ACTION PLAN PARMA

DELIVERABLE D.T1.2.3 ACTION PLANS FOR NEW INNOVATIVE LOW-CARBON MOBILITY SOLUTIONS & IMPROVED AIR QUALITY IN FUA	05/2022

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Development of action plans for new innovative mobility solutions & improved air quality in FUAs

The purpose of the action plan is to design a strategy regulate access and traffic in the municipal territory of Parma, with particular reference to the “Green Area” included among the ring roads, – The objective is to extend the air quality improvement measures based on EURO homologation classification, already in place in the winter period, to the whole year of air quality. This work integrates a range of further measures that the Municipal Administration has already undertaken and that will be carried on in the coming years, with the aim of pursuing the continuous improvement of the mobility system in the municipal area in general and specifically in the Green Area. Those measures focus on several specific objectives, such as the rationalization and fluidization of traffic, the improvement of road safety also for bikers and pedestrians, the development of shared and electric mobility, energy savings in mobility and reduction of polluting emissions, digitalization of transport, developing mobility as a service options.

In particular, this study defines the area for the development and implementation of the following mobility solutions in strong synergy with the city’s territorial pattern, in order to improve its livability: rationalization of the road network and definition of preferential lanes with enhancement of transport Local Public; creation of car sharing and bike sharing services and development of shared electric micro-mobility; building of environmental islands, zones 30, pedestrian areas, Restricted Traffic Zones (ZTL) and Areas of Particular Urban Relevance (ZPRU); rationalization of intermodal parking; implementation of city logistics initiatives.

The concept of “Green Area”, central to the provision object of this study, embeds the concept of “Blue Area”, a more restricted core area, not uniquely regulated at the time of drafting this study, composed by the ZTL 1, 2, 3 and the ZPRU , 1, 2, 6 and partially the ZPRU 11, in addition to the pedestrian areas, Zone 30, environmental islands and sensitive roads located there.

Due to its specific characteristics in terms of localization, urban planning and use, this area will be object of specific measures with special attention to active mobility and new forms of electric and shared micro-mobility. In the long term the access and circulation in the Blue Area will be allowed only to hybrid or electric vehicles, or even only electric, in the event that the N.C.D.S. will allow it.

The Green Area is synergistic with the Ecologistics project which provides for the regulation of accesses and parking with reference to the environmental performance characteristics of vehicles, as well as with respect to other city logistics initiatives, such as shared mobility solutions for the use of ecological vehicles for the distribution and delivery of goods in the city. The limitations associated with the operation of the Green Area may also undergo variations depending on the evolution of regional legislation on air quality, especially in the winter period. Specifically, it is expected that the limitations valid in the Green Area, for the entire calendar year, are at least identical to the structural limitations provided for by the PAIR.

Executive Summary

The scheme primarily envisages extending the restrictions on the circulation of the most polluting vehicles to the calendar year, starting from 1 May 2022.

In particular, the scheme considers as a starting point the prescriptions already provided for in the regulations in force and in the PAIR for the winter period, i.e. the blocking of motor vehicles for the transport of people and goods, fueled by diesel, up to and including the EURO 4 class, of those fueled by petrol up to the EURO 2 class included, of those fueled by gas / methane and of motor vehicles up to the EURO 1 class.

However, also considering the suspension of the structural limitation for diesel vehicles of the EURO 4 class during the state of emergency connected to the Covid-19 pandemic, and in order to gradually accompany the introduction of the Green Area measure, the blocking of diesel vehicles up to the EURO 3 class is envisaged when the Green Area is established on 1 May 2022, petrol up to the EURO 2 class and gas / methane vehicles and motorcycles up to the EURO 1 class, excluding mopeds.

The hypothesis of the block for diesel vehicles of the EURO 4 class and petrol of the EURO 2 class starting from October 2022 remains in the pipeline, to be confirmed also on the basis of the evolution of the regional sector legislation. With respect to the time horizon to 2030, the project provides for the gradual extension of the restrictions on motor vehicles for the transport of people and goods fueled by diesel up to the EURO 5 class included, in 2025, and up to the EURO 6 categories a, b and c, in 2029, with no further restrictions for gasoline vehicles.

It is also planned to introduce, starting from 2025, the blocking of motor vehicles for the transport of people and goods powered by gas / methane and motor vehicles powered by diesel or petrol of classes up to and including EURO 2.

In order to strengthen the protection of the territory and sustainable mobility in the Blue Area, it is also envisaged to limit access and circulation in this area, starting from 2029, to vehicles with hybrid or electric drive, or even electric only, in the event that the N.C.D.S. will allow it. In any case, it should be specified that the scheme is proposed as dynamic and possibly modifiable over the years, both before and after the 2030 horizon, also based on the evolution of the superordinate regional and national legislation. With regard to the exceptions, transit corridors are provided for access to the main car parks, interchange nodes and functional polarities, along the axes and roads already defined by the current ordinance on air quality.

These corridors will be accessible to all vehicles subject to the restrictions, at least for a minimum number of 15 annual accesses. For these same vehicles it is also possible to access and circulate

indefinitely along these axes, by obtaining the electronic permit for transit and parking Parma! iMobility. In order to minimize journeys in the Green area and discourage crossing the area, the Administration will evaluate the opportunity to sanction the passage out of the Green Area, carried out using a different passage than the one entered .

Finally, for vehicles that will be subject to traffic restrictions upon the entry into operation of the Green Area, it is possible to benefit from a number of free accesses to the area, varying between 30 and 60 depending on the power supply, for the first 5 months of operation of the provision, until the end of September 2022. The possibility of benefiting from a number of free accesses to the area, varying between 15 and 45 depending on the 'power supply, without prejudice to compliance with the limitations set by the PAIR in the period of validity of the same. The system of exemptions also provides for a series of vehicles exempt from the provision, in line with the scheme provided for by the PAIR and by the municipal ordinances on air quality already in place.

The Municipal Police is also allowed to issue any exemptions for emergencies.

Where the system of exemptions may be reviewed in light of the evolution of the local transport and mobility system - in the broader socio-economic, technological and regional, national and international regulatory context - it should be noted that the exemptions provided for by the PAIR during the period of validity of the latter, generally prevail over those established by the provisions relating to the introduction and subsequent administration and development of the Green Area.

1. Introduction

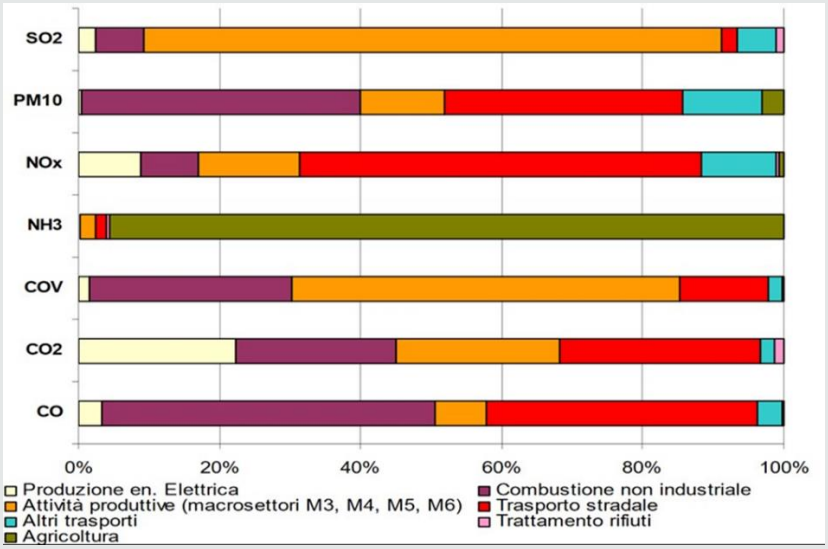
This report illustrates the project relating to the introduction of access and traffic regulations in the area of the municipal territory of Parma included among the ring roads - Green Area - with reference to the EURO homologation classes of motorized two or more-wheeled vehicles used for road transport.

In addition to providing a description of the objectives of the initiative in the broader programmatic and planning context of the mobility system, the document describes the regulatory references underlying the project, the method, the data, the tools and the assumptions adopted for the definition of the rules for the regulation of access and circulation in the Green Area, the regulation and the effects of the provision on the mobility system and on the environment.

Air pollution is recognized as one of the main environmental risk factors for human health. As can be seen from the graph on the following page contained in the current PAIR, the transport sector, and in particular road transport, is the main emissive source of nitrogen oxides and PM10, more

particularly of the PM2.5 component included in PM10, as well as carbon monoxide and carbon dioxide.

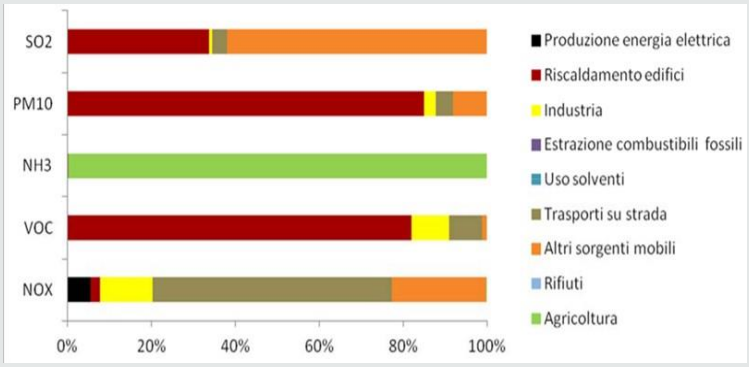
Figure: Breakdown of emissions by macro sector



SourceSource: Region Emilia-Romagna – PAIR 2017

Also contained in the PAIR, the following graph illustrates how, in the objective scenario of reducing polluting emissions, road transport is mainly relevant with reference to nitrogen oxides.

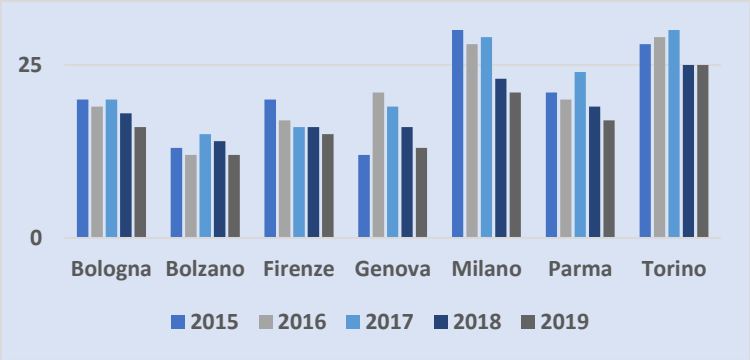
Figure: Ripartizioni degli obiettivi di riduzione delle emissioni per attività



Source: Regione Emilia-Romagna – PAIR 2017

In this regard, it should be noted that, thanks to the activities undertaken so far and technological progress, the emissions of pollutants over the last twenty years in Europe and Italy have greatly decreased. The following table shows the trend of the average annual concentration values of PM2.5 and NO2, according to the data available from the Environmental Data Yearbook of the Higher Institute for Environmental Protection and Research (ISPRA), for reference to some of the cities Italian companies which to date have considered the implementation of measures to improve air quality during the entire calendar year.

Figure: Trend PM2,5 - concentrazione media annua



Source: Tplan su dati ISPRA

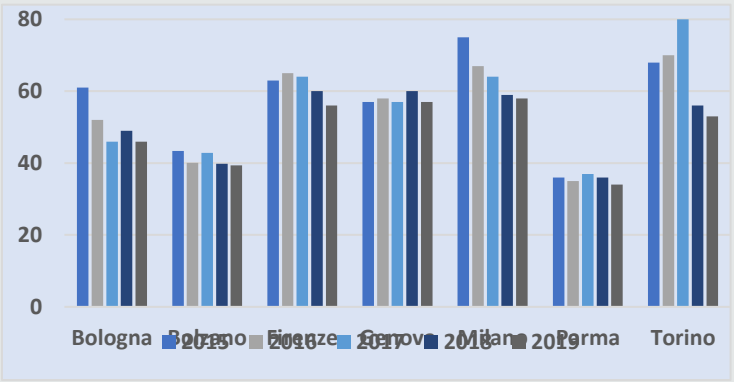
With values equal to 17 µg / m3 of average annual concentration of PM2.5 and 34 µg / m3 of average annual concentration of NO2, Parma falls within the legal limits in force for these two gases. However, the city ranks only 276 in the list of 323 European cities (monitored by urban audit) for air quality compared to PM2.5, according to data monitored by the European Environment Agency (EEA).

Only 5 European cities (including Cremona and Vicenza) exceed the 25 µg / m3 limit value, while another 20 Italian cities have poor quality values, i.e. higher than 15 µg / m3, especially in the Padano Basin.

The limit suggested by the World Health Organization for PM2.5 is, among other things, equal to 10 µg / m3, being particularly harmful to health (with approximately 417,000 deaths attributed to this gas by an EEA assessment carried out in 2018). 127 out of 323 cities record values below this value according to the EEA.

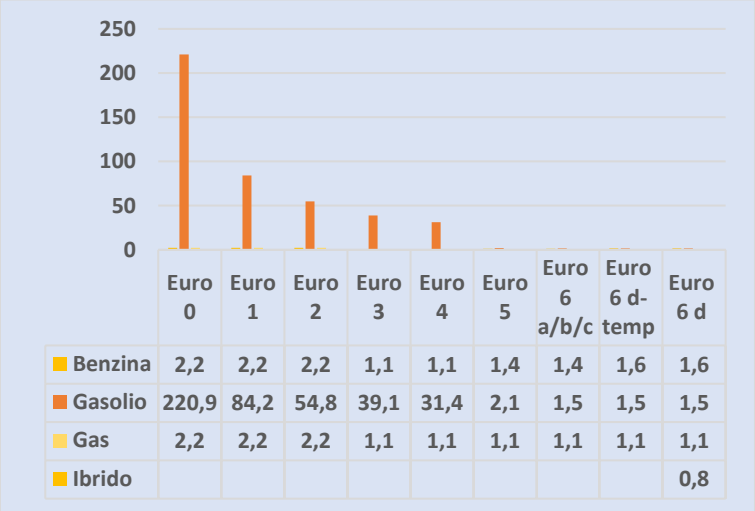
The following graph illustrates the evolution of vehicle emissions according to the EURO homologation class and the power supply, by reference to the particulate mass, PM2.5.

Figure: Trend NO2 - concentrazione media annua



Source: Tplan su dati ISPRA

Figure 7: Emissioni di PM2,5 (g/km) secondo la classe di omologazione EURO e l'alimentazione



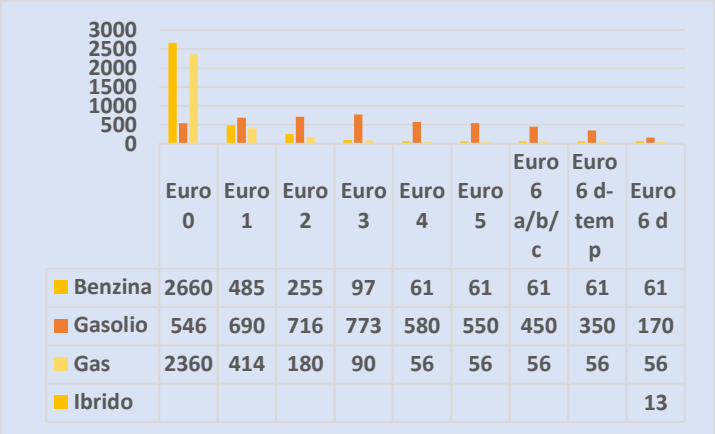
	Euro 0	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 a/b/c	Euro 6 d-temp	Euro 6 d
Benzina	2,2	2,2	2,2	1,1	1,1	1,4	1,4	1,6	1,6
Gasolio	220,9	84,2	54,8	39,1	31,4	2,1	1,5	1,5	1,5
Gas	2,2	2,2	2,2	1,1	1,1	1,1	1,1	1,1	1,1
Ibrido									0,8

Source: Tplan su dati EMEP/EEA air pollutant emission inventory guidebook 2019 – Update Oct. 2020

It is noted that the most polluting vehicles are diesel-fuelled vehicles up to the EURO 5 homologation class, noting that from EURO 6 onwards, diesel and petrol vehicles have similar emission standards and not much higher than those of powered vehicles. gas / methane or hybrids, which have the least impact.

As for nitrogen oxides, the evolution of vehicle emissions according to the EURO homologation class and the power supply represented in the following graph, demonstrates how there is a significant difference between the EURO 0 homologation class and the other classes in particular for vehicles powered by petrol and gas / methane. For the homologation classes from EURO 1 to EURO 6 a / b / c it is noted that the emissions are higher for diesel-fuelled vehicles, gradually reducing from the EURO class onwards for all fuel categories, including diesel, up to EURO 6-d class, a category which in any case has values 3 times higher than vehicles powered by petrol and gas. Also in this case the hybrid vehicles are particularly performing.

Figure 8: Emissioni di NOx (g/km) secondo la classe di omologazione EURO e l'alimentazione



	Euro 0	Euro 1	Euro 2	Euro 3	Euro 4	Euro 5	Euro 6 a/b/c	Euro 6 d-temp	Euro 6 d
Benzina	2660	485	255	97	61	61	61	61	61
Gasolio	546	690	716	773	580	550	450	350	170
Gas	2360	414	180	90	56	56	56	56	56
Ibrido									13

Source: Tplan su dati EMEP/EEA air pollutant emission inventory guidebook 2019 – Update Oct. 2020

In force since the early 1990s, an aspect that deserves attention in the design of regulations for accessibility and circulation based on the EURO homologation classes is represented by the age of the vehicles, especially the first classes.

It can be seen that vehicles of class EURO 3 or earlier have at least 15 years of service, whereas those of class EURO 4 have at least 10 and those of class EURO 5, at least 6, although the first EURO 6 may already have 8 years. As mentioned above, the EURO 7 class is currently not expected to be adopted before 2025/26, while for motorcycles the EURO 5 + class is expected to come into effect in 2024.

Not directly associated with the motorization of the vehicle, but rather with fuel consumption, it is finally carbon dioxide, one of the main gases responsible for the greenhouse effect, hence climate warming. More than the EURO homologation classes, the power supply of the vehicles appears relevant in this regard, with benefits particularly connected to the replacement of the vehicle fleet equipped with internal combustion engines, with hybrid vehicles that improve their performance in terms of consumption and even more with electric vehicles, with "zero emissions". It is no coincidence that these are vehicles that currently benefit from greater advantages both from the point of view of the economic incentives associated with their purchase with the replacement of polluting vehicles, and of circulation, providing for the Legislative Decree 30 April 1992, n. 285 - New Highway Code (NCdS) - that these vehicles cannot be subject to traffic restrictions in the ZTL Limited Traffic Zones.

Over the course of 2021, the European Commission is expected to propose stricter CO2 standards for new cars in Europe as part of a policy package aimed at achieving the goal of reducing the European Union's net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels, to then reach climate neutrality by 2050.

The project relating to the establishment of the Green Area, with reference to the EURO homologation classes, aims to contribute to the process of gradual transformation of the vehicle fleet underway since the beginning of the 1990s, aimed primarily at improving emission standards. internal combustion engines and, more recently, the replacement of internal combustion vehicles with zero-emission vehicles.

To systematize sustainable mobility solutions, integrated into the territory

The objective of promoting a less polluting urban transport system in terms of emissions related to the use of internal combustion vehicles, thanks to the introduction of the Green Area, is proposed by the Municipal Administration as a measure not only aimed at improving the quality of air and decarbonisation, but also as a lever for the overall improvement of the quality of life in the area. In addition to reducing air pollution, as well as noise pollution, the Green Area helps to reduce traffic congestion thereby improving road safety, travel times and quality of life in the municipal area affected by the provision.

The concept of Green Area associated with the municipal territory included in the ring road outlines a territorial area in which to adopt and promote a more sustainable lifestyle, with measures aimed at improving the overall quality of life and liveability of the territory, for all categories. social networks and types of users. This vision of the city requires the adoption of a transport and mobility system that is integrated from an infrastructural and functional point of view with the urban configuration and use of the territory. The Green Area encompasses a sufficient portion of the territory of the city of Parma in which to implement local government policies, in accordance with the most current principles in terms of sustainable development, decarbonisation and energy and soil saving.

The Green Area is configured in these terms as the context in which the measures already adopted and to be consolidated in the future regarding the safeguarding of residential, historical-cultural and urban-relevant areas such as Zones 30 and ZTL 1, 2, 3 and Station the environmental islands and the ZPRUs, the creation of perimeter car parks and interchange nodes, the promotion of active cycle-pedestrian mobility and the enhancement of local public transport, the diffusion development of shared mobility (vehicles for passengers and goods, bicycles and micro-electric mobility) and the rationalization and efficiency of the delivery and distribution of goods in the city (city logistics), acquire a full functional value by strengthening and maximizing the contribution that each individual component can give to the development of a territorial ema and mobility more sustainable, but also more efficient and more effective.

In the vision associated with the Green Area, the restrictions on the circulation of vehicles with the greatest impact on the environment represent an opportunity not only to purchase a more ecological vehicle, but also to rethink one's way of moving, using public transport, rather than ways and shared means or active modes of transport, or the whole of the

transport offer in the Green Area, according to a more conscious way of experiencing mobility and the territory from a sustainable perspective.

The concept of the Green Area - central to the provision object of this study - is accompanied by the concept of the Blue Area. A territory which, due to its size and specific urban planning and use, requires specific attention in terms of regulating accessibility, circulation and parking. Due to its specific characteristics in terms of localization, urban planning and use, this area will be object of specific measures with special attention to active mobility and new forms of electric and shared micro-mobility. In the long term the access and circulation in the Blue Area will be allowed only to hybrid or electric vehicles, or even only electric, in the event that the N.C.D.S. will allow it.

2. Planning and policy framework

In order to provide a framework for the project in the broader context of the policies and planning of the transport sector and sustainable mobility, the following paragraphs summarize the main programmatic and sectoral planning tools with reference to the international, national, regional and local areas.

The transport system is at the centre of the dynamics underway, as it is influenced by the socio-economic scenarios in progress and by the pandemic as well as by the unsustainability linked to the externalities connected to motorized individual transport, one of the main causes of atmospheric pollution and climate change. The transport system is at the centre of the dynamics underway, as it is influenced by the socio-economic scenarios in progress and by the pandemic as well as by the unsustainability linked to the externalities connected to motorized individual transport, one of the main causes of atmospheric pollution and climate change.

Tabella: Obiettivi dell'Agenda 2030 delle Nazioni Unite per lo sviluppo sostenibile

	9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well being, with a focus on affordable and equitable access for all.

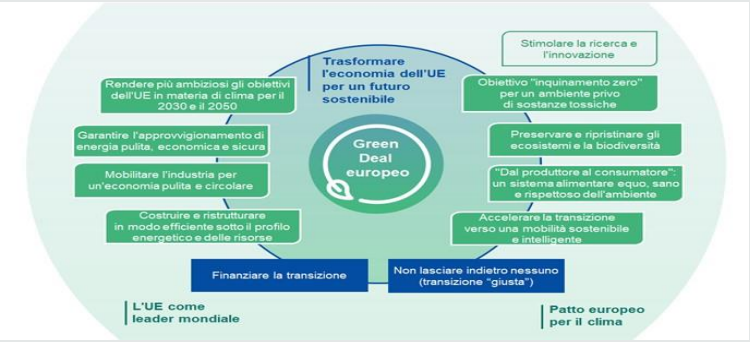
	11.2 Provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons.
	11.6 Reduce the adverse per capita environmental impact of cities, including bypayingspecialattentiontoairqualityandmunicipalandotherwastemanagement.
	13.2 Integrate climate change measures into national policies, strategies and planning.

Source: Agenda 2030 per lo sviluppo sostenibile redatta nel 2015 dell'Assemblea delle Nazioni Unite

At the same time, the innovation associated with the mobility system represents a tool to combat environmental pollution. It is no coincidence that the 2030 Agenda for sustainable development drawn up in 2015 by the United Nations Assembly includes four objectives that also affect the transport sector, among the seventeen identified.

In order to implement the 2030 Agenda and the United Nations Sustainable Development Goals, in December 2019 the European Commission presented the European Green Deal as a characterizing element of the new political agenda of the European Commission for the period 2019-2024.

Figure: Summary of the objectives of the EU Green Deal



Source: Green Deal europeo

The European Green Deal represents a new growth strategy aimed at transforming the European Union into a just and prosperous society, with a modern, resource-efficient and competitive

economy, which in 2050 will not generate net gas emissions. greenhouse effect and in which economic growth will be dissociated from the use of resources.

Among the activities identified for the pursuit of the aims and objectives of the European Green Deal, in December 2020 the European Commission published the Strategy for sustainable and intelligent mobility, which updates and replaces the previous transport strategy contained in the 2011 White Paper, setting itself the target of reducing greenhouse gas emissions by 90% by 2050.

To transform the current transport system in a smart and sustainable perspective, the strategy foresees the implementation of 82 initiatives grouped into 10 actions in the period 2020-2024 which aim, overall, to significantly reduce the impact of transport on environment through the promotion of sustainable transport methods and systems, the decarbonisation of transport through the adoption of non-fossil fuels and digitalisation.

Also in December 2020, the European Commission adopted the Implementing Decision (EU) 2020/2126 which contains the annual emission allocations for the period 2021-2030 in the sectors identified by the Decision 406/2009 / EC on effort sharing) which include, in addition to agriculture, construction, small industry and waste, also transport.

It is one of the main regulatory measures of the European Union on the climate, with which Europe aims to reach the goal of 40% less tons of CO2 equivalent by 2030, in order to comply with the commitments of the Paris Agreement, and the achievement of the Union's energy targets.

In 2029, Italy will have to emit just under 236 million tons of CO2 equivalent emissions, starting from about 273.5 million tons in 2021, or 37.5 million tons less.

At national level, there are numerous programs and plans drawn up in recent years aimed at reducing the climate-changing impacts associated with the mobility sector, promoting and encouraging the decarbonisation of transport and the reduction of emissions in favor of better air quality, also through the energy efficiency of the sector. In this regard, it is important to mention in the first place the National Integrated Plan for Energy and Climate (PNIEC). Drawn up by the Ministries of Economic Development, the Environment and the Protection of the Territory and the Sea, of Infrastructures and Transport and finalized in December 2019, this document outlines the national strategy for the pursuit of the European objectives in the field of energy and the environment, including of which decarbonisation and energy efficiency are of major importance for the transport sector.

The PNIEC cites, among other things, a series of plans and programs of particular relevance for the decarbonisation and energy efficiency of the transport sector, including:

- Elements for a Sustainable Mobility Roadmap. Prepared in 2017, this document provides a description of mobility in Italy and the related environmental impacts, as well as an in-depth analysis of the opportunities offered by the technological evolution of means of transport. According to this document, the construction in Italy of an industrial chain of vehicles based

on innovative technologies represents an indispensable element for developing an adequate infrastructure for the diffusion of alternative fuels.

- National Infrastructure Plan for Recharging Electricity-Powered Vehicles (PNIRE). Approved in 2012 and updated in 2016, the PNIRE aims by 2020 to create up to 13,000 slow / accelerated charging points, 6,000 fast charging points, with a ratio of 1 public charging point for every 8 private charging points, and the presence of 130,000 electric vehicles.
- National strategic framework for the development of the alternative fuel market in the transport sector and the construction of the related infrastructures (Legislative Decree no. 257 of 16/12/2016). The framework favours the use of alternative fuels, in particular electricity, natural gas and hydrogen. Among the actions of particular importance in the field of decarbonisation and reduction of pollution undertaken at the national level, the PNIEC also cites the Action Plan for the improvement of air quality. The Plan has a two-year duration and provides for articulated measures, with effects on both air quality and decarbonisation. With regard to mobility, the Plan provides for the introduction of environmental criteria for the regulation of traffic in the suburban area, limited to the motorway sections adjacent to urban centres and for the control of limited traffic areas, with a disincentive to the use of more polluting vehicles. More specifically, the plan provides:
- A proposal to amend the Legislative Decree 28/4/1992, no. 285, aimed at introducing the environmental criterion for the adoption of measures to limit circulation;
- A proposal to amend the current legislation, in order to specify the possibility of using the devices for the control of restricted traffic areas even within these areas and not only in the passage areas;
- The adoption of guidelines for the classification of hybrid electric vehicles in order to allow national and regional administrations, as part of the incentive programs, to direct these incentives towards hybrid electric technologies with a lower environmental impact;
- The adoption of a decree to authorize in cities the testing of road circulation of vehicles for personal mobility with mainly electric propulsion, such as segways, hoverboards and scooters etc .;
- The introduction of the bonus / malus criterion which makes it possible to discourage the use of vehicles with high polluting emissions;
- The publication on the institutional website of guidelines and good practices to promote active mobility, especially in the home-school and home-work journeys, also by the Regions.

A further document aimed at giving substance to the national strategic policy for combating climate change and improving air quality reported in the PNIEC is the so-called Climate Decree, of 2019, relating to urgent measures for compliance with the obligations established by the 2008 directive. / 50 / EC on air quality. The decree identifies a series of measures to combat climate

change, including the following actions in the sustainable mobility sector, also by setting up specific funds to ensure the resources necessary for their implementation:

- Encouragement of sustainable mobility in metropolitan areas, by setting up a special fund called the "Good Experimental Program bility ", with an endowment, respectively, of 5 million euros for 2019, 70 million euros for 2020, 70 million euros for 2021, 55 million euros for 2022, 45 million euros for 2023 and 10 million euros for 2024;
- Establishment of a "Mobility Voucher" equal to 1,500 Euros for each car and equal to 500 Euros for each scrapped motorcycle, to be used, within the following 3 years, for the purchase of season tickets for local and regional public transport or for bicycles pedal assisted.

More recently, the so-called Relaunch Decree, containing measures for the mitigation of the effects related to the pandemic from Covid-19, has introduced further measures for the decarbonisation of transport and the reduction of climate-altering impacts due to polluting emissions from motorized road transport and has strengthened those already provided for in the Climate Decree.

At the end of April 2021, the Government adopted the National Recovery and Resilience Plan (PNRR), which promotes the creation of a more modern and digitized mobility infrastructure system, in line, moreover, with what is already contained in the fast Italian annex to the Document of Economics and Finance (DEF) of 2020, which contained new strategies for transport, logistics and infrastructure.

In line with the most recent European policies and the objectives of the European Green Deal, the PNRR supports research and development on hydrogen and its experimentation for road and rail transport, the development of infrastructures for electric recharging, the renewal of fleets. green buses and trains, as well as the development of industrial leadership in the main transition chains, in particular renewable energy and batteries, hydrogen, electric buses.

Furthermore, the PNRR aims to develop a more sustainable local transport, not only for the purpose of decarbonisation, but also as a lever for the overall improvement of the quality of life (reduction of air and noise pollution, reduction of congestion and integration of new services). In this regard, the Plan envisages investing in "soft" mobility, favouring intermodality and the use of bicycles (creation of urban cycle paths for ~ 570 km and tourist cycle paths for over 1,200 km) and public transport (construction of 240 km of infrastructure equipped for mass transport).

With regard to regional programming and planning, the Regional Integrated Air Plan (PAIR) should be mentioned in the first place. Approved in 2017, the PAIR pursues the objectives of restoring air quality according to the limit values set by the European directive 2008/50 / EC and, at national level, by the legislative decree transposing this directive (155/2010).

The Plan outlines five areas of intervention, including public transport, sustainable mobility and traffic, and defines 94 actions for the pursuit of the set objectives. The objective of the plan for

traffic reference is the 20% reduction of private individual motorized mobility in the built-up areas of these municipalities.

In addition to the structural measures, the PAIR also provides for emergency measures to be activated following the forecast of overruns of the legal limits of polluting dust, as well as on ecological Sundays.

The municipalities affected by the PAIR, including Parma, have already adopted the measures provided for by the PAIR, through specific ordinances aimed at improving air quality.

It should be specified that in order to protect and safeguard the rights of mobility and circulation of the population, as well as allowing the transit of vehicles at the weekend (except for ecological Sundays) and in any case before 8:30 in the morning and after 20 : 30 in the evening, the PAIR provides for a series of exemptions for certain categories of vehicles and events, in addition to the exemption for owners of a single vehicle - regularly registered and insured - per family unit, with an ISEE of less than 19,000 euros, with self-certification. It should also be noted that the PAIR supports the provision of restrictive measures to traffic with incentives to renew the vehicle fleet and change lifestyles towards more sustainable behaviours.

In addition to having provided a budget of EUR 300 million for the implementation of the PAIR measures, the Emilia Romagna Region, at the beginning of 2021, adopted (DGR 33/2021 and DGR 189/2021) extraordinary measures to combat pollution and improve air quality by intensifying and strengthening interventions and projects against smog and pollutants by allocating resources of approximately € 37 million for 2021, 2022 and 2023 for the replacement of obsolete vehicles in the public administration, and strengthening the "bike to work" project as well as the promotion of school roads and safe home-school routes. With a contribution of 250,000 euros, the Emilia-Romagna Region has in as well as proposed to extend the validity of the urban single journey ticket (purchased in any mode in use) to the whole day during ecological Sundays.

Finally, it should be mentioned that, in continuity with what has already been done in previous years, the Emilia-Romagna Region has confirmed for the period 2021, 2022 and 2023, the regional bonus for hybrid cars which provides for reimbursement, for those registering for private use a '' new car with petrol-electric, diesel-electric, LPG-electric, methane-electric or gasoline-hydrogen fuel, a figure comparable to the cost of the stamp duty for three years, allocating to this measure 3 million euros for each year.

A further regional planning reference of particular relevance for the purposes of this study is represented by the Regional Energy Plan (PER).

Approved in 2017, the PER defines the strategy and objectives for climate and energy up to 2030 and provides for its implementation through the Three-Year Implementation Plans (PTA) which establish the operational lines necessary to achieve the long-term objectives set. from PER.

With regard to the transport sector, in order to achieve these objectives, the PER provides for joint action at national and regional level to encourage the spread of low-carbon vehicles and, in the case of passenger transport, a reduction in travel on private vehicles. in favour of an increase in collective journeys, while in the case of freight transport, a rationalization of logistics and a shift of transport to modes other than road (and in particular towards rail).

These objectives could be pursued through a series of tools, including: the promotion in Urban Plans for Sustainable Mobility (PUMS) of measures that favour cycle and pedestrian mobility, public transport and the use of sustainable vehicles (eg. electric vehicles) especially in urban contexts; the promotion of urban infrastructures for local public transport, primarily electric (trolleybuses, trams, etc.); the promotion of infrastructure for alternative sustainable mobility, including through support for self-production from renewable sources (electricity, biomethane, etc.) in particular in the public transport sector; the promotion of cycle and pedestrian mobility, also as a tool for enhancing public spaces and urban regeneration; the promotion of innovative shared mobility services (e.g. car sharing, corporate car sharing, ride sharing, etc.) and infomobility; subsidized taxation (e.g. exemption from stamp duty) and other incentive measures aimed at facilitating the transition towards the use of certain types of vehicles (e.g. electric vehicles).

With regard to the municipal area, it is important to highlight how in implementation of the Urban Sustainable Mobility Plan (PUMS), approved in 2017, the municipal administration has developed a Mobility Master Plan in 2019, aimed at integrating the tools for regulating access to the urban area with those applied in the central area (ZTL and environmental islands), through the use of electronic control and monitoring technologies.

The Master Plan specifically provides for the introduction of a LTZ extended to the territory included in the ring road, based on the EURO homologation classes, to pursue the objectives inherent in improving air quality, contributing, together with further measures already adopted and to be consolidated in the future by the Administration, to the development of the territory from a sustainable perspective, increasing its accessibility and liveability.

With this proposal, the Mobility Master Plan envisages in the first place to extend the limitations already adopted in the winter period in compliance with the PAIR to the entire year and therefore make permanent. Secondly, the Plan aims to help reduce, in addition to the environmental impacts associated with polluting gas emissions associated with individual motorized road transport, also the congestion generated by vehicle flows in the vast area of Parma. The projects already launched over the years by the municipal administration, particularly relevant for the purpose of improving the accessibility and liveability of the area, include, among others, the following main initiatives:

- The establishment of ZTL 1, 2, 3 and Station, as well as environmental islands, Zones 30, sensitive areas and roads;

- The promotion of intermodality, facilitating the interchange between LPT services and individual motorized road transport at the interchange parking lots, providing shared mobility services at these points (bicycle, car and electric micro-mobility), as well as charging infrastructures for electric cars
- The creation of cycle paths, which today amount to over 130 km;
- The Parking Plan which regulates the transit and the substitution to vehicles in the historic centre and in the surrounding areas, together with the Parma electronic pass! I Mobility, at the gates for electronic access control, the Tap & Park app and the informobility panels for information to users, such as transport digitization tools in order to manage traffic flows, parking and the permits associated with circulation;
- The Ecologistics project for regulating access and parking with reference to the environmental performance characteristics of vehicles, as well as other city logistics initiatives, such as shared mobility solutions for the use of ecological vehicles for the distribution and delivery of goods in city.

The General Urban Traffic Plan (PGTU) of 2011 is also currently being updated, which could provide further elements of analysis regarding the functioning of the introduction of the Green Area in the transport and municipal traffic system.

The Municipality of Parma also joined the Covenant of Mayors in 2013, having already adopted the Sustainable Energy Action Plan (SEAP) in 2014, with the aim of reducing CO2 emissions by 20%, by 2020.

With regard to major initiatives for improving air quality, the AWAIR project is mentioned. Funded by the Interreg Central Europe program, the initiative involved the cities of Parma, Katowice in Poland and Zuglo - Budapest district in Hungary, with the aim of sharing experiences acquired in the management of acute atmospheric pollution events, defining mitigation actions and resilience to protect the health of resident populations.

The AWAIR project has set itself the goal of developing awareness among citizens through specific and targeted communication on air quality, using a capillary system for transferring information also through the creation of an app, in addition to the dissemination of technical knowledge. and of the analysis results through meetings, technical tables, conferences and on social media. The communication is aimed in particular at the most vulnerable population groups by age (children or elderly people), or because they suffer from disorders or diseases, whose symptoms can worsen in the presence of exceptional concentrations of pollutants (e.g. asthmatics, heart patients, diabetics). Pilot actions were also undertaken such as monitoring in schools and outdoor experimental measurements alongside the ARPAE fixed network, to monitor new indicators for air quality (such as black carbon and ultra-fine particles) and to test innovative instruments. As part of this initiative, the Municipality of Parma has also defined the Functional Urban Area which

also involves the following municipalities: Collecchio, Colorno, Felino, Fontevivo, Fornovo di Taro, Langhirano, Lesignano, Montechiarugolo, Noceto, Roccabianca, Sala Baganza, San Secondo Parmense, Sissa-Trecasali, Sorbolo-Mezzani, Torrile, Traversetolo.

The city of Parma is also currently involved in the RUGGEDISED project. Approved on 4 July 2016 by the European Commission, in the Horizon 2020 funding line, SCC-1-2016 (Smart Cities and Communities lighthouse projects), this initiative is aimed at experimenting smart solutions in the field of energy, transport and technologies in three major European cities, Rotterdam (Netherlands), Umeå (Sweden), Glasgow (United Kingdom), in order to promote digitization and decarbonisation. The municipality of Parma is a partner in the project together with these three cities, as well as Brno (Czech Republic) and Gdansk (Poland). The project focuses on the development of advanced smart cities, with the aim of redeveloping cities by accelerating their transition to a low-carbon economy, developing and testing integrated solutions with low energy consumption, sustainable urban transport, energy systems. and ICT infrastructures. The initiative involves various sectors and departments of the Municipality in a transversal manner (Environmental sustainability policies, General Management, Territorial development, IT and technological innovation) with the collaboration of Infomobility, also a partner of the project, in addition to the University of Studies of Parma.

3. Key results and findings

In order to analyse the effects on traffic and related emissions due to the introduction of a new regulation of accesses and circulation within the so-called Green Area, a macro-simulation model of vehicular traffic was developed.

This transport tool allows to visualize and quantify the traffic responses as a function of the independent variables appropriately introduced. In addition, the simulation software used allows you to define time scenarios as a function of the evolution of these variables - also including the access regulation measures.

Therefore, thanks to the use of the simulation model, it was possible to analyse and compare different levels of implementation of the new Green Area regulation, as a function of different combinations of the variables introduced, and to analyse their evolution over time, in consideration of the planning chosen by the Administration.

For this reason, all those municipalities were included in the study area which, although not administratively belonging to the Province of Parma, show a significant gravitation towards the city centre of Parma, including, for example, the municipalities of the province of Reggio Emilia. immediately adjacent to the provincial border. On the contrary, some municipalities of the Province were not considered.

The study area thus defined includes a resident population of approximately 352,000 inhabitants. It is worth considering that the number of residents within the Green Area alone corresponds to just over 75% of the total resident population within the municipality of Parma.

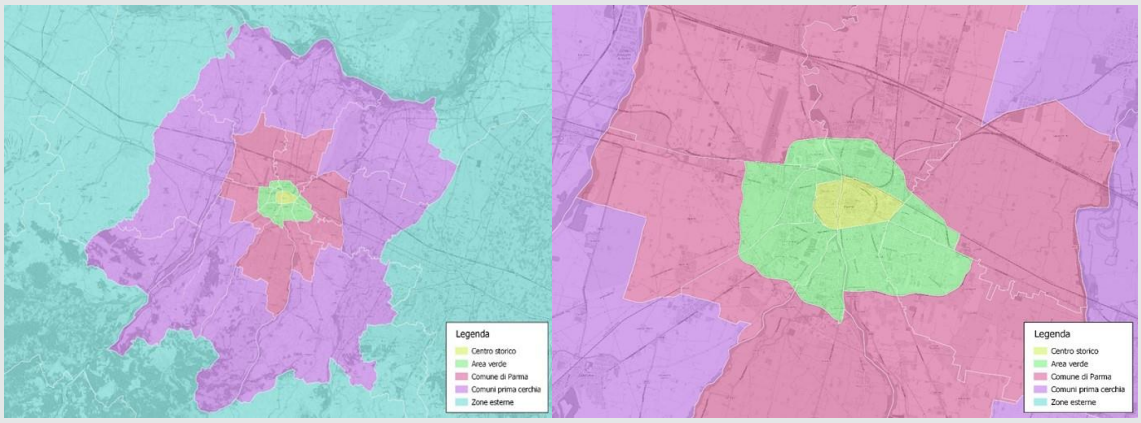
The subsequent schematization takes place through a process called zoning, which consists of dividing the study area into variable size zones, in order to achieve a level of geographical aggregation that meets the transport needs of the study. The size of the single zone, in fact, determines the level of precision with which we intend to model the movements in and out of the zone itself. Basically, the smaller the size of the zones and the wider the range of displacements that can be represented, since the increase in disaggregation brings out shorter journeys.

In the case in question, a very high degree of disaggregation has been adopted within the Green Area, which sees the subdivision into neighbourhoods and sub-neighbourhoods with the aim of representing and analysing the effects of the provision also on short-range travel. The extension of the areas is increased with the distance from the Green Area, until it reaches the size of entire municipalities outside the perimeter of the municipality of Parma and Collecchio.

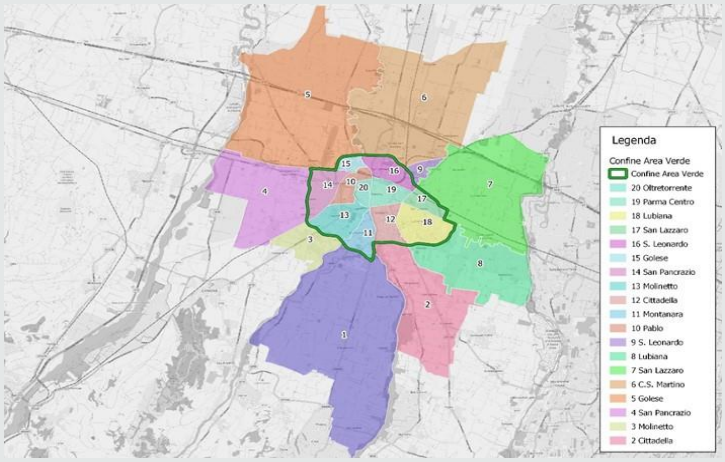
Obviously, there is also a share of movements that have their origin or destination (or both in the case of pure crossing movements) outside the study area but which interact with the traffic flows represented within it.

To take into account these displacements, without increasing the complexity of the model, the study area was made permeable by schematizing the access and exit points along the perimeter of the same (external centroids).

In order to make it easier to read the results described in this subsection, the areas of the study area have been grouped into macro-zones following the same functional hierarchy adopted during zoning, as shown in the figure.



A more detailed analysis of the movements from origin and destination in the study area was carried out by increasing the level of geographical disaggregation. The motorway routes, which identify the most distant areas, have been identified by the related motorway sections that are inserted into the study area. The municipal dimension was adopted for the external areas belonging to the subgroup of road routes and the areas of the first circle municipalities.

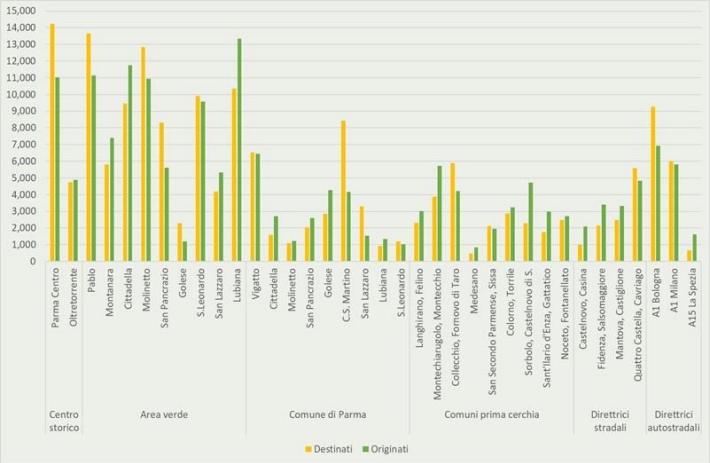


Finally, within the municipality of Parma, the Green Area and the historic centre, the territorial unit used was the neighbourhood. The neighbourhoods crossed by the border drawn by the ring roads were then divided on the basis of the border itself. In this way it was possible to distinguish the movements originated / attracted within the perimeter of the Green Area.

The results obtained from this analysis were distinguished by vehicle type. Referring to the graph of the cars, it is possible to find that, despite the high competition with other modes of transport, the areas within the green area and the historic centre represent, overall, the major attractors and generators of all the trips made. with a light private vehicle. Looking at the graph in detail, it also emerges that within the Green Area, the Montanara, Cittadella and, in particular, Ljubljana districts stand out from the others for their residential nature, suggested by the fact that the number of movements originated is significantly greater than those intended for such areas. The main districts characterized by a prevalence of displacements to destinations within the

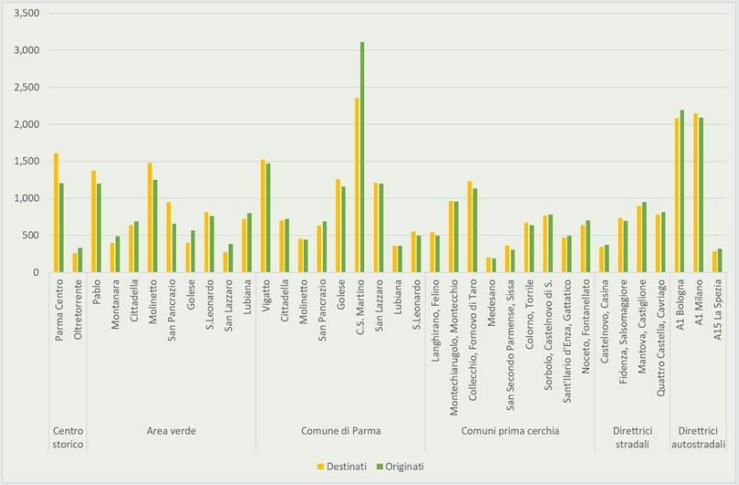
perimeter of the Green Area are Parma Centro, Pablo (where the Maggiore hospital is located), Molinetto and San Pancrazio.

Figure 1: Analisi O/D degli spostamenti effettuati con un'autovettura



Source: Tplan

Figure 2: Analisi O/D degli spostamenti effettuati con un veicolo pesante



Source: Tplan

Through the simulation model, it is possible to plot the traffic volumes on the network graph as a result of the assignment phase of the O / D matrix. In other words, it is possible to view the resulting traffic volumes on each single road arc as a result of the sum of all the vehicles traveling on that particular road segment, having assigned a certain route to go from each origin zone O to each destination zone D.

Figure 3: Flussogramma dell'area di studio – focus sull'Area Verde

Source: Tplan

In addition to a practical graphic display, the simulation model allows you to calculate the distances of vehicles on the road network. This network parameter is expressed in vehicle-kilometers. By appropriately selecting the road arches, it was possible to derive the total distances inside and outside the perimeter of the Green Area, explaining the type of vehicle.

Tabella 1: Percorrenze totali nell'area di studio

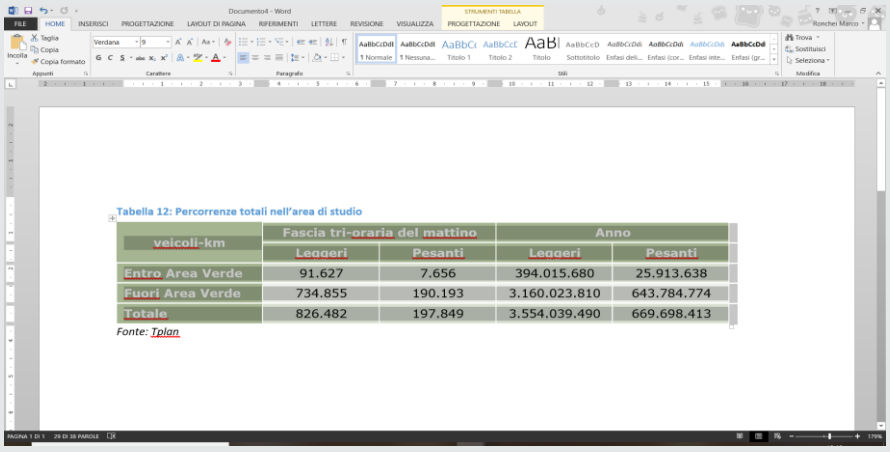


Tabella 12: Percorrenze totali nell'area di studio

veicoli-km	Fascia tri-oraria del mattino		Anno	
	Leggeri	Pesanti	Leggeri	Pesanti
Entro Area Verde	91.627	7.656	394.015.680	25.913.638
Fuori Area Verde	734.855	190.193	3.160.023.810	643.784.774
Totale	826.482	197.849	3.554.039.490	669.698.413

Fonte: Tplan

As can be seen from Table 12, the distances within the Green Area, including the historic center, represent 11% of the total for cars and only 4% of the total for commercial vehicles. These results depend on the relatively small extension of the Green Area compared to the

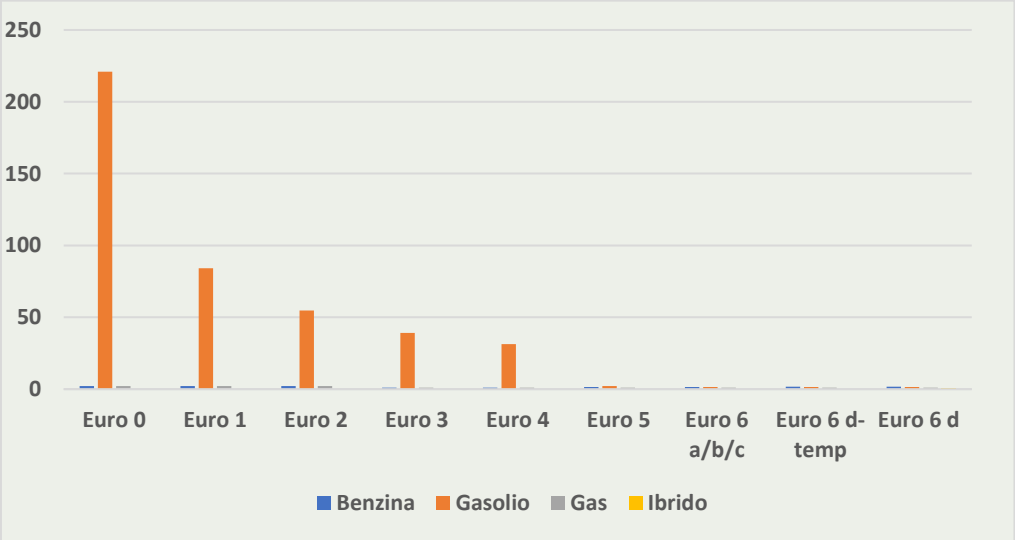
entire study area. In addition, it should be borne in mind that - in line with the boundaries of application of the regulatory measures - the urban ring roads of Parma are considered outside the Green Area.

In line with the foregoing, in this study specific consideration was given to polluting emissions from PM2.5 (fine particulate matter) and NOX (nitrogen oxides, expressed as NO2 equivalent value). In line, in fact, with the analyses carried out as part of the Regional Integrated Air Plan (PAIR), these elements currently represent the main pollutants from vehicular traffic. The following sections describe in detail the average emission factors for cars and commercial vehicles, referring to the EURO homologation class and power supply.

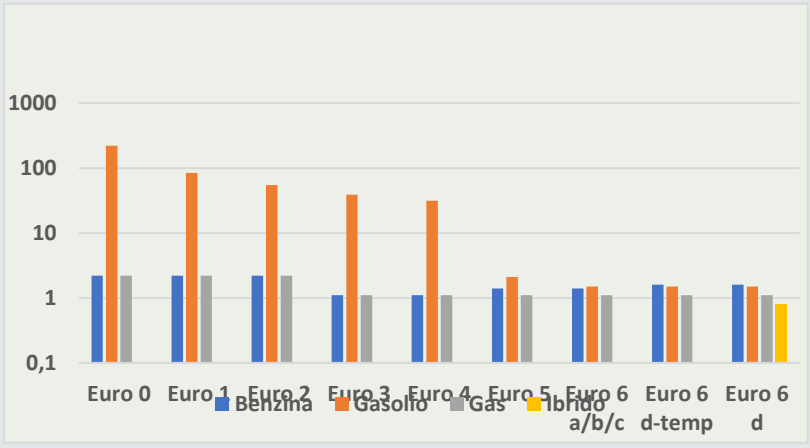
Emissive characteristics of cars

For reference to the power supply and to each EURO homologation class, the following table provides the average emission factors for cars, expressed in g / km. The data represents the quantity of pollutant generated, expressed in grams, for each km of road travelled by the vehicle in average conditions of motion. With regard to power supply, the following four different types were considered: petrol, diesel, gas / methane bi-fuel, hybrid / electric.

Figure: Fattori di emissione di PM2.5 (autovetture), scala lineare [mg/km]

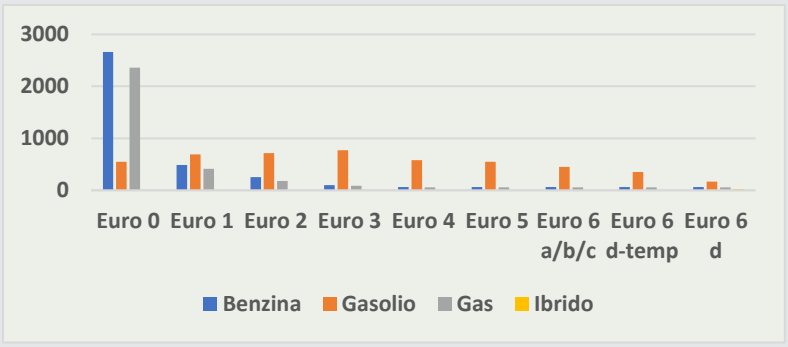


As already mentioned, it is noted that the most polluting vehicles are those fuelled by diesel, up to the EURO 5 homologation class, noting that from EURO 6 onwards, diesel and petrol vehicles have similar emission standards and not much higher than those of vehicles powered by gas / methane or hybrid, which appear to have the least impact. Figure 4: Fattori di emissione di PM2.5 (autovetture), scala logaritmica [mg/km]



Source: Tplan su dati EMEP/EEA air pollutant emission inventory guidebook 2019 – Update Oct. 2020

Figure Fattori di emissione di NOX (autovetture), scala lineare [mg/km]



Source: Tplan su dati EMEP/EEA air pollutant emission inventory guidebook 2019 – Update Oct. 2020

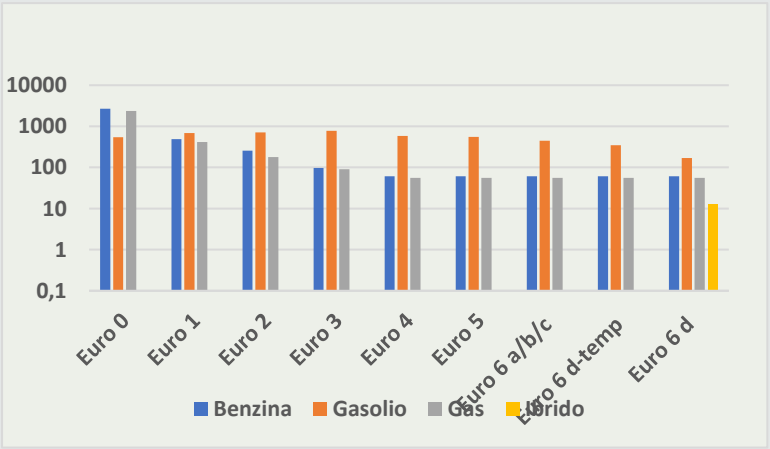


Figure 29: Fattori di emissione di NOX (autovetture), scala logaritmica [mg/km]

Source: Tplan su dati EMEP/EEA air pollutant emission inventory guidebook 2019 – Update Oct. 2020

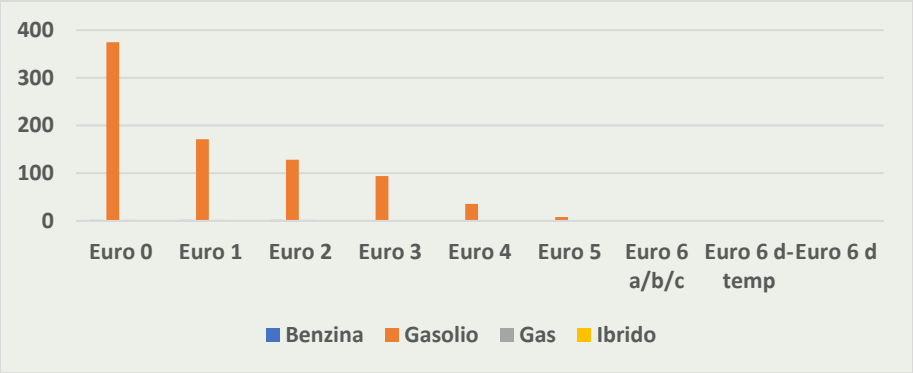
As regards nitrogen oxides, the evolution of vehicle emissions according to the EURO homologation class and the power supply shows how there is a significant difference

between the EURO 0 homologation class and the other classes, in particular for powered vehicles. petrol and gas / methane. For the homologation classes from EURO 1 to EURO 6 a / b / c it is noted that the emissions are higher for diesel-fuelled vehicles, gradually reducing from the EURO 3 class onwards for diesel, up to the EURO 6-d class, category which in any case has higher values than petrol and gas powered vehicles for which there are no significant differences between the EURO 4 and EURO6 classes d. Also in this case the hybrid vehicles are particularly performing

Emissive characteristics of commercial vehicles

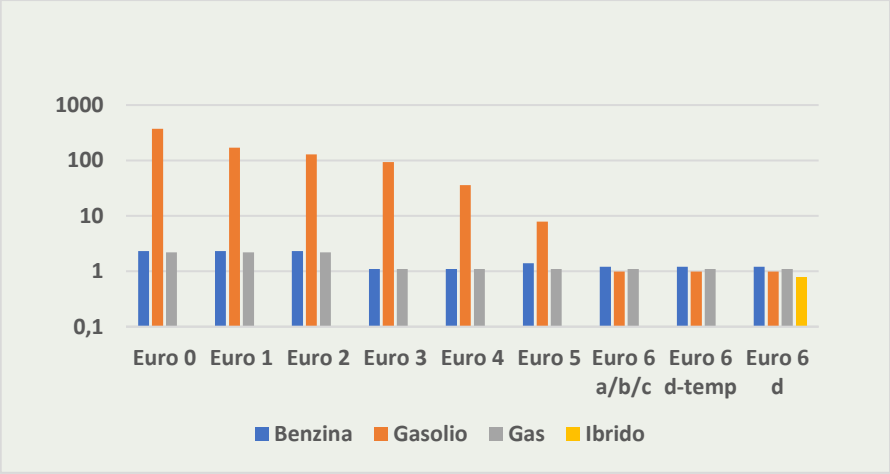
Similarly to what was stated for passenger cars in the previous section, the following table provides the average emission factors for light and heavy commercial vehicles, expressed in g / km.

Figure 5: fattori di emissione di PM2.5 (veicoli commerciali), scala lineare [mg/km]



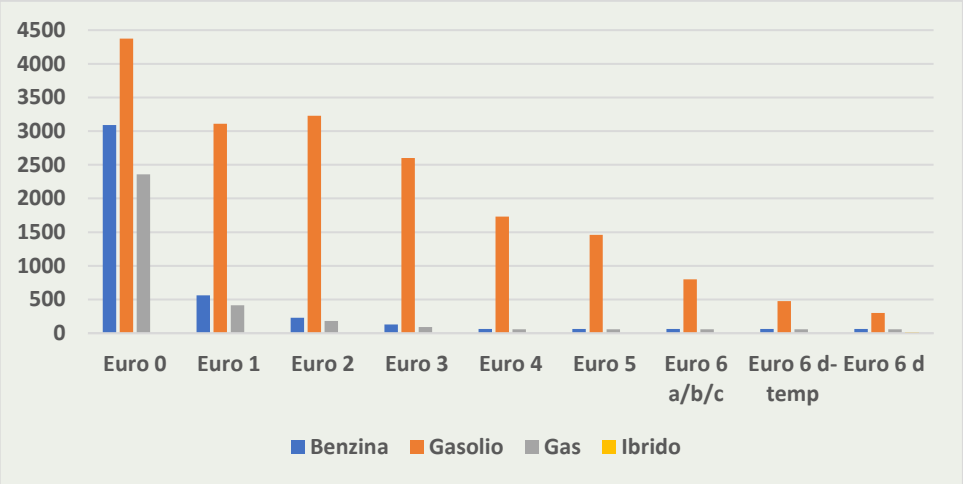
Source: Tplan su dati EMEP/EEA air pollutant emission inventory guidebook 2019 – Update Oct. 2020

Figure 6: fattori di emissione di PM2.5 (veicoli commerciali), scala logaritmica [mg/km]



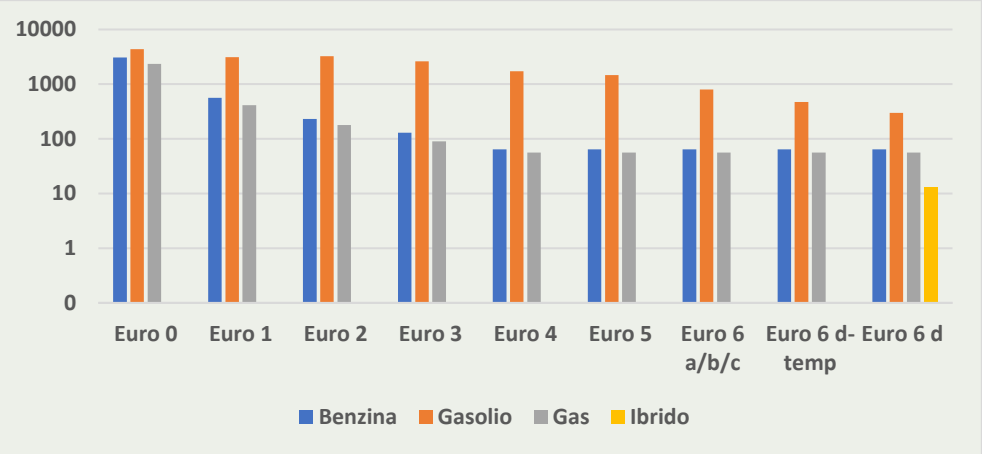
Source: Tplan su dati EMEP/EEA air pollutant emission inventory guidebook 2019 – Update Oct. 2020

Figure 7: fattori di emissione di NOX (veicoli commerciali), scala lineare [mg/km]



Source: Tplan su dati EMEP/EEA air pollutant emission inventory guidebook 2019 – Update Oct. 2020

Figure 8: fattori di emissione di NOX (veicoli commerciali), scala logaritmica [mg/km]



Source: Tplan su dati EMEP/EEA air pollutant emission inventory guidebook 2019 – Update Oct. 2020

4. Action Plan towards UVAR in Parma

In order to introduce access and traffic regulation measures based on the EURO homologation classes of vehicles, the Green Area is configured as a Limited Traffic Zone (ZTL), pursuant to art. 3 of the New Highway Code - as an area in which access and vehicular traffic are limited to pre-established hours or to particular categories of users and vehicles - to be established in accordance with the procedures set out in Art. 7, paragraph 9 of the New Highway Code.

In particular, for the purposes of establishing the ZTL in this area, the Green Area is also identified as a Low Emission Zone (LEZ), regulating the access and circulation of vehicles in the area on the basis of Euro homologation classes, in accordance with the Integrated Regional Air Plan PAIR of the Emilia-Romagna Region, approved in April 2017, to limit the circulation of the most polluting vehicles in the winter period (generally October-March, currently extended to April) , in the territories of the municipalities of the plain, including the Municipality of Parma.

These are measures which, in line with the provisions of the New Program Agreement for the coordinated and joint adoption of measures for the improvement of air quality in the Po valley, signed in June 2017 by the Minister of the Environment and the Presidents of the Emilia-Romagna, Lombardy, Piedmont and Veneto regions, are necessary for the improvement of air quality also in order to fall within the limit values established by the European Directive 2008/50 / EC and implemented by Legislative Decree no. 155/2010

It is to comply with this legislation that the Municipality of Parma has already adopted a series of ordinances on air quality which, in line with the aforementioned PAIR, have already provided for the limitation to structural transit (regardless of the levels of pollutants present in the air) of vehicles up to the EURO 4 diesel fuel class, and in an emergency (subject to exceeding the legal limits), of EURO 5 diesel class vehicles, although these have been suspended for the periods 2020-2021 and 2021 -2022 by virtue of the spread and persistence of the Covid-19 pandemic, the following structural limitations persisting until 30 April 2022: blocking of diesel vehicles up to the EURO 3 class, of petrol vehicles up to the EURO 2 class, of gas / methane vehicles of the EURO 1 class and of motor vehicles and mopeds up to the EURO 1 class.

Operating principles and exceptions

With the introduction of the Green Area, the municipal administration first of all plans to extend the restrictions on the circulation of the most polluting vehicles to the calendar year, starting from 1 May 2022. In particular, the scheme considers as a starting point the prescriptions already provided for in the regulations in force and in the PAIR for the winter period, i.e. the blocking of motor vehicles for the transport of people and goods, fuelled by diesel, up to and including the EURO 4 class, of those fuelled by petrol up to the EURO 2 class

included, of those fuelled by gas / methane and of motor vehicles up to the EURO 1 class. However, also considering the suspension of the structural limitation for diesel vehicles of the EURO 4 class during the state of emergency connected to the Covid-19 pandemic, and in order to gradually accompany the introduction of the Green Area measure, the blocking of diesel vehicles up to the EURO 3 class is envisaged when the Green Area is established on 1 May 2022, petrol up to the EURO 2 class and gas / methane vehicles and motorcycles up to the EURO 1 class, excluding mopeds. The hypothesis of the block for diesel vehicles of the EURO 4 class and petrol of the EURO 2 class starting from October 2022 remains in the pipeline, to be confirmed also on the basis of the evolution of the regional sector legislation. With respect to the time horizon to 2030, the project also provides for the gradual extension of the restrictions on motor vehicles for the transport of people and goods fuelled by diesel up to the EURO 5 class included, in 2025, and up to the EURO 6 categories a, b and c , in 2029, with no further restrictions for gasoline vehicles. It is also planned to introduce, starting from 2025, the blocking of motor vehicles for the transport of people and goods powered by gas / methane and motor vehicles powered by diesel or petrol of classes up to and including EURO 2. According to the provisions of Art. 7, paragraph 9bis of the New Highway Code, there are no restrictions on circulation for hybrid and electric vehicles. In line with the requirements included in the Ordinance of the Mayor of Parma on air quality for the period 2020-2021, the restrictions apply from 8:30 to 18:30, on weekdays, from Monday to Friday. In order to strengthen the protection of the territory and sustainable mobility in the Green Area, it is conceivable to limit access and circulation within the Blue Area (included in the Green Area), starting from 2029, only to vehicles with hybrid or electric traction, or even electric only, in the event that the N.C.D.S. will allow it. In any case, it should be specified that the scheme is proposed as dynamic and possibly modifiable over the years, both before and after the 2030 horizon, also based on the evolution of the superordinate regional and national legislation.

With regard to the exceptions, transit corridors are provided for access to the main car parks, interchange nodes and functional polarities, along the axes and roads already identified in the previous Ordinances of the Mayor of Parma on air quality. These corridors will be accessible to all vehicles subject to the restrictions, at least for a minimum number of 15 annual accesses. For these same vehicles it is also possible to access and circulate indefinitely along these axes, by obtaining the electronic permit for transit and parking Parma! iMobility. In order to minimize the journeys in the Green Area and discourage crossing the area, the Administration will evaluate the advisability of sanctioning the passage out of the Green Area, carried out using a different passage than the entrance. Finally, for vehicles that will be subject to traffic restrictions upon the entry into operation of the Green Area, it is possible to benefit from a number of free accesses to the area, varying between 30 and 60 depending on the power supply, for the first 5 months of operation of the provision, until the end of September 2022, obtaining the electronic transit and parking permit for Parma! iMobility. For these same vehicles and under the same conditions, the possibility of benefiting from a number of free accesses to the area, varying between 15 and 45 depending on the power

supply, is also provided for the period October 2022-September 2023, subject to compliance of the limitations envisaged by the PAIR in the period of validity of the same. Also in conjunction with the introduction of the limitations for further vehicle classes, it is possible to benefit from a number of free accesses to the area, in the number equal to 45 in the first year and 30 in the second year, compared to the introduction of the limitation, again obtaining the electronic transit and parking permit for Parma! iMobility, and without prejudice to compliance with the limitations set by the PAIR in the period of validity of the same. The analysis period considered does not go beyond 2030, although this does not mean that the measure ceases on this date.

Again in order to make the entry into operation of the provision less impactful, it is conceivable that the sanctioning system will only come into operation starting from 1 August 2022. Also for the introduction of the additional restrictions to 2025 and 2029 it is foreseeable to use the same solution, with the introduction of restrictions on 1 October 2024 and 2028 and activation of the sanction system on 1 January 2025 and 2029. In order to manage the monitoring and control of access, as well as administrative sanctions, the Municipal Administration through the Concessionaire Infomobility S.p.A. it will gradually equip itself with an electronic access control system. With the entry into operation of this system, Infomobility S.p.A. will send to the owners of the vehicles detected in access to the Green Area without respecting the constraints provided for by the provision, an appropriate notification following the 5th access, informing them about the terms of the regulation and the advisability of obtaining the electronic transit and parking permit Parma! iMobility to access the Green Area or transit corridors. The system of exemptions also provides for a series of vehicles exempt from the provision, identified in line with the provisions of the Regional Integrated Air Plan (PAIR), which has already been implemented by the Ordinance of the Mayor of Parma on air quality adopted for the period 2020-2021. The list of exempt vehicles is shown in Annex C. In addition to providing for the exemption of hybrid / electric vehicles, as established by Art. 7 of the N.C.D.S., paragraph 9bis, the list provides exemptions for vehicles belonging to persons whose ISEE is below the threshold of 19,000 Euros, as well as exemptions for specific types of vehicles and other special cases. Among other things, the exemptions provide that, at least t the time of entry into force of the provision, the vehicles of historical and collectible interest, as per art. 60 of the New Highway Code, registered in the ASI, Historic Lancia, Italian Fiat, Italian Alfa Romeo, Historic FMI registers, can circulate independently of participation in organized events, as long as they have an electronic permit for transit and parking in Parma! iMobility. The Municipal Police is also allowed to issue any exemptions for emergencies. Where the system of exemptions may be reviewed in light of the evolution of the local transport and mobility system - in the broader socio-economic, technological and regional, national and international regulatory context - it should be noted that the exemptions provided for by the PAIR during the period of validity of the latter, generally prevail over those established by the provisions relating to the introduction and subsequent administration and development of the Green Area.

Permits, supervision and control

The municipal administration intends to entrust Infomobility S.p.A with the management of all activities relating to the monitoring and control of access and circulation in the Green Area, including permits and administrative penalties. As described in the previous section, the permit system is expected to be supported by the use of the electronic Parma transit and parking permit! iMobility and the Apps connected to this tool (eg Tap and Park App). For vehicles subject to the restrictions that are not already associated with a Parma electronic pass! iMobility for the regulation of access and circulation in the ZTL 1, 2, 3 and Station or for permits connected to parking in the ZPRU, it is necessary to have this device, which also involves the payment of an administrative cost.

Access control to the Green Area is expected to be carried out in electronic / digital form by reading the vehicle license plate when passing through gates, operated by Infomobility S.p.A. At the moment, the design and construction of the electronic access control system through gates are underway. The gates installation program provides for the gradual installation of control technologies at the access points, between 2021 and 2024. From a technological point of view, it is also envisaged to obtain ministerial permits to operate the gates for the purpose of controlling the ZTL. The necessary assessments will also be carried out on the legal, administrative, as well as technological and operational feasibility regarding the integration of the accessibility control system through the gates and the management system of the electronic Parma transit and parking permit! iMobility. As a temporary / permanent alternative to the electronic / digital control, the control carried out by the operators is envisaged, a solution temporarily hypothesized also for the control of circulation in the area, although it is expected that technological evolution may in the future allow to evolve towards a system control of both accesses and paths.

5. Conclusions and recommendations for innovative low-carbon mobility planning In FUA

Assumptions and evaluation methodology

As anticipated in section 3.1, the simulation model is particularly useful when it is intended to investigate the effects induced on traffic and related emissions of a given measure over time. The case of the Green Area, in particular, requires a medium-term temporal analysis, as it is characterized by a progressive implementation. It should be noted that for the purposes of the analyses carried out, for modelling reasons, it was assumed that the effects generated by the provision are fully observable starting from the calendar year following the changes introduced in October of the years considered, noting that even for 2022 the simulations carried out relate

to the entire year. For the sake of completeness, the effects of the provision were simulated over a 10-year time horizon, from 2020 to 2030.

The fundamental variable around which the modelled scenarios were built is obviously the share of vehicles subject to restriction. The variability of this share over time mainly depends on two factors: the methods and timing of implementation of the provision, chosen by the Administration; and the physiological renewal of the vehicle fleet. To replicate the implementation process of the provision and the users' response in a more realistic way, a series of hypotheses have also been introduced:

1. Each year the Administration grants a fixed percentage of exemptions to the provision, equal to 20%, to all those movements affected by the restriction that originate within the perimeter of the Green Area. In a nutshell, recalling the three-hour period of the movements simulated by the model (07: 00-09: 59), this hypothesis intends to grant a fixed quota of movements, carried out exclusively by residents within the Green Area, the exemption from the restriction;
2. Net of the exceptions, it is assumed that the remaining share of users has a response to the provision based on the discomfort generated by it. In this regard, please note that to reach the destinations inside the Green Area, the measure will require transit through specific corridors, thus changing the choice of the route and the travel time of the move. It was therefore assumed that the response of the user involved depends on his tolerance for the additional delay.

This tolerance threshold, set at 5 minutes, represents the watershed between two types of users:

- For users affected by a delay greater than 5 minutes, two different responses were hypothesized and simulated:
- Assessment of minimal impact: all users decide to renew their vehicle, purchasing one of the EURO classes not affected by the Green Area provision. The consequence of this hypothesis is an important reduction of the pollutants emitted by the vehicles affected by the measure, which see the relative emission coefficient drastically improve;
- Maximum impact assessment: all users decide to abandon the use of their private vehicle to switch to local public transport. This hypothesis actually represents a modal shift from private to public means. In this sub-scenario, the share of emissions produced by the vehicles affected by the restriction is zero, as public transport has absorbed the relative demand.I due sotto-scenari appena descritti rappresentano gli estremi del ventaglio di possibili sotto-scenari all'interno del quale si attesterà la risposta degli utenti nella realtà;
- It has been assumed that users affected by a maximum delay of 5 minutes prefer to tolerate the additional delay rather than renew their vehicle or change modes of transport. This share of travel, which is certainly a minority, represents to all intents and purposes the totality of users of the transit corridors.

In conclusion, year after year, the share of vehicles affected by the restrictions will be the result of the combination of the factors described above.

6. Dissemination and exploitation plans

The process included a participatory workshop to present the Parma Green Area plan and collect information and recommendations from the local community. The administrators of the neighbouring municipalities (FUA), the Mobility Managers of the local companies, the technicians and representatives of the Municipality of Parma, the citizens' committees (CCV) and local trade associations were invited to the meeting. A total of forty people took part in the meeting, representing all categories

The new system for regulating access and circulation within the ring road assumes incremental scenarios for regulating vehicles access up to 2030. The regulations of the plan have already been approved in the City Council and communicated to the citizens with the adoption of a municipal ordinance.

The objective of the participatory meetings is to collect observations and proposals on the Parma Green Area plan that could be received during the monitoring phase of the plan, also to ensure a proper evolutionary alignment.

The opening of the workshop

The day was opened by tiziana benassi, councilor for mobility of the municipality of parma and by nicola ferioli, the manager of the energy and mobility sector of the municipality of parma.

The virtuous path of the municipality of parma to lower the emissions of pollutants into the air began many years ago with the concrete implementation of projects to encourage sustainable mobility and the enhancement of local public transport. The projects have often provided for an active involvement of the local community, and it is in this logic that the municipality has organized this moment of discussion.

During the interventions has been showed two explanatory videos:

- Parma european green capital 2022 - https://www.youtube.com/watch?v=tujjmb8wkh8&t=4s

- Area verde, uno spazio da vivere - https://youtu.be/8imt0ngq_zc

Then the landing page of the Parma green area project was presented: www.areaverdeparma.it. The Parma green area project was presented, and has been showed the main changes in relation to future scenarios, by marco ronchei of the municipality of Parma in collaboration with the consultant roberto zani of tplan consulting. The project can be consulted attached to this document or on https://www.infomobility.pr.it/area-verde/

THE APPROACH OF THE WORKSHOP "AREA VERDE LAB

At this point, the workshop activity and the working method were presented by the facilitators Andrea Panzavolta and Gianluca Ruotolo of FormAttiva.

Two focus groups (of about 20 participants each) were organized, composed in a heterogeneous way, and defined before the day of the event in order to ensure a balance between the subjects representing the invited categories (administrators / technicians and mobility managers, Municipal Police, Subsidiaries, associations of categories, citizens, etc ...).

Each group was led by a facilitator and worked in two distinct environments for about 60 minutes.

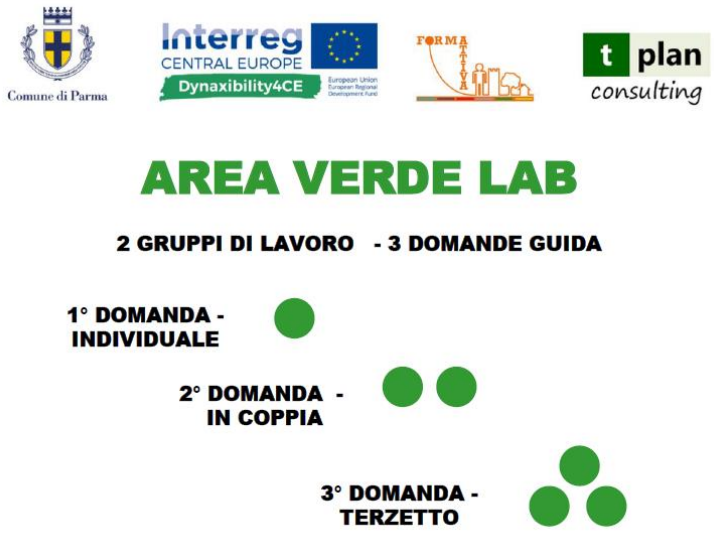
The group work activity involved the interaction of the participants on the basis of the 3 guiding questions:

1. What considerations/evaluations on the effects of the Parma Green Area project?

2. What has been done that goes in the direction of the Parma Green Area project proposal?

3. What solutions can further support the realization of the Parma Green Area project?

The representatives of the Municipality of Parma and Tplan consultants played the role of experts within the two working groups and provided answers to doubts, questions and provided indications for integrating the proposals of the participants with ideas or suggestions.



THE RESULTS OF THE WORKING GROUPS

GROUP 1

Considerations/evaluations on the effects of the Parma Green Area project

Considerations

- It is necessary to drastically reduce the number of vehicles on the road
- The Green Area project is appreciable and to be extended to other municipalities
- 50% of the moving vehicles in Parma are inside the ring road, it is an excessive number
- The increasing elderly population is an element to be evaluated in the choice of regulations
- The pedestrian and the cyclist must be placed "in the center", must be able to move freely and safely in urban spaces
- To date, zones 30 are not respected, vehicles (and couriers) go at a higher speed
- It is necessary to have disaggregated data with respect to surveys on users who use private vehicles and public transport, for example to understand the gender and age of users (as provided for in the home-work plans), also to address the rewards
- Concrete structural interventions are needed to activate the plan, otherwise it will remain "of little substance"
- The cost-benefit analysis of the plan must be better analysed, the inconveniences seem greater than the advantages
- The area affected by the plan is too large
- Ambitious, courageous and far-sighted project
- Social, green and respectful project
- A health protection project

Effects

- Well-being of the population
- Improvement of air quality
- Reduction of pollution
- Improvement of neighborly relations
- Improvement of accessibility
- Greater convenience in travel
- Multimodality
- More alternatives for getting around
- Decrease in traffic and short trips within the urban space
- More space available for pedestrians and bicycles
- Risk of discrimination for certain categories of citizens, for example those with low income and the elderly

Interventions carried out in the direction of the Parma Green Area project proposal

- Expansion of the network of cycle lane and the redevelopment of existing ones
- Dissemination and purchase of new electric vehicles, such as scooters and electric bicycles
- Communication and awareness of sustainable mobility issues
- Rewards aimed at young people, for example to whom join the project of home-school path
- Car sharing and car pooling activities
- Electric taxis
- Taxi sharing
- The constant renewal of the vehicle fleet
- The rewards activated with the app for walking “green apes”
- Rewards activated with “bike work”
- The pedestrianization of the historic center
- The zones 30
- The provision of passes for local public transport for employees coming from outside the city
- The enhancement of local public transport, for example with smaller buses and with trips even in the evening at the weekend
- Green areas and furnishings in urban areas

The solutions to support the implementation of the Parma Green Area project

- Choose priorities for action and implement them with strength and decision
- Focus interventions to reduce small vehicular movements inside the green area
- Activate the Parma Green Area project with an intersectoral approach, involving several sectors of the municipality of Parma, for example mobility, energy, green areas, maintenance, social, etc ...
- Strengthen the role of parking exchanges in relation to the Green Area project and give incentives for their use, for example economic or providing free public transport from them
- Provide an incentive for those who are in difficulty for the purchase of a new car

- Provide incentives for the purchase of electric/ecological vehicles
- Strengthen local public transport, increasing the number of vehicles (decreasing the size) and the frequency of rides
- Communicate the strategies of the plan well and implement them concretely
- Focusing the interventions in "zone 30" as mosaic areas of the Green Area project: investing in actions to ensure compliance with the rules and support policies for the creation of more services for citizens in the "zone 30" areas
- Establish a monitoring group, that involves the main stakeholders and the representatives of the administration, to study how to communicate and adapt the actions implemented
- Provide an exemption for citizens over 70
- Implement a streamlined and rapid accreditation system for access to the gates, or by providing both digital systems and face-to-face services
- Think of practical solutions to verify that the vehicles "on the white list" of car pooling (to date it is an exception to the plan) are checked when accessing the gates

GROUP 2

Considerations/evaluations on the effects of the Parma Green Area project

Considerations

- Make sure that the Green Area Project is linked with the PUG and to the Municipal noise reduction plan
- The Project must integrate with policies/plans related to Local Public Transport and the Mobility Manager
- Effective and incentive management in consideration of the vehicles of work and maintenance systems that will have to be replaced
- Make an evaluation of the project with regard to the winter period: with a harsh climate, the impact on citizens could be critical for the use of alternative to the car (e.g. bikes)
- Provide incentives for companies with respect to corporate policies that favour greater use of smart working (e.g. creation of smart hub working)
- Communicate and explain the project well to the community
- The need for the community to rethink its movements: to use alternative manner to move, alternative to the private car
- Great vision
- It is necessary to have adequate answers for critical issues related to accessibility (ZTL gates)
- An effective study of mobility is necessary for a correct application of the Plan
- Slow assimilation/Graduality of the plan

Effects

- Reduction of noise/acoustic pollution
- Lower environmental impact as long as alternatives and "rewards" are provided
- Wellbeing in people's lives
- Better air quality
- Probable problems related to vehicle replacement, access control and management of exemptions

- Economic hardship especially for the most fragile part of the community, from the socio-economic point of view
- Citizen unable to replace their car
- Damage to trade
- Failure to comply with the time line and milestones set by the plan
- Unsustainable project for businesses (especially small and artisans)
- Interventions carried out in the direction of the Parma Green Area project proposal
- Alternative mobility tools (cycle paths; bike lane; bike to work, etc…)
- Project for freight mobility in the historic center
- Existing ZTL (traffic restricted zone)
- Renewal of the local public transport vehicle fleet
- Good prior communication to citizenship by the administration on the actions/tools that it would have implemented/deployed in favour of mobility

The solutions to support the implementation of the Parma Green Area project

- Increase the number of preferential bus lanes
- Establish a permanent supra-municipal monitoring group (on data and information) of the Green Area plan and possible adaptation of the measures
- Increase the number of charging stations for electric bikes and cars
- Define and implement an incentive system for the change of company fleets aimed in particular at craftsmen/traders
- Provide an integrated IT tool (app) to manage and facilitate the use find travel alternatives to the car (e.g. MAAS)
- Implement alternative solutions for logistics (e.g. Parcel delivery)
- Expand the sharing mobility offer
- Implement the Green Area system in the province of Parma

THE FINAL PLENARY

- A seguire si riportano le risposte dei partecipanti alla plenaria conclusiva.
- During the final plenary, the results of the two working groups were presented and a collective activity was organized to co-define the common elements indicated by the participants. Then the participants used an online pool tool and answered convergent questions with their own devices:
- What priority recommendations to support the Parma Green Area project?
- What struck you about the day (in a word)?
- The responses of the participants in the concluding plenary are reported below.

What priority recommendations to support the Parma Green Area project?

- More incentives for companies that do smart working
- Participation and Co planning with citizens
- Area is not an island, involve the territory and the major traffic routes
- Courage and determination
- Opt for more radical choices aimed at limiting emissions and pollutants as well as the traffic
- Facilitating the reduction of demand along with increasing the variety of integrated supply

- Vehicle monitoring perhaps using OCR cameras
- Few things, but clear
- More communications to inform and raise awareness
- Graduality
- Gradual introduction alongside information
- Really and permanently involve stakeholders in a work group
- Creation and monitoring group with local contacts
- Electric infrastructure
- Implement free and electric transport from the parking lots
- Monitoring of the plan and possible adaptation of measures
- Evaluate the cases of those who access in few cases or that are owner of old vehicles, eg. allowing access even for a fee
- Data of users disaggregated by gender, age, geographical origin. Taking care of the differences and defining policies in related to the people.
- Incentives to companies for changing vehicles
- Communication, rewards for citizens and alternative mobility services

What struck you about the day?

- Sharing
- Participation
- Planning
- Systemic
- Constructive comparison
- Competence
- Freedom of expression
- Change
- Interaction