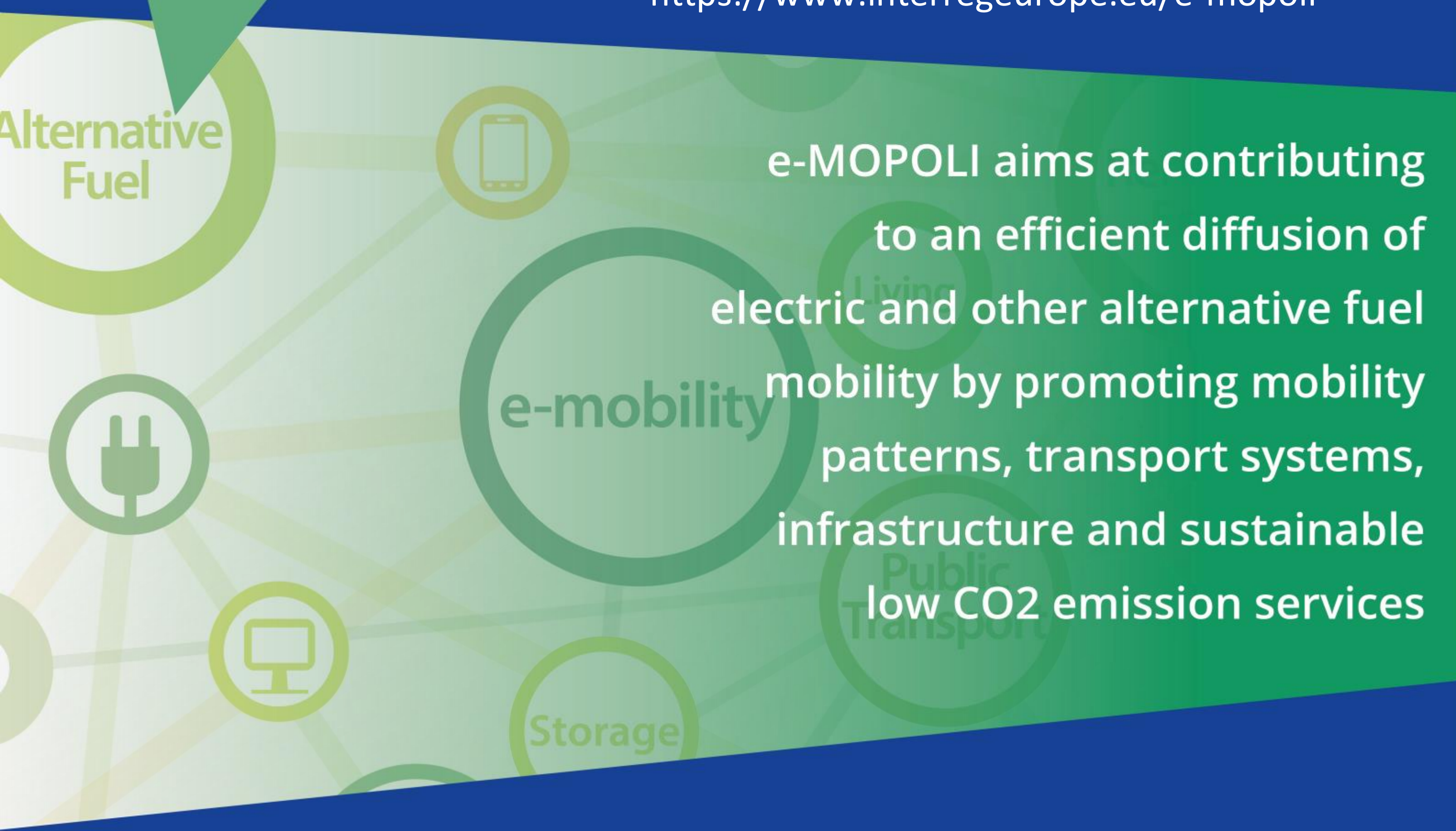
e-MOPOLI
Interreg Europe

European Union
European Regional Development Fund

https://www.interregeurope.eu/e-mopoli



e-MOPOLI aims at contributing to an efficient diffusion of electric and other alternative fuel mobility by promoting mobility patterns, transport systems, infrastructure and sustainable low CO2 emission services

e-MOPOLI Regional Context Analysis

Responsible partner
Region of Flanders – department Environment

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Project partners

Zemgale Planning Region
Regione Calabria
Kainuun liitto
Provincia di Brescia
Hellenic Republic Region of Attica
Rogaland County Council
BSC Poslovno podporni center Kranj Regionalna razvojna agencija Gorenjske
Flanders State of the Art
ADR Agenția pentru Dezvoltare Regională București-Ilfov

Low-carbon economy

1. Inhoud

1. Executive summary

This report presents a regional context analysis of the 9 participating European regions of the e-MOPOLI project, Province of Brescia, Calabria Region, Regional Development Agency of Gorenjska, Region of Attica, Flemish government Department Environment, Regional Council of Kainuu, Rogaland County Council, Bucharest-Ilfov Regional Development Agency and Zemgale Planning Region. The aim of this report is to compare and examine factors influencing adoption of alternative fuel technologies in the respective regions of the project partners and to provide an overview for governments regarding the suitability of good practices with respect to the regional territorial context.

Two categories of factors are distinguished: market-related factors and individual-related factors. The first category consists of barriers that limit and incentives that stimulate the adoption of the new alternative fuel technologies. We distinguish product-related barriers, such as charging time, driving range and purchase costs, but also external barriers such as availability of charging infrastructure and fuel costs. Financial and non-financial policy measures are already implemented as incentives, but also the roll-out of charging infrastructure and the raising awareness are useful policies. Individual-related factors involve the individual's attitude and behaviour, where environmental concern, openness to innovation and symbolic meaning of products play a role, but also socio-demographic characteristics, such as age, education and income.

To analyse the regional context with respect to alternative fuel technology adoption, we collected data on indicators proven to show correlation with adoption of alternative fuel technologies, categorised according to the following five topics: natural, physical and geographic characteristics; demographic data; economic indicators; energy indicators and mobility indicators. Then a descriptive cross-regional analysis allowed to identify those properties that make a region unique and that form relevant indicators for effectiveness of past or future policy instruments. For each indicator the values of all the regions are grouped through natural classification, distinguishing minimum, maximum and mean values. Data for all regions was also benchmarked with the European average.

An overview of the regional results given and the regions' performance in comparison to the other regions is discussed. Four groups of partners can be distinguished based on current state and suitability for alternative fuel technologies. A first group only consists of Rogaland, scoring highest on economic, energy and current state indicators. Rogaland has the highest Gross Regional Product per capita, average income, lowest electricity price, highest level of renewable energy and highest amount of electric vehicles. A second group consists of Brescia and Flanders, differentiating themselves from the other groups on economic and mobility indicators. They have the largest populations, Gross Regional Products, total amount of vehicles, available public charging infrastructure and after Rogaland, the most electric cars. Flanders however, has the lowest percentage of renewable energy and highest electricity prices of all the project regions. A third group consists of Attica and Bucaresti. This group can be characterized by the higher level of market penetration of electric vehicles with respect to the fourth group. A fourth group consists of Calabria, Gorenjska, Kainuu and Zemgale. Here we find the lowest population, Gross Regional Products, total amount of vehicles, vehicles per household and electric vehicles in the region.

Based on the Regional Context Analysis and the Sourcebook of Good practices, regions will be able to optimize their local action plans, that will then be implemented and monitored. Regions are advised to further invest in qualitative data collection to improve the quality of future research.

2. Introduction

In 2016, the European transport sector is responsible for 28,26% of the total CO_2 emissions, of which 95% comes from road transport or 26,79% of the total CO_2 emissions (International Energy Agency, 2018a). In the scope of an Interreg Europe project, e-MOPOLI, 9 European regions (Province of Brescia, Calabria Region, Regional Development Agency of Gorenjska, Region of Attica, Flemish government Department Environment, Regional Council of Kainuu, Rogaland County Council, Bucharest-Ilfov Regional Development Agency and Zemgale Planning Region) aim to contribute to an efficient diffusion of e-mobility and alternative fuels mobility.

Adoption of new technologies, however, is often characterized by internal and external barriers limiting government policies trying to overcome these barriers (Coffman, Bernstein, & Wee, 2017). Furthermore, there are psychological and socio-demographic factors playing a role on the individual level of the consumer (Rezvani, Jansson, & Bodin, 2015). The aim of this paper is to compare and examine these factors influencing adoption of alternative fuel technologies in the respective regions of the project partners and to provide an overview for governments regarding the suitability of good practices with respect to the regional territorial context.

The remainder of this paper is structured in nine chapters. Chapter 2 describes the EU-framework of Interreg and the specific e-MOPOLI project, for which this document is a deliverable. In chapter 3, relevance and current state of e-mobility and factors influencing consumers behaviour on adoption of alternative fuel technologies will be discussed. Based on the insights derived from chapter 4 and availability of data, indicators were selected. Chapter 4 elaborates on the methodology used to collect the information on these indicators and provides clarification on how the indicators will be analysed. Chapter 5 and 6 contain a representation of the collected data for the European benchmark (chapter 5) and the project partner regions (chapter 6). In chapter 7, a cross regional analysis can be found to clarify the differences between regions and offer deeper insights into the current state and potential future success. The conclusion of this analysis can be found in chapter 8, followed by the references in chapter 9 and an appendix with an overview of the survey questions (see methodology) in chapter 10.

3. The Interreg framework and e-MOPOLI project

To situate this paper with respect to the project for which it is a deliverable, first the framework of Interreg is described and next the project itself is presented.

3.1 Interreg

Interreg Europe is a European programme funded by the European Reginal Development Fund to stimulate corporation between regional and local authorities across Europe. To achieve this goal, Interreg financially supports interregional projects executed in collaboration with other policy organizations based in Europe. Regions commit to work together for three to five years on a common interest and produce an action plan, set up a stakeholder group and participate in the Interreg Europe Policy Learning Platform (https://www.interregeurope.eu/policylearning/). Afterwards, progress of the implementation of the action plan is monitored.

In order to make best use of the limited financial recourses -funded by the European Regional Development Fund-available, four topics were selected:

- Research and innovation
- Small and Medium-sized Enterprises competitiveness
- Environment & resource efficiency
- Low-carbon economy

Since 2014, four project calls have been held, accumulating 876 project applications. In 2018, 258 were selected ("Interreg Europe," n.d.).

Fig.1 Interreg, fact and figures, approved projects 2018 ("Interreg Europe," n.d.).

3.2 e-MOPOLI

As written in the project proposal, several Structural Fund programmes include specific priorities on innovative mobility patterns and transport systems based on lower or zero CO2 emissions. Alternative fuels and e-mobility represent an excellent opportunity to reduce the carbon footprint of economic activities in urban and extra-urban areas. e-MOPOLI aims to contribute to an efficient diffusion of e-mobility and alternative fuels mobility with improvement of 9 regional policy instruments, namely in Italy (2 regions), Slovenia, Greece, Belgium, Finland, Norway, Romania and Latvia; 6 of which directly linked to Structural Funds.

Fig.2 Picture of the project partners.

There are 9 project partners: Province of Brescia, Calabria Region, Regional Development Agency of Gorenjska, Region of Attica, Flemish government Department Environment, Regional Council of Kainuu, Rogaland County Council, Bucharest-Ilfov Regional Developmebt Agency and Zemgale Planning Region.

These project partners commit to concentrate on several main working areas:

- charging and tolling policies in favour of e-vehicles;
- development of charging infrastructure powered by alternative sources;
- integration of charging infrastructure and charging hubs in spatial planning, deployment and purchase of alternative fuel vehicles in public transport;
- promotion of e-mobility in niche market fleets.

The policy instruments selected by the 9 partners will be improved mainly through new projects and enhanced governance. The regional and interregional learning process will actively involve the project partners, their institutions and their stakeholders groups. The project, in order to effectively reach its goal, will be soundly structured on following steps:

- e-MOPOLI methodology;
- partners' local and regional territorial context analysis;
- good practices selected for exchange of experience and transfer of lesson learnt;
- 9 regional action plans;
- monitoring of 9 Action Plans through e-MOPOLI webtool;
- e-MOPOLI recommendations on business, governance and RIS3 level for regional and local authorities.

Besides reaching e-MOPOLI outputs and results, the partnership will transfer them to a wider audience, through carefully planned communication activities, which will include regional and interregional events such as conferences, workshops, dissemination events, a policy learning platform and programme events.

4. Literature Review

In the context of facing the sustainable mobility issues, a possible solution to reduce emissions is the introduction of alternative fuel vehicles. These vehicles are often more energy efficient than conventional cars and account for lower CO2 emission if the energy is generated from renewable energy sources. However, due to the limited economization of these technologies, the market has found itself trapped in a chicken-egg-problem between consumers and charging infrastructure suppliers (Gnann & Plötz, 2015). In the next sections, the current state and relevance of these new technologies will be discussed as well as the different factors influencing how consumers make the transition (Messagie, 2017).

In table 1 (see below) the different factors and their found associations with e-mobility adoption are listed. Where possible, quantitative information for these factors was gathered for each of the project partners in order to study the regional territorial context with respect to the current regional e-mobility adoption.

4.1 E-mobility in Europe: relevance and current state

In 2016, the European transport sector is responsible for 28,49% of the total CO2 emissions, of which 95% comes from road transport or 27,17% of the total CO2 emissions (International Energy Agency, 2018a). Decarbonising the transport sector is central to achieving the Paris Agreement temperature objectives and Europe's long term strategy in achieving a climate-neutral economy by 2050.

The electrification of passenger cars is perceived as key asset for reaching the imposed targets. In 2017, global sales of electric cars exceeded 1 million units for the first time, accounting for an accumulated stock of over 3 million vehicles (International Energy Agency, 2018b).

In Europe, sales accounted for more than 200 thousand electric vehicles that year, resulting in a total stock of more than 650 thousand units. In 2018 this number has increased till approximately 970 thousand (European Alternative Fuels Observatory, 2019). Closely linked to the increasing number of electric vehicles is the growth of charging infrastructure. Worldwide, the number of private chargers is estimated at almost 3 million, accumulated with another 430 thousand publicly accessible chargers (International Energy Agency, 2018b). In Europe today, there are around 23 thousand fast chargers and 128 thousand slow chargers deployed ("Alternative fuels (electricity) charging infra stats | EAFO," n.d.). Because electric vehicles are still expensive, because charging infrastructure allowing long distance travel (fast chargers) is still inadequate in some regions and because the availability of popular models in the market is poor, sales are mainly driven by governmental incentives (See 3.1 Factors influencing adoption and purchase intention for more information on barriers). However, price parity is assumed to be achieved for a battery electric vehicle and a comparable internal combustion engine vehicle in the period 2022-2026. The combination of increased availability, price competitiveness and sufficient charging infrastructure, might possibly move the adoption of battery electric vehicles over to the fast lane (Witkamp, van Gijlswijk, Bolech, Coosemans, & Hooftman, 2017).

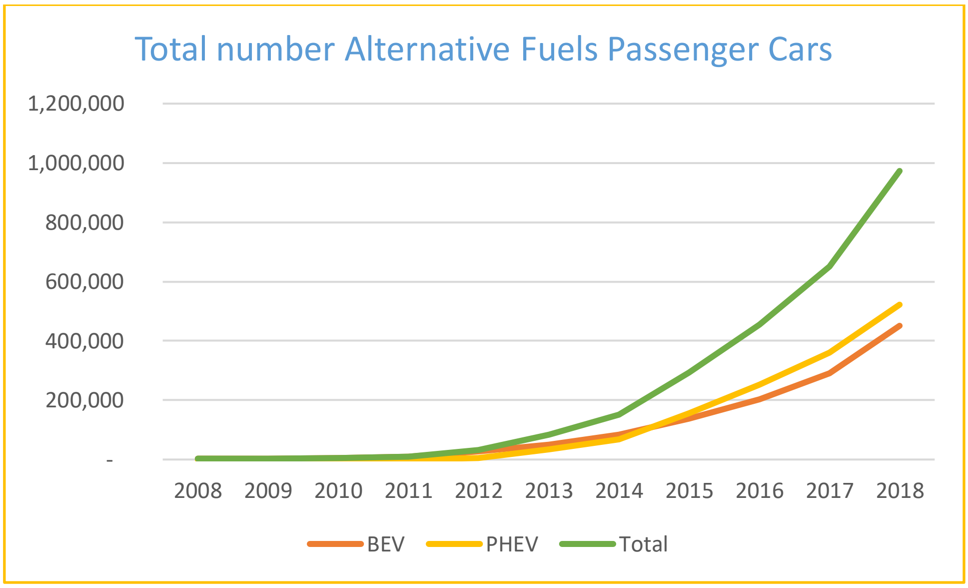


Fig.3 Total number of Alternative Fuels Passenger Cars in Europe (Source EAFO).

To achieve a 100% Zero Emission Vehicle fleet by 2050, Witkamp et al. (2017) computed that all new car sales should be Zero Emission Vehicles by 2035. This is a considerably faster introduction of Zero Emission Vehicles than current policies will achieve. Only the Netherlands and Norway are planning to ban the sale of cars solely using internal combustion engines by 2030 and 2025 and France and the United Kingdom have set similar targets by 2040 (Witkamp et al., 2017).

4.2 Factors influencing adoption and purchase intention

When discussing the adoption of a new technology, two main groups of factors are distinguished within literature: market-related factors and individual-related factors.

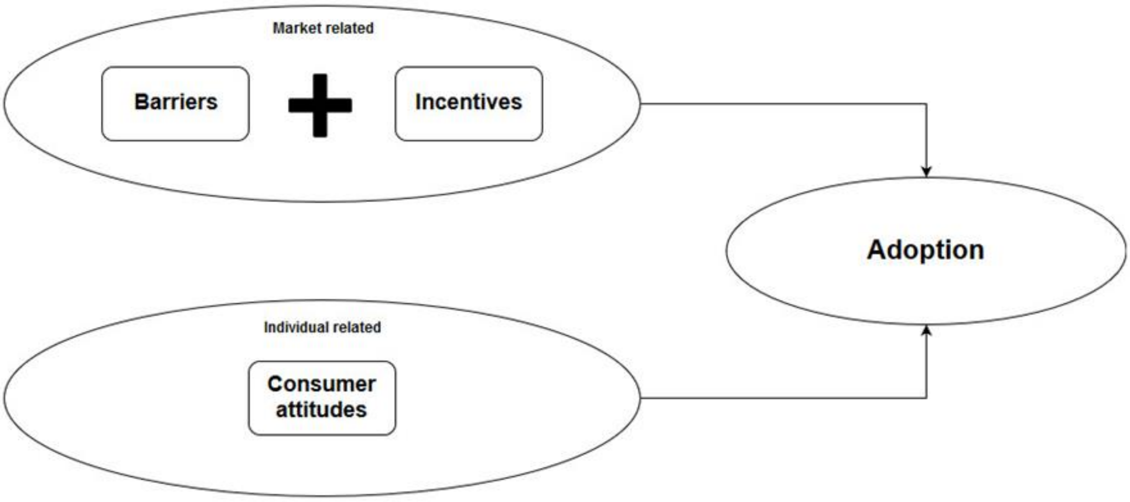


Fig.4 Conceptual framework Adoption.

4.2.1 Market-related factors

Literature describing these market-related factors can be summarized as barriers that limit the development and adoption of new technologies and the incentives taken by governments trying to overcome these barriers.

Sierzchula, Bakker, Maat, and Van Wee (2014) characterize the adoption of an innovative technology as limited by general barriers, including knowledge spill-over and bounded rationality. Positive knowledge spill-over occurs when innovations provide valuable information to non-consumers and can thus lead to underinvestment in research and development of new technologies, because an innovation's public benefit often outweighs it's private value to the company. (Sierzchula et al., 2014). Consumers are faced with bounded rationality when making a decision due to limited and often unreliable information availability and their capacity to evaluate this information. Additionally, eco-innovations are specifically disincentivized because benefits from lower pollution levels are difficult to quantify and hard to include in a product's price (Sierzchula et al., 2014).

Another category of barriers limiting adoption of a new technology are product-specific. Coffman, Bernstein, and Wee (2017) group literature in factors internal to the technology and factors external to the technology. Internal factors, first, include purchase cost, driving range and charging time. Many studies have demonstrated the significant negative influence of the high upfront purchase cost on the adoption of alternative fuel vehicles (Carley, Krause, Lane, & Graham, 2013; Hackbarth & Madlener, 2013; Jensen, Cherchi, & Mabit, 2013; Lebeau, Van Mierlo, Lebeau, Mairesse, & Macharis, 2012; Tanaka, Ida, Murakami, & Friedman, 2014; Tran, Banister, Bishop, & McCulloch, 2013). In electric vehicles this is mainly caused by the high battery cost, though these are subject to a rapid cost decline (Berckmans et al., 2017; Nykvist & Nilsson, 2015). Secondly, driving range is often seen as one of the major barriers and has a significant positive effect on adoption (Dimitropoulos, Rietveld, & van Ommeren, 2013; Egbue & Long, 2012; Helveston et al., 2015; Hess, Fowler, Adler, & Bahreinian, 2012; Hidrue, Parsons, Kempton, & Gardner, 2011; Hoen & Koetse, 2014). Coffman et al. (2017) suggest in their paper that range anxiety is better addressed through enabling access to charging infrastructure, rather than extending the vehicles range. Lastly, charging time has been found to be a significant indicator for adoption as well (Carley et al., 2013; Hackbarth & Madlener, 2013; Hidrue et al., 2011; Hoen & Koetse, 2014). To overcome this barrier the availability of a sufficient amount of fast charging infrastructure is important.

External factors, second, include fuel prices and the availability of charging stations (Coffman et al., 2017). These factors are related to the environment where decisions are being taken. Fuel prices are closely linked to ownership costs and are often used as an indicator for operational costs (Al-Alawi & Bradley, 2013; Wu, Inderbitzin, & Bening, 2015). Higher gasoline and diesel prices increase potential cost savings for alternative fuel vehicles and thus have a positive effect on adoption (Hackbarth & Madlener, 2013; Helveston et al., 2015; Hess et al., 2012; Lebeau et al., 2012; Tanaka et al., 2014). Additionally, the presence of a sufficient amount of charging infrastructure is important to meet consumers driving needs and has been proven to be a crucial and highly significant factor in consumers adoption behaviour (Carley et al., 2013; Egbue & Long, 2012; Hackbarth & Madlener, 2013; Hess et al., 2012; Jensen et al., 2013; Sierzchula et al., 2014; Tanaka et al., 2014; Tran et al., 2013). Furthermore, the increased visibility of the charging infrastructure may cause a higher state of awareness and trust in the new technology.

A second group of market-related factors are government incentives, taken to overcome the earlier discussed barriers. Coffman et al. (2017) grouped these policy mechanisms into three key categories: financial and non-financial incentives, supporting charging infrastructure and raising awareness. The effectiveness of the policy instruments is defined by whether the policy leads to market uptake beyond what would have occurred without the intervention (Coffman et al., 2017).

Financial and non-financial incentives, first, are probably the most common and most discussed category of policy mechanisms. They include tax incentives -exemptions as well as punitive- and purchase subsidies on the financial side and access to high occupancy vehicles lanes, free or preferred parking on the non-financial side. Most papers seem to confirm the effectiveness of financial incentives (Glerum, Stankovikj, Thémans, & Bierlaire, 2014; Hess et al., 2012; Langbroek, Franklin, & Susilo, 2016; Sierzchula et al., 2014), though mixed results have been published regarding non-financial incentives (Hackbarth & Madlener, 2013; Hess et al., 2012; Hoen & Koetse, 2014; Langbroek et al., 2016; Mersky, Sprei, Samaras, & Qian, 2016). As it was already identified as an important barrier, Mersky, Sprei, Samaras, and Qian (2016) identified a supporting charging infrastructure incentive, second, as the greatest predictor for market uptake. It was, however, unclear whether the uptake was purely due to the incentive effect of the charging stations or if the charging stations were built in response to local demand. Third, consumers are often not sufficiently informed, or misinformed (Browne, O'Mahony, & Caulfield, 2012; Krause, Carley, Lane, & Graham, 2013; Zhang, Yu, & Zou, 2011). Governments can provide information to raise awareness and make consumers more familiar with the technology (Bakker & Trip, 2013).

4.2.2. Individual-related factors

A second category of literature describes the individual-related factors influencing adoption. In most papers it is assumed that the adoption of alternative fuel vehicles is a rational behaviour and therefore attitudes towards the new technology are measured. Rezvani, Jansson, & Bodin (2015) describe in their work four other behavioural frameworks explaining consumers intention: 'normative theories and environmental attitudes', 'symbols, self-identity and lifestyle', 'diffusion of innovations and consumer innovativeness' and 'consumer emotions'. Another common approach to tackle individual-related factors is examining the influence of the consumers socio-demographic profile on adoption.

Environmental concern is probably one of the most common researched psychological attributes and has been found to show a positive correlation with the adoption alternative fuel vehicles. However, it is often indicated that, though environmental belief has a positive influence on adoption, ownership costs and performance of the vehicles have a much stronger impact on this process (Carley et al., 2013; Graham-Rowe et al., 2011; Hidrue et al., 2011; Jensen et al., 2013; Moons & de Pelsmacker, 2012). The symbolic meaning of products in relationship with self-identity and the purchase of products has been described in adoption literature as well (Rezvani et al., 2015). People whom attach high symbolic value to their car and perceive an alternative fuel vehicle as a symbol of high class status tend to be more receptive for adoption (Graham-Rowe et al., 2011; Helveston et al., 2015; Moons & de Pelsmacker, 2012). A third psychological attribute often mentioned in adoption literature is consumers' openness to innovative technologies and the uncertainty that comes with it (Rezvani et al., 2015). Adopters of alternative fuel technologies tend to engage more in a technology-oriented lifestyle and find it enjoyable to be identified as such (Egbue & Long, 2012; Graham-Rowe et al., 2011; Hardman, Shiu, & Steinberger-Wilckens, 2016;

Plötz, Schneider, Globisch, & Dütschke, 2014). Lastly, consumers emotions and feelings have been shown to affect attitudes and adoption intentions as well (Rezvani et al., 2015). Literature describes mixed feelings from being ashamed to feeling good and happy when driving the vehicle (Graham-Rowe et al., 2011; Moons & de Pelsmacker, 2012).

Another common approach to tackle individual-related factors is examining the influence of the consumers socio-demographic profile on adoption. Plötz, Schneider, Globisch and Dütschke (2014) identified early adopters in Germany as more likely to be men with families, working full-time, who value the environment and new technologies and probably travel a significant number of kilometres annually. Axsen, Goldberg and Bailey (2016) characterize pioneers as more likely to have a higher income (5 times more likely to earn over $125kCAD/year) and education (being about three times more likely to have a graduate degree), more likely to be middle-aged (55% of sample in 45–64 age range) and much more likely to be male (82% of sample). They also found them to be more likely to be part of a multi-vehicle household and more likely to have charging access at home. Finally, Hardman, Shiu and Steinberger-Wilckens (2016) described early adopters as individuals with a high income, being highly educated, mostly male, car ownership above average and between 35 and 65 years old.

In table 1 the different factors and their found associations with e-mobility adoption are listed. Where possible, quantitative information for these factors was gathered for each of the project partners in order to study the regional territorial context with respect to the current regional e-mobility adoption.

Table 1: Overview of scientific journal articles discussing market-related and individual-related factors influencing e-mobility adoption.

Paper	Attributes															
	Internal Barriers			External Barriers		Government Policy				Psychological				Socio-Demographic		
	Charging time	Driving range	Purchase price	Available infrastructure	Fuel prices	Financial incentives	Non-financial incentives	Supporting charging infrastructure	Raising awareness	Emotions	Environmental awareness	Innovation	Symbols	Age	Education	Income
Graham-Rowe et al. (2011)			✓		✓					✓	✓	✓	✓			
Hidrue et al. (2011)	✓	✓	✓		✓						✓			−	✓	✗
Zhang et al. (2011)					+	+	✗						+	−	+	+
Browne et al. (2012)						+	+	+	+							
Egbue & Long (2012)		✓	✓	✓								✓		✗	✗	✗
Hess et al. (2012)		+	−	+	+	+	✗							−		
Lebeau et al. (2012)			✓		✓											
Moons & de Pelsmacker (2012)										+	+		+			

Bakker & Jacob Trip (2013)						✔	✔	✔	✔							
Carley et al. (2013)	✔	✔	✔	✔							✔				✔	
Dimitropoulos et al. (2013)		+	−													
Hackbarth & Madlener (2013)	−	+	−	+	+	+	+				✔			−	✔	✔
Jensen et al. (2013)		✔	✔	✔							✔					
Krause et al. (2013)					+	✗	✗		+		+			−	+	✗
Tran et al. (2013)			✔	✔												
Hoen & Koetse (2014)	−	+	−	+		+	✗									
Plötz et al. (2014)											+	+				+
Sierzchula et al. (2014)				+		+					✗				✗	✗
Tanaka et al. (2014)		✔	✔	✔	✔	✔										
Helveston et al. (2015)		+	−		+	+							+			
Axsen et al. (2016)				+							+	+	+	−	+	+
Hardman et al. (2016)	−				+						+		+	−	+	+
Langbroek et al. (2016)		+				+	+									
Mersky et al. (2016)				+		+	✗	+								+

+: positive correlation ✔: correlation (direction not indicated) −: negative correlation ✗: no correlation

5. Methodology

The regional context analysis provides a structure to compare the policy contexts of the different partner regions within the e-MOPOLI project. To perform this analysis, specific indicators were selected that show correlation with the adoption of alternative fuel vehicles, as seen in the literature review (see chapter 3. Literature review), and expected availability of information on these indicators. In a second phase, data was collected using a survey and consulting additional data sources. Last phase of the regional context analysis consisted of analysing and evaluating the collected data to allow a conclusion regarding similarities between regions and possible openness and suitability for alternative fuel technologies of the participating regions.

5.1 Data

In January 2019 data on five main topics were collected to perform a regional context analysis: 'Natural, physical and geographic characteristics', 'Demographic data', 'Economic indicators', 'Energy indicators' and 'Mobility indicators'.

The information for 'Natural, physical and geographic characteristics', 'Demographic data', 'Economic indicators' and 'Energy indicators' could be retrieved from Eurostat (https://ec.europa.eu/eurostat/) for Europe (EU28) and for the following partners: Brescia (Lombardia) (Eurostat code: ITC4), Calabria (Eurostat code: ITF6), Attica (Eurostat code: EL3), Flanders (Eurostat code: BE2), Rogaland (Eurostat code: NO04) and Bucharest-Ilfov (Eurostat code: RO32). 'Mobility indicators' were collected from the project partners via an online survey (see Appendix A), since this information was not publicly available on regional level. For the Gorenjska, Kainuu and Zemgale regions, all regional statistics were collected via the survey, since no regional data were available in Eurostat. Finally, to fill the last gaps in the collected data, additional desk research was conducted by means of national databanks and if necessary other internet sources. Table 2 describes the indicators used in the analysis and their sources.

Table 2: Description of indicators and sources (own setup).

Indicator	Data	Source
Natural, physical and geographic characteristics		
Region	*Land use, total area in square kilometres*	Eurostat[a], online survey[b]
Climate	*Average temperature in Celsius*	Online survey
	Average windspeed in meters per second	Online survey
	Total hours of sunshine per year	Online survey
CO_2 emission	*Percentage of CO2 emission per industry source*	Online survey
	Percentage of emission per different transport modes	Online Survey
Demographic Data		
Population	*Number of inhabitants*	Eurostat[a], online survey[b]
Population density	*Number of inhabitants per square kilometres*	Eurostat[a], online survey[b]
Age structure	*Percentage of population per age group (<15, 15-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75-84, >85)*	Eurostat[a], online survey[b]
Education mix	*Percentage of population aged 25-64 by educational attainment level (0-2, 3-4, 5-8)*	Eurostat[a], online survey[b]
Environmental awareness	*Recycling rates for packaging waste*	Eurostat[a], online survey[b]
Economic indicators		
Purchasing power	*Gross Regional Product*	Eurostat[a], online survey[b]
	Gross Regional Product per capita	Eurostat[a], online survey[b]

	Average yearly net income	Eurostat[a], online survey[b]
Employment rate	*Percentage of the population performing an economic activity*	Eurostat[a], online survey[b]
Tourism	*Arrivals at tourist accommodation*	Eurostat[a], online survey[b]
Energy Indicators		
Electricity mix	*Primary production of energy by resource*	Eurostat[c]
Renewable energy mix	*Primary production of renewable energy by type*	Eurostat[c]
Electricity price	*Average national price in Euro per kWh for medium size consumers*	Eurostat[c]
Fuel price	*Average price for 1 litre Diesel*	Online survey
Mobility indicators		
Transportation mix	*Percentage of distance covered by different transport modes*	Online survey
Vehicle mix	*Percentage of all vehicle types*	Online survey
Passenger cars	*Total number of passenger cars in the region*	Online survey
	Number of cars per household	Online survey
Electric Vehicles	*Total number of Electric Vehicles (plug-in hybrid and battery electric vehicle) in the region*	Online survey
	Increase in total number of Electric Vehicles (plug-in hybrid and battery electric vehicle) since last year	Online survey
Charging Infrastructure	*Total number of available public charging infrastructure*	Online survey
Financial Benefits	*Is there an active governmental policy providing financial incentives stimulating EV sales ? (e.g. purchase subsidies, etc.)*	Online survey
Non-financial benefits	*Is there an active governmental policy providing non-finacial benefits stimulating the daily use of EVs ? (e.g. free reserved parking spots, etc.)*	Online survey
Low emission zone	*Is there a low emission zone in the region ?*	Online survey
Public transport	*Average distance to public transport stop*	Online survey
Total streets distance	*Total distance of streets in the region*	Online survey
Street Mix	*Percentage of street types in the region*	Online survey

a: PP1, PP2, PP4, PP5, PP7 and PP8 b: PP3, PP6 and PP9   c: national information

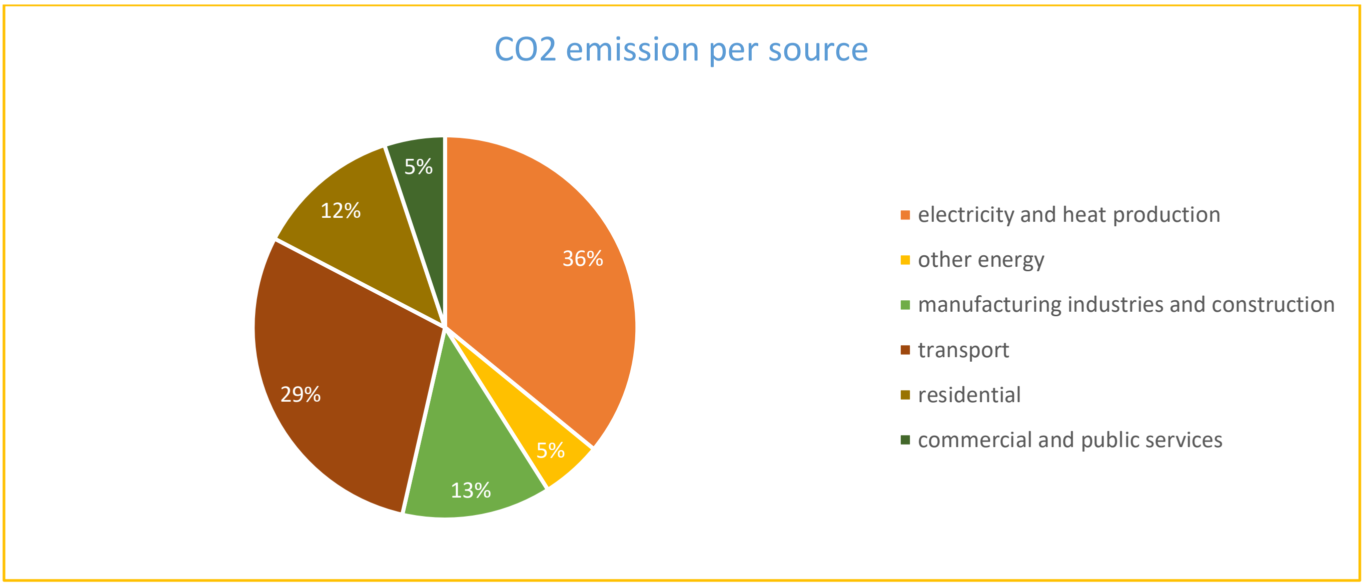
5.2 Analysis

After collecting the necessary information for each region, a descriptive cross-regional analysis is appropriate to identify those properties that make a region unique and might form an indicator for effectiveness of past or future policy instruments. For each indicator the values of all the regions are grouped through natural classification, distinguishing minimum, maximum and mean values. This is visualised by using colour labels representing its status in comparison to the other regions (see figure 4). Values in green represent a higher value between regions and indicates a higher positive effect. The values in blue represent the lowest values between regions and will thus have a less positive effect on adoption than the values in green. The middle segment or average values are labelled yellow. The European benchmark is also given to situate the regions performances in a broader context, providing an idea of the European average or total.

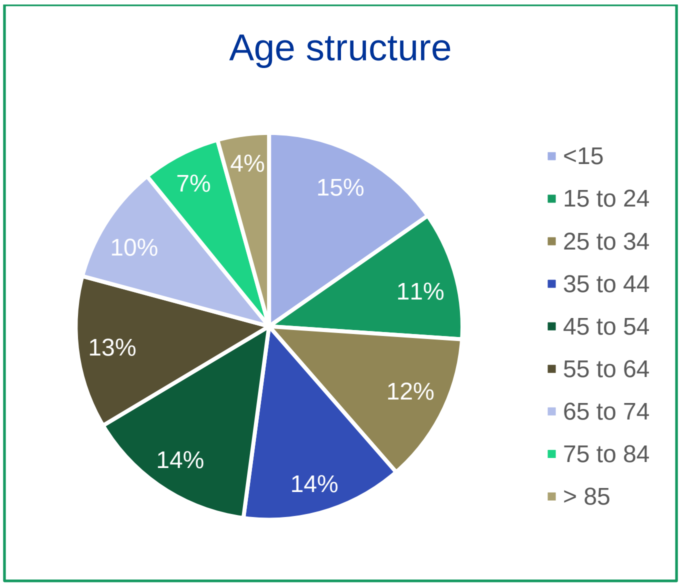
Fig.5 Color shades used in the cross-regional analysis.

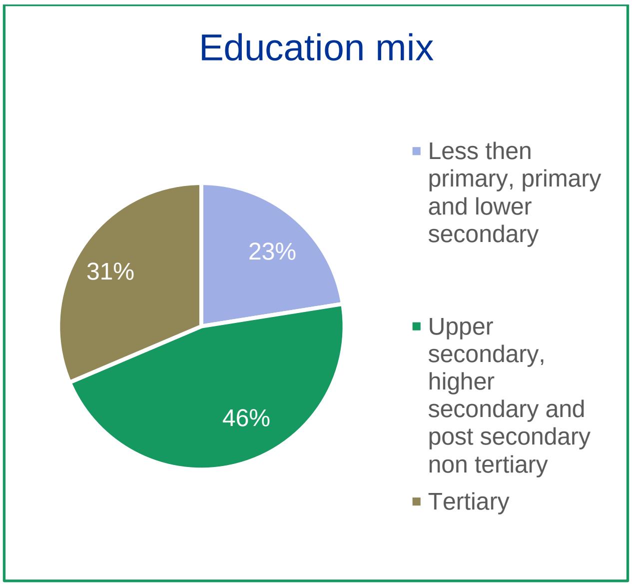
6. European Benchmark

Natural, physical and geographical characteristics			
		Year	***Source***
Region Size (km²)	4.469.668	2016	Eurostat
Average temperature (°C)	-		
Average windspeed (m/s)	-		
Sunshine (hours/year)	-		
CO2 emission per source	35,2% electricity and heat production; 5,0% other energy; 12,3% manufacturing industries and construction; 28,5% transport; 12,0% residential; 5,0% commercial and public services	2016	IEA2018

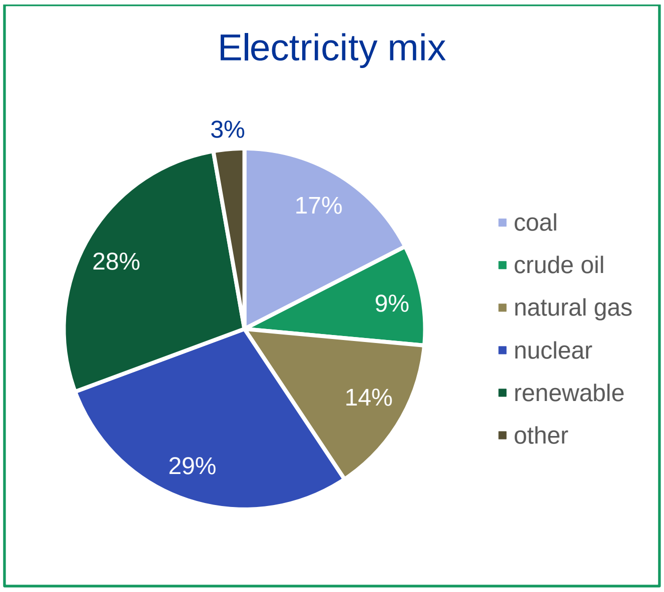


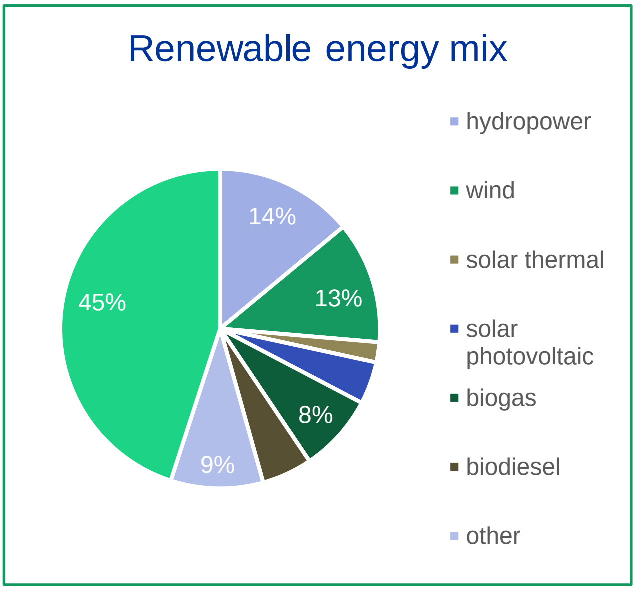
Demographic Data			
		Year	***Source***
Population	511.522.671	2017	Eurostat
Population density (inhabitants/km²)	117,5	2016	Eurostat
Age structure	15,31;10,76;12,52;13,53;14,31;12,75;9,96;6,56;4,3	2017	Eurostat
Education mix	22,5%;46,10%;31,40%	2017	Eurostat
Environmental awareness	67,2	2016	Eurostat





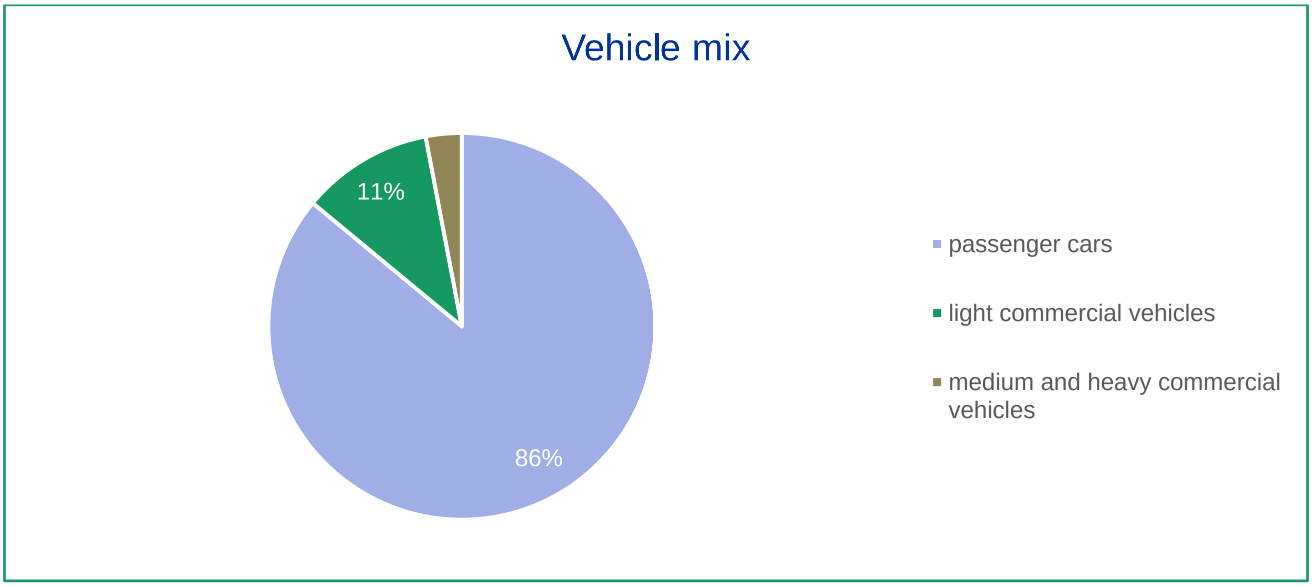
Energy Indicators			
		Year	***Source***
Electricity mix	17,45;9,01;14,20;28,69;27,89;2,76	2016	Eurostat
Renewable energy mix	14,28;12,36;2,04;4,29;7,87;5,10;9,35	2016	Eurostat
Electricity price (€ per kWh)	0,2041	2017	Eurostat
Fuel price	1,210	2019	Fuelo.net





Economic indicators			
		Year	***Source***
Gross Regional Product (euro in millions)	14.907.852	2016	Eurostat
GRP per capita (€)	29.215	2016	Eurostat
Average income (€)	17.311	2015	Eurostat
Unemployment rate	7,8%	2016	Eurostat
Arrivals at tourist accommodation	631.416.180	2016	Eurostat

Mobility indicators			
		Year	***Source***
Vehicle mix	85,74% passenger cars; 10,79% light commercial vehicles; 3,46% medium and heavy commercial vehicles	2015	ACEA 2017
Number of vehicles	378.318.034	2015	ACEA 2017
Number of cars in household	1,73	2015	Eurostat
Number of Electric Vehicles	450.938 BEV – 522.121 PHEV	2018	EAFO
Electric Vehicle Sales (last year)	147.476 BEV – 152.809 PHEV	2018	EAFO
Available Charging Infrastructure	161.426	2018	EAFO

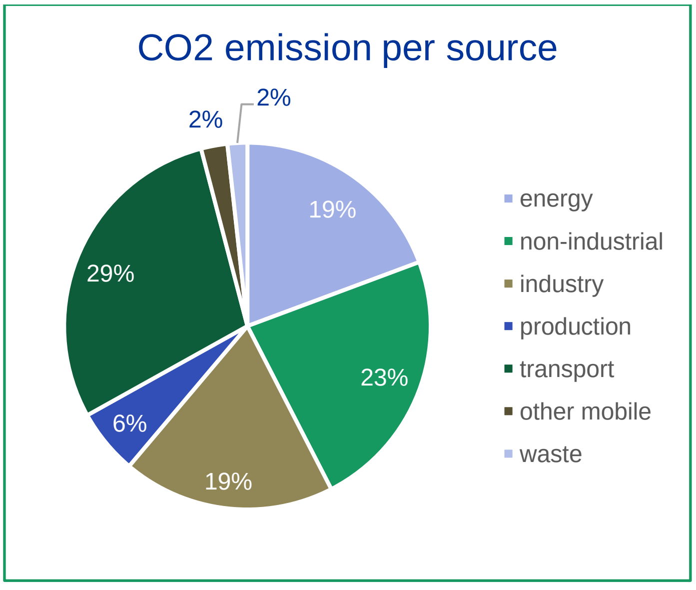

Vehicle mix
11%
86%
passenger cars
light commercial vehicles
medium and heavy commercial vehicles

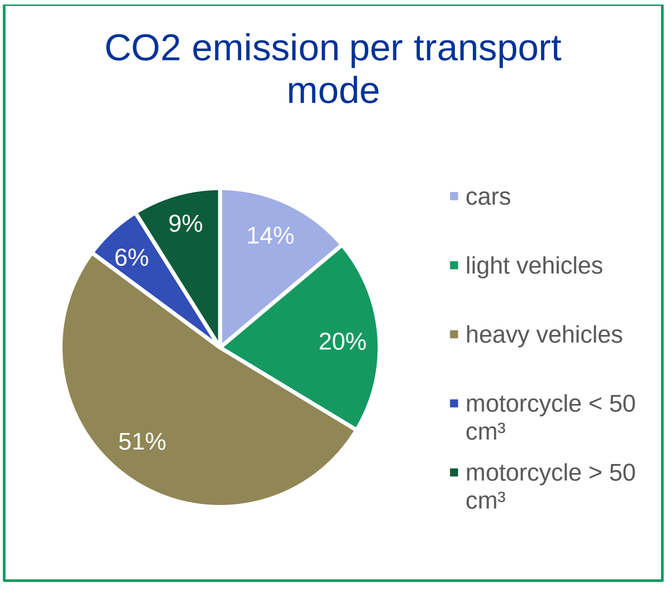
7. Overview of the project partner regions

This chapter presents the data collected for each project partner region, allowing to create an image of the characteristics of each region. Indicators will be structured per theme, as it was done in the methodology.

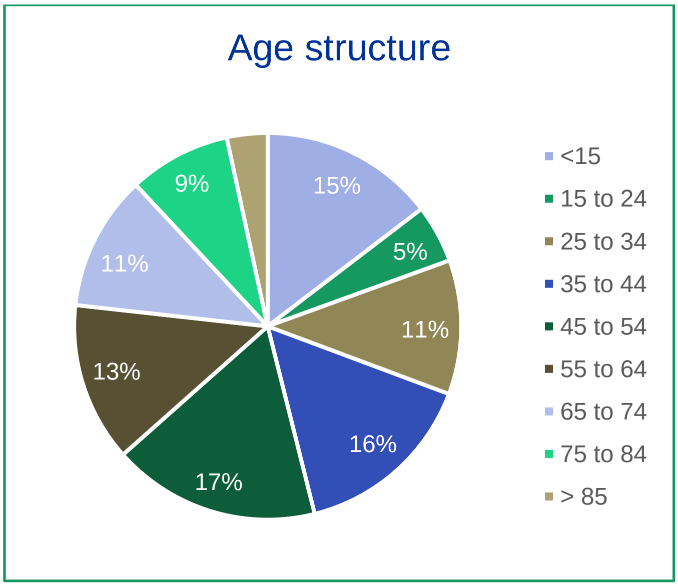
7.1 Province of Brescia

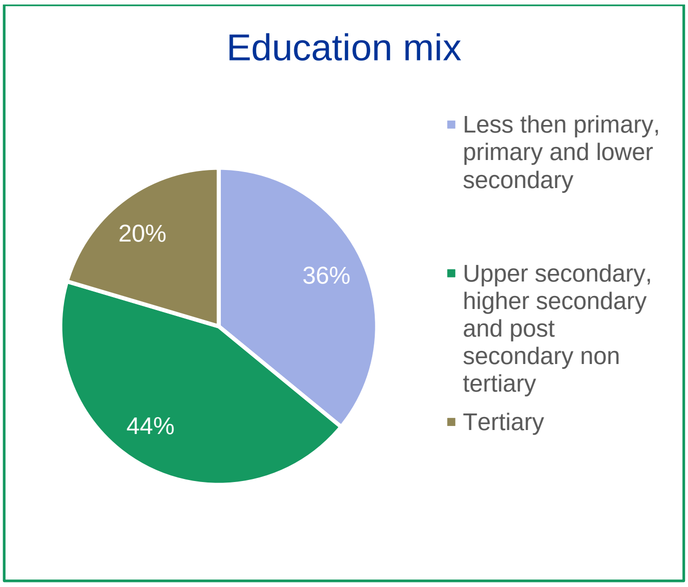
Natural, physical and geographical characteristics			
		Year	***Source***
Region Size (km²)	23864	2015	Eurostat
Average temperature (°C)	12,5	2017	climate-data.org/
Average windspeed (m/s)	3-4	2019	Altante eolico RSE
Sunshine (hours/year)	1914	2017	3bmeteo.com
CO2 emission per source	19,32% energy, 23,1% non-industrial, 18,73% industry, 5,75% production, 29,00% transport, 2,32% other mobile, 1,75% waste	2014	INEMAR ARPA Lombardia
CO2 emission per transport mode	14,08% cars, 19,98% light vehicles, 51,6% heavy vehicles, 5,73% motorcycle <50cm³, 8,60% motorcycle >50cm³	2014	INEMAR ARPA Lombardia





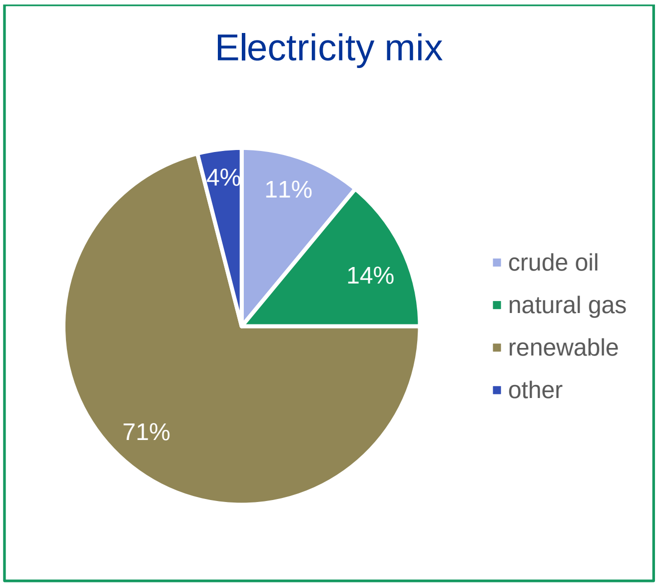
Demographic Data			
		Year	***Source***
Population (inhabitants)	10.019.166	2017	Eurostat
Population density (inhabitants/km²)	434,5	2016	Eurostat
Age structure	14,61% <15; 4,85% 15-24; 11,23% 25-34; 15,4% 35-44; 17,35% 45-54; 13,31% 55-64; 11,31% 65-74; 8,53% 75-84; 3,4% >85	2017	Eurostat
Education mix	0,359;0,436;0,204	2017	Eurostat
Environmental awareness	66,90%	2016	Eurostat

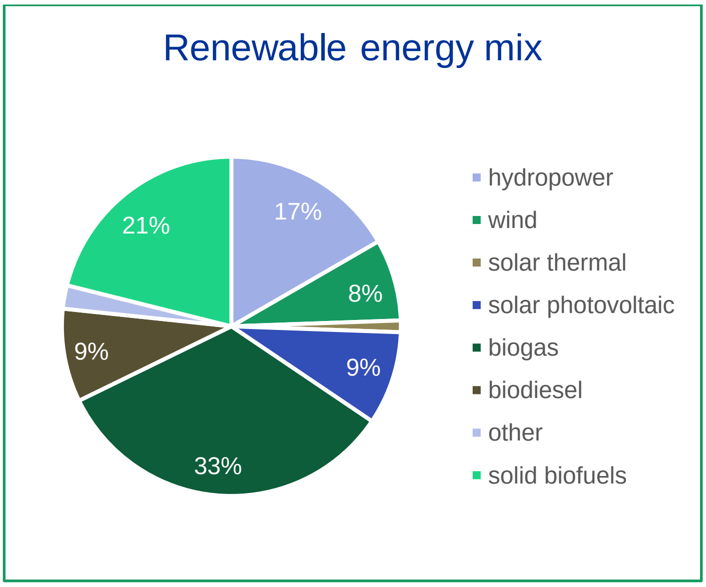




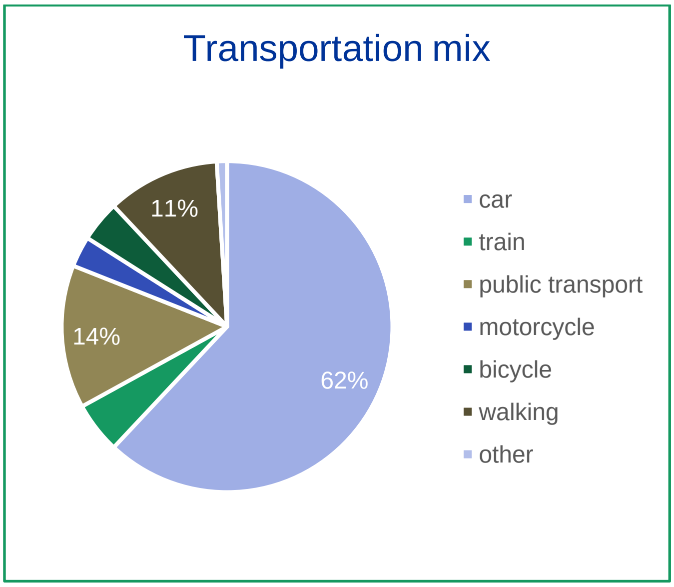
Economic indicators			
		Year	***Source***
Gross Regional Product (€ in millions)	366.541	2016	Eurostat
GRP per capita (€)	36.583	2014	Eurostat
Average income (€ per year)	25.200	2016	Eurostat
Unemployment rate	6%	2016	Eurostat

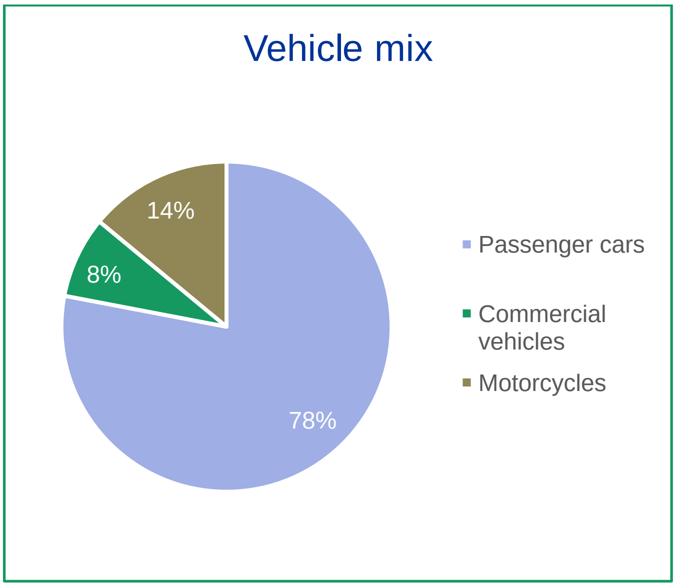
Energy Indicators			
		Year	***Source***
Electricity mix	0;0,1116;0,1402;0;0,7048;0,0434	2016	Eurostat
Renewable energy mix	0,1531;0,0638;0,0084;0,0798;0,3036;0,0787;0,0214;0,2911	2016	Eurostat
Electricity price (€ per kWh)	0,2132	2017	Eurostat
Fuel price (€ per litre)	0,1434	2018	Ministry of Transport





Mobility indicators			
		Year	***Source***
Transportation mix	0,62;0,045;0,144;0,032;0,044;0,105;0,011	2016	Regional Programme for Mobility Transport
Vehicle mix	0,78;0,08;0,14	2017	ACI
Number of vehicles	6.709.523	2017	ACI
Number of cars in household	1,45	2017	ACI
Number of Electric Vehicles	2.805	2017	ACI
Electric Vehicle Sales (last year)	553	2017	ACI
Available Charging Infrastructure	646	2017	ACI



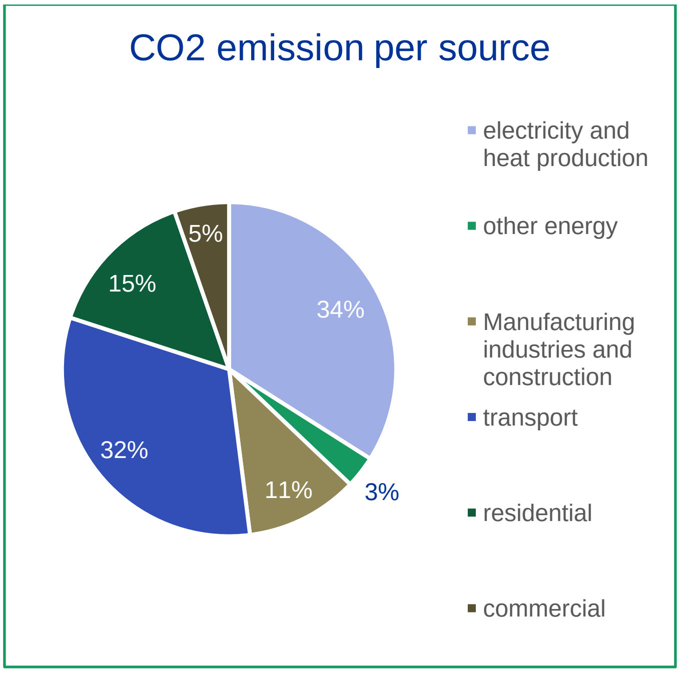


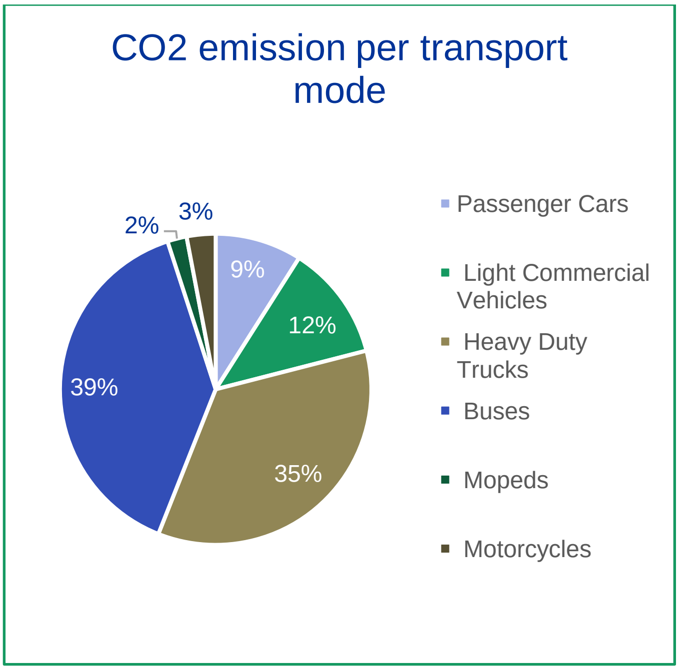
Benefits	
Financial Benefits	✔
Non-financial benefits	✔
Low emission zone	✔

		Year	***Source***
Total streets distance (km)	553	2016	Regional Programme for Mobility Transport
Street Mix	0,01 motorway; 0,14 provincial; 0,01 national roads; 0,83 municipal road	2017	Regional Programme for Mobility Transport

7.2 Calabria region

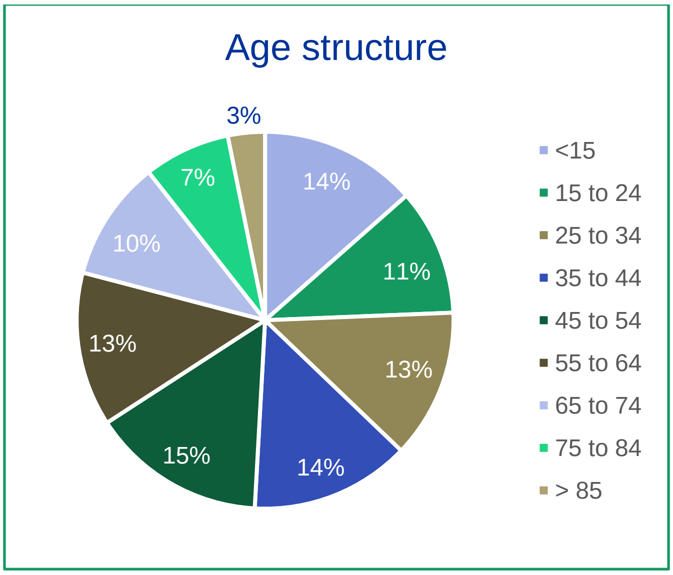
Natural, physical and geographical characteristics			
		Year	***Source***
Region Size (km²)	15.222	2016	Eurostat
Average temperature (°C)	21	2017	Ministry of Agricultural, Food, Forestry and Tourism Policies
Average windspeed (m/s)	4-5	2019	atlanteeolico.rse-web.it
Sunshine (hours/year)	4.451	2018	dateandtime.info
CO2 emission per source	34,0% electricity and heat production; 3,1% other energy; 10,9% Manufacturing industries and construction; 32,0% transport; 14,7% residential; 5,3% commercial	2017	IEA
CO2 emission per transport mode	Passenger Cars 9%; Light Commercial Vehicles 12%; Heavy Duty Trucks 35%; Buses 39%; Mopeds 2%; Motorcycles 3%	2017	Higher Institute for Environmental Protection and Research

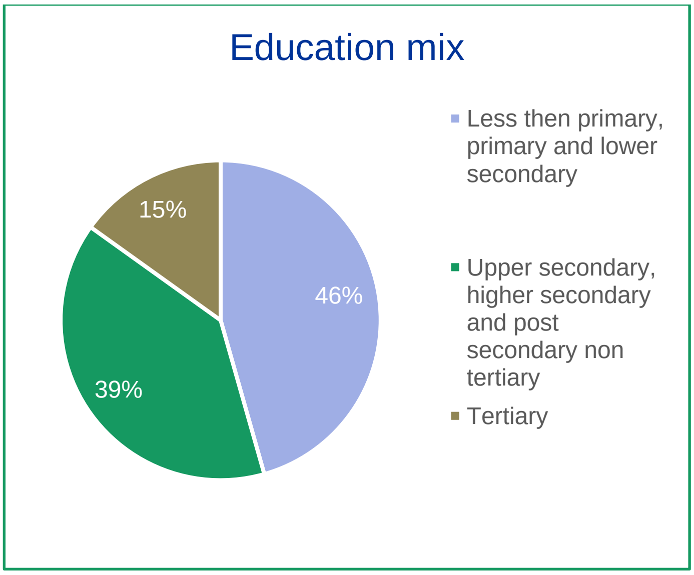




Demographic Data

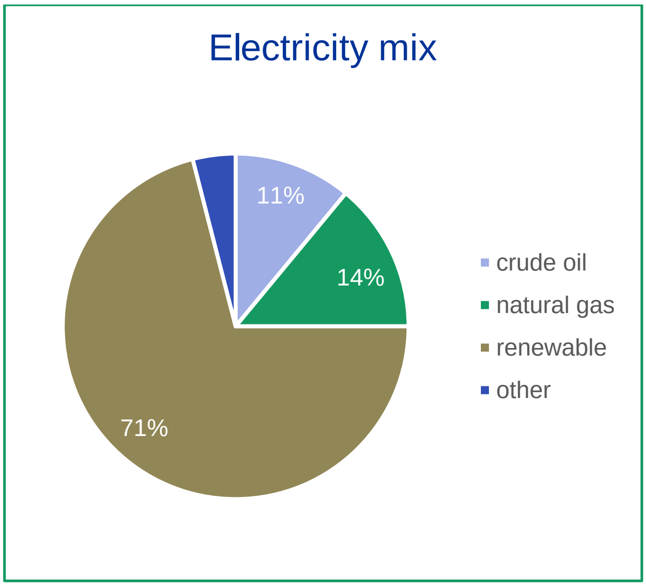
		Year	*Source*
Population (inhabitants)	1.965.128	2017	Eurostat
Population density (inhabitants per km²)	129,6	2016	Eurostat
Age structure	13,50%;10,86%;12,80%;13,72%;14,97%;13,23 %;10,33%;7,42%;3,18%	2017	Eurostat
Education mix	45,60%;39,30%;15,10%	2017	Eurostat
Environmental awareness	66,90%	2016	Eurostat

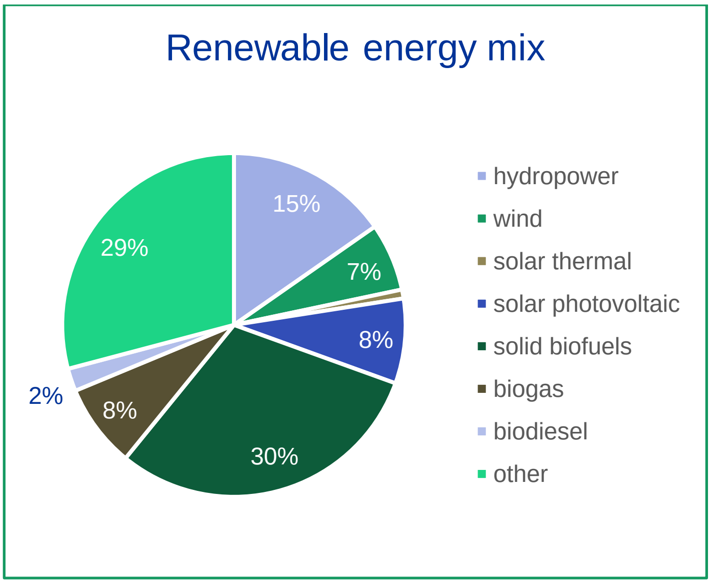




Economic indicators			
		Year	*Source*
Gross Regional Product (euro in millions)	32.440	2016	Eurostat
GRP per capita (€)	16.463	2014	Eurostat
Average income (€ per year)	11.200	2016	Eurostat
Unemployment rate	6%	2016	Eurostat

Energy Indicators			
		Year	*Source*
Electricity mix	0;11,16;14,02;0;70,48;4,34	2016	Eurostat
Renewable energy mix	15,31;6,38;0,84;7,98,30,36;7,87;2,14;29,11	2016	Eurostat
Electricity price (€ per kWh)	0,2132	2017	Eurostat
Fuel price (€ per litre)	1,57	2018	Ministry of Economic Development





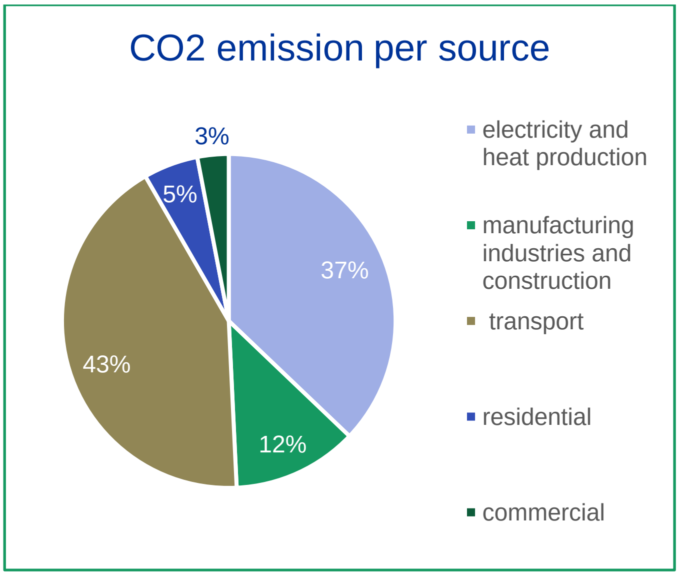
Mobility indicators			
		Year	***Source***
Transportation mix	0,897 car; 0,09 train; 0,03 bus	2016	Regional Programme for Mobility Transport
Number of vehicles	1.280.935	2018	ACI (Automobil Club Italia)
Number of cars in household	1,99	2015	ACI
Number of Electric Vehicles	55	2017	ACI
Available Charging Infrastructure	104	2019	Sole 24 ore

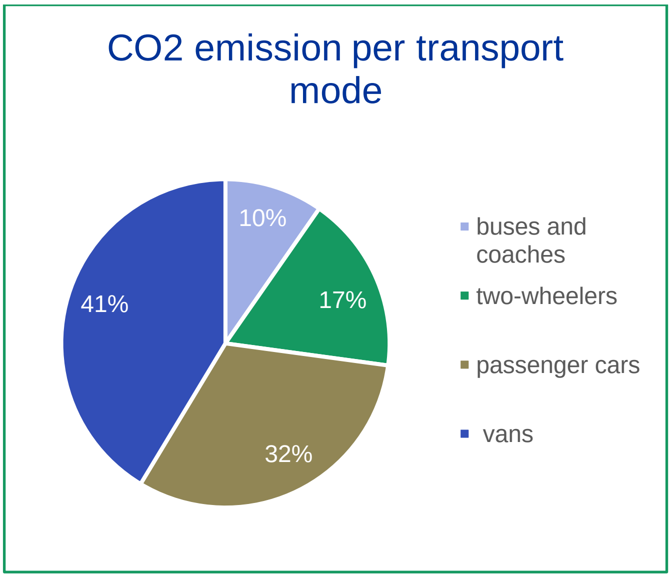
Benefits	
Financial Benefits	✔
Non-financial benefits	✗
Low emission zone	✗

		Year	***Source***
Total streets distance (km)	15.700	2019	ANAS (National Road Organization) – Observatory on mobility and road safety (Calabria Region)
Street Mix	442,920 km national roads; 5.880,69 Km provincial roads	2019	ANAS (National Road Organization) – Observatory on mobility and road safety (Calabria Region)

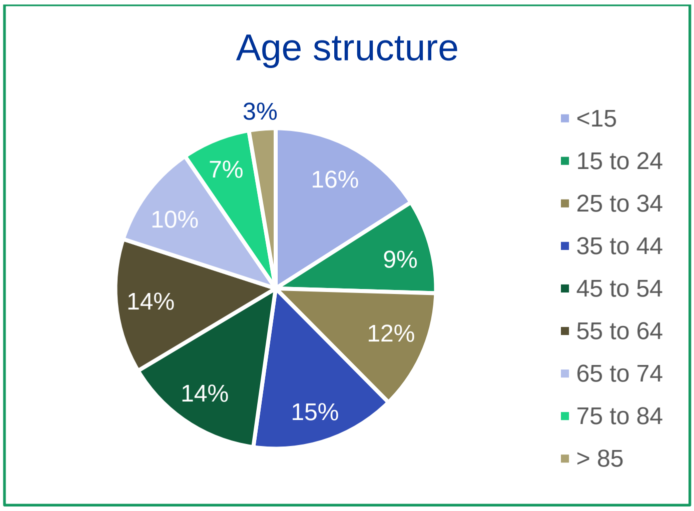
7.3 Regional Development Agency of Gorenjska

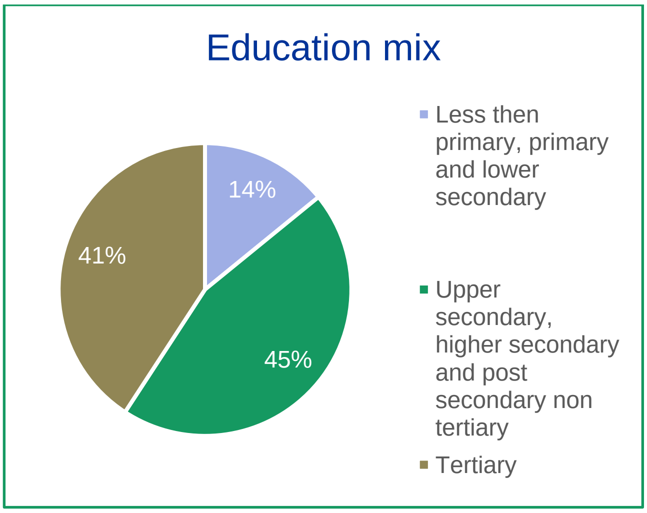
Natural, physical and geographical characteristics			
		Year	***Source***
Region Size (km²)	2.137	2000	Natura
Average temperature (°C)	10,6	2014	SURS
Average windspeed (m/s)	1-2	2017	Geopedia.si
Sunshine (hours/year)	2.000	2017	Meteo.arso.gov.si
CO2 emission per source	37,12% electricity and heat production; 0% other energy; 12,12% manufacturing industries and construction; 42,42% transport; 5,30% residential; 3,03% commercial	2017	IEA
CO2 emission per transport mode	9,68% buses and coaches; 17,47% two-wheelers; 31,50% passenger cars; 41,36% vans	2011	EEA





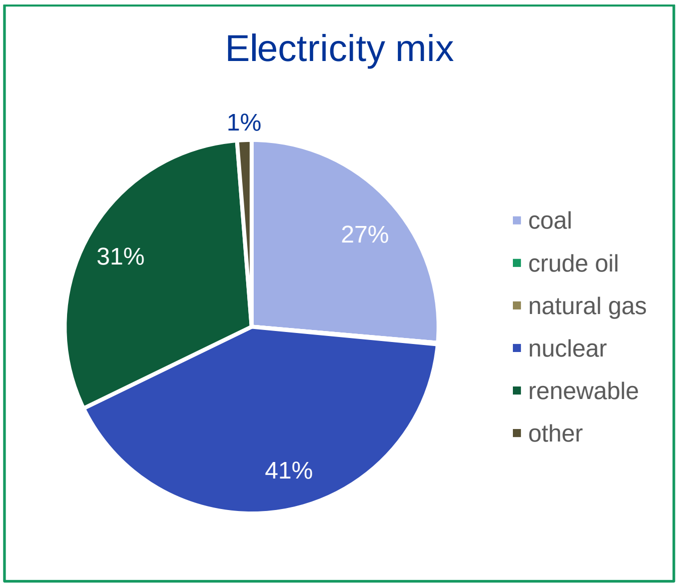
Demographic Data			
		Year	***Source***
Population (inhabitants)	203800	2018	SURS
Population density (inhabitants per km²)	95,4	2015	Ess.gov.si
Age structure	0,1596; 0,095; 0,121; 0,1464; 0,1418; 0,1356; 0,1045; 0,0687; 0,0268	2019	Ess.gov.si
Education mix	14,12%; 45,08%; 40,80%	2019	Ess.gov.si
Environmental awareness	67%	2016	Eurostat

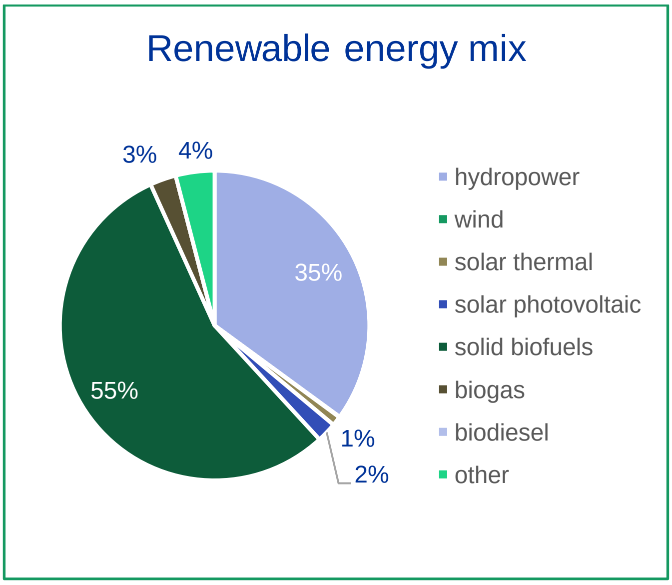




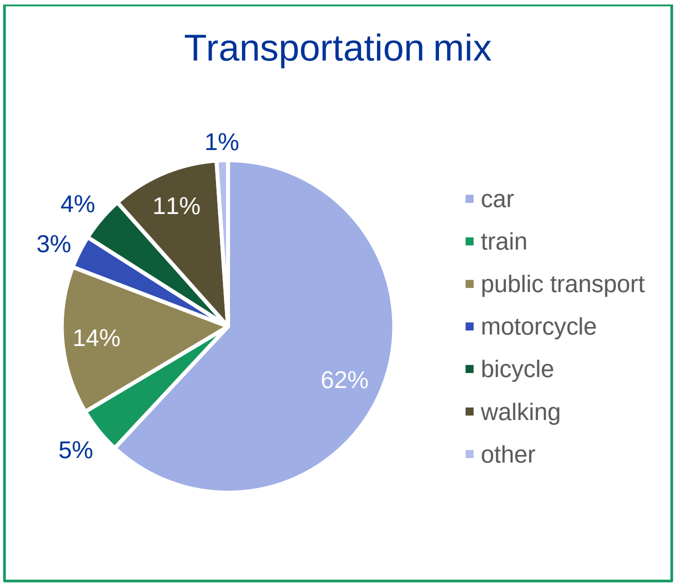
Economic indicators			
		Year	***Source***
Gross Regional Product (euro in millions)	3.796	2017	SURS
GRP per capita (€)	18.570	2017	SURS
Average income (€ per year)	18.507	2017	SURS
Unemployment rate	9%	2018	SURS

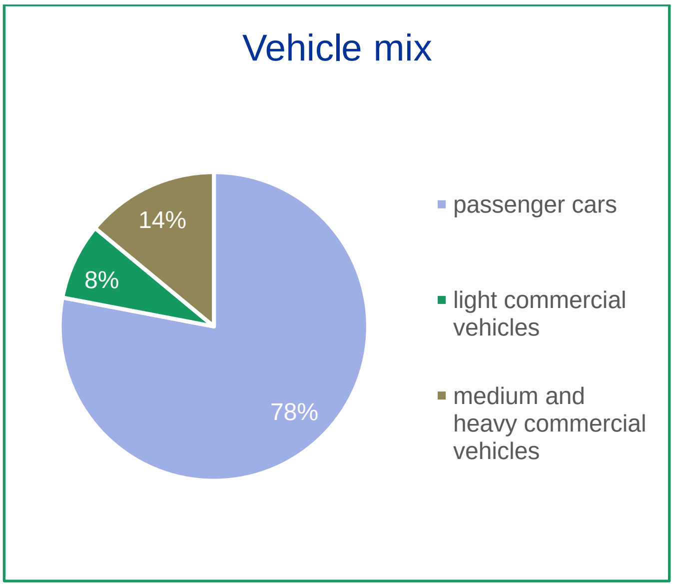
Energy Indicators			
		Year	***Source***
Electricity mix	26,38;0;0,12;41,29;30,95;1,25	2016	Eurostat
Renewable energy mix	35,03;0,05;0,99;2,08;55,06;2,73;0;4,05	2016	Eurostat
Electricity price (€ per kWh)	0,1609	2017	Eurostat
Fuel price (€ per litre diesel)	1,19	2016	Eurostat





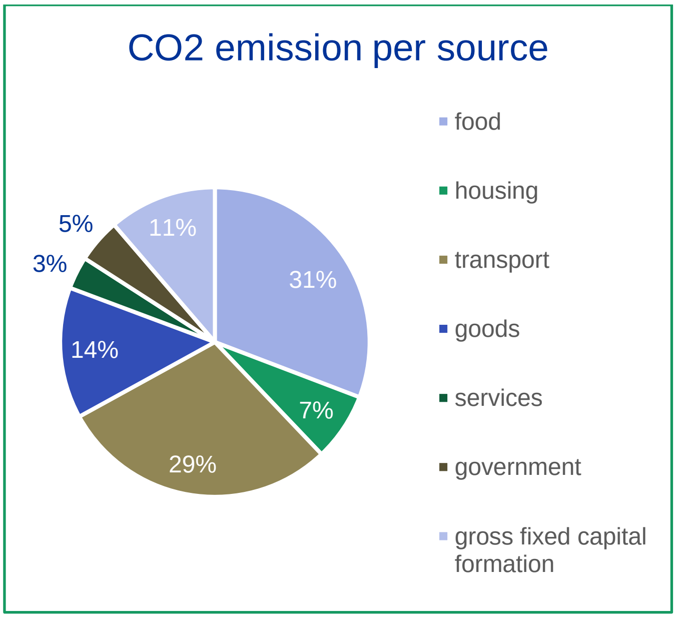
Mobility indicators			
		Year	***Source***
Transportation mix	0,62;0,045;0,144;0,032;0,044;0,105;0,011	2016	Regional Programme for Mobility Transport
Vehicle mix	0,78;0,08;0,14	2017	ACI
Number of vehicles	6.709.523	2017	ACI
Number of cars in household	1,45	2017	ACI
Number of Electric Vehicles	2.805	2017	ACI
Electric Vehicle Sales (last year)	553	2017	ACI
Available Charging Infrastructure	646	2017	ACI

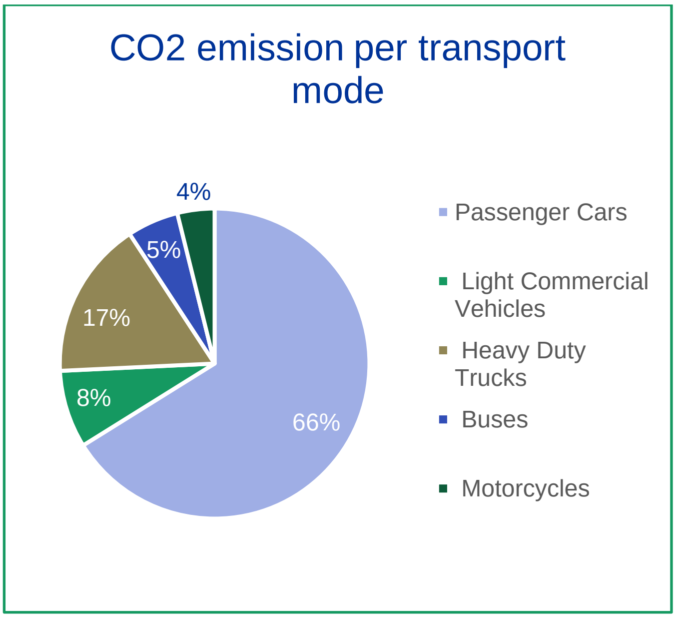




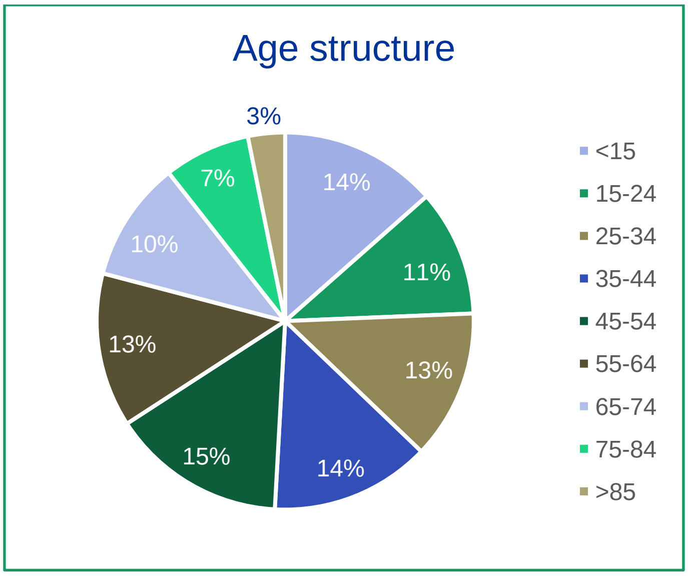
7.4 Region of Attica

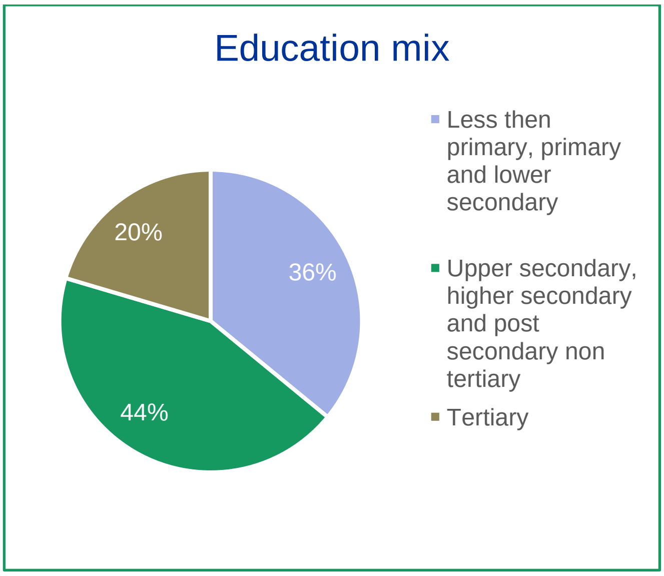
Natural, physical and geographical characteristics			
		Year	***Source***
Region Size (km²)	3.817	2016	Eurostat
Average temperature (°C)	17,5	2018	HNMS
Average windspeed (m/s)	3-4	2018	HNMS
Sunshine (hours/year)	2.873	2018	HNMS
CO2 emission per source	30,8% food, 7,1% housing, 29,1% transport, 13,7% goods, 3,4% services, 4,6% government, 11,3% gross fixed capital formation	2015	Babbou, et al. 2017
CO2 emission per transport mode	66.15% passenger cars, 8,10% light commercial vehicles, 16,5% heavy vehicles, 5,37% buses, 3,88% motorcycles	2010	Fameli and Assimakopoulos, 2015





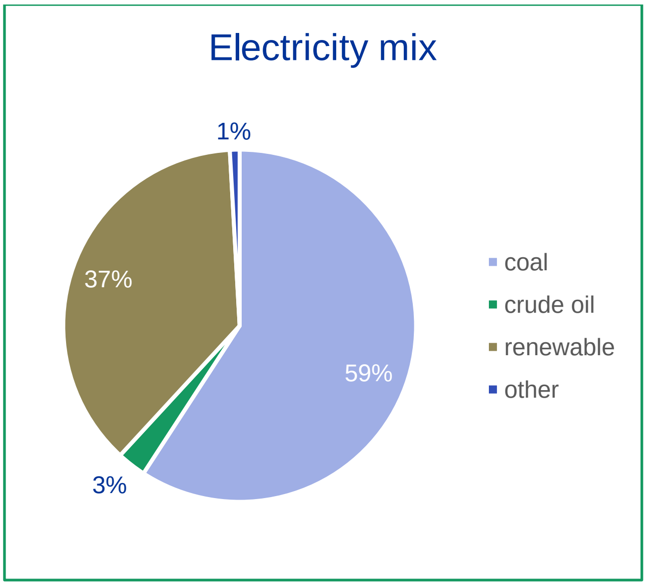
Demographic Data			
		Year	***Source***
Population (inhabitants)	3.773.559	2017	Eurostat
Population density (inhabitants per km²)	992,5	2016	Eurostat
Age structure	14,29%; 9,66%; 12,05%; 15,97%; 15,12%; 12,76%; 10,22%; 7,00%; 2,93%	2017	Eurostat
Education mix	17,20%;44,40%;38,40%	2017	Eurostat
Environmental awareness	60,3%	2016	Eurostat

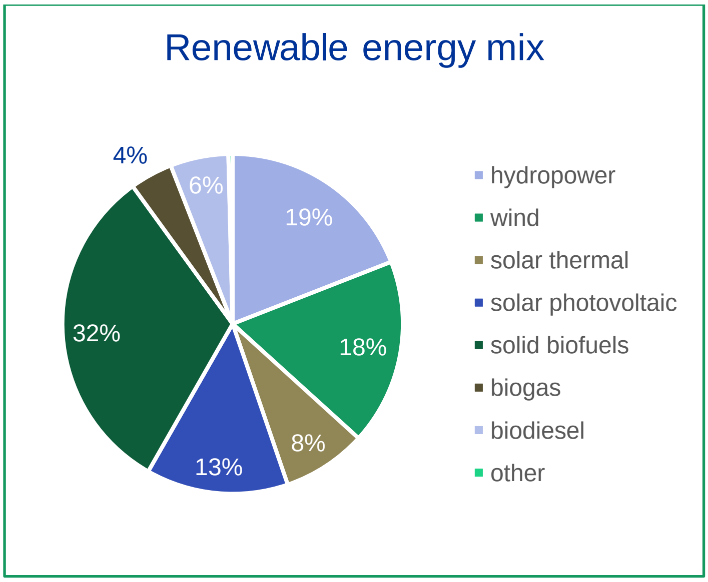




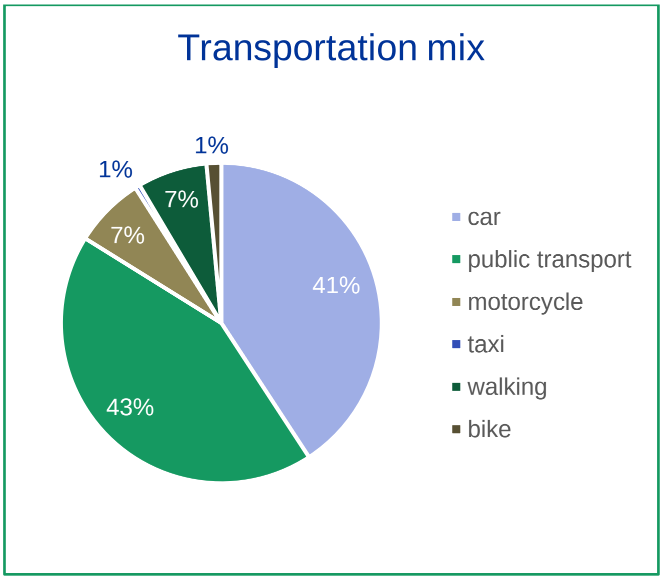
Economic indicators			
		Year	***Source***
Gross Regional Product (€ in millions)	84.374	2016	Eurostat
GRP per capita (€)	22.313	2014	Eurostat
Average income (€ per year)	12.200	2016	Eurostat
Unemployment rate	22%	2016	Eurostat

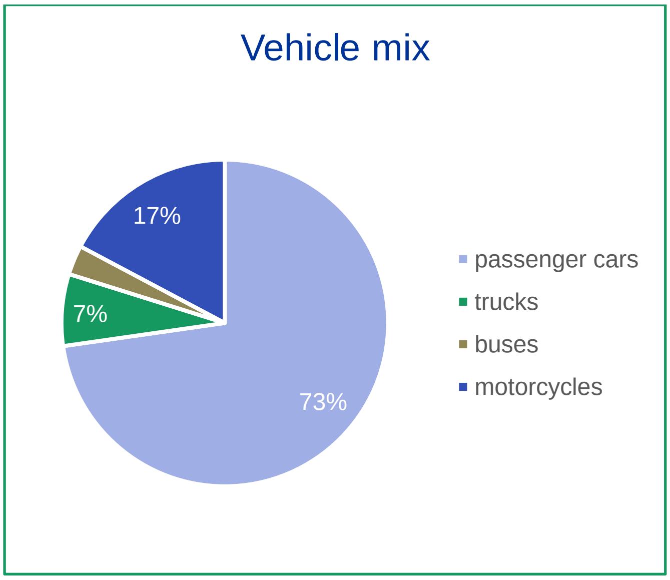
Energy Indicators			
		Year	***Source***
Electricity mix	59,09;2,66;0,14;0;37,21;0,89	2016	Eurostat
Renewable energy mix	19,05;17,68;8,00;13,50;31,74;4,06;5,52;0,40	2016	Eurostat
Electricity price (€ per kWh)	0,1936	2017	Eurostat
Fuel price (€ per litre diesel)	1,341	2019	MINDEV





Mobility indicators			
		Year	***Source***
Transportation mix	0,412 car; 0,435 public transport; 0,072 motorcycle; 0,005 taxi; 0,071 walk; 0,015 bike	2018	OASA
Vehicle mix	74,7% passenger cars; 7,3% trucks; 3% buses; 17,7% motorcycles	2018	ELSTAT
Number of vehicles	3.920.083	2018	ELSTAT
Number of cars in household	0,99	2011	ELSTAT
Number of Electric Vehicles	293	2018	HELIEV
Available Charging Infrastructure	24	2019	HELIEV



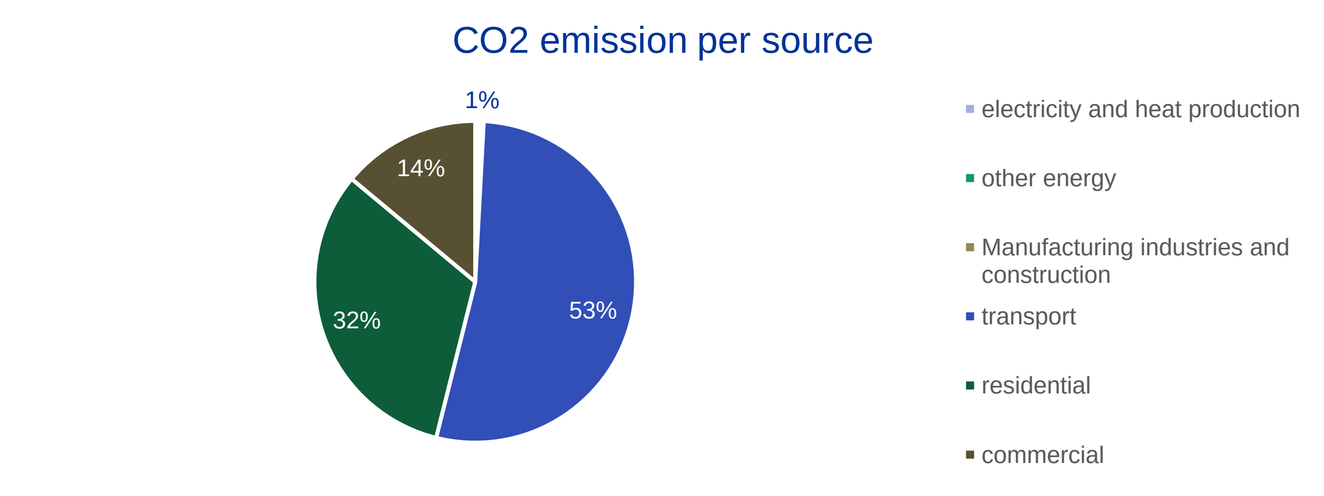


Benefits	
Financial Benefits	✔
Non-financial benefits	✔
Low emission zone	✔

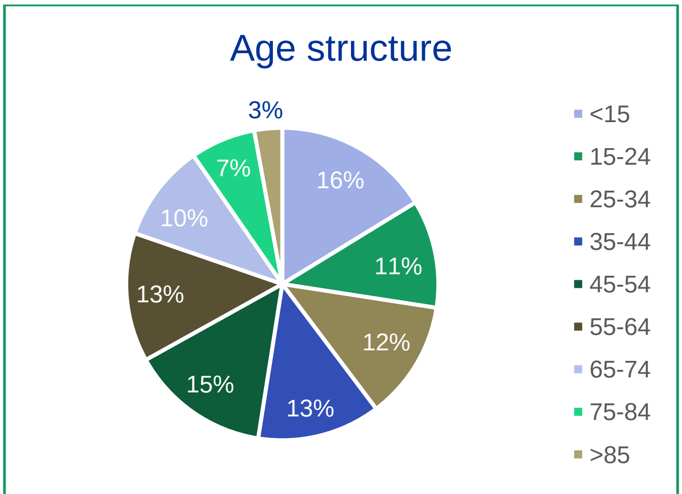
		Year	***Source***
Total streets distance (km)	1.644	2016	Ypodomes.com
Street Mix	0,8802 street; 0,1198 highway	2016	Ypodomes.com

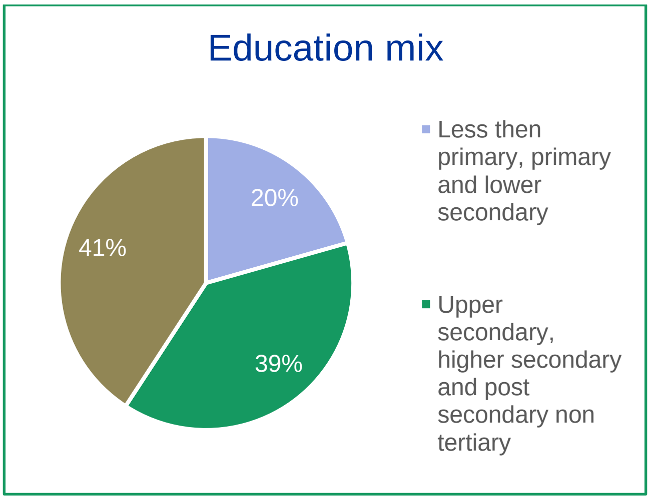
7.5 Flemish government Department Environment

Natural, physical and geographical characteristics			
		Year	***Source***
Region Size (km²)	13.599	2016	Eurostat
Average temperature (°C)	11,1	2018	KMI
Average windspeed (m/s)	3-4	2018	KMI
Sunshine (hours/year)	1545	2018	KMI
CO2 emission per source	18,0% electricity and heat production; 6,7% other energy; 21,4% manufacturing industries and construction; 28,9 transport; 17,5 residential, 7,6 commercial	2017	IEA



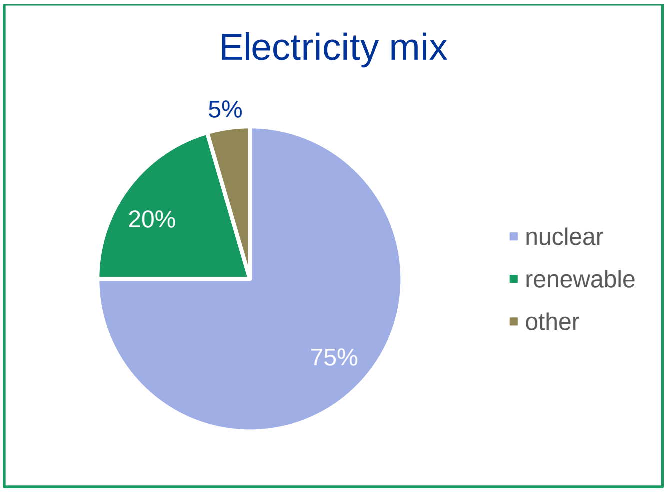
Demographic Data			
		Year	***Source***
Population (inhabitants)	6.526.061	2017	Eurostat
Population density (inhabitants per km²)	484,8	2016	Eurostat
Age structure	16,26%; 11,17%; 12,29%; 12,75%; 14,46%; 13,34%; 10,09%; 6,74%; 2,89%	2017	Eurostat
Education mix	20,60%;38,60%;40,80%	2017	Eurostat
Environmental awareness	81,9%	2016	Eurostat

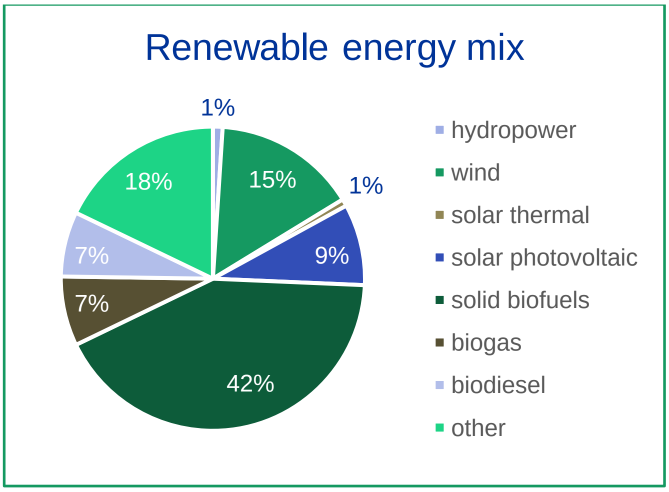




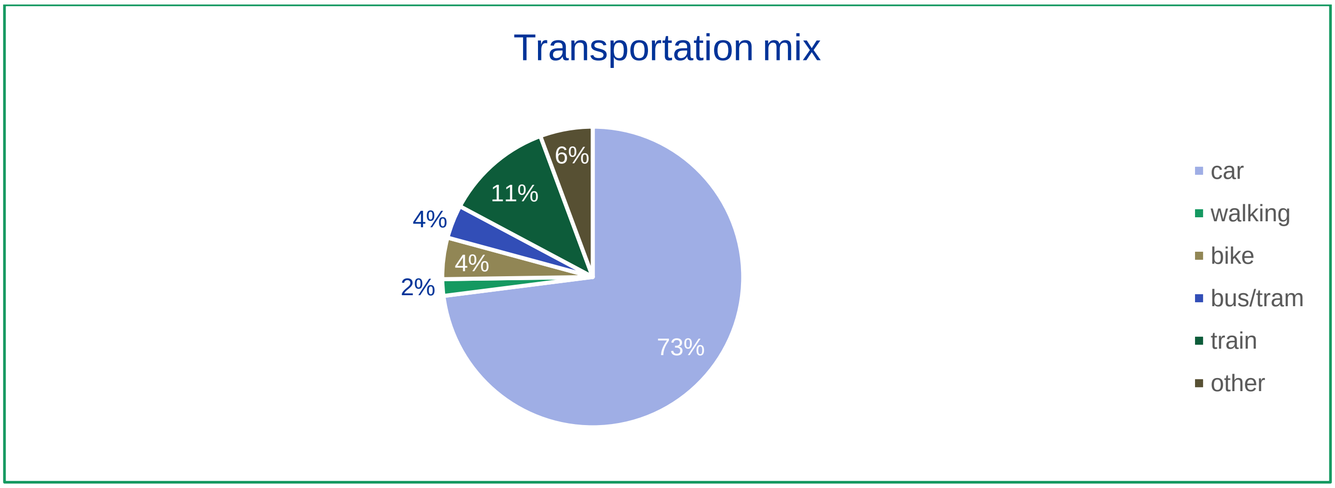
Economic indicators			
		Year	***Source***
Gross Regional Product (€ in millions)	241.094	2016	Eurostat
GRP per capita (€)	6.491.999	2014	Eurostat
Average income (€ per year)	0,037137098	2016	Eurostat
Unemployment rate	4%	2016	Eurostat

Energy Indicators			
		Year	***Source***
Electricity mix	0;0;0;75;20,48;4,52	2016	Eurostat
Renewable energy mix	1,03;15,24;0,75;8,65;42,14;7,39;6,91;17,85	2016	Eurostat
Electricity price (€ per kWh)	0,2799	2017	Eurostat
Fuel price (€ per litre diesel)	1,37	2017	Eurostat





Mobility indicators			
		Year	***Source***
Transportation mix	72,98 car; 1,78 walk; 4,45bike; 3,58bus/tram; 11,54 train; 5,66 other	2016	Onderzoek verplaatsingsgedrag Vlaanderen
Number of vehicles	3.538.693	2018	FOD Mobiliteit en Vervoer
Number of cars in household	1,26	2018	FOD Mobiliteit en Vervoer
Number of Electric Vehicles	7.934 (BEV) 25.376 (PHEV)	2018	FOD Mobiliteit en Vervoer
Electric Vehicle Sales (last year)	2.658 (BEV) 6.924 (PHEV)	2018	FOD Mobiliteit en Vervoer
Available Charging Infrastructure	2.733	2018	Ecomovement

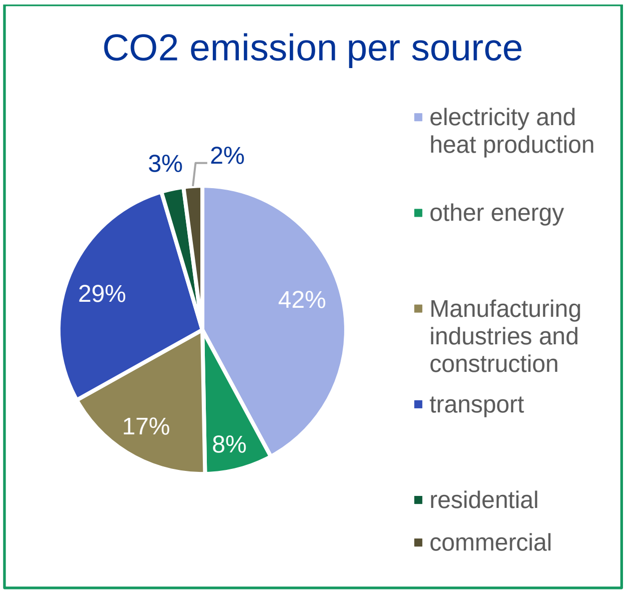


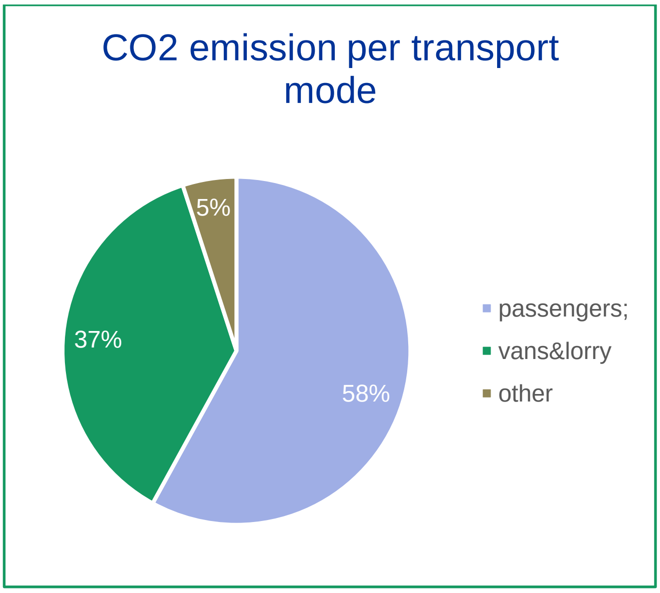
Benefits	
Financial Benefits	✔
Non-financial benefits	✗
Low emission zone	✔

		Year	***Source***
Total streets distance (km)	71.528	2017	Ruimterapport Vlaanderen
Street Mix	0,0974 highways; 0,9026 municipal roads	2017	Ruimtetrapport Vlaanderen

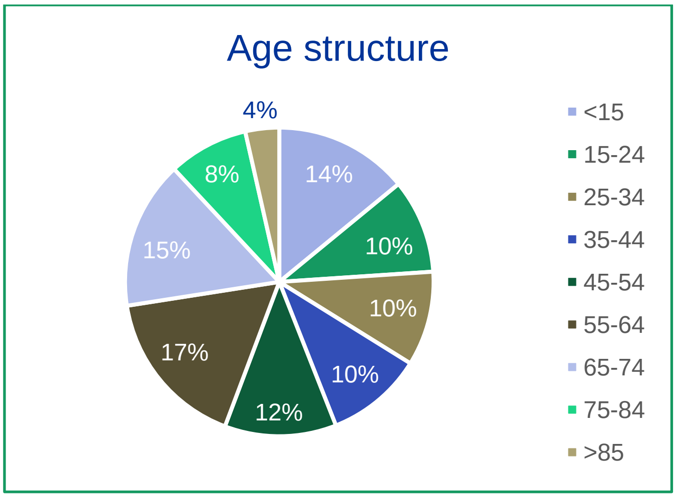
7.6 Regional Council of Kainuu

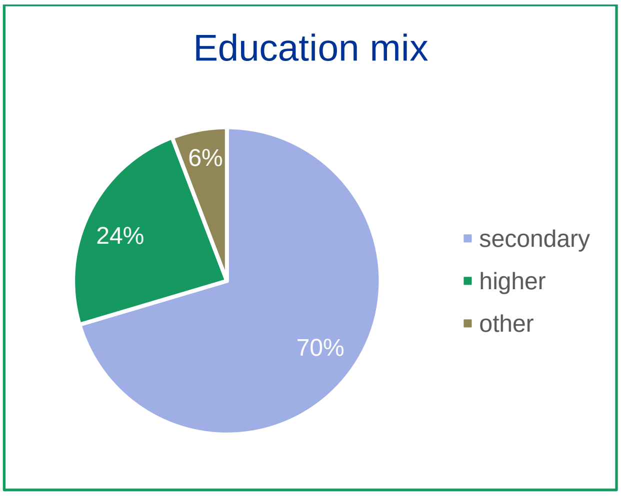
Natural, physical and geographical characteristics			
		Year	***Source***
Region Size (km²)	22.688	2019	NLS
Average temperature (°C)	1.5	2018	FMI
Average windspeed (m/s)	4	2018	Finnish wind atlas
Sunshine (hours/year)	1600	2018	FMI
CO2 emission per source	42,1% electricity and heat production; 7,6% other energy; 17,2% manufacturing industries and construction; 28,5% transport; 2,5% residential; 2,1% commercial	2017	IEA
CO2 emission per transport mode	0.58;0.37;0.05 passengers; vans & lorry ; other Finland level	2018	Kainuu's Transportation System Plan





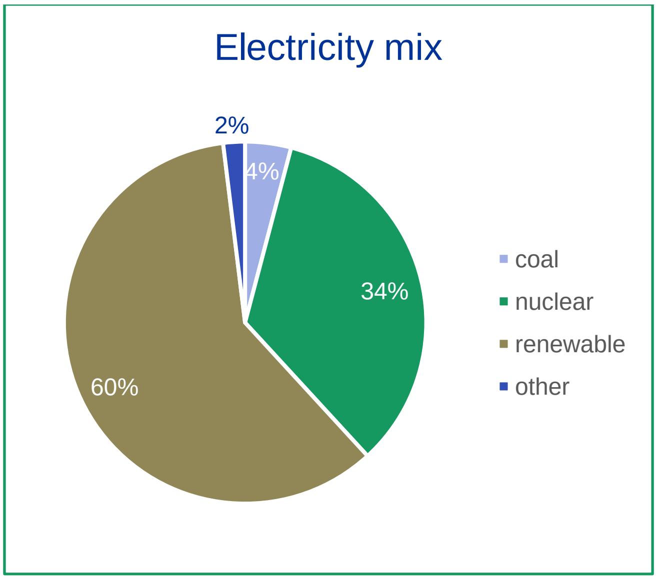
Demographic Data			
		Year	***Source***
Population (inhabitants)	73.061	2018	Statistics Finland
Population density (inhabitants per km²)	3.6	2018	Statistics Finland
Age structure	14,06; 9,88; 9,91; 10,17; 11,71; 16,80; 15,53; 8,39; 3,55	2018	Statistics Finland
Education mix	0,704 secondary; 0,238 higher; 0,058 other	2018	Finland
Environmental awareness	64,70%	2016	Eurostat

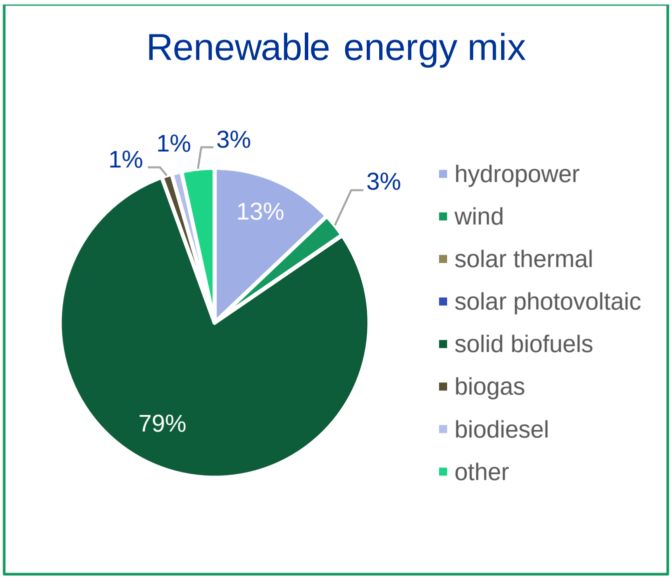




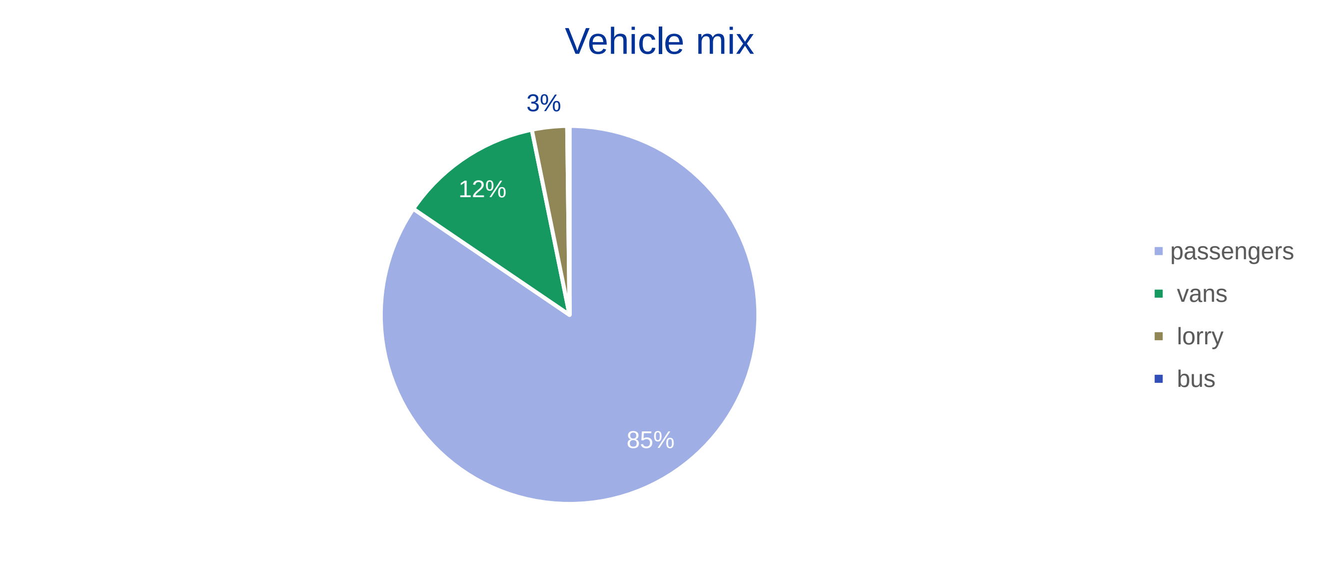
Economic indicators			
		Year	***Source***
Gross Regional Product (€ in millions)	2.441	2017	Statistics Finland
GRP per capita (€)	28.596,3	2016	Statistics Finland
Average income (€ per year)	18 993	2017	Statistics Finland
Unemployment rate	11.5%	12/2018	Statistics Finland

Energy Indicators			
		Year	***Source***
Electricity mix	4,10;0;0;34,08;59,88;1,94	2016	Eurostat
Renewable energy mix	12,91;2,51;0,02;0,01;79,01;1,07;1,03;3,44	2016	Eurostat
Electricity price (€ per kWh)	0,1581	2017	Eurostat
Fuel price (€ per litre diesel)	1,5 (95 E10)	2018	Statistics Finland





Mobility indicators			
		Year	***Source***
Transportation mix	0.82; passengers;	2018	Kainuu's Transportation System Plan
Vehicle mix	84.4; 12.3; 3.0; 0.2 passengers; vans; lorry; bus	2018	Statistics Finland
Number of vehicles	53.131	2018	Statistics Finland
Number of cars in household	53.131 cars / number of households	2018	Statistics Finland
Number of Electric Vehicles	28 (EV's and PHEV's)	2018	Presentation of Huusko 7th of Nov 2018 in e-MOPOLI Kajaani meeting
Electric Vehicle Sales (last year)	18	2018	Statistics Finland
Available Charging Infrastructure	13 Public charging places	2018	Presentation of Huusko 7th of Nov 2018 in e-MOPOLI Kajaani meeting

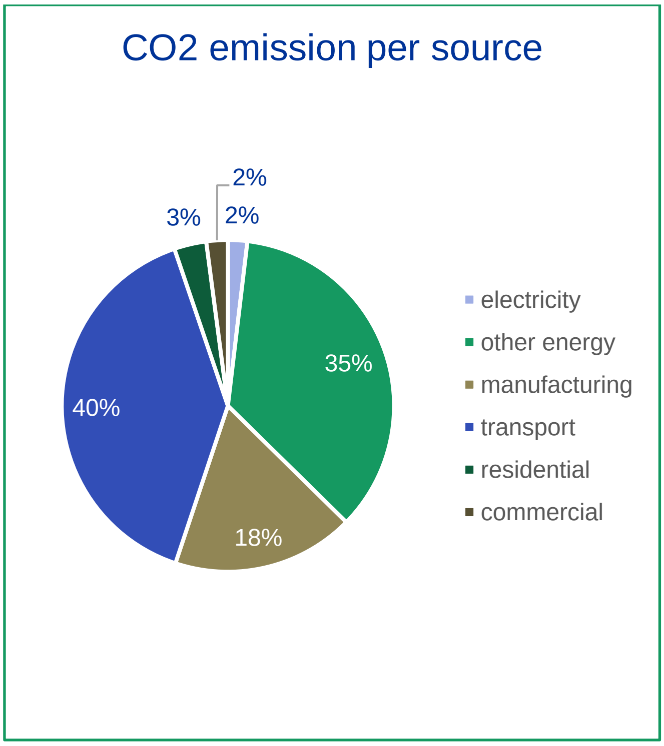


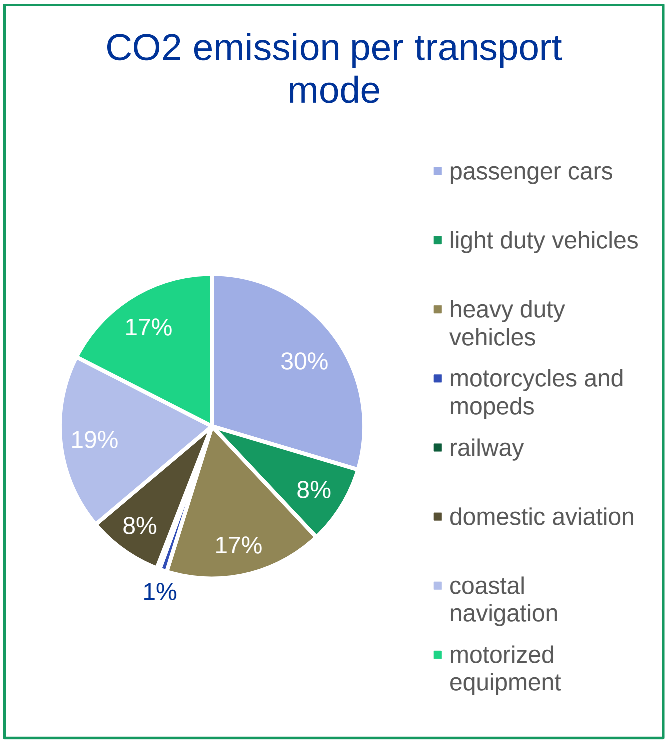
Benefits	
Financial Benefits	✗
Non-financial benefits	✗
Low emission zone	✗

		Year	***Source***
Total streets distance (km)	4.460 Excluding streets inside cities and municipalities	2018	Kainuu's Transport System plan
Street Mix	0,08 highways; 0,07 small roads; 0,85 other common roads Excluding streets inside cities and municipalities	2018	Kainuu's Transport System Plan

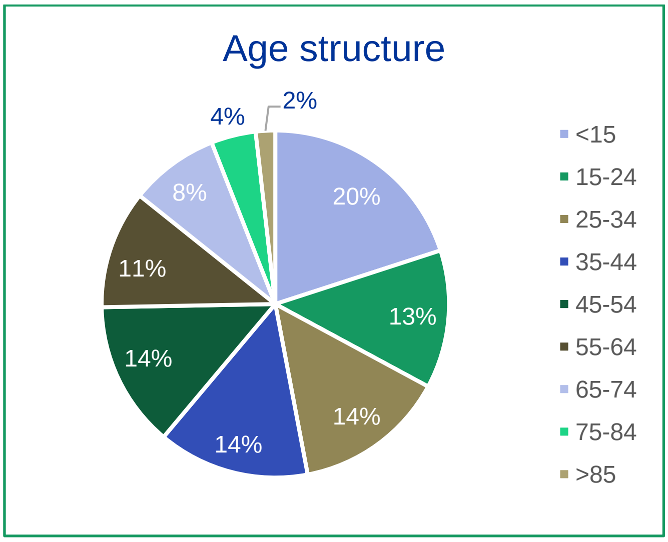
7.7 Rogaland County Council

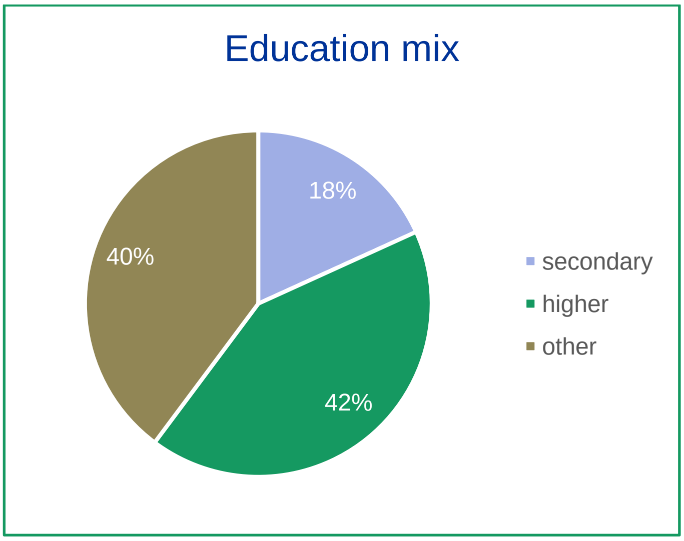
Natural, physical and geographical characteristics			
		Year	***Source***
Region Size (km²)	9.363	2016	Eurostat
Average temperature (°C)	7,5	2019	yr.no
Average windspeed (m/s)	4-6	2019	yr.no
Sunshine (hours/year)	1513	2019	yr.no
CO2 emission per source	1,8% electricity, 34% other energy, 17% manufacturing, 38% transport, 3% residential, 2% commercial	2017	IEA
CO2 emission per transport mode	29,60% passenger cars; 8,39% light duty vehicles; 16,82 heavy duty vehicles; 0,78% motorcycles and mopeds; 0,31% railway; 7,94% domestic aviation; 18,67 coastal navigation; 17,48% motorized equipment	2017	Ssb.no





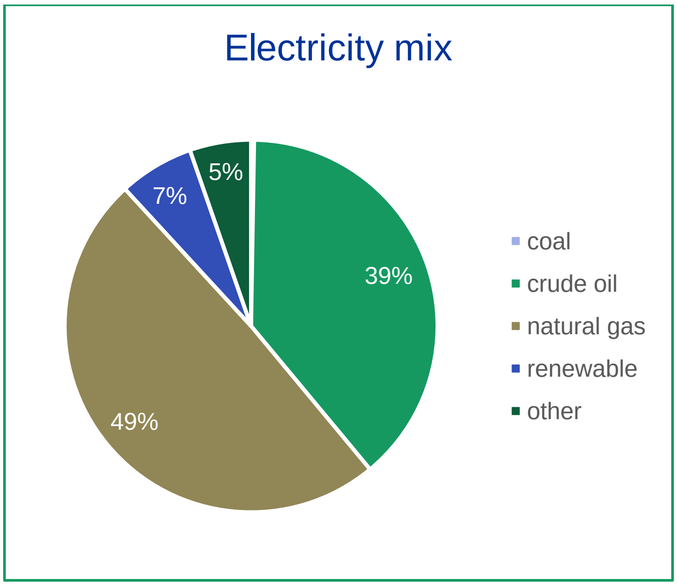
Demographic Data			
		Year	***Source***
Population (inhabitants)	473.525	2018	Eurostat
Population density (inhabitants per km²)	53,5	2017	Eurostat
Age structure	20,00;12,88;14,13;14,10;13,59;11,03; 8,29;4,16;1,81	2017	Eurostat
Education mix	18,20%;42%;39,80%	2017	Eurostat
Environmental awareness	57,20%	2016	Eurostat

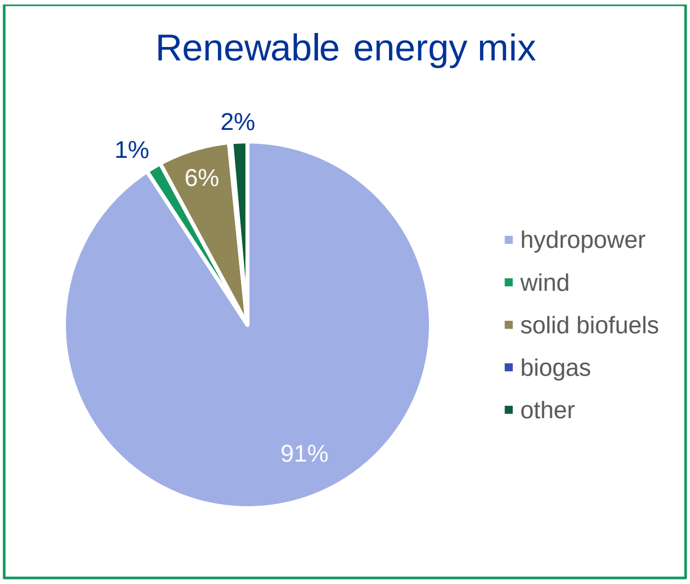




Economic indicators			
		Year	***Source***
Gross Regional Product (€ in millions)	28.294,52	2016	Eurostat
GRP per capita (€)	60.233,02	2014	Eurostat
Average income (€ per year)	43.300	2016	ssb.no
Unemployment rate	2,70%	2019	ssb.no

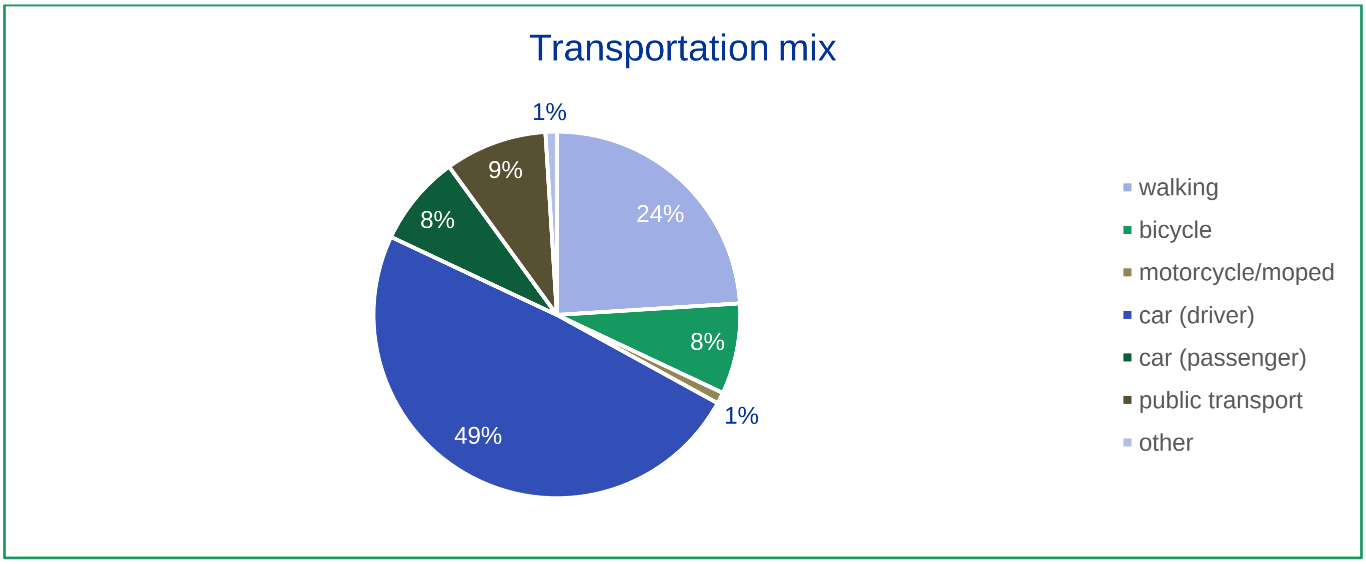
Energy Indicators			
		Year	***Source***
Electricity mix	0,26;38,72;49,19;0;6,51;5,32	2016	Eurostat
Renewable energy mix	90,78;1,34;0;0;6,27;0,21;0;1,4	2016	Eurostat
Electricity price (€ per kWh)	0,099	2019	ssb.no
Fuel price (€ per litre)	1,54	2019	ssb.no





Mobility indicators			
		Year	***Source***
Transportation mix	24% walking; 8% bicycle; 1% motorcycle/moped; 49% car (driver); 8% car (passenger); 9% public transport; 1% other	2014	Institute Transport Economics
Number of vehicles	264.038	2017	Ssb.no
Number of cars in household	1,3	2017	Ssb.no
Number of Electric Vehicles	20.155	2018	ssb.no
Electric Vehicle Sales	31,2 %	2018	Ofv.no

(last year)			
Available Charging Infrastructure	735	2019	Nobil.no



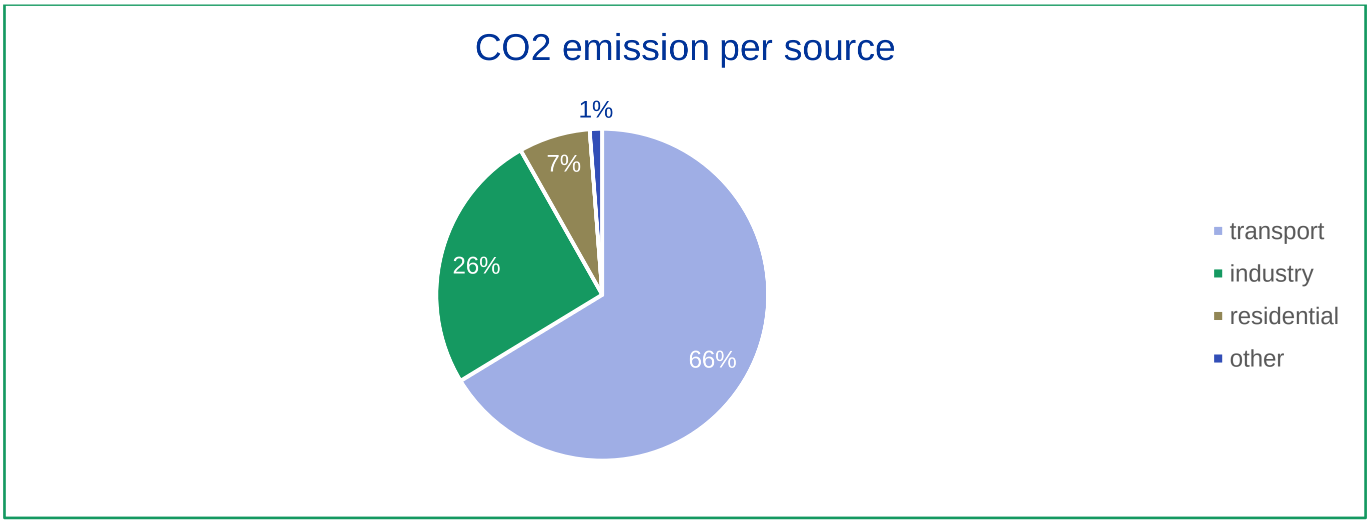
Benefits	
Financial Benefits	✔
Non-financial benefits	✔
Low emission zone	✗

		Year	***Source***
Total streets distance (km)	6.332	2018	Ssb.no
Street Mix	0,0845 higway;0,392 county roads;0,5236 municipal roads	2018	Ssb.no

7.8 Bucharest-Ilfov Regional Development Agency

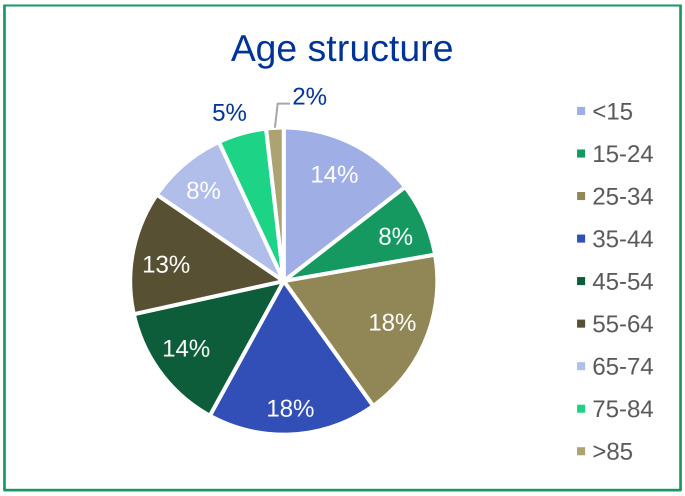
Natural, physical and geographical characteristics			
		Year	***Source***
Region Size (km²)	1.804	2015	Eurostat
Average temperature (°C)	11,2	2017	Annual Report on the State of the environment in Romania
Average windspeed (m/s)	3-4	2017	Annual Report on the State of the environment in Romania
Sunshine (hours/year)	2.187	2017	Annual Report on the State of the environment in Romania

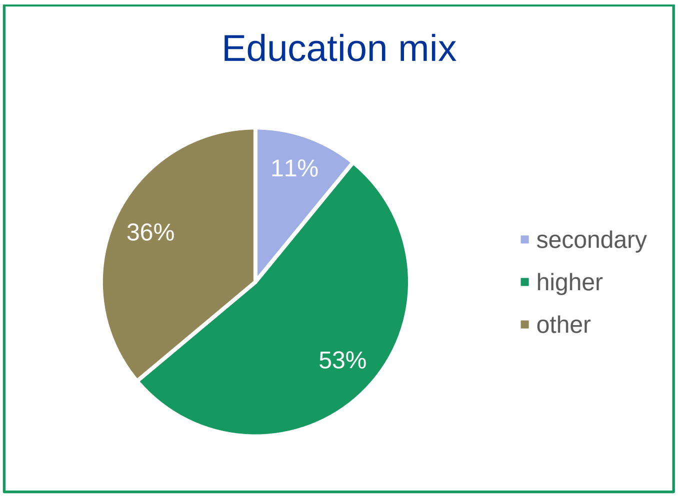
CO2 emission per source	0,6631 transport; 0,255 industry; 0,0697 residential; 0,0122 other	2017	Annual Report on the State of the environment in Romania



Demographic Data

		Year	***Source***
Population (inhabitants)	2.287.347	2017	Eurostat
Population density (inhabitants per km²)	1.304,40	2016	Eurostat
Age structure	14,51%;7,74%;17,86%;17,89%;13,55 %;12,98%;8,54%;5,10%;1,84%	2017	Eurostat
Education mix	10,90%;53%;36,10%	2017	Eurostat
Environmental awareness	55,90%	2016	Eurostat

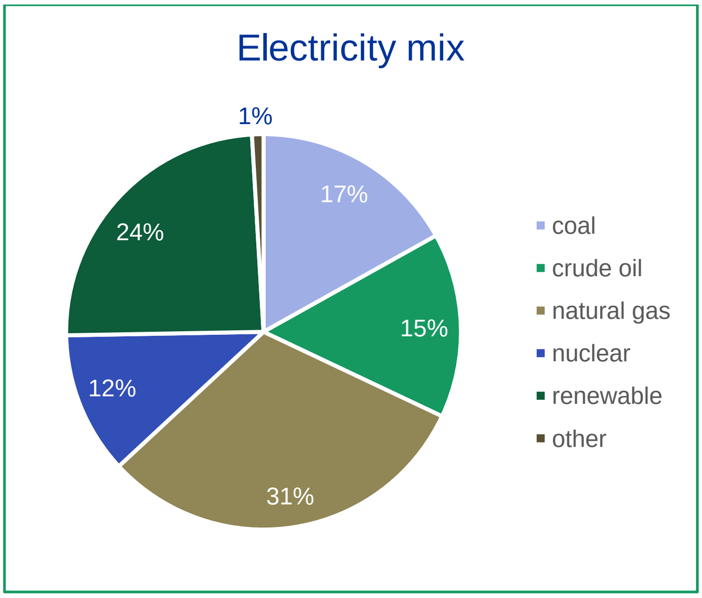


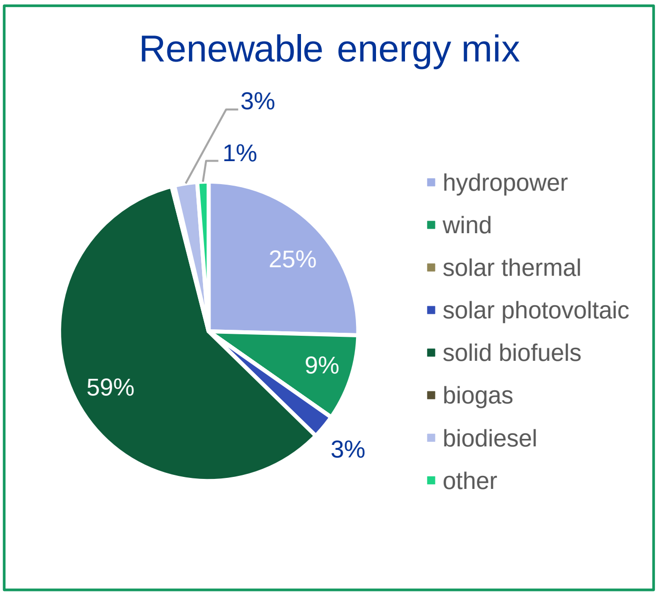


Economic indicators

		Year	Source
Gross Regional Product (€ in millions)	44.512	2016	Eurostat
GRP per capita (€)	19.450	2014	Eurostat
Average income (€ per year)	12.700	2016	Eurostat
Unemployment rate	1%	2016	Eurostat
Arrivals at tourist accommodation	901.731	2017	Eurostat

Energy Indicators			
		Year	***Source***
Electricity mix	16,91;15,11;31,08;11,62;24,34;0,94	2016	Eurostat
Renewable energy mix	25,42;9,3;0,01;2,57;58,72;0,29;2,47;1,22	2016	Eurostat
Electricity price (€ per kWh)	0,1198	2017	Eurostat
Fuel price (€ per litre diesel)	1,21	2018	Global Petrol Prices





Mobility indicators			
		Year	***Source***
Number of vehicles	1.382.122	2017	Automotive Manufacturers and Importers Association
Number of cars in household	1,54	2017	Automotive Manufacturers and Importers Association

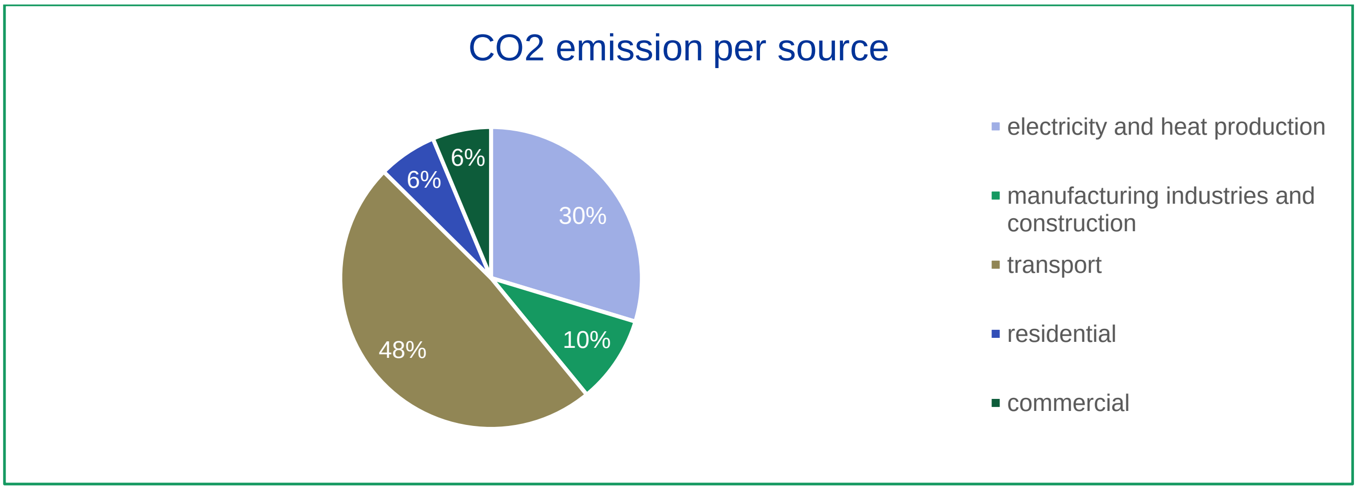
Number of Electric Vehicles	308	2017	Automotive Manufacturers and Importers Association
Electric Vehicle Sales (last year)	162%	2017	Automotive Manufacturers and Importers Association
Available Charging Infrastructure	26	2017	Automotive Manufacturers and Importers Association

Benefits	
Financial Benefits	✔
Non-financial benefits	✗
Low emission zone	✗

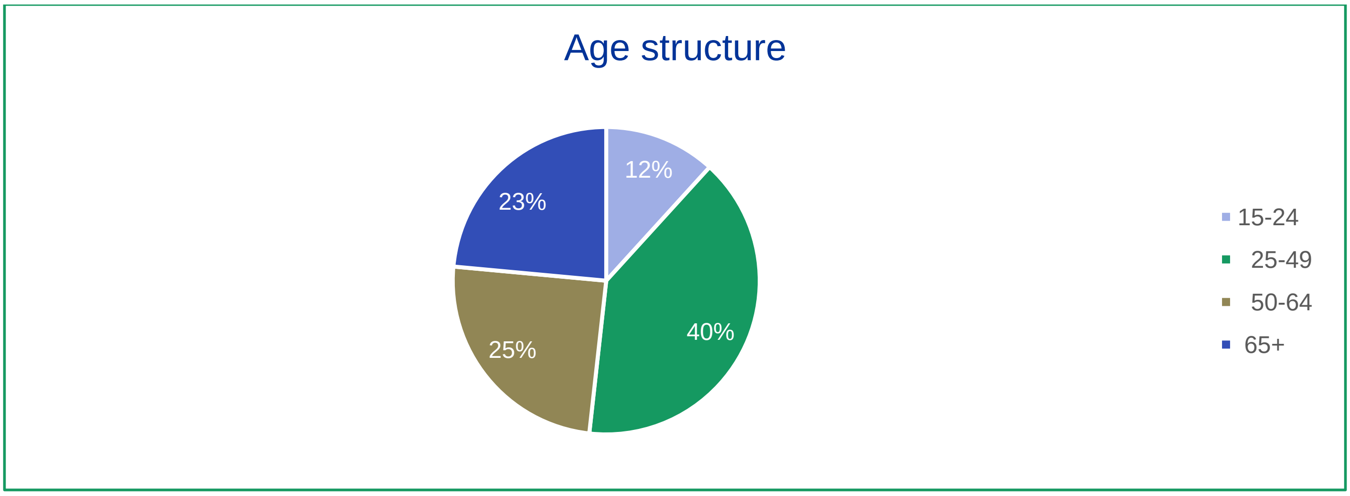
		Year	***Source***
Total streets distance (km)	*1.086*	*2017*	*Sustainable Urban Mobility Plan*
Street Mix	*13,08% highway; 20,26% national roads; 45,21% county roads; 21,46% communal roads*	*2017*	*Sustainable Urban Mobility Plan*

7.9 Zemgale Planning Region

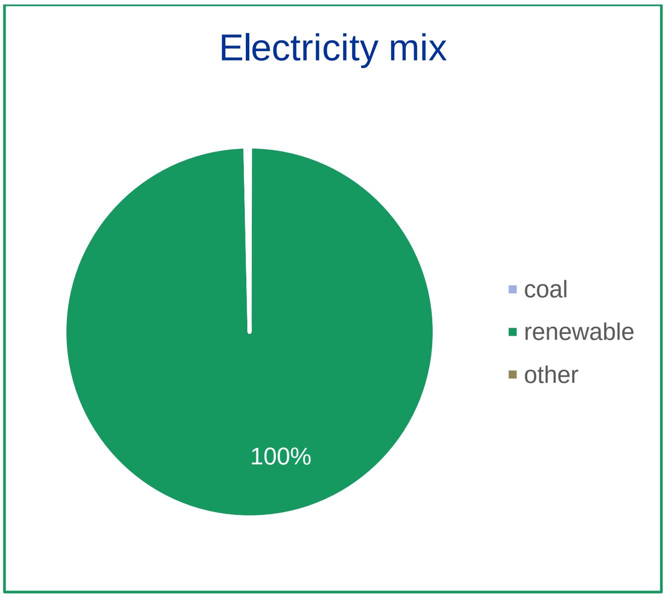
Natural, physical and geographical characteristics			
		Year	***Source***
Region Size (km²)	10.732	2015	Eurostat
Average temperature (°C)	5	2016	Latvia Central Statistic Bureau
Average windspeed (m/s)	4	2016	Latvia Central Statistic Bureau
Sunshine (hours/year)	1850	2016	Latvia Central Statistic Bureau
CO2 emission per source	29,7% electricity and heat production; 9,4% manufacturing industries and construction; 48,4% transport; 6,3% residential; 6,3% commercial	2017	IEA

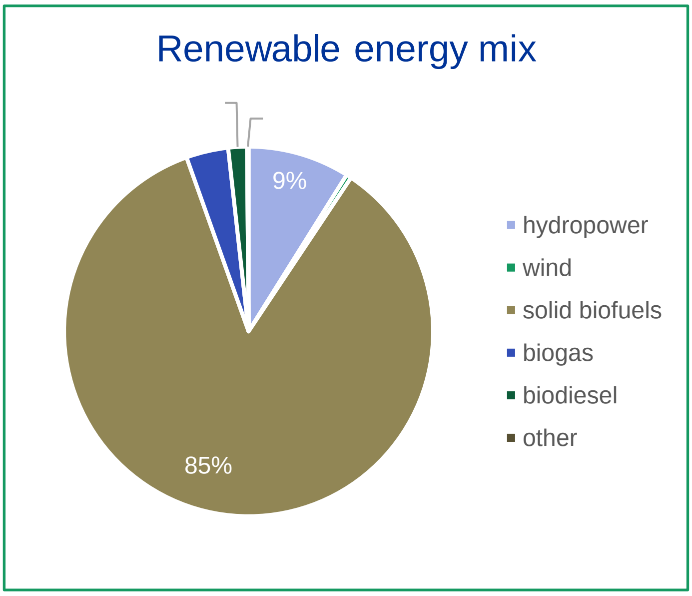


Demographic Data			
		Year	***Source***
Population (inhabitants)	232.759	2017	Latvia Central Statistic Bureau
Population density (inhabitants per km²)	22	2017	Latvia Central Statistic Bureau
Age structure	15-24 / 10%, 25-49 / 34%, 50-64 / 21%, 65+ / 20%	2017	Latvia Central Statistic Bureau



Energy Indicators			
		Year	***Source***
Electricity mix	0,04;0;0;0;99,6;0,36	2016	Eurostat
Renewable energy mix	8,92;0,45;0;0;0;85,17;3,69;1,64;0,13	2016	Eurostat
Electricity price (€ per kWh)	0,1586	2017	Eurostat
Fuel price (€ per litre diesel)	1,16	2019	Petrol Station





Mobility indicators			
		Year	***Source***
Number of vehicles	74.199	2017	Road Traffic Safety Board
Number of cars in household	0,70	2017	Road Traffic Safety Board
Number of Electric Vehicles	12	2017	Road Traffic Safety Board
Available Charging Infrastructure	15	2017	Road Traffic Safety Board

Benefits	
Financial Benefits	✔
Non-financial benefits	✔
Low emission zone	✗

8. Analysis

This section describes the cross-regional analysis to allow comparison between regions and identify unique characteristics that might explain past or future successfulness of certain policy instruments. High values or values having a positive influence on the adoption of alternative fuel technologies are coloured green, middle values are coloured yellow and lower values or values indicating a less positive influence on adoption are coloured blue (see section 4.2 Analysis). The analysis is broken down in the earlier mentioned themes of indicators, where each indicator will be discussed separately.

8.1 Natural, physical and geographical characteristics

Size wise, partner regions can be categorized in three groups: larger regions, mid-sized regions and the smaller regions. The larger regions (Brescia and Kainuu) have a surface of more than 20.000 km², the mid-sized regions (Calabria, Flanders, Rogaland and Zemgale) average around 12.500 km² and the smaller regions (Attica, Bucaresti and Gorenjska) don't exceed a region size of 4.000 km².

Table 3: Overview region sizes in square km.

	EU28	Brescia	Calabria	Gorenjska	Attica	Flanders	Kainuu	Rogaland	Bucaresti	Zemgale
Region Size	4.469.668	23.864	15.222	2.137	3.817	13.599	22.688	9.363	1.804	10.732

Climate wise, southern regions (Attica and Calabria) differ greatly from the most northern regions (Kainuu and Zemgale) with a spread of almost 20°C in average temperature. Other regions fluctuate around the European average (10,7°C). Since battery performance decreases under colder temperatures, Kainuu region might not be the most suitable environment for electric vehicles and opt other alternative fuel technologies.

Table 4: Overview average temperatures (°C).

	EU28	Brescia	Calabria	Gorenjska	Attica	Flanders	Kainuu	Rogaland	Bucaresti	Zemgale
Average temperature	10,7	12,5	21	10,6	17,5	11,1	2	7,5	11,2	5

Logically, total hours of sunshine are highest in the southern regions, Attica and Calabria. Brescia, Bucaresti and Gorensja follow with an average around the European benchmark (1928). These regions might be more suitable for renewable energy production focussing on solar energy. Brescia, Gorenjska and Zemgale score close to the European average (1928 hours). Flanders, Kainuu and Rogaland form the lower segment and have less hours of sunshine than the European average.

Table 5: Overview total hours of sunshine.

	EU28	Brescia	Calabria	Gorenjska	Attica	Flanders	Kainuu	Rogaland	Bucaresti	Zemgale
Sunshine	1.928	1.914	2.371	2.000	2.873,4	1.545	1.600	1.513	2.187	1.850

Most regions average windspeed amounts to 3-4 m/s, though Rogaland and Calabria region indicated to average a bit higher (4-6 m/s) and Gorenjska region a bit lower (1-2 m/s). The average windspeed is a good indicator for an opportunity to generate wind powered energy.

Table 6: Overview average windspeed (m/s).

	EU28	Brescia	Calabria	Gorenjska	Attica	Flanders	Kainuu	Rogaland	Bucaresti	Zemgale
Wind		3-4	4-6	1-2	3-4	3-4	4-5	4-6	3-4	4

Earlier mentioned natural indicators might indicate unexploited opportunities for renewable energy in most of the concerning regions, but as will be shown in section 7.4 'Energy indicators', other sources for renewable energy production like geothermal and hydropower are possible too.

Regarding CO2 emission in the regions, CO2 in the transport sector is the highest in Bucaresti, scoring well above European average and the other regions. Next regions, still scoring above the European benchmark, are Gorenjska and Zemgale, followed by Calabria and Rogaland. Lowest segment consists of Attica, Brescia, Flanders and Kainuu, scoring only little below the European benchmark. These numbers indicate great potential for decarbonising the transport sector in all regions.

Table 7: Overview percentage of CO2 emission in the transport sector.

	EU28	Brescia	Calabria	Gorenjska	Attica	Flanders	Kainuu	Rogaland	Bucaresti	Zemgale
CO2 emission in transport sector	28,5%	29%	32,00%	42,42%	29,10%	28,90%	28,50%	38%	66,31%	48,40%

8.2 Demographic data

The region with the largest population number is Brescia, followed by Flanders, then Attica, Bucaresti and Calabria, and lastly Rogaland and Gorenjska, Kainuu and Zemgale.

Table 8: Overview total population.

	EU28	Brescia	Calabria	Gorenjska	Attica	Flanders	Kainuu	Rogaland	Bucaresti	Zemgale
Population	511.522.671	10.019.166	1.965.128	203.800	3.773.559	6.526.061	73.085	473.525	2.287.347	232.759

When putting these numbers in perspective by comparing them with their corresponding region size, it can be noted that Bucaresti and Attica have the highest population density, followed by Brescia and Flanders, and lower densities for Calabria and Gorenjska and Kainuu, Rogaland and Zemgale. Liveability in terms of air quality and noise levels could greatly benefit from the introduction of e-mobility alternatives in the region.

Table 9: Overview population density (inhabitants per square kilometre).

	EU28	Brescia	Calabria	Gorenjska	Attica	Flanders	Kainuu	Rogaland	Bucaresti	Zemgale
Population density	117,5	434,5	129,6	95,4	992,5	484,8	4	53,5	1.304,40	22

As discussed in the literature review, often found indicators for adoption of alternative fuel vehicles are age and the level of environmental awareness. Younger people tend to be more open for these new technologies and change of lifestyle, however, identified pioneers and early adopters typically range from age 35 to 64. Examining the age structures between regions, Bucaresti region has the highest percentage of inhabitants between age 35 and 54. Next come Attica, Brescia, Calabria and Rogaland averaging around the European benchmark. Flanders scores slightly lower than average.

Table 10: Overview population density (inhabitants per square kilometre).

	EU28	Brescia	Calabria	Gorenjska	Attica	Flanders	Kainuu	Rogaland	Bucaresti	Zemgale
Age	*26,05%*	26,63%	26,52%	n/a	28,02%	25,04%	n/a	27,69%	35,75%	n/a

Although also influenced by other factors, national recycling rates are used as a measure for environmental awareness. Scoring highest on this measure was the Flanders region, followed by Brescia, Calabria, Gorenjska and Kainuu and then Attica, Bucaresti, Rogaland and Zemgale.

Table 11: Overview Recycling rates for packaging waste.

	EU28	Brescia	Calabria	Gorenjska	Attica	Flanders	Kainuu	Rogaland	Bucaresti	Zemgale
Environment awareness	67,20%	66,9%	66,9%	67,0%	60,3%	81,9%	64,7%	57,2%	55,9%	57,7%

8.3 Economic indicators

Given the possible, capital intensive nature of the transition to alternative fuel technologies or implementing other e-mobility good practices, it is interesting to examine the economic situation of the regions. The region with the highest Gross Regional Product is Brescia, followed by Flanders, then Attica, Bucaresti, Calabria and Rogaland, and finally Gorenjska.

Table 12: Overview Gross Regional Products (in millions euro).

	EU28	Brescia	Calabria	Gorenjska	Attica	Flanders	Kainuu	Rogaland	Bucaresti	Zemgale
Gross Regional Product	14.907.852	366.541	32.440	3.769	84.374	241.094	2.441	28.294,52	44.512	n/a

When taking into account the number of inhabitants of the respective regions, a slightly different picture appears. Notable difference for Rogaland region, scoring highest in Gross Regional Product per capita, followed by Brescia and Flanders. Attica, Bucaresti, Calabria and Gorenjska form the lower segment, scoring below European average. The difference between Gorenjska and the other regions is lower when the number of inhabitants is considered.

Table 13: Overview Gross Regional Product per capita.

	EU28	Brescia	Calabria	Gorenjska	Attica	Flanders	Kainuu	Rogaland	Bucaresti	Zemgale
GRP per capita	29.215	36.583,9	16.462,6	18.493,2	22.313,6	37.137,1	28.596,3	60.233,0	19.449,9	*n/a*

A similar relationship appears when examining average income. Average income is highest in Rogaland region, followed by Brescia and Flanders, then Kainuu averaging around the Europen benchmark, and finally Attica, Bucaresti, Calabria and Gorenjska.

Table 14: Overview average income in euro.

	EU28	Brescia	Calabria	Gorenjska	Attica	Flanders	Kainuu	Rogaland	Bucaresti	Zemgale
Average income	18.240	25.200	11.200	11.493	12.200	26.100	19.771	43.300	12.700	10.200

Taking a closer look at the unemployment rate, Bucarest, Flanders and Rogaland score highest with an unemployment rate between 1% and 4%. The middle- segment includes Brescia, Gorenjska and Kainuu, averaging around the European Benchmark. Next is Zemgale with an unemployment rate of 13%. Partner regions Attica and Calabria have an unemployment rate of 22%.

Table 15: Overview unemployment ratio.

	EU28	Brescia	Calabria	Gorenjska	Attica	Flanders	Kainuu	Rogaland	Bucaresti	Zemgale
Unemployment rate	7,8%	6,2%	22,0%	9,2%	21,5%	3,5%	7,4%	2,7%	1,1%	12,6%

8.4 Energy indicators

A huge influence on the climate impact of e-mobility practices is the sustainability of energy sources. Examining the energy indicators, particularly the percentage of electricity produced out of renewable energy sources is of interest. Scoring highest in this area is Rogaland, recording 71,2% of their energy production out of renewable sources. Today this number has even increased till a whopping 99%, thanks to hydropower generated in the fjords. Next are Zemgale and Kainuu region, followed by Attica, Brescia, Bucaresti, Calabria and Gorenjska, scoring around the European average. Flanders region scores below average on this indicator.

Table 16: Overview percentages renewable energy production.

	EU28	Brescia	Calabria	Gorenjska	Attica	Flanders	Kainuu	Rogaland	Bucaresti	Zemgale
Renewable energy	*16,7%*	18,3%	18,3%	21,6%	16,3%	9,1%	41,0%	71,2%	24,5%	39,0%

As discussed in the literature review, a significant correlation between energy prices and adoption of alternative fuel technologies has been found. A lower price of electricity will result in a lower operating cost for battery electric- and hybrid cars and a higher price for diesel and gasoline will make alternative fuel vehicles more attractive. Electricity prices are highest in Flanders, followed by Attica, Brescia and Calabria. Lowest electricity prices can be found in Kainuu, Rogaland and Zemgale and even lower in Bucaresti.

Table 17: Overview electricity prices (Eur per kWh).

Indicator	*EU28*	Brescia	Calabria	Gorenjska	Attica	Flanders	Kainuu	Rogaland	Bucaresti	Zemgale
Electricity price	0,2041	0,2132	0,2132	0,1609	0,1936	0,2799	0,1581	0,099	0,1198	0,1586

Examining diesel prices, highest prices exist in Rogaland, followed by Attica, Brescia, Calabria, Flanders and Kainuu. Lowest prices are found in Bucaresti, Gorenjska and Zemgale. The combination of high diesel prices with low electricity prices creates a positive environment for electric vehicles and could have a positive influence on market uptake.

Table 18: Overview diesel prices (Eur per litre).

Indicator	*EU28*	Brescia	Calabria	Gorenjska	Attica	Flanders	Kainuu	Rogaland	Bucaresti	Zemgale
Diesel price	1,210	1,434	1,5	1,19	1,341	1,37	1,4	1,54	1,21	1,16

8.5 Mobility indicators

The current state of mobility might offer some insight into the possible impact of a transition to alternative fuel vehicles. The region with the highest number of vehicles is Brescia, followed by Attica and Flanders, then Bucaresti and Calabria and finally Gorenjska, Kainuu and Rogaland.

Table 19: Overview of total vehicles.

	EU28	Brescia	Calabria	Gorenjska	Attica	Flanders	Kainuu	Rogaland	Bucaresti	Zemgale
Total vehicles	378.318.034	4.194.000	1.280.935	143.555	3.920.083	3.538.693	62.469	264.038	1.382.122	74.199

When taking into account the corresponding regional number of inhabitants, a slightly different image is obtained. Calabria region has the highest number of cars per household, while Attica, Brescia, Bucaresti, Flanders, Gorenjska and Rogaland average around 1,4 cars per household, below the European benchmark. Attica and Kainuu have the lowest number of cars per household.

Table 20: Overview of cars per household.

	EU28	Brescia	Calabria	Gorenjska	Attica	Flanders	Kainuu	Rogaland	Bucaresti	Zemgale
Cars per household	1,71	1,45	2,31	1,31	0,99	1,26	0,71	1,3	1,54	0,7

As for electric vehicles, Rogaland currently has the highest number of electric vehicles, followed by Flanders, then Brescia and lastly Attica, Bucaresti and Kainuu. In Calabria there are currently no electric vehicles.

Table 21: Overview of cars per household.

	EU28	Brescia	Calabria	Gorenjska	Attica	Flanders	Kainuu	Rogaland	Bucaresti	Zemgale
Total battery electric vehicles	450.938	2.805	55	30	283	7.934	28	20.155	308	12

Comparing this with the total fleet size, a similar image was found. Rogaland has the highest market penetration ratio, followed by Flanders and then the other regions. Except for Rogaland no region exceeds the European average.

Table 22: Overview current market penetration of electric vehicles.

	EU28	Brescia	Calabria	Gorenjska	Attica	Flanders	Kainuu	Rogaland	Bucaresti	Zemgale
Market penetration EV	0,119%	0,0669%	0,0043%	0,0209%	0,0072%	0,2242%	0,0448%	7,6334%	0,0223%	0,0162%

As mentioned in the literature study, high correlation has been found between the presence of available charging infrastructure and adoption of the new technologies. The highest number of public available charging infrastructure can be found in Flanders. Followed by Brescia and Rogaland, and then the other regions.

Table 23: Overview of number public available charging infrastructure.

	EU28	Brescia	Calabria	Gorenjska	Attica	Flanders	Kainuu	Rogaland	Bucaresti	Zemgale
Available charging infrastructure	161.426	646	104	28	24	2.733	13	630	26	15

When this number of available chargers is compared to the number of electric vehicles, the highest ratio is found in Gorenjska, followed by Kainuu and Flanders, then Brescia and finally Attica, Bucaresti and Rogaland. Suprisingly, Rogaland has the highest market penetration, but the lowest level of public chargers per electric vehicle. This suggests that, though important following the literature, the availability of public charging infrastructure is not always the most important barrier to adoption as long as other charging opportunities are available (private and semi-private). Bucaresti, Gorenjska and Kainuu have a relatively low number of electric vehicles in their fleet, caution when interpreting these rates is therefore recommended.

Table 24: Overview ratio available charging infrastructure per electric vehicle.

	EU28	Brescia	Calabria	Gorenjska	Attica	Flanders	Kainuu	Rogaland	Bucaresti	Zemgale
Chargers per EV	*0,36*	0,23	0,53	0,93	0,08	0,34	0,46	0,03	0,08	1,25

9. Conclusion

Within the Interreg framework, the e-MOPOLI project was set up with the rationale to learn from good practices and realise effective guidelines for the implementation of policy instruments, eventually to contribute to an efficient diffusion of e-mobility and alternative fuels mobility. To fully understand the shared good practices, it is important to see them within their regional context. A regional context analysis of the participating regions was thus appropriate and provided in this paper.

Data on indicators proven to show correlation with adoption of alternative fuel technologies was collected and compared. An overview of the regional results can be found in table 25. Colour labels indicate the regions' performance in comparison to the other regions. In general, green indicates a higher positive effect on adoption than blue. Four groups of partners can be distinguished based on current state and suitability for alternative fuel technologies. A first group only consists of Rogaland, scoring highest on economic, energy and current state indicators. Rogaland has the highest Gross Regional Product per capita, average income, lowest electricity price, highest level of renewable energy and highest amount of electric vehicles. A second group consists of Brescia and Flanders, differentiating themselves from the other groups on economic and mobility indicators. They have the largest populations, Gross Regional Products, total amount of vehicles, available public charging infrastructure and after Rogaland, the most electric cars. Flanders however, has the lowest percentage of renewable energy and highest electricity prices of all the project regions. A third group consists of Attica and Bucaresti. This group can be characterized by the higher level of market penetration of electric vehicles with respect to the fourth group. A fourth group consists of Calabria, Gorenjska, Kainuu and Zemgale. Here we find the lowest population, Gross Regional Products, total amount of vehicles, vehicles per household and electric vehicles in the region.

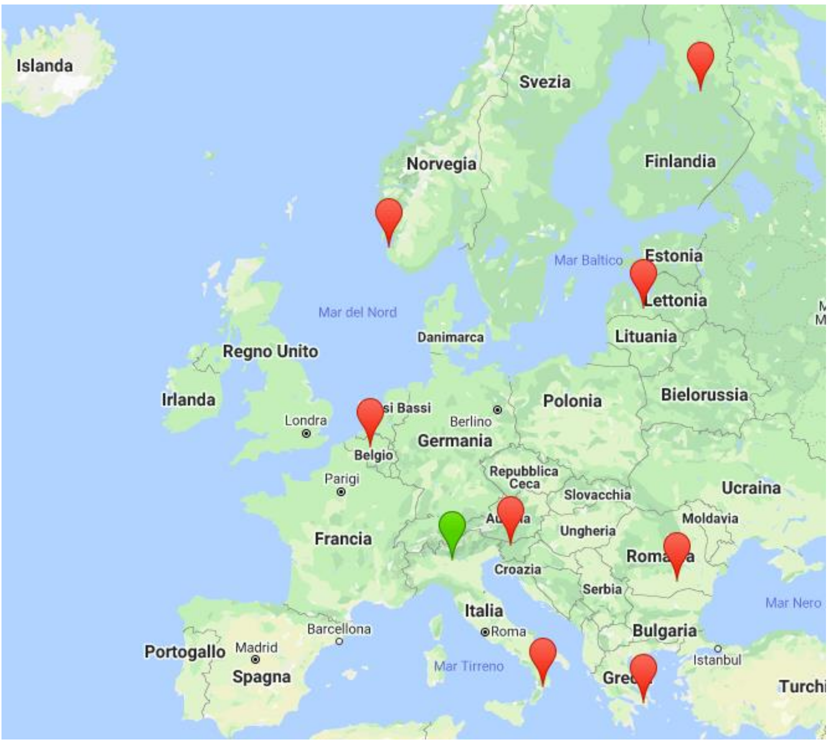
Possible limitations to the accuracy of this research can be linked to deviations in the used data, due to the use of mixed data sources (See Chapter 4. Methodology and Chapter 6. Overview of the project partner regions) and incomparability of regional data and national data. Other limitations might be caused by data gaps due to the absence of a reliable data source. Further research will focus on collecting, selecting and afterwards analysing regional good practices from the participating regions. Based on the Regional Context Analysis and the Sourcebook of Good practices, regions will be able to optimize their local action plans, that will then be implemented and monitored. Regions are advised to further invest in qualitative data collection to improve the quality of future research.

Table 25: Overview results.

	Rogaland	Brescia	Flanders	Attica	Bucaresti	Calabria	Gorenjska	Kainuu	Zemgale
Region Size	9.363	23.864	13.599	3.817	1.804	15.222	2.137	22.688	10.732
Average temperature	7,5	12,5	11,1	17,5	11,2	21	10,6	2	5
Sunshine	1.513	1.914	1.545	2.873,40	2.187	2.371	2.000	1.600	1.850
Wind	4-6	3-4	3-4	3-4	3-4	4-6	1-2	4-5	4
CO2 emission in transport sector	38%	29%	28,9%	29,1%	66,31%	32,0%	42,42%	28,50%	48,4%
Population	473.525	10.019.166	6.526.061	3.773.559	2.287.347	1.965.128	203.800	73.085	232.759
Population density	53,5	434,5	484,8	992,5	1.304,40	129,6	95,4	4	22
Environment awareness	57,20%	66,90%	81,90%	60,30%	55,90%	66,90%	67,00%	64,70%	57,70%
Gross Regional Product	28.294,52	366.541	241.094	84.374	44.512	32.440	3.769	2.441	N/A
GRP per capita	60.233,00	36.583,90	37.137,10	22.313,60	19.449,90	16.462,60	18.493,20	28.596,30	N/A
Average income	43.300	25.200	26.100	12.200	12.700	11.200	11.493	19.771	10.200
Unemployment rate	2,70%	6,20%	3,50%	21,50%	1,10%	22,00%	9,20%	7,40%	12,60%
Renewable energy	71,2%	18,3%	9,1%	16,3%	24,5%	18,3%	21,6%	41,0%	39,0%

Electricity price	0,099	0,2132	0,2799	0,1936	0,1198	0,2132	0,1609	0,1581	0,1586
Diesel price	1,54	1,434	1,37	1,341	1,21	1,5	1,19	1,4	1,16
Total vehicles	264.038	4.194.000	3.538.693	3.920.083	1.382.122	1.280.935	143.555	62.469	74.199
Cars per household	1,3	1,45	1,26	0,99	1,54	2,31	1,31	0,71	0,7
Total battery electric vehicles	20.155	2.805	7.934	283	308	55	30	28	12
Available charging infrastructure	630	646	2.733	24	26	104	28	13	15

10. Project facts and figures



e-MOPOLI: Electro MObility as driver to support POLicy Instruments for sustainable mobility

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This project is co-financed by ERDF - European Regional Development Fund 2014-2020. The content of this publication is the sole responsibility of the e-MOPOLI Partnership and does not reflect the official opinion of the European Union. Published in April 2020

€1,792,053.00

from **1 Jun 2018** to **30 Nov 2022**

Low carbon economy

9 partners
IT - SI - EL - BE - FI
NO - RO - LV

11. Bibliography

Al-Alawi, B. M., & Bradley, T. H. (2013). Total cost of ownership, payback, and consumer preference modeling of plug-in hybrid electric vehicles. Applied Energy, 103(2013), 488–506. https://doi.org/10.1016/j.apenergy.2012.10.009

Alternative fuels (electricity) charging infra stats | EAFO. (n.d.). Retrieved May 7, 2019, from https://www.eafo.eu/alternative-fuels/electricity/charging-infra-stats

Axsen, J., Goldberg, S., & Bailey, J. (2016). How might potential future plug-in electric vehicle buyers differ from current "Pioneer" owners? Transportation Research Part D: Transport and Environment, 47, 357–370. https://doi.org/10.1016/j.trd.2016.05.015

Bakker, S., & Trip, J. J. (2013). Policy options to support the adoption of electric vehicles in the urban environment. Transportation Research Part D: Transport and Environment, 25, 18–23. https://doi.org/10.1016/j.trd.2013.07.005

Berckmans, G., Messagie, M., Smekens, J., Omar, N., Vanhaverbeke, L., & Van Mierlo, J. (2017). Cost Projection of State of the Art Lithium-Ion Batteries for Electric Vehicles Up to 2030. Energies, 10(9), 1314. https://doi.org/10.3390/en10091314

Browne, D., O'Mahony, M., & Caulfield, B. (2012). How should barriers to alternative fuels and vehicles be classified and potential policies to promote innovative technologies be evaluated? Journal of Cleaner Production, 35, 140–151. https://doi.org/10.1016/j.jclepro.2012.05.019

Carley, S., Krause, R. M., Lane, B. W., & Graham, J. D. (2013). Intent to purchase a plug-in electric vehicle: A survey of early impressions in large US cites. Transportation Research Part D: Transport and Environment, 18(1), 39–45. https://doi.org/10.1016/j.trd.2012.09.007

Coffman, M., Bernstein, P., & Wee, S. (2017). Electric vehicles revisited: a review of factors that affect adoption. Transport Reviews, 37(1), 79–93. https://doi.org/10.1080/01441647.2016.1217282

Dimitropoulos, A., Rietveld, P., & van Ommeren, J. N. (2013). Consumer valuation of changes in driving range: A meta-analysis. Transportation Research Part A: Policy and Practice, 55, 27–45. https://doi.org/10.1016/j.tra.2013.08.001

Egbue, O., & Long, S. (2012). Barriers to widespread adoption of electric vehicles: An analysis of consumer attitudes and perceptions. Energy Policy, 48(2012), 717–729. https://doi.org/10.1016/j.enpol.2012.06.009

European Alternative Fuels Observatory (2019). Retrieved April 2, 2019, from https://www.eafo.eu/vehicles-and-fleet/m1

Glerum, A., Stankovikj, L., Thémans, M., & Bierlaire, M. (2014). Forecasting the Demand for Electric Vehicles: Accounting for Attitudes and Perceptions. Transportation Science, 48(4), 483–499. https://doi.org/10.1287/trsc.2013.0487

Gnann, T., & Plötz, P. (2015). A review of combined models for market diffusion of alternative fuel vehicles and their refueling infrastructure. Renewable and Sustainable Energy Reviews, 47, 783–793. https://doi.org/10.1016/j.rser.2015.03.022

Graham-Rowe, E., Gardner, B., Abraham, C., Skippon, S., Dittmar, H., Hutchins, R., & Stannard, J. (2011). Mainstream consumers driving plug-in battery-electric and plug-in hybrid electric cars: A qualitative analysis of responses and evaluations. Transportation Research Part A: Policy and Practice, 46(1), 140–153. https://doi.org/10.1016/j.tra.2011.09.008

Hackbarth, A., & Madlener, R. (2013). Consumer preferences for alternative fuel vehicles: A discrete choice analysis. Transportation Research Part D: Transport and Environment, 25, 5–17. https://doi.org/10.1016/j.trd.2013.07.002

Hardman, S., Shiu, E., & Steinberger-Wilckens, R. (2016). Comparing high-end and low-end early adopters of battery electric vehicles. Transportation Research Part A: Policy and Practice, 88, 40–57. https://doi.org/10.1016/j.tra.2016.03.010

Helveston, J. P., Liu, Y., Feit, E. M. D., Fuchs, E., Klampfl, E., & Michalek, J. J. (2015). Will subsidies drive electric vehicle adoption? Measuring consumer preferences in the U.S. and China. Transportation Research Part A: Policy and Practice, 73, 96–112. https://doi.org/10.1016/j.tra.2015.01.002

Hess, S., Fowler, M., Adler, T., & Bahreinian, A. (2012). A joint model for vehicle type and fuel type choice: Evidence from a cross-nested logit study. Transportation, 39(3), 593–625. https://doi.org/10.1007/s11116-011-9366-5

Hidrue, M. K., Parsons, G. R., Kempton, W., & Gardner, M. P. (2011). Willingness to pay for electric vehicles and their attributes. Resource and Energy Economics, 33(3), 686–705. https://doi.org/10.1016/j.reseneeco.2011.02.002

Hoen, A., & Koetse, M. J. (2014). A choice experiment on alternative fuel vehicle preferences of private car owners in the Netherlands. Transportation Research Part A: Policy and Practice, 61, 199–215. https://doi.org/10.1016/j.tra.2014.01.008

International Energy Agency. (2018a). CO2 emissions from fuel combustion - Highlights, 1–166. https://doi.org/10.1787/co2_fuel-2014-en

International Energy Agency. (2018b). Global EV Outlook 2018. Towards cross-model electrification, 143. https://doi.org/EIA-0383(2016)

Interreg Europe. (n.d.). Retrieved April 8, 2019, from https://www.interregeurope.eu/

Jensen, A. F., Cherchi, E., & Mabit, S. L. (2013). On the stability of preferences and attitudes before and after experiencing an electric vehicle. Transportation Research Part D: Transport and Environment, 25, 24–32. https://doi.org/10.1016/j.trd.2013.07.006

Krause, R. M., Carley, S. R., Lane, B. W., & Graham, J. D. (2013). Perception and reality: Public knowledge of plug-in electric vehicles in 21 U.S. cities. Energy Policy, 63(2013), 433–440. https://doi.org/10.1016/j.enpol.2013.09.018

Langbroek, J. H. M., Franklin, J. P., & Susilo, Y. O. (2016). The effect of policy incentives on electric vehicle adoption. Energy Policy, 94, 94–103. https://doi.org/10.1016/j.enpol.2016.03.050

Lebeau, K., Van Mierlo, J., Lebeau, P., Mairesse, O., & Macharis, C. (2012). The market potential for plug-in hybrid and battery electric vehicles in Flanders: A choice-based conjoint analysis. Transportation Research Part D: Transport and Environment, 17(8), 592–597. https://doi.org/10.1016/j.trd.2012.07.004

Mersky, A. C., Sprei, F., Samaras, C., & Qian, Z. S. (2016). Effectiveness of incentives on electric vehicle adoption in Norway. Transportation Research Part D: Transport and Environment, 46, 56–68. https://doi.org/10.1016/j.trd.2016.03.011

Messagie, M. (2017). Life Cycle Analysis of the Climate Impact of Electric Vehicles. Transport and Environment, 1–14.

Moons, I., & de Pelsmacker, P. (2012). Emotions as determinants of electric car usage intention. Journal of Marketing Management, 28(3–4), 195–237. https://doi.org/10.1080/0267257X.2012.659007

Nykvist, B., & Nilsson, M. (2015). Rapidly falling costs of battery packs for electric vehicles. Nature Climate Change, 5(4), 329–332. https://doi.org/10.1038/nclimate2564

Plötz, P., Schneider, U., Globisch, J., & Dütschke, E. (2014). Who will buy electric vehicles? Identifying early adopters in Germany. Transportation Research Part A: Policy and Practice, 67, 96–109. https://doi.org/10.1016/j.tra.2014.06.006

Rezvani, Z., Jansson, J., & Bodin, J. (2015). Advances in consumer electric vehicle adoption research: A review and research agenda. Transportation Research Part D: Transport and Environment, 34, 122–136. https://doi.org/10.1016/j.trd.2014.10.010

Sierzchula, W., Bakker, S., Maat, K., & Van Wee, B. (2014). The influence of financial incentives and other socioeconomic factors on electric vehicle adoption. Energy Policy, 68, 183–194. https://doi.org/10.1016/j.enpol.2014.01.043

Tanaka, M., Ida, T., Murakami, K., & Friedman, L. (2014). Consumers' willingness to pay for alternative fuel vehicles: A comparative discrete choice analysis between the US and Japan. Transportation Research Part A: Policy and Practice, 70(2014), 194–209. https://doi.org/10.1016/j.tra.2014.10.019

Tran, M., Banister, D., Bishop, J. D. K., & McCulloch, M. D. (2013). Simulating early adoption of alternative fuel vehicles for sustainability. Technological Forecasting and Social Change, 80(5), 865–875. https://doi.org/10.1016/j.techfore.2012.09.009

Witkamp, B., van Gijlswijk, R., Bolech, M., Coosemans, T., & Hooftman, N. (2017). The transition to a Zero Emission Vehicles fleet for cars in the EU by 2050 Pathways and impacts: An evaluation of forecasts and backcasting the COP21 commitments.

Wu, G., Inderbitzin, A., & Bening, C. (2015). Total cost of ownership of electric vehicles compared to conventional vehicles: A probabilistic analysis and projection across market segments. Energy Policy, 80, 196–214. https://doi.org/10.1016/j.enpol.2015.02.004

Zhang, Y., Yu, Y., & Zou, B. (2011). Analyzing public awareness and acceptance of alternative fuel vehicles in China: The case of EV. Energy Policy, 39(11), 7015–7024. https://doi.org/10.1016/j.enpol.2011.07.055

12. Annex A - Survey Regional Context Analysis

Natural, physical and geographical characteristics

- Region size (km²)

Only to be filled in by PP1, PP3, PP6 and PP9

- Average temperature (°C)

To be filled in by all partners

- Average wind speed (m/s)

To be filled in by all partners

- Total hours of sunshine (hours/year)

To be filled in by all partners

Demographic data

- Population

Only to be filled in by PP1, PP3, PP6 and PP9

- Population density

Only to be filled in by PP1, PP3, PP6 and PP9.

- Age structure (15-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75-84, 85+)

Only to be filled in by PP1, PP3, PP6 and PP9.

- Education mix (Doctorate or equivalent, masters or equivalent, bachelors or equivalent, high school diploma or equivalent, other)

Only to be filled in by PP1, PP3, PP6 and PP9.

Economic indicators

- Gross Regional Product

Only to be filled in by PP1, PP3, PP6 and PP9.

- Gross Regional Product per capita

Only to be filled in by PP1, PP3, PP6 and PP9.

- Average income

Only to be filled in by PP1, PP3, PP6 and PP9.

- Employment rate

Only to be filled in by PP1, PP3, PP6 and PP9.

- Business mix
  - Importance of tourism

Only to be filled in by PP1, PP3, PP6 and PP9.

Energy indicators

- Electricity mix (Oil – Gas – Nuclear – Renewable – other)

Only to be filled in by PP1, PP3, PP6 and PP9.

- Renewable energy mix (hydro – wind – solar – tide – biogas – other)

Only to be filled in by PP1, PP3, PP6 and PP9.

- Electricity price (Eur per kWh)

Only to be filled in by PP1, PP3, PP6 and PP9.

- Fuel price (Eur per litre Diesel)

To be filled in by all partners

Mobility indicators

- Transportation mix (public transport – car – walk – bike)

To be filled in by all partners

- Number of vehicles (all)

To be filled in by all partners

- Number cars in household

To be filled in by all partners

- EV & EVSE status
  - Total EVs

To be filled in by all partners

  - EV growth (sales last year)

To be filled in by all partners

  - Available charging infrastructure (public – private)

To be filled in by all partners

- EV & EVSE targets
  - EV target

To be filled in by all partners

  - EVSE target

To be filled in by all partners

  - Available subsidiary budget

To be filled in by all partners

- CO_2 emission mix per source (residential, commercial, transportation, industrial, other)

To be filled in by all partners

- CO_2 emission mix per transport mode (cars, light commercial, heavy commercial, buses, motorcycles)

To be filled in by all partners

- Financial benefits (Yes – No)

To be filled in by all partners

- Non-financial benefits (Yes – No)

To be filled in by all partners

- Low emission zone (Yes – No)

To be filled in by all partners

- Average daily travel

To be filled in by all partners

- Presence of airports, ports or other logistics centres

To be filled in by all partners

- Total amount street coverage (km) mix (highway - major roads- small roads)

To be filled in by all partners

- Public transport mix

To be filled in by all partners

- Accessibility public transport (average distance to stop)

To be filled in by all partners