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Project Report

Promotion of Electric Mobility in the European Union—Overview of Project PROMETEUS from the Perspective of Cohesion through Synergistic Cooperation on the Example of the Catching-Up Region

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Abstract: This project report presents the rationale and the first results as regards the ongoing learning process of the PROMETEUS (PROMotion of EmobiliTy in EU regionS) project, co-financed by the Interreg Europe program, in the context of EU policies and programs dedicated to the promotion of sustainable mobility, and electric mobility in particular. Electric mobility, and in general low-carbon mobility, is one of the main targets of the European Union's policies dedicated to a green transition. Despite continuous efforts, the number of electric cars in circulation remains low and the objectives of expanding the market for such vehicles by 2030 are still far from being fulfilled. Up until 2018, the share of electric vehicles was in fact only 1.5% of total car sales in the EU. Specifically, it has been noted that an increase in the uptake of electric vehicles in Europe is hampered by the presence of three main barriers: affordability, infrastructure availability, and lack of investments. In this context, project PROMETEUS has aimed at tackling the lacunae in the availability of infrastructures for a transition towards electric mobility in the partnership's regions, namely, Carinthia in Austria, Castilla y León in Spain, Lazio in Italy, Malta, and Prešov in Slovakia, and at countering low awareness in the public through the improvement of policy instruments linked to structural funds. In order to approach and clarify the process of improvement of those policy instruments, we have summarized and presented the reference results and outputs from the Action Plans across the partners. Moreover, the report discusses in detail the output of the regional Action Plan of the one of project partners—the Prešov region, as the form of a model example—as the initial situation in terms of infrastructure development in the region posing as the biggest challenge for the project. Managerial as well as research summaries can be helpful in the implementation of similar projects; in the continuous improvement of policy instruments; and, last but not least, in the formulation of new challenges to improve awareness of sustainable forms of transport.

Keywords: low-carbon mobility; electric mobility; policy instruments; awareness raising; infrastructure

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1. Introduction

In a market economy with a highly developed competitive environment, it is natural to maximize utility of resources. Overconsumption, as the desired state of the economy of growth, puts enormous pressure on production and thus on securing sufficient resources of diverse nature. Here, seemingly endless growth meets the limitations of the physical world.

The application of the principles of sustainability is thus one of the basic determinants of the long-term survival of market economies, or even entire economic ecosystems as we know them today. In view of these facts, it is possible to assess the issue of sustainable development, sustainability, and a low-carbon economy as extremely topical, even key, for all industries, as well as for any entities using resources of a physical nature. Current global trends and their negative impact on the environment and on the quality of life, in particular climate change, air pollution, and the related unprecedented increase in the number of civilization diseases and economic costs for society, make the issue of electromobility more pressing than ever. These challenges also include widespread urbanization, which puts pressure on the systemic reorganization of cities and urban areas. The fact is that nowadays, the automotive industry finds itself in a breakthrough phase that reflects the demands of the European Union and industrial policies that govern the current consumerism. In relation to the subject, terms such as the environment, the green economy, emissions' reduction, and carbon footprint are frequently discussed. The increasing pressure placed by society on innovativeness and creativity in the implementation of solutions give rise to solutions focusing on low-emission or emission-free forms of transport. Thus, an effective solution seems to be electromobility, at the same time a trend and a challenge of the 21st century, which largely polarizes society. The combination of the highly topical issue of sustainability in transport and the need to optimize communication forms and promotional activities across the various regions of the European Union has created a unique space for carrying out the study presented. This project report presents the rationale and the first results as regards the ongoing learning process of the PROMETEUS (PROMotion of EmobiliTy in EU regionS) project, co-financed by the Interreg Europe program, in the context of EU policies and programs dedicated to the promotion of sustainable mobility and electric mobility in particular. Electric mobility, and in general low-carbon mobility, is one of the main aims of European Union policies. The study was based on the findings of almost five years of intensive research efforts by a consortium of partners—selected regions of the European Union implementing the PPROMETEUS project with the methodological coordination of the advisory partner Poliedra - Politecnico di Milano. From the point of view of the structure of the presented study, in its first part the main topic of electric mobility is elaborated, starting from its basic characteristics from the point of view of the industry, followed by the connection of electric mobility with the priorities and policies of the European Union. The following part describes the methodology of implementation of the PROMETEUS project and subsequently the key parts of the Action Plans of all participating partner regions; moreover, in the form of a model example, the report discusses in detail the output of the regional Action Plan of one of project partners, the Prešov region in Slovakia, which within the project consortium represented the region in the most initial phase of transition to electric mobility in terms of infrastructure. On the basis of the accumulated knowledge, we formulated discussions and evaluations that aim to help in the implementation of follow-up projects, continuous improvement of policy instruments, or the formulation of new challenges to improve awareness of the issue of sustainable and electric transport.

2. Theoretical Framework

2.1. Electric Mobility—A Priority within EU Policies

The European Union has long identified electric mobility, in the wider context of sustainable mobility, as one of the priorities for the decarbonization of transport in all Member States [1], [2,3]. Electric mobility has long been considered as a key transition to overcome the fossil fuel dependency of the EU's transport systems—Hawkins et al. [4], Hawkins et al. [5], Nordelöf et al. [6], Grea and Lehmann [7], and Ortar and Ryghaug [8] offer, among others, an ample review of the beneficial environmental effects, mostly in terms of reduction in the emissions of greenhouse gases, of electric vehicles, both per se and when considered in the whole life cycle.

As outlined in the Clean Power for Transport Infrastructure Deployment [9] and in Krause et al. [10], transport in Europe is 94% dependent on oil, 84% of it being imported,

with a bill up to EUR 1 billion per day and increasingly costly effects on the environment. One of the first attempts to reduce greenhouse gas emissions, and CO_2 ones in particular, was the Regulation no. 443/2009 that set, starting from 2012 and by 2015, the maximum level of grams of CO_2 emitted per kilometer at 130. Two years later, in 2011, the European Commission decided to set the target of reducing transport emissions by 60% by 2050 compared to 1990 levels [11]. Subsequently, in 2014, the Regulation 443/2009 was revised, and the threshold dropped to 95 gCO_2/km [11]. In the same year, 2014, the European Parliament and the Council adopted the Alternative Fuels Infrastructures Directive (EU/2014/94) with the aim to encourage Member States to define a regulatory framework for the development of alternative fuel infrastructures. Moreover, with the adoption of the European Green Deal, this directive will be totally reviewed in 2021 [12]. Following the 2015 Paris Agreement, the European Union decided to reduce the domestic GHG emissions of at least 40% by 2030 and by 80% to 95% by 2050 with respect to the 1990 levels [11,13], and in 2016 the European Commission drafted the European Strategy for low-emission mobility [1] in which, with 2030 as a timeline, three important guidelines are highlighted. The first one is the need to increase the availability in the territories of charging points; the second is the need to use renewable energies for the power supply of electric vehicles; and, in the end, the third is encouraging Member States to increase incentives for the purchase and maintenance of electric cars [14]. In 2018, the European Commission launched a new strategy for a climate-neutral economy by 2050 and one of its pillars is the implementation of measures to improve both vehicle efficiency (thus reducing emissions) and increase the number of electric vehicles [15]. Moreover, in 2019, the European Commission promoted a comprehensive study named "Sustainable transport infrastructure charging and internalization of transport externalities" that focuses on possible actions to create a network of charging infrastructures able to foster the use of electric vehicles even outside urban centers for long and medium-to-long journeys. Indeed, at the moment, the use of electric cars is mainly carried out in urban areas, although it has been shown that most of the emissions occur in long and medium distances [11,16]. Table 1 summarizes the actions taken at European level for each year:

Table 1. Main steps of European policies for low-carbon mobility.

Year	Action
2009	Regulation no. 443/2009
2011	Target to reduce GHG emissions by 60% compared to 1990 levels by 2050
2014	Revision of the regulation no. 443/2009 Alternative Fuels Infrastructures Directive (EU/2014/94)
2016	Target to reduce GHG emissions compared with 1990 levels of at least 40% by 2030 and by 80% to 95% by 2050 European Strategy for low-emission mobility
2018	New strategy for a climate-neutral economy by 2050
2019	Sustainable transport infrastructure charging and internalization of transport externalities

Despite various interventions at both European and national levels, CO_2 emissions from the road transport sector persist in growing [17,18]. A crucial focus on enabling a behavioral change in order to shift to electric mobility lies in addressing the lack of availability of infrastructures; the preconceptions and doubts of the general public; and, more broadly, the low awareness among both public administrations, private actors, and citizens concerning electric mobility. These and other barriers, as well as possible incentives and roadmaps for the promotion of electric mobility, have been identified by several authors in the dedicated literature (among others, Bakker and Trip [19], Bignami et al. [20], Browne et al. [21], Diamond [22], Egbue and Long [23], Sierzchula et al. [24], Steinhilber et al. [25] and Longo et al. [26]. However, poor availability of dedicated infrastructures and

low user awareness are considered as the major barriers to be addressed. Decarbonization in the transport sector can certainly be supported by the electrification of mobility, but it is necessary that electricity generation is also low in carbon emissions [27]. If on the one hand, the Green Deal will certainly give a strong boost to electric mobility, and on the other hand, the economic crisis caused by the COVID-19 pandemic, which has hit Europe, could reduce the number of electric vehicles purchased in all over the world, and therefore also in Europe, as already highlighted by the 15% reduction between January and April 2020 compared to the same period of 2019 [14].

2.2. Basic Characteristics of the Industry

The origin of electromobility dates back to the 19th century. In 1834, Thomas Davenport built the first electric car that included a battery that could not be recharged. The car was able to reach a distance of 15 to 30 km. Its lifetime was therefore relatively short. Between 1834 and 1860, a lot of research and testing took place until the first rechargeable lead-acid batteries were invented in 1860 [28]. Electromobility, described as the movement of vehicles using electricity or the operation of electric vehicles, is a very wide area that needs to be understood not only in the context of general mobility but also as the overall functioning of modern human society in economic and social dimensions. The basic element of electromobility is the vehicle itself [29–32]. An electric car is a road transport vehicle driven by an electric motor. Thus, electricity is needed to operate it. Electricity can be acquired or stored in various forms [33].

On the basis of these differences described in the study of Amsterdam Roundtable Foundation and McKinsey and Company The Netherlands [34], we distinguish between the following types of electric vehicles:

- Plug-in hybrid electric vehicle (PHEV);
- Battery electric vehicle (BEV);
- Range extended electric vehicle (REEV);
- Fuel cell electric vehicle (FCEV).

The entry of e-cars to the transport market has also changed the transport ecosystem itself, including new and old brands. The operation of this mode of transport has its specific requirements that new players on the market try to meet. This situation creates space for new products and services [35].

The basic roles and actors of the emerging ecosystem actors are as follows [35–37]:

- automobile manufacturers and their suppliers—for the production of electric vehicles and their spare parts, distribution of electric vehicles to end customers;
- electromobility technical service providers—for the development and delivery of electromobility-related technology (batteries, electric motors, fuel cells, etc.);
- IT providers—creating software and platforms for data management;
- electromobility service providers—offering comprehensive services and products to end customers;
- charging station providers—providing a link between the manufacturer and end customers (charging or replacing batteries);
- energy producers—producing and selling electricity to distributors;
- distribution network operators—for the provision of energy distribution infrastructure and network operation;
- public administration—for the management of public projects related to electromobility, tax administration, and the development of smart cities/districts/communities;
- government—for the creation of a legislative framework for the entire ecosystem, including new investment incentives, subsidies, and taxes.

The primary element of an infrastructure suitable for electric vehicles is its ability to recharge the batteries. An alternative to recharging is the replacement (swapping) of the batteries, or even companies providing full service for electric vehicles, e.g., GreenWay [38]. In the future, fuel cells can also be the solution for the range extension. These, through

modern technology, can produce electricity from a variety of raw materials, and thus suppliers of these raw materials can also be part of the future infrastructure for electric vehicles [39]. Electromobility in transport offers society various benefits, although there are still some limitations in this respect. Augenstein [40] mentions the following, that it has been shown that the transformative capacity of BEVs is high. Essentially this may mean that the BEV is doomed to fail eventually because it does not fit within the current mobility system and cannot compete with internal combustion engine cars. However, these shortcomings may turn into triggers for change, dealing with high prices and small ranges of BEVs by integrating them in intermodal mobility systems or car-sharing schemes and transport system in which multiple means of transport are used to transport people from point A to point B [41,42]. One of the benefits of electromobility is the ever-growing number of projects regarding this mode of transport. German Chancellor Angela Merkel reaffirmed the goal of 1 million electric cars running on German roads by 2020. This is, of course, is still a small percentage of the total number of vehicles, but this incentive may result in financial and various other types of state support. The support for electromobility also depends to a large extent on those who bring new ideas regarding e-mobility. However, the momentum in the development of e-mobility will not be lost, due to landscape factors such as scarcity of resources and, in particular, developments in the Chinese market.

Europe in general does not lag behind in the field of electromobility. The largest institution on the continent is the European Union. Several projects are being implemented thanks to its support. Some of the most significant projects will be reported in the following lines, whereas other interesting examples can be found, e.g., in Petrauskiene et al. [43]:

- Project Electromobility +, which includes support for research projects in the field of electromobility through cooperation between France, Germany, the Netherlands, Austria, Finland, Norway, Sweden, Denmark, Poland, Flanders (Belgium), and Piedmont (Italy). The project involves 18 smaller projects divided into 3 categories: socio-economic, technological, and scientific. Together, the project was offered EUR 20 million in financial support, paid for by the involved countries, regions, and the European Commission. The call attracted 40 projects in total, of which 18 were selected. A total of 96 partners are involved in these projects. Currently, some projects have already been completed with successful results and some are still in their implementation phase [44].
- Project Electric Urban Mobility is carried out within the Horizon2020 funding with a total of EUR 10 million granted by the EU and EUR 20 million granted by the participating countries and regions. Most EU countries are participating in the project [44,45].
- The Green eMotion project was launched in 2011 by the Vice-President of the European Commission Siim Kallas. The project's budget of EUR 42 million was supported by the EU, which provided EUR 24 million. The main objectives were to set up a framework for a pan-European interoperable electromobility that had to be widely accepted, user-friendly, and scalable; involve the integration of smart grids, the development of innovative ICT solutions, and production of different urban mobility concepts; and open a pan-European electromobility market and provide a unique knowledge base [46].
- The EU has also supported the Smart Vehicle-to-Grid project, which aims to connect electric cars to the grid, thereby facilitating the charging process and adding value for the customer. All charging scenarios were considered in the project. The system allowed for continuous communication between vehicles, charging stations, and operator centers. This is an extensive two-way exchange of information [47,48].

In conclusion, further development will focus on dynamic charging. There are currently not many solutions available. Damousis [49] considers the main advantages of reduced battery size, increased range of electric vehicles, but above all increased comfort. Dynamic charging works on the principle of a special lane that carries the charging infrastructure and the vehicle does not have to stop to recharge. The European Commission has gathered information with more than 320 studies and projects on electric vehicles for

a total budget of EUR 1.9 billion (65% from public sources). The aim of the research has been mainly to assess the gaps and possible risks in the Member States. The European Commission's solutions focus on the following three main areas:

- control systems (battery interaction–electric motor–electronics), energy storage, car bodywork and design, funds;
- removing major barriers hindering the wider use of electric vehicles—cost and range (fear of lack of energy);
- development of new electric vehicles and infrastructure.

3. Methodology Used to Develop the Project's Action Plans and Methodological Framework for Creating the Project Report

This section focuses on the project PROMETEUS itself, which will be presented and defined; it will then proceed to describe the main methodology of elaboration of Action Plans from the point of view of the process (gathering, analysis, and selection of information) with a specific focus on the activities in the Prešov region in Slovakia. With regard to diverse range of information sources, a comprehensive part will be presented at the end of this chapter. This conclusion part will be focused on the description of the methodological apparatus from the point of view of the scientific methods of our research.

3.1. The Interreg Europe PROMETEUS Project

In the context of the debate on how to facilitate the transition towards electric mobility and the behavioral changed implied by it, the European Union has promoted several projects and initiatives within the Structural Funds to explore possibilities and tackle barriers (see, e.g., also Cansino et al. [50] and Liven [51]). Among those projects and initiatives, the PG102299 Interreg Europe project PROMETEUS (PROMotion of E-mobiliTy in European regionS) project, co-financed by the Interreg Europe program, focuses on promoting electric mobility by tackling two of the main issues presently hindering its uptake in Europe, and more specifically in European regions: the lack of infrastructure for electric mobility (charging pillars, dedicated parking spaces, etc.) and the low awareness about the opportunities belied by electric mobility among the general public. Customarily, Interreg Europe projects imply a partnership composed by regions (or NUTS-2 equivalent in Europe, where applicable), of which one is the Lead Partner. The regions work towards changing existing policies, of which their own institution is responsible, in order to foster actual and concrete change. (The present publication, in agreement with the Subsidy Contract of PG 102299 INTERREG EUROPE PROMETEUS project, art. 12.2, and recalling the provisions of Regulation (EU) 1303/2013, Annex XII 2.2 and the rules specified in the program manual, only reflects the Authors' views; the program authorities and the European Commission are not liable for any use that may be made of the information contained herein [52].)

The PROMETEUS partnership is composed by one advisory partner (AP—Poliedra – Politecnico di Milano) and five public administrations, of which one is a national ministerial entity (Transport Malta for Malta, also Lead Partner of the project) and four are regional authorities (Carinthia in Austria, Lazio in Italy, Prešov in Slovakia and Castilla y León in Spain).

The general objective of PROMETEUS is to support national and regional governments in developing and delivering better policies on e-mobility by creating opportunities for sharing solutions, in order for government investment, innovation, and implementation efforts to jointly lead to low-carbon transport policies.

3.2. The PROMETEUS Regions, Their Policy Instruments, and the Groundwork for the Regional Action Plans

The PROMETEUS project created a procedure of interregional knowledge exchange and a learning process aimed at identifying strengths and weaknesses of the regional policies dedicated to the promotion of a transition towards electric mobility, as well as

in setting the groundwork for the drafting, and later the adoption, of Regional Action Plans actualizing and structuring such transition. The PROMETEUS knowledge exchange and learning process was structured both locally—with the creation of groups of stakeholders, representative of local public administrations, academia (where applicable), local businesses, and groups of citizens—and inter-regionally, with knowledge exchange inter-regional events and focus meetings between two or three partners. The structure of the learning process of PROMETEUS was structured, in more detail, as shown in Figure 1.

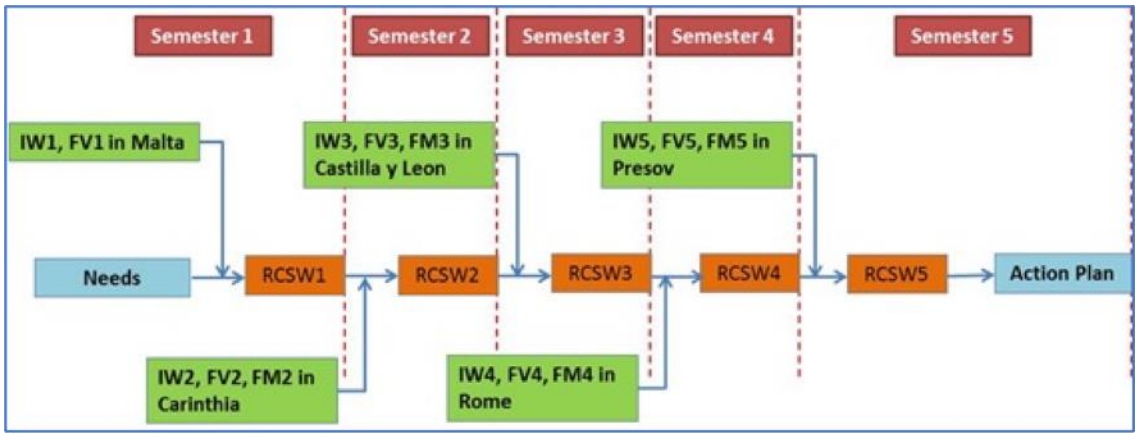

Figure 1. The structure of the PROMETEUS (PROMotion of EmobiliTy in EU regionS) interregional knowledge exchange and learning process. (Legend: FV = field visit, IW = interregional workshop, FM = focused meeting, RCSW = regional co-design stakeholder workshops).

3.3. The Prešov Region, Policy Instruments, and the Groundwork for the Regional Action Plan

In 2014, the Prešov self-governing region signed a memorandum on the promotion of electromobility and, through its participation in PROMETEUS under the Interreg Europe scheme, it sought to further promote activities in this area. The aim of the project was to improve the policy instruments associated with the structural funds, focusing on e-mobility promotion. The Action Plan development process was supported by the regional activities, and thus have been the events organized over the past five semesters, namely, five Regional Co-Design Stakeholder Workshops and three Regional Dissemination Events. Practical examples and current status as well as opportunities for the development of electromobility in the Prešov region were discussed. In the final phase, these inputs led to the identification and subsequent design of specific activities. The promotion of e-mobility in the context of the Prešov self-governing region had to overcome two main obstacles, namely, the difficult availability of infrastructure and low public awareness. In order to overcome them, PROMETEUS supported actions and activities that were suitable to be implemented into the policy instruments of the region. The submitted Action Plan is a decision support tool primarily intended for a management of the Prešov self-governing region; management of affected organizations in the Prešov self-governing region; municipal/city authorities in the Prešov self-governing region, and secondarily as a supporting information tool for stakeholders in the Prešov self-governing region (commercial sphere, education, etc.); affected and interested bodies of the Slovak Republic, other self-governments in Slovakia, and interested EU bodies; and professionals and the general public. Thus, the declared goals and activities have required a high degree of mobilization of stakeholders in the implementation process itself, which was crucial as it could facilitate and direct public and private investments, contributing to raising awareness of low-emission transport among the general population, business sector, and other potential parties, as well as contributing to the development of electromobility itself. The above facts have led us to believe that the PROMETEUS project, as one of the key activities in the region with regard

to electromobility, also brought the expected improvements in the form of new projects aimed at the quality of life of individuals, the environment, and the related infrastructure.

3.4. Methodological Framework of the Report

The project report provides an in-depth description of the EU-funded project PROMETEUS, with a more detailed focus on the situation with respect to electromobility in the Region of Prešov, from its initial situation to the development of new and ambitious local policies. PROMETEUS is an Interreg Europe project and, as such, has a strong emphasis on improving existing policies (Interreg Europe program manual, 2020) and in creating an environment that is conducive for concrete actions towards the declared goal of any of the funded projects—in the case of PROMETEUS, the declared goal is the improvement of policies regarding electric mobility, and the main deliverable to fulfill this goal is the creation of Regional Action Plans on electric mobility, one for each participating regions, in order to create the policy framework to enable the regional transition towards disinvestments in conventional mobility and investments in electric mobility.

The creation of the Regional Action Plans in the project PROMETEUS was based on several steps detailed in the following:

- Analysis of strengths, weaknesses, opportunities, and threats (SWOT) as well as analysis of the state-of-the-art. The first stage of the project in the five partner regions focused on studying and analyzing the initial situation in the five partner regions. Every situation was specific, and for each regional case, a different team of experts was created and assumed the responsibility for the development of local activities. Within the policy analysis aimed at recognizing the project, there was a specific focus on the following areas [53]:
  - a) Existence of relevant documents and policies about sustainable and electric mobility.
  - b) Experience and current stage of sustainable and electric mobility.
  - c) Main problem areas considering sustainable and electric mobility.
  - d) Vision or plan for near future considering sustainable and electric mobility.
- Organization of Regional Stakeholder Workshops and Regional Dissemination Events. Throughout the project, the regional partners had the opportunity of learning from one another by visiting the other countries, taking part in field visits dedicated to good practices of electric mobility, and attending regional workshops on electric mobility where more good practices were presented. Those international mutual learning events were then communicated locally to locale Regional Stakeholder Groups that could discuss merits and challenges of the specific issues discussed and evaluate the potential for inspiration for the local policies. Moreover, wider Regional Dissemination Events were organized in all partner regions to communicate the project activities and the most relevant good practices.
- Semi-structured interviews and Focused Meetings. PROMETEUS also organized, at a project level and at regional levels, expert interviews with relevant personnel (city/regional management responsible for the specific topic) and examined their opinions about (a) the level of understanding towards sustainable mobility and electromobility, (b) practical steps they perform towards sustainable mobility and electromobility, and (c) all of above-mentioned areas (within field analysis).
- Creation of the Action Plans. Formulation of propositions, recommendations, actions, and budgets. As a final step in the project, and following the completion of the activities listed, the first versions of the Action Plans were formulated and then reviewed by regional government managements. Final versions were modified according to the reviews and signed as official documents.

The methodology for preparing the regional Action Plans had several main phases and is shown in Figure 1. It was a process of learning between partners within the project consortium's regions, which is, among other things, one of the main objectives of the

Interreg Europe's project schemes. Thus, the aim was to transform this learning process into actions and, above all, to ensure that the lessons learned from the project led to concrete actions in the participating regions, ideally within the policy instrument initially chosen or, if that is not possible, in any relevant policy framework. In particular, PROMETEUS aimed to support cooperation across the EU countries involved, where the Interreg Europe scheme aims to create or improve the political instruments of the member states considering the program priorities.

This means that the Action Plans had to be tailored to the needs of the region and describe the main elements of each proposed measure—such as relevance to the project, nature of activities, stakeholders, timeframe, costs, and sources of funding—and had to specify the extent to which the Action Plan is supported by the relevant policy organization in the region. Moreover, each proposed measure of the Action Plan had to be clearly related to the project, i.e., it should result from project training and interregional exchange of experience.

From the point of view of the research process, it was primarily a content analysis of the issue, through secondary sources, which formed all relevant strategies and Action Plans at the national and international level as reference (see also Lieven, 2015). This process started with Semester 1 in 2017 (see Figure 1), where the basic needs of specific regions regarding the project plan were defined at the introductory project meeting in Malta.

In the Prešov region, this occurred also with the involvement of universities, where the authors of the study also participated as stakeholders and ambassadors of the idea. In the final phase of the preparation, focus meetings and round tables were held, where the working version of the Action Plans was presented to the professional public and regional government. At this phase, selection of the measures to be included in the Action Plan took place, followed by synthesis and subsequent production of the final version of Action Plans to be approved by the relevant regional authorities. A description of the five regional Action Plans is presented in Section 4 of the present report, whereas a more in-depth focus on the Action Plan for the promotion of electric mobility in the Region of Prešov is included in Section 5 of the present report.

The whole project (including project outputs) contributes to all Europe 2020's priorities [54]. Europe 2020 is the strategy to shift the EU towards a smart, sustainable, and inclusive economy delivering high levels of employment, productivity, and social cohesion through

- Smart growth: the use of e-vehicles in transport will be a key factor for the EU economic growth and employment and for the industrial competitiveness in the next years.
- Sustainable growth: e-mobility can break the overdependence of European transport on oil, promoting a more resource efficient, greener, and more competitive economy.
- Inclusive growth: the knowledge exchange among EU regions on e-mobility promotion can foster a high employment economy, delivering social and territorial cohesion.

The creation of the Action Plans alone is not enough from the point of view of the Interreg Europe Program Manual—it is only a means to achieve results, but not an end in itself. Therefore, the second phase of Interreg Europe projects has been introduced, within which the achievement of the planned objectives/implementation of the developed Action Plans is monitored. It is essentially a regular review of the extent to which the measures described in the Action Plans are implemented in practice, the results of these measures are evaluated, and evidence of success is collected. The project is currently in the phase of implementing the Action Plans and disseminating the idea to the professional public.

4. Results Obtained by Each of the Involved Partners

On the basis of the structure of the PROMETEUS interregional knowledge exchange and learning process, each partner region developed its own regional Action Plan to support national and/or regional policy instruments. In this part of the study, all initial regional Action Plans are briefly presented. Then, the Action Plan of the Prešov region is

presented and discussed separately in Section 5 in detail, since as a partner region, Prešov within the project consortium represents a region that is in terms of infrastructure in the initial phase of transition to electric mobility.

4.1. Results from Malta: Integrating National Transport and National Energy Strategies

In Malta, PROMETEUS has focused on the Priority Axis 7 "Shifting towards a lower carbon transport sector" of the Cohesion Fund 2014-2020 Operational Program I of Malta (OPI), and in particular on Investment Priority 7c "Developing and improving environmentally friendly (including low noise) and low carbon transport systems, including inland waterways and maritime transport, ports, multimodal links and airport infrastructure". The OPI as delineated in its foreword had to be in line with the National Transport Strategy (NTS). The overall aim of project PROMETEUS in Malta has been in the reduction of traffic congestion in the main island of the Maltese archipelago and in fostering the use of energy-efficient modes of transport. To this end, and with the full support of the Maltese government, Malta's Action Plan for the promotion of electric mobility is constituted of three main Actions, namely,

- **Action 1**: "Financial Incentives" for the transition from internal combustion vehicles to electric vehicles. Funds have been announced and government budget has been allocated to incentives both for electric cars and pedelec/motorcycles. The government will also move on the regulation of e-scooter use nationally.
- **Action 2**: "Deployment of Electric Buses to the Maltese Islands", slightly delayed due to the COVID-19 pandemic, has resumed—two electric buses have already been delivered to the island of Gozo, and there is interest for an on-demand service to the ferry linking Malta's two main islands.
- **Action 3**: "Roadside Charging Pillars" is well underway, with the idea of also expanding the network by identifying new locations for regular and fast chargers.

As of October 2020, the main results in the implementation of the Maltese Action Plan are briefly summarized as follows:

- **Action 1**: "Financial Incentives" has been very successful nationally. Funds announced in the 2020 government budget have been allocated and the indicators of results are being respected, with 299 electric scheme applications and 280 pedelec/motorcycle applications in December 2019, followed by 275 electric scheme applications and 216 pedelec/motorcycle applications in June 2020. The government will also move on the regulation of e-scooter use nationally.
- **Action 2**: "Deployment of Electric Buses o the Maltese Islands" has been slightly delayed due to the COVID-19 pandemic but has resumed—two electric buses have already been delivered to the island of Gozo, and there is interest for an on-demand service to the ferry linking Malta's two main islands.
- **Action 3**: "Roadside Charging Pillars" is well underway, with the idea of also expanding the network by identifying new locations for 108 regular and 22 fast chargers.

4.2. Results from Carinthia, Austria: Uptake of Electric Vehicles, Reduction of Emissions, New Alliances, and Consortia

Carinthia's focus in PROMETEUS, in terms of its policy instrument, is on the "Investment priority 4e—promote policies to reduce CO_2 emissions for all regions, Specific objective 1: To contribute to reducing CO_2 emissions by developing new local or regional strategies" of the European Regional Development Fund (EFRE) Programm Investitionen in Wachstum und Beschäftigung Österreich 2014–2020, which, among its measures, includes "M13_CO2_IP4e_MN1 Die Lokale und regionale Strategien für Energieeffizienz und nachhaltige Mobilität" (Local and regional strategy for power efficiency and sustainable mobility). Within the sector of transport, the main target is the mitigation of CO_2 and other emissions (nitrogen oxides (NOx), particulate matter (PM10)) by encouraging a behavioral change in users towards other mobility modes with fewer emission or, if this is

not possible, towards the replacement of a used vehicle with a more CO_2-friendly one. The main activities in Carinthia's Action Plan for the promotion of electric mobility are

- **Action 1**: "Supporting the uptake and the further development of electric vehicles", which is being implemented for M1, M3, and N1-N3 vehicles, and that has seen a significant increase in those categories of vehicles' uptake in the region in the years 2019-2020.
- **Action 2**: "Development of the Competence Centre for Innovative Mobility—KIM", a physical location dedicated to research and alliances dedicated to electric mobility.

As per October 2020, also the Carinthian Action Plan is well under way, most namely through

- **Action 1**: "Supporting the uptake and the further development of electric vehicles", which is being implemented as planned, with the only exception of the bus sector due to the bankruptcy of one of the interested bus companies because of the COVID-19 pandemic. The expected result of 0.70% M1 vehicles licensed was hit in December 2019; the expected value of 0.40% for N1-N3 vehicles was only slightly missed (0.34%), and the uptake of M3 vehicles has also been very close (with a revised aim of 0.25% instead of the planned 0.26%).
- **Action 2**: "Development of the Competence Centre for Innovative Mobility—KIM", which is also being implemented according to plans, with a contract being signed with the German Land of Rheinland-Pfalz, as well as with the transport provider from the German city of Mainz.

4.3. Results from Castilla y León, Spain: Creation of a Strategy for Alternative Energy Vehicles, and Incentives for the Promotion of Electric Mobility

The policy instrument chosen by the PROMETEUS partner of Castilla y León is TO1 Research and Innovation within the 2014–2020 ERDF ROP of the Region, coupled with the RIS3. The specific goals of the 2014–2020 ERDF ROP of Castilla y León as regards TO1 are to promote innovation for a regional development that contributes to a change of the production model of Castilla y León. The RIS3 of Castilla y León is conceived as an instrument to increase the competitiveness of the activities in which Castilla y León is specialized. The second priority of the RIS3 is to look for a productive efficiency in transport sectors. In addition, RIS3's second priority specifies "efficient and sustainable transport" as field performance in R&D. Within this policy context, Castilla y León has drafted an Action Plan composed by four main Actions, namely,

- **Action 1:** "VEACYL—Regional Action Plan for Alternative Energy Vehicles in Castilla y León" is in the third phase of approval by the Regional Government, with three steps to be completed before the final approval.
- **Action 2**: "Purchasing Incentive Program" has been functional since 2019 and is going on during 2020.
- **Action 3**: "Income Tax Deduction" is also ongoing, but the actual results can be provided only at the end of the 2019 fiscal year.
- **Action 4**: "Training" has been particularly successful, with more students taking part in the 10 provinces of the region with respect to the expected numbers (1.171 instead of 1.000).

Castilla y Leon's Action Plan is being implemented rather successfully as well, as briefly detailed in the following:

- **Action 1**: "Regional Action Plan for Alternative Energy Vehicles in Castilla y León" is in the third phase of approval by the Regional Government, with three steps to be completed before the final approval.
- **Action 2**: "Purchasing Incentive Program" continues as foreseen by the Action Plan, with 43 applications received by December 2019.
- **Action 3:** "Income Tax Deduction" is ongoing, but the actual results can be provided only at the end of the 2019 fiscal year (July 2020).

- **Action 4:** "Training" has been particularly successful, with more students taking part in the 10 provinces of the region with respect to the expected numbers (1.171 instead of 1.000).

4.4. Results from Lazio, Italy: Promotion of Electric Mobility in the Region and New Guidelines

The Italian region of Lazio has identified its ROP ERDF 2014–2020, priority axis IV, investment priority 4.6—Increasing sustainable mobility in urban areas, the policy instrument to be addressed within PROMETEUS. The policy instrument was considered by Lazio as not sufficiently detailed as regards e-mobility, especially in terms of integration of measures able to foster the use of private electric vehicles. Moreover, a comprehensive and multifaceted view on e-mobility policies seems to lack at regional as well at local level. To this end, Lazio has created a very specific Action Plan, containing one single action:

- **Action:** "Update and Integration of the Guidelines for the Regional Plan on Electric Mobility—RPEM". Phase 1 has been completed, with the finalization of the newest version of the Guidelines for the RPEM in December 2019. Phase 2, represented by the formal endorsement of the Guidelines for the RPEM via a formal act of the Regional Government is underway—it is expected to be completed in December 2020, but further 6 months may prove necessary for the fulfilling of the formal approval phase.

The Lazio Action Plan is well underway in terms of its implementation. In more detail:

- **Action:** "Update and Integration of the Guidelines for the Regional Plan on Electric Mobility—RPEM". Phase 1 has been completed, with the finalization of the newest version of the Guidelines for the RPEM in December 2019. The new version is composed of eight sections. Phase 2, represented by the formal endorsement of the Guidelines for the RPEM via a formal act of the regional government is underway—it is expected to be completed in December 2020, but further 6 months may prove necessary for the fulfilling of the formal approval phase.

5. Discussion

For the best possible description of the initial procedures, we chose the partner region of Prešov, which was the best example of a developing region among the entire consortium. From the point of view of infrastructure and the level of awareness of the issue, this is a region at the beginning of the transition to electromobility. This is confirmed by the fact that Slovakia was in 2018 ranked 22nd among the European countries with respect to e-vehicles, with 222 registered electric cars and plug-in hybrids. This represents a year-on-year increase of 72.1%. During the subsidy program for electric cars in Slovakia [55], at least 789 e-vehicles were registered. In the third quarter of 2018, after the end of the subsidy program, only 19 e-vehicles were registered. The following section discusses the starting points of the PROMETEUS project in the region of Prešov and the key proposed activities.

5.1. Analysis of the Baseline

One of the main reasons for electromobility is to improve people's quality of life, improve air quality, and foster sustainability in the transport system. Part of this goal is the constant reduction of emissions. The electromobility development strategy could not do without a high-quality information campaign. The aim of this campaign was to inform the professional and general public, the corporate sector, and the public administrations about electromobility as a sustainable transport system for the 21st century. Following the national emphasis, but also in terms of the needs of the region, it was necessary to develop information at the level of lower organizational and administrative units of Slovakia.

The basic electromobility services have included

- providing charging and fast charging of cars, e-bikes, and e-vehicles;
- e-bike rental and later car-sharing;
- provision of parking—reserved parking houses and provision of charging in reserved places;

- management, monitoring, functional control, and maintenance of charging stations;
- providing information to customers of charging stations—hot-line, web portal;
- measuring the level of progress and services.

When building electromobility as one element of integrated mobility, which includes electromobility, intelligent transport systems, and parking management, a Smart City concept can be used and can be based on the Smart City development strategy of the city of Prešov [56]. There is a need to create an urban digital platform that can coordinate individual service providers, sponsors, and paying users of individual smart solutions. This platform must be modular and capable of development and expansion. Current legislation at the supranational or national level provides the basis for the introduction of electromobility in the city. It is necessary to adjust whether to develop generally binding measures, especially with regard to the construction of a strategy for parking garages and the installation and deployment of charging stations (also in relation to their performance or the method of charging). In addition, the support of all stakeholders to develop and use electromobility in the city should also be considered. The Master Plan of the City of Prešov represents a document on how to deal with public transport in the city in the future and is a very important starting point for the development of electromobility, especially because it contains all the key directions and intentions of development. The Master Plan reveals key elements of the city's transport services and catchment areas, starting from the intensity of traffic in individual parts of the city and the associated pollution. An important measure is the implementation of the legal, technical, and business environment of electromobility in the Slovak Republic. Mobility measures to reduce the carbon footprint include:

- Optimizing the transport system and constantly increasing its efficiency—use of new technologies for better use of resources in transport, fair pricing in road transport, and promotion of combined transport.
- Expanding the use of low-emission energy sources and moving away from the use of petroleum products in transport (legislative frameworks focusing on renewable energy sources, promoting electromobility, focusing on the efficient use of electric vehicles for urban and public transport and public services).
- Strengthening the orientation of citizens and supporting their thinking and action in terms of reducing their carbon footprint with regard to sustainable development.

5.2. Introduction of Electromobility Services

To get an idea of the introduction of electromobility services in the Prešov region, we must realize how these services will be implemented, maintained, and managed, and at the same time which actors are involved. Users of electromobility services will be

- **Citizens**—residents (individuals and organizations) (regular night charging, preference for slow charging for the night tariff, use in densely populated parts of the city, family houses);
- **Visitors** to the city and its organizations (need for medium-fast charging in the city center, at offices and places of cultural activity);
- **Passing visitors**—a short stay in the city (no need to spend a long time in the city, the need for very fast charging or medium–fast battery charging);
- **Regional capital** (City of Prešov)—city office (responsible for the process of introducing electromobility, related services, and pricing);
- **Electricity provider** (electricity supplier, selected on the basis of a tender);
- **Charging infrastructure operator** (the operator ensures the development, operation, administration, and maintenance of the entire charging station infrastructure; it is responsible for the functionality, ensuring regular inspections and regular maintenance of the charging stations);
- **Electromobility service provider** (provides hot-line and information about charging stations and their functionality and occupancy, as well as interconnection of stakeholders at local, regional, and national levels; manages the electromobility information system, which provides monitoring the current state of charging station infrastructure,

data communication between network elements, utilization of charging stations, and e-bike stores, and, according to processed predictions, logistics and invoicing for provided services).

5.3. Introduction of the Regional Action Plan

The presented regional Action Plan implemented within the PROMETEUS project (PROMotion of EmobiliTy in EU regionS) represents a key strategic output of the first implementation phase of the project in the Prešov region. The Regional Action Plan focuses on improving the chosen policy instrument and the related emergence of regional sustainable mobility plans. The previous analysis of the initial state resulted in the formulation of the following set of activities leading to the acceleration of the issue of electromobility, specifically in the conditions of the Prešov region. The purpose of the following project activities is to contribute to the development of electromobility in the Prešov self-governing region with emphasis on the quality of life of its residents and visitors. As far as individual activities are concerned, the first activity represents the basic and initial precondition for the success of all electromobility activities.

One of the key measures of this activity is the establishment of an information and organizational center, followed by the involvement of individual stakeholders with an emphasis on the young generation and the support of examples of electromobility by key stakeholders. An important stakeholder is the public administration, which is to lead by example in the field of electromobility and to act as an enlightenment. The aim of the first activity is to address and inform both the professional and lay public, the corporate sector (B2B), and public administration in the form of conferences and training on electromobility as part of sustainable transport for the 21st century.

The second activity is the creation of a dynamic parking system according to the zoning and with the use of the most modern information and communication technologies, which will improve the use of parking spaces. There is a need to review pedestrian zones and parking policies and to define the interface between pedestrians, cyclists, and vehicles, as well as ensuring a link with charging infrastructure for mobility.

The third activity addresses the support of electromobility through micro-grant schemes, as electric cars are still relatively expensive and therefore it is necessary to consider a real micro-grant policy that will address the type, nature, and form of assistance.

The fourth activity addresses the issue of e-vehicle sharing, which can significantly enhance the interest in the use of electromobility. One of the goals of the shared economy, which is also the sharing of e-vehicles, is to replace other cars in households, to reduce the number of vehicles needed, and to use them more efficiently. In terms of system sizing, see also Marchionni et al. [57].

The fifth activity emphasizes the importance of national parks, protected areas, and specific landscape units in the context of transport and electromobility in the Prešov region. It focuses on mitigating the negative effects of transport on nature and the landscape in protected and culturally important localities through the use of electromobility. In the following sections are descriptions of the key ideas of each proposed activity.

5.4. Action Plan Activities—Activity 1: Popularization and Increase of Awareness about the Phenomenon of Electromobility and Related Trends

In order to support the expansion of electromobility in the region, it is currently necessary to increase awareness and thus promote awareness of the need and possibilities of e-mobility with an emphasis on the young generation and students who are most affected by this issue. The regional e-mobility development plan is based on the Master Plan, the "Smart City" approaches, and the analysis of the overall situation in the field of e-mobility and represents the basis for follow-up activities. A key role in this situation is played by an increased awareness of the benefits of e-mobility for individual stakeholders.

1. **Information centers**—An important element of ensuring long-term information and support of e-mobility is the creation of a permanent organizational unit—an infor-

mation center with the support of the Prešov region. The center will gather all the important information needed for the development of e-mobility and the decision-making of those interested in considering the use of e-mobility. Up-to-date information on subsidy programs of the state, the region, and car importers will also be gathered here. From a marketing point of view, they will work closely with suppliers in providing workshops, communication, and marketing events, either for citizens or for businesses. Later, and gradually, this center can function as a central body for the management of electromobility, which will contribute to the effectiveness of the development of electromobility of the Prešov self-governing region, while the positive effect will also be the generation of new jobs. It is necessary to involve primarily importers of individual car brands and their dealers who offer electric passenger cars in these "roadshows". We recommend a wider range of successful electric cars. The opportunity to actually see the cars of this brand attracts relatively many people. Lectures under the auspices of some cars (or their importer) will also be attractive to the audience.

2. **Roadshows**—These events need to be supported by the regional media. Information support can also be provided by environmental organizations in the region. It is necessary for such an event to include workshops as activation meetings with actors and stakeholders interested in the issue of electromobility in relation to the environment. Important target groups of the "roadshows" include young people (primary, secondary, and university students), professionals, journalists, bloggers, and representatives of major regional players from public and private organizations. This activity can be done as a stand-alone event or, for example, in combination with presenting the progress in Smart City's assets, of which smart electromobility is a part.
3. **Students and schools**—In addition to the above activities, it is very important to involve students and their education in primary and especially secondary schools. The Prešov self-governing region has taken over the competences in the field of education since July 2002 and has 75 secondary schools, 2 language schools, a school boarding school, and a school in nature. The region's competences include the establishment and abolition of school facilities, the creation of conditions for education and training at secondary schools, and the implementation of state administration in the second stage. The School Office and the Department of Education within the Prešov self-governing region can be very helpful in popularizing and spreading electromobility by having such competences and can thus influence student training in areas that are important for supporting electromobility in relation to the environment and context, also in terms of the Smart City concept. The study of environmental aspects and possibilities of alternative energy sources (photovoltaics, wind sources and alternative sources of propulsion, etc.) should be supported. Education in the field of e-mobility and its relationship to citizens' health, the environment, and its sustainability must also be ensured. In addition to lectures, activation workshops are also preferred as a form. Students are young people and their relationship to the environment, sustainable development, and the quality of the environment in which they will live affects them most. In addition, they know how to influence closer or more distant family members very well. It is also very important to emphasize the perspectives of young people in e-mobility in creating new jobs. Regarding the competences of the Prešov self-governing region in the field of education, it must be said that under its responsibility it will be possible to pay increased attention to and adapt study programs to the current situation within the support of electromobility. These are mainly professions such as car repairman, car electrician, mechanic, electrical engineer, mechatronics, electromechanics, electrical engineer for distribution equipment, information and network technologies, technical services in car service, technology of creation, and protection of the environment.
4. **Communication by example**—Communication activities of information about electromobility will also be supported by the real use of e-vehicles in the bodies of the

Prešov region. It is not just that the vehicles will be "mobile advertising" themselves, but above all it is a matter of people seeing the region and its authorities as an example, which is more than a public statement. In addition to public institutions, key cooperating private companies in the region can also be involved in this way.

5. **EUSEW Information Days**—EU Sustainable Energy Week (EUSEW) is the largest event focusing on renewable energy sources and energy efficiency in Europe. It consists of a three-day conference that offers various networking opportunities, an EU competition for sustainable energy with a competition for citizens' prizes and local events. Within this week, the Action Plan proposes the implementation of information days—conferences and accompanying workshops dedicated to popularizing the ideas of e-mobility and renewable energy sources. In addition, the follow-up to the previous EUSEW week will be very important in securing key public and private actors involved in electromobility, transport, and sustainable development, thus supporting the creation of a network of collaborating actors.

5.5. Action Plan Activities—Activity 2: Reservation of Parking Spaces by Zones

1. The system of parking in the city of Prešov and the determination of zones must be in accordance with the needs of the city, its inhabitants, and visitors according to where they live and how they move around the city. The framework of the parking system in the city will be created by the authorized body of the Prešov self-governing region together with expert consulting organizations focusing on the required dynamics of the system, capacity, and the resulting requirements for information security. **Zoning**—This is a key element of the parking system, determining payment methods and ensuring compliance with parking rules in accordance with the city's parking regulations. The parking system together with the connection to the zoning must primarily deal with the parking of residents (parking card per apartment and person), while the price for parking depends on the zone where the resident lives. It is also important to charge for the second and next car a higher fee while determining the time of charging (for example, during the day from 8 a.m. to 7 p.m.). As far as car parks and the interconnected local public transport system are concerned, their significance lies primarily in the fact that they relieve the city (location) from a large number of cars and the associated noise and smog. The importance of the zones is also growing in carparks with a large number of visitors, if entry into the pedestrian zone is not allowed. Zones according to the degree of traffic restriction can be, for example,

    - pedestrian zone;
    - central urban zone;
    - resident zones;
    - wider center;
    - parking in the center reserved by the city;
    - intercepting car parks.

    Entrance to the pedestrian zones—This involves police, suppliers of goods, and all e-vehicles. Entry into the central zone has to have defined rules and conditions (under which components of public and private interest and under what conditions are e-vehicles allowed entry). Another element is the setting of prices for visitors to the city. These are tourists who pass through the city and those who come to the city for work wherein their employer does not have their own parking lot or reserved space. In this case, too, the zones play an important role. When distinguishing between working days, holidays, and weekends, it is possible to look for other parking options for visitors to the city in cooperation with business entities and shopping centers. Determining the methods of payment for parking services currently stands at issuing parking tickets, wherein text messages can also be used, although it must be underlined that the possibilities of using new info-communication technologies are multifold, from booking parking spaces to various payment options, with the application in the mobile phone playing an increasingly important role. This applies

mainly to visitors to the city. For residents, this is most often a form of subscription. In any case, it is necessary that there are more payment options according to customer requirements.

2. Design of an intelligent parking system—New information and communication technologies together with a sophisticated transport system create modern parking systems and bring about not only comfort, but also control of the administration and management of parking areas while minimizing the need for human capital. We are heading towards the so-called dynamic parking, where the network of parking cities is centrally captured and a mobile application on a smartphone is used, which can reserve the selected parking space and can navigate the customer to a nearby free parking space or one reserved for them. The advantage for the customer is that they can quickly find a free parking space using navigation from the headquarters. The advantage of this intelligent dynamic system for the city is statistical information, for example, in which places and how often they are used (usability and turnover), where the need for parking spaces is sufficient and where not, and so on. It was necessary to design such a system in cooperation with a consulting partner and the city, followed by the selection of a software (SW) company with experience with the reservation and parking system, completion of the parking system, design of information system and mobile application, and test operation of intelligent parking system management. **Parking houses**—The regional capital, in cooperation with developers and landowners, can accelerate the construction of parking houses with the appropriate charging infrastructure for both visitors to the city and residents. It is about improving the culture of parking and at the same time providing support for the development of electromobility. The number of parking spaces will also be affected by the growth of the shared economy in this case of shared electric vehicles—e-bicycles and electric cars. As electric vehicle sharing increases, the need for parking spaces is expected to decrease.

5.6. Action Plan Activities—Activity 3: Creation of a Regional Subsidy Microgrant Scheme to Promote E-Mobility

Options for grant support can be summarized as follows:

1. **Dissemination of information** about e-mobility and its relations with the environment. Examples are educational and promotional events in schools. Objective: awareness raising, dissemination of information on the topic.
2. **Educational activities** (again in line with activity 1): support for specific educational activities. Only for the Prešov region: secondary schools, towns and villages, companies, and organizations (for target groups in the Prešov region). Objective: specific educational objectives through structured educational activities (lectures, courses, seminars).
3. **Building and development of charging infrastructure**: According to the draft of the new Building Act, it is possible that builders of new apartment buildings will be obliged to build a specific number of charging points for electric cars. The restriction applies only to the territory of the region. Objective: development of charging infrastructure.
4. **Systems for management and organization in e-mobility** (sharing of e-bikes, cars, charging stations, booking of charging stations and parking): In essence, ICT and organizational system solutions. Primarily for companies and organizations. Objective: effective management and organization of e-mobility.
5. **E-vehicle sharing**: Specific systems for the public or for the internal environment of companies and organizations. Commercial and non-commercial. Primary for municipal and city governments, secondary for companies and organizations. Objective: to promote environmentally sustainable passenger transport. Focus on e-bikes, e-cars, other e-vehicles (scooters, etc.).

6. **Rental of e-vehicles** (longer-term for small suppliers of goods to shops): Primarily for use in the region. Objective: to promote environmentally sustainable transport.
7. **Purchase or long-term lease** for organizations with partially or fully managed by local governments in the region: schools, kindergartens, others. Objective: to promote environmentally sustainable transport.
8. **Purchase or long-term lease for entrepreneurs**: Suppliers of goods to shops and facilities in city centers. Primarily for use in the region. Objective: to promote environmentally sustainable transport.
9. **Aid in the form of exemptions from city/local taxes and fees**: Primarily for use in the region. Objective: to promote environmentally sustainable transport.
10. **Support for "green taxis"—e-vehicles**: Primarily for use in the region. Objective: to promote environmentally sustainable transport.
11. **Financial or non-financial support for the purchase of a personal electric car for private individuals**: Only for fully electric passenger cars suitable for traffic on the road network in the Slovak Republic. Objective: to promote environmentally sustainable passenger transport.

5.7. Action Plan Activities—Activity 4: Electric Public Transport and E-Vehicle Sharing (Concept)

An attractive possibility of using electromobility for the self-governing region is the purchase and operation of electric vehicles primarily in urban, and secondarily in suburban or interurban passenger transport. It is a financially demanding solution. The vision of the municipality could be to operate ecological and sustainable public transport. Its fulfillment could be a gradual change of vehicle fleets in favor of electric vehicles. These facts must be taken into account:

- it is necessary to build sufficient charging infrastructure with a view to the needs of the future;
- ensure the operation of electricity from renewable sources as far as possible;
- deploy electric buses on routes due to their range;
- use potential modern technologies (fast charging at stops, charging belts in reserved lanes, etc.).

On the basis of the concepts of e-mobility sharing (e-bikes, e-car) in practical deployment, as well as potential opportunities and trends, we can provide the following information:

What needs to be included in the solution:

- to have more vehicles available, a network of sites set up in suitable locations (transport hubs, gatherings of people and businesses, etc.);
- to develop and implement a vehicle reservation model (mail, smartphone), which will allow one to reserve a vehicle in advance at a designated location;
- to ensure the possibility of booking for any period of time;
- technically master the self-service system of customers to the vehicle (reading card, radio-frequency identification RFID, mobile application).

Advantages of e-vehicle sharing:

- higher environmental friendliness than in the case of car ownership (there are newer, faster changes);
- savings on operating and procurement costs—the costs are shared by more people and thus there is less downtime, as they are newer;
- fewer cars in the city and thus less need for parking spaces;
- the possibility to use different vehicles for different uses (car, bicycle);
- accident and statutory insurance, energy, maintenance is included in the price (transparency and overview of costs);
- many people in cities will not need to own cars (future horizon).

General prerequisites for planning and implementing shared e-solutions:

- Operation—the company that will own the vehicles in question will take care of maintenance, reservation system, and billing of services;

- It is necessary to decide on the ownership shares of the whole system. Whether it is private activities permitted and approved by the local government or activities in co-ownership (partnership) or sole ownership of local governments;
- Critical circles for decision-making and system planning—organization of the network system (infrastructure), charging stations, public parking spaces, contractual security of suppliers (management system, charging stations, various forms of payments, subscriptions, contractual security—charging, maintenance), relocation of vehicles to places where future needs are expected (if they are more remote);
- Clients of a natural or legal person. Primarily physical. Legal with various prepaid options;
- Main partners—local government, public administration, manufacturers and carriers;
- ICT support is needed. Web and applications that allow the use of the system: search for free vehicles and their reservation, forms of payment, service provision, etc.;
- Support for "Uber"-type activities with e-vehicles is appropriate and beneficial.
- Additional prerequisites for e-vehicle sharing:
- Increasing the efficiency and development of energy management technologies together with the development of e-vehicles;
- Significant improvement of batteries and associated operating costs, extension of their life cycle, and reduction of price;
- Raising public awareness and having sufficient relevant information.

5.8. Action Plan Activities—Activity 5: Public E-Transport for Specific Protected Landscape Areas in Prešov Region

Proposals for measures to mitigate the adverse effects of transport—in its further development, it will be necessary to respect regulations and guidelines as NATURA 2000. Protected monuments and archaeological sites and so on. In order to mitigate the adverse effects of transport on nature and the landscape, we must design an optimal transport service with regard to its further development and use in protected and culturally important localities:

In addition to passenger cars, the use of electric propulsion is also very suitable for public transport because it is very suitable from an ecological point of view and impact on environmental protection:

- A bus (minibus) carries more than one passenger at a time. Hybrid propulsion, or purely electric propulsion, must have adequate power, but there are no such negative effects on protected areas (areas of European importance, Natura 2000), national parks, protected landscape areas, protected water management areas, etc.
- The intensity of conventional bus transport contributes to the pollution and spending of non-renewable resources. The electric drive is a clear and suitable solution in this sense.
- For protected areas in the region, it is possible to use only electric vehicles in terms of public transport. For areas and routes that use fewer passengers, these may be minibuses.
- Electric buses can run more often. The environmental load on the environment is minimized by electric drive.
- Areas with a high degree of protection may only be accessible to electric vehicles (in terms of public and individual transport.
- The prerequisites of this proposal include:
- choosing and purchasing suitable vehicles according to current needs with a strategic future outlook (future needs, changes)—currently hybrid and electric vehicles, for example;
- building remote parking lots for internal combustion engines, whether they are passenger cars, buses, or minibuses;
- remote parking lots should feature charging stations for all types of electric vehicles;

- provide (rent) suitable environmentally friendly means of transport for groups of persons and individuals (electric minibuses, electric passenger cars, electric bicycles, etc.) from the remote parking lots where combustion engines vehicles are parked;
- a system of checks to ensure that both the nature protection rules and the rules on the use of electrical means of transport that minimize negative impacts on nature are respected.

5.9. Results from Prešov, Slovakia: Integration of E-Mobility Criteria in iROP Projects, Incentives, Incorporation of E-Mob in General Transport Plan

The internal strategy of the iROP (integrated Regional Operation Program) is based on the development of regional competitiveness with complementary support of four competitive areas within Slovak regions: infrastructure, accessible and efficient public services, business and job creation, and local communities in towns and villages. The Regional Integrated Territorial Strategy (RIUS) is an implementation tool of the iROP, and its ambition is to channel investment priorities (IP) in specific areas that have the highest potential for development of a priority and become the engine for further growth. In PROMETEUS, the focus of Prešov lies on the role of e-mobility in Priority axis 1 (Safe and environmentally friendly transport in regions), IP 1.1 (Enhancing regional mobility through connecting secondary and tertiary nodes to TEN-T infrastructure (TEN-T is official name of the Programme established by the European Commission), including multimodal nodes). In particular, specific objective 1.1 will be attained by the development of local/regional sustainable mobility plans (SMP), as the precondition for all the following proposed interventions in the transport system. The SMP will be the basic tool to guarantee a balanced development of the transport system. Prešov believes that that e-mobility should be integrated into this framework by supporting its promotion within the RIUS measures. Although e-mobility is not directly supported by any legally binding document in Slovakia, a variety of strategies and plans are on the rise and it is important to incorporate them into existing Operational Programmes. The improvement of the policy instrument will be carried out by implementation of new projects. The Slovak partner have announced that the Action Plan has been submitted and approved by the regional authorities in Prešov, and it has been integrated in the Sustainability Mobility Plan financed by the iROP. Activities are from November 2020 completed/in progress or suspended as follows:

- **Action 1:** "Popularizing and raising awareness of the phenomenon of electromobility and related trends in the Prešov region" was completed, except for the one of expected dissemination event, which was canceled due to measures related to the COVID-19 pandemic.
- **Action 2**: "Reservation of parking spaces by zones" is currently suspended as this activity strongly depends on municipal decisions and the completion of electric infrastructure.
- **Action 3**: "Creating a regional subsidy microgrant scheme to promote e-mobility" is currently in the implementation stage, as the launch of the subsidy scheme is expected within the call of the president of the Prešov Region.
- **Action 4**: "e-vehicle sharing (concept)" has seen the implementation of a e-bike-sharing system in Poprad, followed by the Municipality of Prešov, which approved support for the operation of electric scooters at the beginning of 2020.
- **Action 5**: "Public e-transport in specific protected landscape areas of Prešov region" has been integrated in the Sustainable Mobility Plan, although activity is currently paused.

6. Challenges and Limitations of the Researched Topic

Before summarizing the main findings, we consider it necessary to comment on the main challenges and limitations of the researched topic. The challenges are as follows:

6.1. Power Grid Potential Issues

All of our main recommendations considering electromobility are connected with the recent stage of the power grid. This is a potential issue, and it is a real limitation of electromobility progress. On the basis of these studies [58–61], we conclude following limitations and partial solutions as the most significant ones:

a) Electromobility will place increased demands on the power grid.
b) Uncontrolled charging of an increasing number of electric vehicles may result in (1) increasing the maximum load on the power grid, (2) power grid overload, and (3) reduced quality of electricity supply.
c) Charging should be managed by integrated power distribution and management. Uncontrolled charging needs to be switched to integrated electricity distribution and power management. With the increased number of electric vehicles, it is essential to (1) gradually improve the quality of the entire infrastructure (power distribution network, electricity production), (2) introduce electricity storage technology into the infrastructure, (3) support renewable electricity sources at the expense of non-renewables.
d) The ideal solution would be the public recharging infrastructure using renewable sources (100%). Charging stations in family houses and apartment buildings should also use 100% renewable energy.
e) It is currently possible to envisage the future solutions using the so-called smart technology solutions. These should, through machine learning, properly manage recharging of back-up battery clusters so as not to create unforeseen electricity infrastructure requirements. They can be used to manage the entire infrastructure as well as to manage home charging infrastructure.

6.2. Other Major Issues

Other major issues connected with electromobility [8,62–64] are as follows:

- Batteries production and batteries disposal procedures are "highly unecological". The main challenges for the future connected with batteries involve the continual increasing of battery lifespan and recycling "100%" of waste batteries. Lithium batteries used in electric vehicles are usually designed with a lifespan of approximately 10 years. During the first 5 years, there is a significant decrease in their capacity, however, even after 10 years, the battery is still usable in some way, especially in the stationary areas with a lower number of charging cycles. Experiments show that batteries that are no longer suitable for use in electric vehicles will find application as balancing sources of temporarily stored electricity produced, for example, from the sun or wind. They can serve this use for a longer time and, in addition, companies are emerging that are developing new technological procedures for the more ecological disposal of batteries.
- Production of electricity from non-renewable sources. This is, from a long-term perspective, a very unsustainable problem. Continuous switch toward renewable sources is crucial for reaching a sustainable solution. There is also a dispute about nuclear power plants, mainly considering safety as a number one issue. Some EU countries are quite strictly against the usage of nuclear energy, e.g., Austria. Other countries such as Slovakia produce most of their electricity from nuclear power.
- Limitations of Evs in comparison with standard combustion engines: (a) range of Evs is still quite limited; (b) the same goes for charging of Evs, which takes more time; (c) lastly, prices of Evs are still considerably higher.
- Higher usage and availability of public transport. More efficient and effective public transport is a more ecological and sustainable solution in comparison with individual transport (even with Evs). Especially in rail transport, electric traction is very important. For city or intercity buses, electromobility is a potential trend. We add to the topic that the safety of public transport is another very important challenge with regards to the current COVID-19 pandemic situation. In cities and concentrated urban areas lies this issue, which is closely bound with emissions. Emissions in these areas

are more concentrated and are thus more harmful. If the combustion engine is warm and operates in optimal operating parameters, it has lower consumption. However, the emissions are still more concentrated. Electromobility is a partial solution for this issue. Public transport with low emissions, electric public transport, or systems based on maglev are nowadays the best solutions for urban concentrated areas. The greatest challenges here are represented by higher costs of these modern solutions and of course the willingness of local representatives towards higher investments.

- The activities within the project have shown us that it is necessary to carry out a relatively large number of information campaigns. Their goal is to explain the benefits of sustainable transport. We consider young people of productive age, young adults, and teenagers to be very important target groups. Their decision-making will have a major impact on the near future. Moreover, through school education, they are in most cases aware that ecology and sustainability are critical global issues. Furthermore, on the basis of our experience within the project, we assume that they will be much more sensitive to the perception of the provided information. It is also necessary to emphasize the use of appropriate content and form (according to age, education, etc.). Of course, these information campaigns should target younger parents as well. To raise overall awareness about the topic is a crucial issue.

6.3. Limitations

The first and most significant limitation of this work is that we only focused on specific countries and regions, namely, on those which were participating on the project PROMETEUS, with a particular focus on the region of Prešov. We tried to overcome this limitation thorough analysis of the EU strategic documents, case studies, and scientific papers from a worldwide perspective. However, our findings and propositions are valid in regions and countries of the main interest of the project. For usage in other countries or regions, our findings must be adapted and specified by further analysis. From our point of view, this is a valuable knowledge base. From the methodological point of view, we focused mainly on document analysis, expert interviews, discussions, and expert evaluations. This can be considered as a limitation—we could have used several other research and analytical methods, such as big data and neural networks. Decision about methodology was a compromise about reaching project goals and gaining analytical knowledge. From our point of view, it was the best decision in terms of practical Action Plan prioritization. Dynamic of the topic could also be considered as a kind of limitation. In every EU country and even in different regions, the situations considering electromobility are different in terms of the level of infrastructure, the main issues and needs, funding and support opportunities, etc. Moreover, the level of understating about the topic is also different. Politicians and regional authorities sometimes have different point view, and they may prefer to focus on different issues. More importantly, they may not perceive the vision of electromobility as a crucial part of sustainable development in the same way. All these limitations have influenced our results. Our view is that this is not a negative. We analyzed and work with dynamic social systems. We considered limitations as a natural part of scientific and expert work with these kinds of systems.

7. Conclusions

The impact of the international economic and financial crisis has manifested itself in macroeconomic variables, such as the reduction in the number of active companies and labor market opportunities. There is still a lack of innovation and there is still a need to strengthen competitiveness, improve training for innovation in sectors that can lead to state transformation, and increase creative potential throughout society. International competition for sustainable mobility requires high levels of efficiency in production processes and distribution and thus lower resource consumption. Regulatory requirements draw attention to lower emissions, thus reducing the weight of vehicles. An alternative to this issue is the sustainable mobility sector, which requires the support and dissemination of

the idea, starting with public administrations and businesses that lead by example. Projects such as PROMETEUS are necessary to raise public awareness within EU countries. We conclude that we have learnt that electromobility is in fact a strong tool for support the sustainable traffic solutions. There are a lot of positives and negatives, or pros and cons. The most important positive is lowering of CO_2 emissions. Negatives can be seen as problems that can be solved, e.g., charging infrastructure could be developed very effectively with strong cooperation of regional governments and private companies. Higher pricing of electric vehicles could be solved by government and/or EU support mechanisms. Issues considering the electricity grid could be solved by strict expert planning and focused strategic investments, etc. The negatives are still very serious. It will take a large amount of time and effort to overcome them. What we see as the biggest challenge is the change of peoples' mindset. Information campaigns are very important in order to provide correct information in attractive form. Every country and every region has slightly different problems and priorities. Therefore, an analytical and critical approach is essential in every further step, and the focus on the region of Prešov shows this methodological and behavioral process having taken place. It is necessary to identify very precisely these problems and people's opinions about the topic. This is the crucial background for qualified decision-making processes.

As academics, we are often confronted in our work with a considerable asymmetry between the expended effort and the results of our efforts. This asymmetry is two-sided—if the declared goal is too high and the effort insufficient, it is a more acceptable scenario, as in most cases it does not lead to frustration. However, the second of the scenarios is more common, where the effort is above average, and the goal is reasonably ambitious, but in the application phase it is reduced to a state where the results of the effort are explicitly marginalized. In terms of pointing out the contribution of the study we present to the further development of science, we, in our opinion, find ourselves in the third scenario. This is a scenario where the efforts synergistically multiplied by the multidisciplinary profiling of participating collaborators benefit from both human potential and the support of a consortium represented by the EU regions. Participating regions are (by their nature of the presented project) mandated to apply the knowledge generated in the project implementation process directly to life through the creation of effective and innovative policy instrument. For the development of science, it is necessary to point out as many positive examples of the transformation of knowledge into innovation as possible. Institutions were represented within the consortium, each of which in its own way and uniqueness in the form of approaches but also competencies contributed to the generation of synergies. The rational approach resulting from empiricism and current market needs has been balanced by a scientific approach in the form of discovering knowledge through a wide range of analytical tools. Learning by example; field visits; analysis of examples of good practice; in-depth discussions; expert commissions; round tables; meetings with stakeholders from both politicians and businesspeople; and, last but not least, basic research of hundreds of documents in the form of development plans and strategies has created, on the supply side, a considerable concentration of knowledge. At this moment (from the point of view of the project, this is the moment of the completion of phase 1 of its implementation), in our opinion, a positive asymmetry has arisen. The most important contribution to the development of science is therefore to point out the fact that even in today's time of limited resources in all their forms, it is possible to generate positive asymmetries through the synergy of effective cooperation, wherein efforts are multiplied at several points by the diversity of stakeholders' approaches and priorities, and the product of these efforts is further transformed into effective policy instruments that have the ambition to contribute to one of the European Union's main priorities—cohesion across its regions. The contribution of the project is all the more fundamental because, from the point of view of its main topic, the project aims at one of the main challenges of the coming decades, namely, the transition to low-carbon forms of transport. By pointing out the clear links between efforts and the direct application of the results of scientific research, we believe it is essential to stimulate academics' aspirations, specifically academics focusing on sustainable development, as

well as to highlight the opportunities that effective multidisciplinary collaboration between academics and practitioners can generate.

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