innovations and Assessment of its Implications

50 years of knowledge on urban cycling practices squeezed into 5 years of transnational cooperation to boost a sustainable mobility transition. Building on five decades of experience and know-how accumulated by 3 cycling front-runners like Amsterdam, Copenhagen, and Munich, HANDSHAKE rolled out an integrated approach to hasten the adoption of sound cycling policy and innovative infrastructural solutions in 10 other European cities: Dublin, Manchester, Helsinki, Riga, Krakow, Bordeaux, Cadiz, Turin, Rome, Bruges.

The HANDSHAKE self-assessment tool aids cities in understanding their performance and proficiency in cycling with a focus on: *hardware* (the characteristics of the infrastructure and facilities in the local cycling network, *software* (the vital awareness and communication elements of a sound cycling policy), and "*orgware*" (the preparedness of the local authority to deliver cycling ambitions). The tool is the gateway to the Cycling Community of Practice (CCoP), a prospective online platform aiming at gathering cities worldwide interested in assessing and growing cycling capacity, cooperating, accessing existing resources, and requesting specialized support to plan, design, and deliver world-class cycling ambitions.

Project website: www.handshakecycling.eu

LeViTate: Societal Level Impacts of Connected and Automated Vehicles

LEVITATE built tools to help European cities, regions, and national governments prepare for a future with increasing levels of automated vehicles in passenger cars, urban transport services, and urban logistics.

The LEVITATE Policy Support Tool (PST) is the go-to, one-stop-shop to support decisions on Cooperative, Connected, and Automated Mobility (CCAM) - related interventions. It is designed as an open-access, web-based system. Its detailed design takes into account the specific needs of the key stakeholders and it provides access to related bibliography, project results, documentation of tools and methods, excerpts from CCAM guidelines, as well as a Decision Support System

with forecasting and backcasting capabilities. The tool enables policymakers and other stakeholders to estimate the short, medium, and long-term impacts of connected and automated transport systems (CATS) and to establish the most effective policy pathways for the introduction of CATS to achieve predefined objectives.

Project website: www.levitate-project.eu

PIONEERS: Protective Innovations of New Equipment for Enhanced Rider Safety

PIONEERS aimed to reduce the number of Powered Two-Wheeler fatalities and severely injured by increasing the safety, performance, comfort, and usage rate of Personal Protective Equipment and the development of new onboard safety devices.

Detailed accident data was used to simulate with Finite-Elements human body models. The analysis in the virtual environment allowed a deep understanding of potential prevention measures as well as assessment for future personal protective equipment tests. During the last phase of the project, a new generation of test methods was developed to ensure good quality of PPEs such as airbag jackets, boots, helmets, pelvic protectors, and onboard safety systems. New ideas, such as lateral bars and airbags to mitigate lateral impacts at low speeds were also developed.

PIONEER contributed to road safety in three ways: (1) by identifying the Key Accident Scenarios in Europe in terms of frequency and severity; (2) by drawing an empathy map with PTW users to better understand the issues they encounter as users mainly related to use of PPEs, and (3) by defining the current and

Project website: www.pioneers-project.eu

Park4SUMP: Parking Management as Game Changer for Urban Mobility

As one of the few EU-funded projects solely dedicated to the topic of parking policy, Park4SUMP supported sixteen European cities and make parking management part of a wider strategy that can benefit urban mobility and also the overall quality of life of our cities.

Park4SUMP provides tangible help for cities. It helps to integrate parking management into their (future) SUMP, free an average of 10% of public space currently used for parking using participatory planning, and invest at least 10% of parking revenues into sustainable transport, active modes such as walking and cycling and develop more human-centred neighbourhoods.

This can be achieved thanks to a robust tool to support the implementation of parking policies, which is an outcome of the project. ParkPAD tool includes an audit framework that enables European cities to start the restructuring process of their parking management and to receive tailor-made feedback on their current parking policy. It will remain available beyond the lifetime of the project as it provided a case for replicability and scalability of the ParkPAD process beyond the lifespan of Park4SUMP.

Project website: www.park4sump.eu

MOMENTUM: Modelling Emerging Transport Solutions for Urban Mobility

MOMENTUM developed a set of new data analysis methods, transport models, and planning support tools to support cities in designing the right policy mix to exploit the full potential of emerging mobility solutions such as MaaS (Mobility as a Service), CAVs (Connected Automated Vehicles), new shared mobility services and demand-responsive transport in the urban mobility ecosystem.

The multilevel Decision Support Toolset consists of three levels and its primary goal, is to develop a conceptual framework for assessing the impacts of new mobility options by collecting and analysing heterogeneous data sources and developing mobility patterns. The Decision Support Toolset integrates mobility data from different sources and modelling improvements into one online platform, where cities can virtually test and asses the performance and impact of emerging mobility solutions. Policymakers can resourcefully

use the integrated Toolset to investigate mobility scenarios in every city, to enhance environmental sustainability and social responsibility while simultaneously securing efficient budgeting allocation.

Project website: www.h2020-momentum.eu

AEROFLEX: Aerodynamic and Flexible Trucks for Next Generation of Long Distance Road Transport

The AEROFLEX project developed the knowledge, concepts, and technology to improve the efficiency of long-range freight vehicles while drawing up recommendations for implementing the results within European regulations and in the transport & logistics industry. AEROFLEX provided architectures for complete vehicles with optimised aerodynamics, powertrains, and safety systems as well as flexible and adaptable loading units with advanced interconnectedness contributing to the vision of a "physical internet".

The project produced two long-haul trucks, capable of running in EMS2 (European Modular System) vehicle configurations and demonstrating: distributed powertrains (traction capable in the tractor unit the trailer, and the smart powered e-dolly); active and passive aerodynamic devices; active and passive safety features in the vehicle tractor units; new modular loading units; assisted with the PUZZLE software; cargo volume detection; as well as being compatible with Truck2Train multi-modality. As a result, an **18-33%** efficiency improvement in long-haul road freight transport was achieved.

Project website: www.aeroflex-project.eu

ORCA: Optimised Real-world Cost-Competitive Modular Hybrid Architecture for Heavy Duty Vehicles

ORCA has successfully developed two PHEV prototypes: a multimodal bus and a distribution truck, increasing three times their range in full electric mode. At the same time, these vehicles have been equipped with innovative PHEV rechargeable

energy storage (RES) systems, designed specifically for each vehicle application.

ORCA developed a simulation framework to enhance and analyse performance by optimising the powertrain configuration and its components for both design and control. This approach accelerated the design and development phases as well as the verification and validation phases.

Project website: www.h2020-orca.eu

ENSEMBLE: Enabling Safe Multi-Brand Platooning for Europe

ENSEMBLE's main goal was to pave the way for the adoption of multi-brand truck platooning in Europe to contribute to traffic safety, throughput, and fuel economy. The ambition of ENSEMBLE was to realise pre-standards (i.e., mature input for standardisation) for interoperability between trucks, platoons, and logistics solution providers, to speed up actual market take-up of (sub)system development and implementation and to enable harmonisation of legal frameworks in the member states.

The Platooning Support Function (PSF) is based on mature and proven technology. This multi-brand solution is ready for standardisation and is able to cope with all the different use cases encountered in current traffic. The PSF fits within the current legislation and can make today's spontaneous platooning safer.

Project website: www.platooningensemble.eu

MeBeSafe: Measures for Behaving Safely in Traffic

There has been a lot of progress to prevent risky situations from turning into crashes as well as to mitigate the impact of occurring crashes. However, less effort has been invested in preventing risky situations from occurring in the first place. MeBeSafe tested and developed 8 soft measures to make traffic safer, including lights on the roadsides, flat stripes, moving balls, and an app to help truckers coach each other. The purpose was to reduce the number of

"almost-crashes" - increasing safety margins can lead to risky situations being avoided – which in turn can lead to fewer crashes in general.

The legacy of MeBeSafe consists of 8 well-evaluated nudges and coaching measures:

1. InfraDriver nudge - to help drivers adapt speed before dangerous road exits.
2. ACC order nudge - to increase distances between cars by using Adaptive Cruise Control.
3. ACC scoreboard nudge - to increase distances between cars by using Adaptive Cruise Control (ACC).
4. ACC COACHING - to help people understand features in their car, such as Adaptive Cruise Control (ACC).
5. Cyclist nudges - to help adapt speed and increase attention before hazards.
6. Attention nudge - to increase drivers' attention towards crossing cyclists.
7. Trucker Coaching app - to help truckers drive better by coaching one another.
8. Take-a-break reward - to help tired drivers stop and take a break before an accident.

Project website: www.mebesafe.eu

i-HeCoBatt: Intelligent Heating and Cooling Solution for Enhanced Range EV Battery Packs

i-HeCoBatt aimed to achieve a smart, cost-bursting industrial battery heat exchanger to minimise the impact on full electric vehicle range in extreme conditions. It integrates an innovative heat exchanger that removes the currently used gap filler between the heat exchanger and the battery.

A burst-costing novel heat exchanger based on MIBA's FLEXcooler® technology with greater heat transmission capabilities was designed, manufactured, and assembled in a commercial battery pack. It implies a great advance in terms of technology, but especially, it brings a relevant decrease in the economic cost as well as in the environmental cost of actual heat exchangers. MIBA's FLEXcooler® compared with the actual SOA provides 12% improved heat transmission capacity, 75% cost reduction, and 80% environmental effect reduction.

The project generated a model library in MATLAB/SIMULINK that provides the resources to simulate accurately the original AUDI e-tron battery pack, the assembled prototype (A-sample), and the designed industrialized set-up (B-sample). It created a proof of concept of a

BTMS control strategy based on machine learning algorithms and contributed to the design and validation of a smart BTMS control strategy through simulations and tests at the lab level.

Project website: www.ihecobatt.eu

VIRTUAL: Open Access Virtual Testing Protocols for Enhanced Road User Safety

The VIRTUAL project contributed to the development of virtual testing in the crash safety assessment area to increase road user safety. It developed and provided models of the human (both an average female and male model) and procedures needed to conduct virtual testing in scenarios addressing vehicle occupants and vulnerable road users' safety.

Open-source Human Body Models of both average females and males as seated occupants, pedestrians, and cyclists are available as an outcome of the project. Furthermore, it has made tools and procedures openly available for conducting virtual safety assessments. OpenVT platform provides all the components needed for Virtual Testing (VT). A non-profit organization, OVTO, has been established to make the OpenVT and all the material available after the end of the project and contribute to the further development of virtual testing. VT has the potential to optimise adaptive safety systems and reduce female injuries by up to 32% by closing the optimisation gap between female and male drivers.

Project website: www.projectvirtual.eu

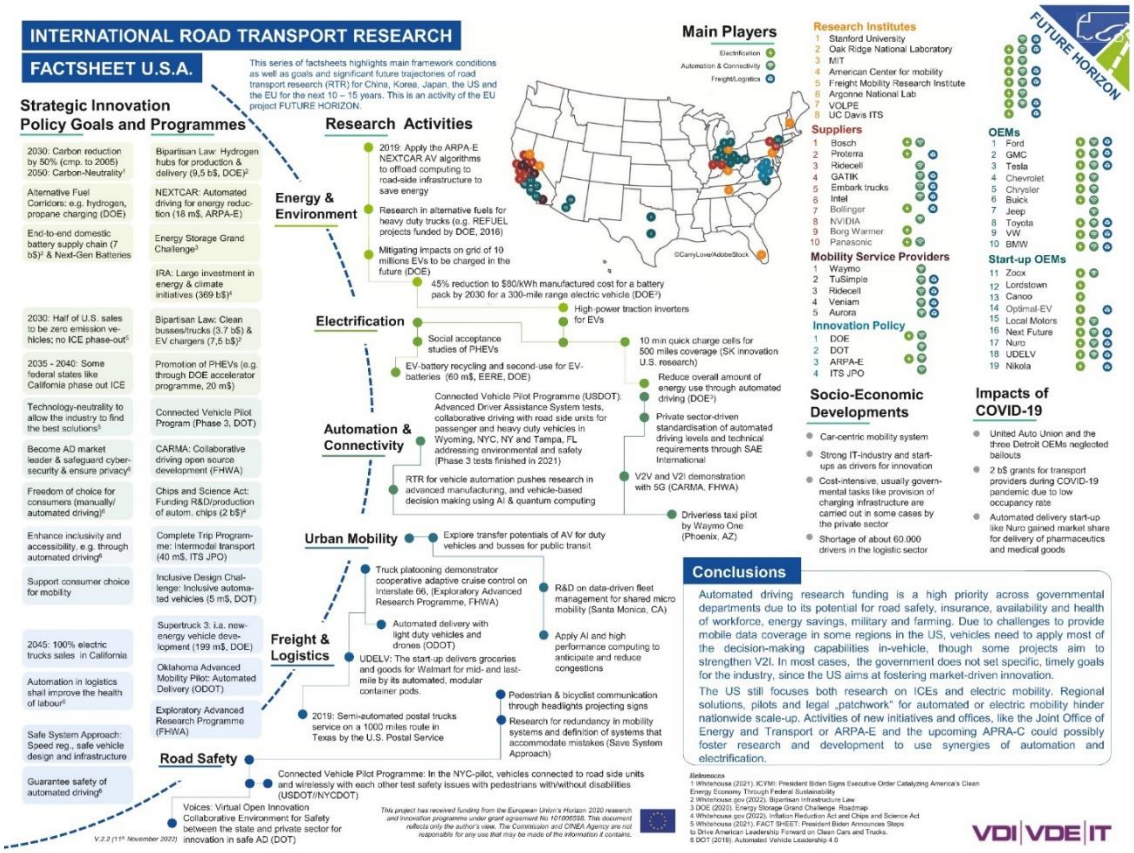
For further details, follow the links to the project pages and read the publication FUTURE-HORIZON '*Success Stories*'.

3. EU Research in a global context

In order to create standards and refine approaches to road transport research, it is beneficial to keep up to date on international approaches, methodologies, and areas of focus. This information provides a valuable baseline and frame of reference to compare EU activities and future research goals. The following chapter provides this international overview through fact sheets created within FUTURE-HORIZON.

3.1. Global mapping

This chapter includes an overview of the condensed fact sheets created within FUTURE-HORIZON to analyse "*International Road Transport Research*" in four countries: China, Japan, South Korea, and the United States of America. The factsheets cover highlights representing the countries up to date approach to road transport research and display goals and strategies. Transport-related socio-economic developments are displayed. The impacts of COVID-19, if applicable, are listed as well.



Based on the findings, a conclusion of possible future developments is drawn per country. The results provide the base for comparison to international developments in road transport research. The fact sheets summarise the most important findings and conclusions.

The International Road Transport Research Factsheets provide details on Strategic innovation, policy goals, and programmes; research activities in the fields of the ERTRAC WG topics; the main players; socio-economic developments; impacts of COVID-19; and conclusions.

- **Summary & Outlook**

The factsheets provide a comprehensive overview of strategic innovation policy goals and programmes and the corresponding RTR activities as well as socio-economic developments and the impacts of COVID-19.

- **United States of America**

Automated driving research funding is a high priority across governmental departments due to its potential for road safety, insurance, availability and health of the workforce, energy savings, military, and farming.

Due to challenges to provide mobile data coverage in some regions in the U.S., **vehicles need to apply most of the decision-making capabilities in-vehicle, though some projects aim to strengthen Vehicle-to-infrastructure (V2I).** In most cases, the government does not set specific, timely goals for the industry since the U.S. aims at fostering market-driven innovation. The U.S. still focuses research on ICEs and electric mobility.

Regional solutions, pilots, and legal *'patchwork'* for automated or electric mobility hinder nationwide scale-up. Activities of new initiatives and offices, like the Joint Office of Energy and Transport or ARPAE and the upcoming APRA-C, could foster research and development to use synergies of automation and electrification.

- **China**

Start-ups are driving the automation of vehicles and provision of intelligent infrastructure, whereas Original Equipment Manufacturers (OEMs) focus more on electrification. Synergies between automated driving and electric mobility are not particularly pushed through state goals but are occasionally considered. The uptake of automated driving could perhaps reach goals at similar speeds as electrification due to the economic connection between cities/regions and major enterprises.

Overall, the government strives to reduce the number of cars causing congestion, emissions, and safety issues, through credit-based nudging, the diffusion of Mobility as a Service, and the promotion of resilient public transport as well as public-private partnerships in smart cities. **Big-data companies advance AI and its application in smart cities.** However, despite the focus on connectivity and smart cities, there are no trials of linking automated vehicles to the cloud (e.g., city brain).

- **Japan**

The Japanese government emphasises industrial competitiveness as well as solving societal issues of an aging society with its AV policy. Hereby, **research and development are often initiated from the application side**, following a mixed approach between technology development (e.g., platform technologies) and the testing of AVs as well as the implementation of real-life applications.

Due to Japan's experiences with crises and catastrophes, the country aims for preventive and resilient development in the road transport sector, giving less priority to disruptive innovation technologies.

Furthermore, Intelligent Transport Systems (ITS) and connectivity are considered a prerequisite for the effective implementation of AVs, which are also tested and implemented within different field operations tests (FOT) and model cases. Due to Japan's many experiences with crises and catastrophes, the country aims for preventive and resilient development also in the road transport sector, giving a little less priority to disruptive innovation technologies.

Electrification research is mainly focused on charging and refuelling infrastructure as well as hydrogen generation. Additionally, energy-related research has high importance since the island wants to stay independent during a crisis. The Japanese transport landscape is shaped by strong cooperation between public authorities and companies.

The COVID-19 pandemic accelerated the development and implementation of next-generation mobility, e.g., smart cities, AVs, robotics, and unmanned platooning as well as the digital transformation, e.g., by founding a digital agency. Furthermore, a local public transport plan has been elaborated as a reaction to the pandemic.

○ South Korea

South Korea mainly focuses on commercializing AV products and components to become an international technology and export leader. The AV policy in South Korea has therefore mainly been established to achieve economic growth and industrial development. South Korea wants to use this push in technology expertise to increase the domestic supply ratio up to 80%. Furthermore, South Korea has excellent 4G coverage supplemented by 5G services, which enables connected mobility applications. One additional focus is Cooperative Intelligent Transport Systems (C-ITS), tested in various pilot and test projects.

Besides AV technologies, South Korea has a strong focus on hydrogen (H2) technologies compared to battery research. The road transport sector benefitted from an accelerated uptake of AV legislation and adoption during COVID-19. Furthermore, the Korean government provided certain production and liquidity support measures, simplifying import procedures for auto parts, and allowing more than 52 working hours per week as well as employment retention subsidies, R&D support for localization of auto parts, loan and credits guarantee programs for SMEs and extensions of debt maturity periods.

• Outlook

In the next step, the RTR goals and strategies for the considered countries will be assessed in further detail and compared to the European approach. Therefore, the strengths and weaknesses in terms of technical innovation, legal frameworks, and socio-economic conditions are identified for the EU and each of the countries focused on. Afterward, opportunities and risks for road transport research will be determined given current and potential crises. This will cover a benchmark of RTR competences and development potentials. Next steps will be taken in the follow-up project of FUTURE-HORIZON. Based on the challenges, necessary RTR strategies can be derived that update the ERTRAC roadmaps.

The full report can be found in FUTURE-HORIZON D2.1 '*Factsheet collection on RTR in established markets*'.

The discussions and analysis may bring up new findings. In this case, the factsheets will be updated and seen as a living document, which can be found under the following link: https://vdivde-it.de/de/publication/future-horizon-country-factsheets-road-transport-research

3.2. International cooperation

The following section provides an overview of potential areas for international cooperation, presented through a collection of international projects and pilots, and information on training and capacity building.

3.2.1. Catalogue of demonstration concept notes on mobility innovations

This section provides a broad overview of FUTURE-HORIZON's research into different areas for urban mobility innovation and outlines a selection of very specific concepts that cover several relevant levels of intervention in urban mobility transition processes in developing and emerging economies. Different fields of sustainable urban mobility detailing aspects of selected pilot concepts from a more general perspective.

The concepts draw from several international cooperation projects, most notably the Urban Pathways project funded by the International Climate initiative and the EU-funded INCO flagship project SOLUTIONSplus. These concepts illustrate various aspects of urban mobility interventions to highlight the potential for international cooperation. The concepts are described from the perspective of one city, which is representative of a diverse cluster of local authorities working on similar solutions.

For each intervention area, a reflection on the ERTRAC roadmaps is provided to feed back into the overall road mapping process to ensure that European actors can play an active role in urban mobility innovations internationally.

- **Objectives and scope**

Several cities have been working on the development and implementation of sustainable urban mobility pilots with a strong focus on active and electric (public and shared) mobility embedded in their Sustainable Urban Mobility Plans (SUMPs) with a high potential of being replicated in other areas of the cities. This section focuses on summarizing concrete local implementation projects, aiming to boost low-carbon urban mobility in cities. This builds on current and planned demonstration activities which were co-developed with the host city and describes key needs and opportunities. It entails activities in several intervention areas contributing to the mobility transition.

While the concepts serve as guiding ideas they are of course adapted to the local contexts. It is also worth mentioning that the type of pilots included in this document include an approach that aims to integrate the different sectors/activities in one neighbourhood, e.g., in low-traffic, low-emission, low-waste neighbourhoods ('*EcoZones*').

The findings also reflect on how the pilot projects align with the work of ERTRAC and to the objectives of the recently drafted Towards Zero Emission Road Transport (2Zero) Strategic Research and Innovation Agenda (SRIA) document which seeks to describe "*some of the research and innovation activities needed to achieve a climate-neutral road transport. The 2Zero document further details the technical and specific objectives sets milestones, and provides a timeframe for such R&I activities and their expected outcomes.*"

The research also reflects on ERTRAC's Integrated Urban Mobility Roadmap, which proposes actions to promote a modal shift to sustainable transport modes, such as public transport and active travel, and considers the dichotomy between mobility demand and place demand, aiming to establish a better link between urban mobility and land use planning.

- **Selected pilot actions by thematic area**

Different fields of sustainable urban mobility of the selected pilots from a more general perspective are covered. The concepts draw from several international cooperation projects, most notably the Urban Pathways project funded by the International Climate initiative and the EU-funded INCO flagship project SOLUTIONSplus. These concepts aim to illustrate various aspects of urban mobility interventions to highlight international cooperation potential. The following boxes present the thematic areas with some of the pilot projects.

Active mobility projects
Open Streets in Cape Town, South Africa.
Placemaking, pedestrianization, and impact on public health, Luthuli Avenue Transformation – Nairobi, Kenya.
Pedestrian Street along Tam bac River – Hai Phong, Vietnam.
Reflections over ERTRAC's Roadmap and 2Zero Strategy – Active mobility and Pedestrianization schemes.

Integration of e-mobility solutions for last-mile connectivity and logistics
E-mobility for last-mile connectivity – Hanoi, Vietnam.
Integrating e-mobility for last-mile connectivity – Dar Es Salaam, Tanzania.
Locally developed/assembled E-Cargo Quadricycles – Pasig, Philippines.

Easing movement and logistics of small-scale businesses through the adoption of Electrical Handcarts (E-Handcarts) – Mombasa, Kenya.
E-mobility in public transportation in Kathmandu and Montevideo, Retrofitting e-buses – Kathmandu, Nepal.
Installation of charging infrastructure for e-buses – Montevideo, Uruguay.
Reflections over ERTRAC's Roadmap and 2Zero Strategy – Electric mobility.

Integrated urban planning and design: implementing multimodal hubs, EcoZones and Low-Emission-Zones
Multimodal and inclusive e-mobility hub in Zero Emissions Historic Centre – Quito, Ecuador.
EcoZone Santa Tereza – Belo Horizonte, Brazil.
Comparative EcoZones – Quito, Ecuador.
Car-free day in Kilagal – Kathmandu, Nepal.
Reflections over ERTRAC's Roadmap and 2Zero Strategy – Low-Emission Zones, Zone 30 areas, and Car Free Days.

Comprehensive details of the pilot projects and analysis can be found in FUTURE-HORIZON D3.1 *'Catalogue of demonstration concept notes on mobility innovations*.

3.2.2. Training and peer-to-peer capacity building

This section provides an overview of peer-to-peer exchange and capacity building among urban change makers from public and private sectors, civil society, and academia.

- **Peer-to-peer exchange and capacity-building activities**

As indicated in the 2Zero Strategy, the development of the necessary capacity-building instruments and tools to support the adoption and integration of innovative urban mobility concepts, solutions, and services at the urban, regional, and national levels is required for the seamless adoption of zero tailpipe emission vehicles. Likewise, the ERTRAC Roadmap identifies capacity building, knowledge transfer, and site visits as key measures in upscaling and transferring innovative urban mobility solutions.

Whilst the Roadmap acknowledges European cities' leadership in promoting sustainable mobility, it advocates that such knowledge is shared through international cooperation with other world regions.

Whilst the Roadmap acknowledges European cities' leadership and rich experiences in promoting sustainable transport and mobility, it advocates that such knowledge is shared through international cooperation with other regions of the world. It recommends mainstreaming, upscaling, and transferring good experiences in urban mobility contexts, focusing on smaller cities outside Europe, and learning from best practices of countries outside Europe, such as emerging markets, to strengthen the competitiveness of the European transport industry.

Participants of the capacity-building activities discussed technical issues and increased their awareness of topics relevant to implementing innovative urban mobility projects, such as coalition building, public relations, stakeholder relationships, and financing activities. These topics are in line with ERTRAC's recommended training focus that borders on political acceptance and support for innovation, public acceptance of innovation, access to financial support, coherence in legal frameworks, access to 'best practice' studies and guidelines; standards, relationships between stakeholders on the same and different levels, viable business models, Living Labs approaches, transferability methodology, cost-benefit analysis, and impact assessment.

Attention is drawn to the EU's international cooperation on capacity building in some relevant initiatives and projects; for example, the EU-funded SOLUTIONSplus project, which delivered several capacity-building activities in Africa, Asia, Europe, and Latin America. These activities include:
Living Lab oriented approach.
Linking professional training with academic teaching.
Peer-to-peer exchanges.
Individual advice and training.
E-learning.
Training sessions at conferences.
Integration into formal academic programmes.
Integration into broader capacity-building programmes.

In the full report, the work of European Industry players who extend capacity-building opportunities to cities outside of Europe through their participation in several EU-funded projects is highlighted. Workshops, webinars, and training aiming at developing a network of change-makers and establishing capacity-building hubs, and creating a platform that allows the facilitation of information exchange and e-learning resources have also been summarised.

- **Lessons learned and recommendations: International exchange and capacity building**

International exchange and capacity building can be a key stepping-stone towards closer cooperation with public and private sector partners.

International exchange and capacity building can be a key stepping-stone towards closer cooperation with public and private sector partners. The capacity-building activities focused on the interaction with partners from emerging and developing countries and had a particular focus on electric mobility.

Capacity building and peer-to-peer exchange activities should focus on key topics to foster

technical capacity and foster skills and knowledge that are critical for the development and implementation of sustainable mobility solutions. A vital step in this process is an assessment of the needs of the target audience. This points towards critical information which helps understand the critical barriers which may be addressed through strengthened capacity building and peer-to-peer exchange activities, as well as in identifying opportunities for expertise and experience towards addressing knowledge and capacity gaps.

Peer-to-peer exchange activities were considered by many partners as the preferred mode of knowledge exchange as it highlights topics with perspectives that are similar situation in terms of challenges, contexts, and resources.

The following criteria were rated by the respondents as the most important ones to consider in selecting partner cities for exchanging experiences:
Common sustainable mobility objectives/ challenges.
Similarity in terms of types of vehicles/technology to be implemented in their city.
Similar levels of budget are available for planned e-mobility innovations.
Similar levels of economic welfare.
Long-term experiences of the partner city with specific transportation modes.
Similar geographic features of a city (flat land, hilly area, wetlands).
Status of a city as international leader/ best practice in e-mobility.

"*Similarity*" seems to be a critical term that had been mentioned in these criteria for peer-to-peer activities. This highlights the importance of having dialogues with those who have been able to pursue successful solutions. In this light, establishing success factors and going further in terms of highlighting how to contextualise these factors would be highly useful in maximising the transformative potential towards the action of experiences shared by European cities and industries.

Overall, it is important to consider that capacity-building activities focus on complementary to short- and medium-term activities of sector projects for competence development. It is necessary to adapt capacity building and training programs to the requirements of sustainable development. This includes the further development of existing training framework plans, the expansion of the training offers, and, if necessary, the development of new

training programs. Core aspects of sustainability, climate protection, and just transition should increasingly be part of the core competencies in many professional profiles.

The following recommendations result from the systematic further development of training offers:

- Different offers from short-term training and further education offers to higher education should be better coordinated.

- A solid basic understanding of the interaction between urban development, system integration, mobility, and digitization should be conveyed to target audiences in the areas of vehicle technology, traffic management, and logistics and be incorporated accordingly into the development of curricula.

- So far, in most partner countries, the main focus has been on training for jobs in the field of transport infrastructure and conventional drives. An expansion of the portfolio of capacity building and training, in particular with offers in the field of traffic management, integration of different modes of transport, and efficient logistics systems should be an important focus of the expansion of existing training framework plans. The introduction of adapted programs, e.g., for entrepreneurs in the areas of transport services and logistics, can usefully complete the range of training offered in partner countries.

- Similar processes are currently underway in higher education in relevant transport and urban planning courses, with the focus expanding substantially into sustainable and integrated transport, energy, and urban planning solutions. For the integration of vocational schools and universities and the exchange with relevant training and practice partners, it is advisable to coordinate the content of the dialogue and development processes.

- The involvement of universities and vocational schools in real laboratories of sustainable mobility can offer an important contribution to the integration of relevant practice partners. In this way, core competencies for training can be conveyed and trainees can make active contributions to the validation of innovative mobility solutions.

Further details can be found in FUTURE-HORIZON D3.3 '*Report on training and peer-to-peer capacity building*'.

Image to the right:

A busy road in London city centre.

Ruoyu Li, Unsplash.

4. Funding guide

This guide outlines financial institutions and mechanisms that provide opportunities to access funding for innovative and sustainable transport initiatives, including electric mobility. It further provides an overview of the costs of electric mobility solutions and highlights robust business models, financing mechanisms, and incentives that can facilitate the transition to electric mobility.

To ensure alignment of electric mobility solutions to national and local policy frameworks and priorities, the guide summarises strategies, methods, and processes to design integrated transport policies and provides insights into how to build cross-cutting institutional cooperation. The complete guide also highlights the results of procurement round tables and details strategies that ensure the benefit of all interested parties in co-implementing mobility innovations. The following is an overview of the topics covered in detail in the full report.

- **Funding mechanisms for international cooperation**
  - Green Climate Fund.
  - Global Environment Facility.
  - NAMA Facility.
  - International Climate Initiative.
  - Adaptation Fund.
  - Bilateral and multilateral development funds and banks.

- **Costs, business models, and financing of electric mobility**
  - Costs of electric mobility.
  - Example: E-Auto Rickshaws in Kochi, India.
  - Innovative business models for electric mobility.
  - Financial incentives for e-mobility.
  - Example: Financing electric bus adoption.
  - Operator Procurement Model.
  - Leasing Model.
  - Pay-as-you-Save (PAYS).

- **E-mobility and national frameworks**

  - Build cross-cutting institutional cooperation.
  - Stakeholder Engagement, Public-private Partnerships, Transition Co-ownership.
  - Investing in building technical capacity and resources.

- **Procurement of round tables and the way forward**

UN-Habitat is facilitating procurement round tables to allow for favourable negotiations between manufacturers, service providers, and local implementing. The procurement exercise is based on the premise that the uptake of e-mobility in cities requires close cooperation between start-ups, industry, city administrations, and research and academic institutions. Innovators are encouraged to show how they will work with various service providers and relevant stakeholders in their proposed demonstration actions.

E-mobility's uptake in cities requires close cooperation between start-ups, industry, city administrations, and research and academic institutions.

As part of the procurement process, UN-Habitat organised roundtables with local innovators from the target regions of Africa, Asia, and Latin America to address any questions that they may have on the process and each party's expectations. Each roundtable was organised on a city basis to address the specific e-mobility needs in the specific context.

- **Working with innovators to promote electric mobility: UN-Habitat's Experience**

UN-Habitat's experience of supporting a "*mobility accelerator*" at the University of Nairobi C4DLab in Kenya, led to the idea of challenging local innovator communities to come up with e-mobility solutions in collaboration with city authorities. A competitive selection process was run in 2021 by UN-Habitat, which resulted in 21 proposals tackling various electric vehicle types from different cities, including Hanoi (Vietnam), Pasig City (Philippines), Kathmandu (Nepal), Dar es Salaam (Tanzania), Kigali (Rwanda), Quito (Ecuador) and Montevideo (Uruguay).

This experience shows that cities can similarly adapt their standard procurement process to "*procure*" and "*co-develop*" innovative e-mobility solutions with the entrepreneurial community. Based on UN-Habitat's experience, cities can consider the following steps to collaborate with the start-up community:
Engage with national, and local universities and technical institutions to establish "*start-up/ mobility accelerators".*
Carry out a market assessment of what is available. Cities can run a process or competition asking the start-up communities to present their innovative ideas and conduct a city-industry meet.
Frame more detailed specifications and invite competitive bids from the market for broadly defined solutions, for instance, a bike-sharing or a freight delivery system.
Launch a call for proposals and compare bids based on objective criteria such as passenger or freight kilometres offered by the e-mobility solution.
Frame contracts and make payments to the successful start-up based on performance criteria.

The funding guide draws insights from the publication titled "*Integration is key: The role of electric mobility for low carbon and sustainable cities*", jointly developed by the United Nations Human Settlements Programme (UN-Habitat) and the Urban Electric Mobility Initiative (UEMI).

Further details can be found in FUTURE-HORIZON D3.2 '*Funding, financing, and procurement guide*'.

5. ERTRAC visibility

5.1. Website and events

- **ERTRAC updated the website**

The ERTRAC website is now brought up to date given user friendliness and more intuitive navigation, as well as its members' area (over time expanded for the full management of working group activities). Cohesivity and attractiveness have increased, with a total design revamping.

Increased accessibility has been ensured which makes the website compatible with mobile platforms and more accessible for all users, also in a visual way (example: fonts). The document repository has been revised and the ERTRAC Coordination and Support Actions have their own segment of the website, ensuring a clearer distinction between the CSA activities and the ERTRAC European Technology Platform activities. The website is the main gateway to the outside world and includes reports on the activities of ERTRAC members, working groups, key outputs, and events.

- **Transport Research Arena**

The Transport Research Arena (TRA) 2022 took place in Lisbon, Portugal, from 14-17 November 2022. It is the foremost European transport event which covers all modes of transport and all aspects of mobility. The theme was *"Moving together – reimagining mobility worldwide".* The conference is a forum that brings together international experts to discuss and introduce the most current innovations for the future of mobility and transport. The target group of the conference includes researchers, policymakers, and industry representatives, among others. FUTURE-HORIZON supported the joint booth of ERTRAC, 2Zero, and CCAM.

FUTURE-HORIZON partners were present with three abstracts that were accepted for presentation at the conference recently:

o A novel systematic analysis of the network of H2020 project participants in Road Transport research topics (AUTh).

o Vision Zero for Sustainable Mobility – Adopting a Safe System Approach for Decarbonised Mobility (UEMI).

o Urban Living Labs as Tool for Transformative Change Towards Sustainable Mobility (UEMI).

FUTURE-HORIZON organised a workshop at the event.

- **RTR conference**

The #RTRConference2023 conference took place as a physical event from 14-16 February 2023 in Brussels. The conference aims to gather selected H2020 and Horizon Europe-funded projects on road transport areas to give attendees an overall picture of the achievements of EU-funded R&I and identify the next steps needed to reach the EU's transport policy objectives.

The conference is co-organised by the European Commission, ERTRAC, EGVIAfor2Zero (the European Green Vehicles Initiative Association for the 2Zero partnership), and the Connected, Cooperation and Automated Mobility Association. For all in-person editions that took place during the FUTURE-HORIZON lifetime, the project supported communication and managed a stand at the event.

List of references

This document is based upon extracts from the following Future Horizon / ERTRAC documents below. Deliverables can be found at https://www.ertrac.org/support-actions/future-horizon/ once public and formally approved.

- **FUTURE-HORIZON D1.3**

Report on identifying European academic centres of excellence.
Authors: AUTh - Yannis Tolias, Zissis Samaras, BOSCH - Ian Faye.

- **FUTURE-HORIZON D1.4**

Report on identifying European academic centres of excellence - Part 2.
Authors: BOSCH - Ian FAYE, AUTh - Yannis Tolias, Zissis Samaras.

- **FUTURE-HORIZON D2.1**

Factsheet collection on RTR in established markets.
Authors: VDI/VDE-IT - Jakob Michelmann, Carolin Zachhäus, Gereon Meyer.

- **FUTURE-HORIZON D3.1**

Catalogue of demonstration concept notes on mobility innovations.
Authors: UEMI, UNH, WI, AVL.

- **FUTURE-HORIZON D3.2**

Funding, financing, and procurement guide.
Authors: UN-HABITAT - Kennedy Kamau, Stefanie Holzwarth.

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- **FUTURE-HORIZON D3.3**

Report on training and peer-to-peer capacity building.
Lead beneficiaries: UEMI. Contributors: UEMI, WI, UNH.

- **FUTURE HORIZON**

Success stories.
Edited by: POLIS.

- **2ZERO PARTNERSHIP 2021-2027**

https://www.2zeroemission.eu/wp-content/uploads/2023/01/2Zero-SRIA-webversion-2022.pdf

- **CCAM European leadership in safe and sustainable road transport through automation 2021-2027**

https://www.ccam.eu/wp-content/uploads/2022/05/CCAM_SRIA-report_web.pdf

- **Connected, Cooperative, and Automated Mobility Roadmap (2022)**

https://www.ertrac.org/wp-content/uploads/2022/07/ERTRAC-CCAM-Roadmap-V10.pdf

- **New Mobility Services Roadmap (2021)**

https://www.ertrac.org/wp-content/uploads/2022/07/ERTRAC-New-Mobility-Roadmap-V4.pdf

- **Safe Road Transport Research Roadmap (2021)**

Towards Vision Zero: Following the Safe System Approach.
https://www.ertrac.org/wp-content/uploads/2022/07/ERTRAC-Safety-Roadmap-2021.pdf

- **Urban Mobility Resilience Roadmap (2021)**

https://www.ertrac.org/wp-content/uploads/2022/07/ERTRAC-Urban-Mobility-Resilicience-Roadmap-V3.pdf